

2021 Edition

**IGCSE
CHEMISTRY
0620
Paper 2**

**Years
2012-2020**

**Unsolved Topical
Past Papers with Marking
Schemes All Variants**

Muz Vines

IGCSE O LEVEL CHEMISTRY TOPICAL PAPER 2

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TOPICAL PAPERS

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The Periodic Table of Elements

I		II		Group												VIII		VII		VI		V		IV		III	
				1		2		3		4		5		6		7		8		9		10		He helium 4			
				H hydrogen 1		He helium 4																					
				atomic number		atomic symbol																					
3	Li	4	Be	beryllium 9																							
11	Na	12	Mg	magnesium 24																							
19	K	20	Ca	calcium 40	21	Sc	titanium 45	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr					
37	Rb	38	Sr	strontium 88	39	Y	yttrium 89	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe					
55	Cs	56	Ba	barium 137	57-71	lanthanoids	hafnium 178	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn					
87	Fr	88	Ra	radium -	89-103	actinoids	rutherfordium -	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Rf	Fr	Atmospheric -	As	Radon -						
Key																											
atomic number name relative atomic mass																											

57	La	58	Ce	59	Pr	60	Nd	61	Pm	62	Sm	63	Eu	64	Gd	65	Tb	66	Dy	67	Ho	68	Er	69	Tm	70	Yb	71	Lu
	lanthanum 139		cerium 140		praseodymium 141		neodymium 144		promethium -		europium 150		gadolinium 157		terbium 159		dysprosium 163		holmium 165		erbium 167		ytterbium 173		thulium 169		ytterbium 175		
89	Ac	90	Th	91	Pa	92	U	93	Np	94	Pu	95	Am	96	Cm	97	Bk	98	Cf	99	Fm	100	Md	101	No	102	Lr	103	lawrencium -

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

[0620/01/M/J/07/Q1]

Q1.

When there is no wind, the scent of flowers can be detected more easily on a warm evening than on a cold evening.

This is because the molecules of the scent1.....2..... than in colder conditions.

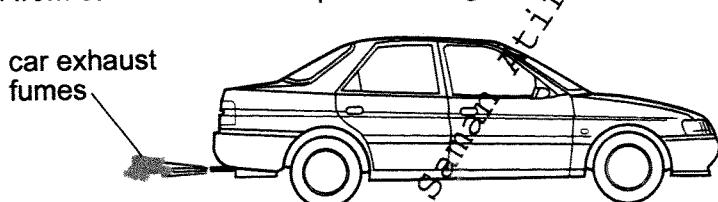
Which words correctly complete gaps 1 and 2?

	gap 1	gap 2
A	condense	nearer to the flowers
B	condense	further from the flowers
C	diffuse	nearer to the flowers
D	diffuse	further from the flowers

[0620/01/O/N/07/Q1]

Q2.

Oxides of nitrogen from car exhausts can spread through the atmosphere.



This occurs because gas molecules move from a region of1..... concentration to a region of2..... concentration by a process called3..... .

Which words correctly complete the gaps?

	1	2	3
A	high	low	diffusion
B	high	low	evaporation
C	low	high	diffusion
D	low	high	evaporation

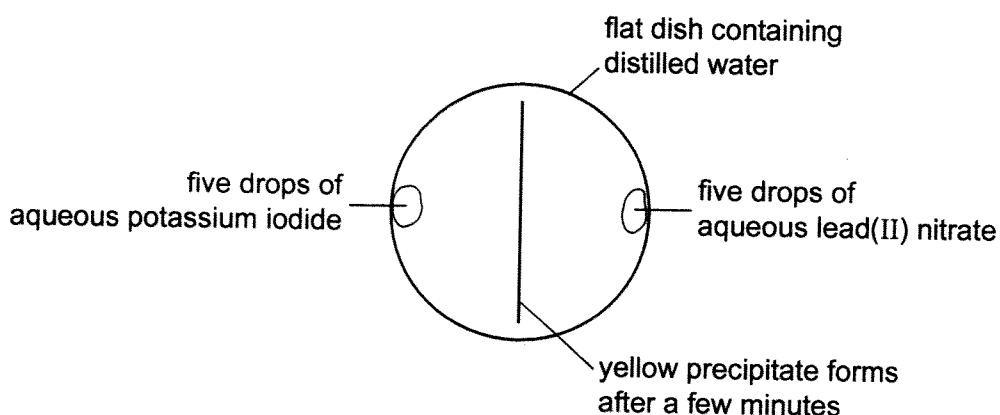
[0620/01/O/N/08/Q1]

Q3.

In which substance are the particles furthest apart at room temperature?

- A ethanol
- B methane
- C salt
- D sugar

Q4. A yellow precipitate is formed in the experiment shown.



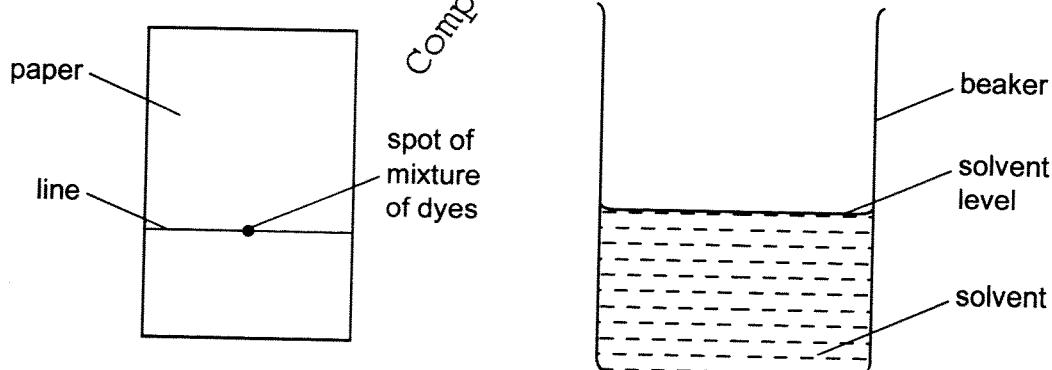
How is the precipitate formed?

- A Particles collide, diffuse and then react.
- B Particles collide, react and then diffuse.
- C Particles diffuse, collide and then react.
- D Particles diffuse, react and then collide

Q5.

[0620/01/O/N/08Q2]

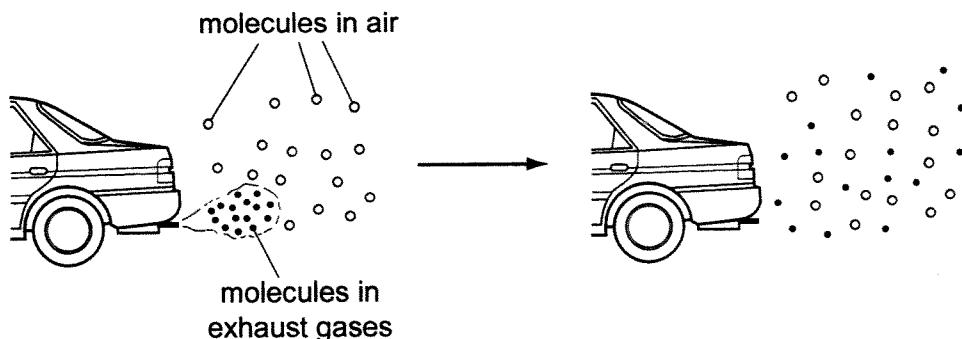
An experiment is carried out to separate a mixture of two dyes. A line is drawn on a piece of chromatography paper and a spot of the dye mixture placed on it. The paper is dipped into a solvent and left for several minutes.



Which statement about this experiment is correct?

- A The dyes must differ in their boiling points.
- B The dyes must differ in their solubilities in the solvent.
- C The line must be drawn in ink.
- D The line must be placed below the level of the solvent.

Q6. The diagram shows how the molecules in the exhaust gases diffuse into the air.

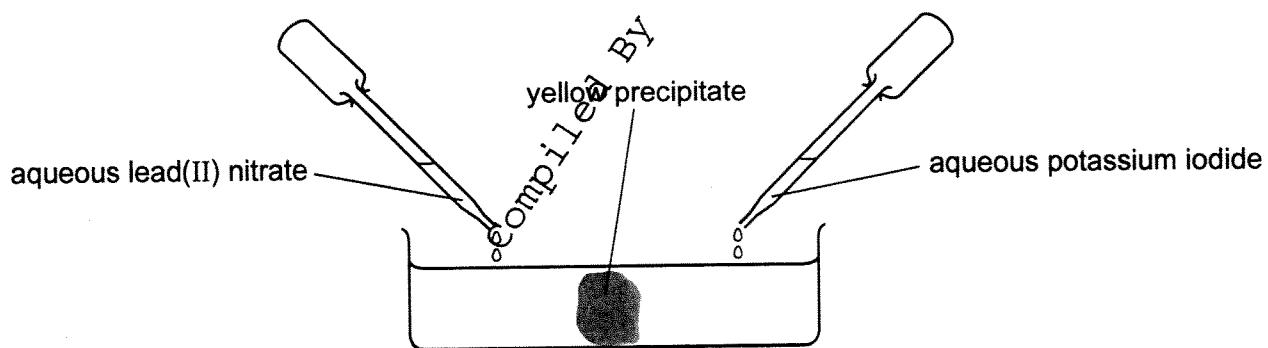


Which statement describes what happens to these molecules next?

- A The molecules fall to the ground because they are heavier than air molecules.
- B The molecules go back together as they cool.
- C The molecules spread further into the air.
- D The molecules stay where they are.

Q7.

Aqueous lead(II) nitrate and aqueous potassium iodide are added to a dish containing water, as shown.



A yellow precipitate forms after a few minutes.

Which process occurs before the precipitate forms?

- A diffusion
- B distillation
- C fermentation
- D filtration

IGCSE Chemistry Topical Paper 2 Topic 1 : The Particulate Nature of Matter

Q8.

[0620/12/M/J/10/Q1]

The diagram shows a cup of tea.



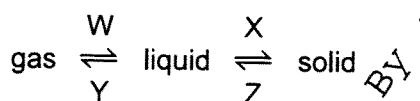
Which row describes the water particles in the air above the cup compared with the water particles in the cup?

	moving faster	closer together
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

[0620/12/O/N/10/Q1]

Q9.

In which changes do the particles move further apart?



A W and X

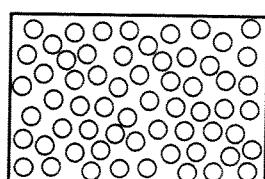
B W and Z

D Y and Z

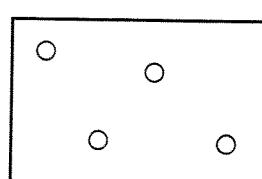
Q10.

[0620/12/M/J/11/Q1]

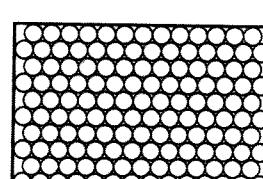
The diagrams show the arrangement of particles in three different physical states of substance X.



state 1



state 2



state 3

Which statement about the physical states of substance X is correct?

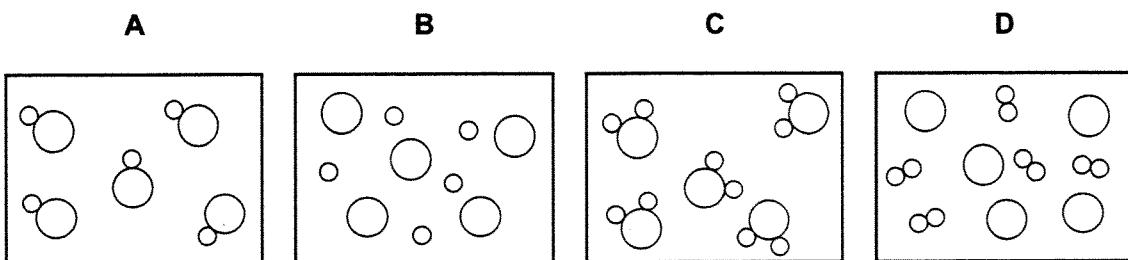
- A Particles in state 1 vibrate about fixed positions.
- B State 1 changes to state 2 by diffusion.
- C State 2 changes directly to state 3 by condensation.
- D The substance in stage 3 has a fixed volume.

Q11.

[0620/12/M/J/11/Q2]

In the diagrams, circles of different sizes represent atoms of different elements.

Which diagram represents hydrogen chloride gas?



Q12.

[0620/12/O/N11/Q1]

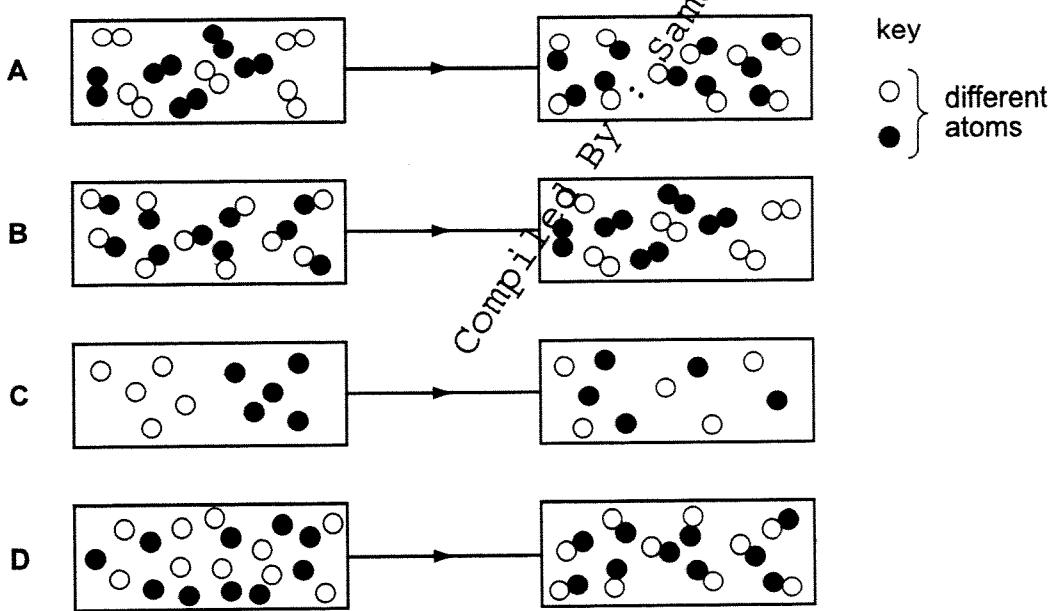
In which substance are the particles close together and slowly moving past each other?

- A air
- B ice
- C steam
- D water

Q13.

[0620/11/M/J/12/Q1]

Which diagram shows the process of diffusion?



Q14.

[0620/13/O/N/12/Q1]

'Particles moving **very slowly** from an area of high concentration to an area of low concentration.'

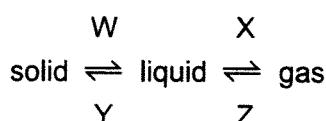
Which process is being described above?

- A a liquid being frozen
- B a solid melting
- C a substance diffusing through a liquid
- D a substance diffusing through the air

Q15.

[0620/12/O/N/12/Q1]

What are the processes W, X, Y and Z in the following diagram?



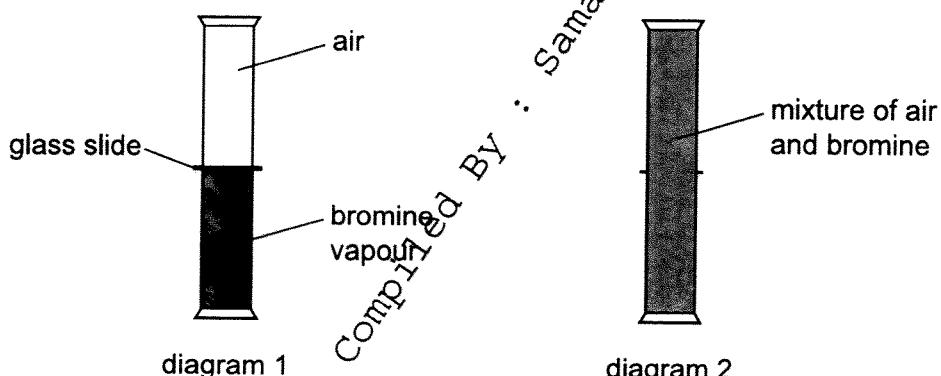
	W	X	Y	Z
A	condensing	boiling	freezing	melting
B	condensing	freezing	melting	boiling
C	melting	boiling	freezing	condensing
D	melting	freezing	condensing	boiling

Q16.

[0620/13/O/N/13/Q1]

A gas jar of bromine vapour and a gas jar of air are set up as shown in diagram 1.

The glass slide is removed. Diagram 2 shows the appearance of the gas jars after one hour.



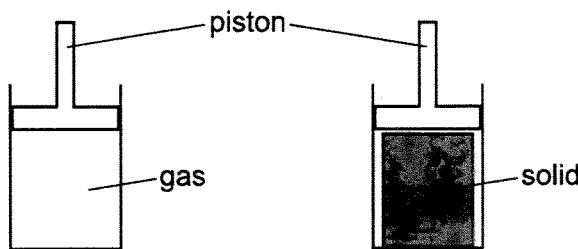
Which statement explains why the bromine and air mix together?

- A Bromine is denser than air.
- B Bromine is lighter than air.
- C Bromine molecules moved upwards and molecules in air moved downwards.
- D Molecules in bromine and air moved randomly.

Q17.

[0620/12/O/N/13/Q1]

An attempt was made to compress a gas and a solid using the apparatus shown.



Which substance would be compressed and what is the reason for this?

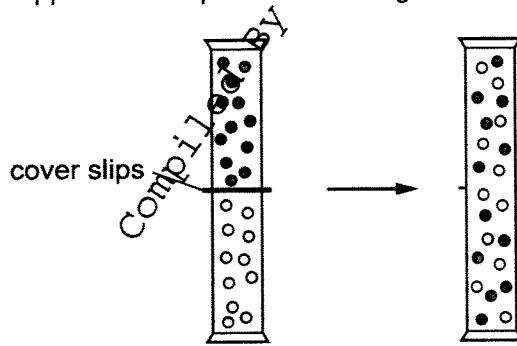
	substance	reason
A	gas	the gas particles are close together
B	gas	the gas particles are far apart
C	solid	the solid particles are close together
D	solid	the solid particles are far apart

0620/12/M/J/14/Q1

Q18.

Two gas jars each contain a different gas. The gas jars are connected and the cover slips are removed.

The diagram shows what happens to the particles of the gases.



Which process has occurred?

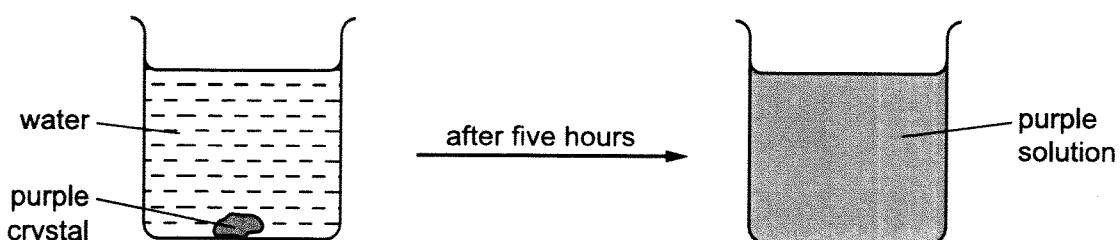
- A chemical reaction
- B condensation
- C diffusion
- D evaporation

IGCSE Chemistry Topical Paper 2 Topic 1 : The Particulate Nature of Matter

Q19.

[0620/11/M/J/[14/Q1]

The diagram shows the result of dropping a purple crystal into water.



Which processes take place in this experiment?

	chemical reaction	diffusing	dissolving
A	✓	✓	✓
B	✓	✗	✓
C	✗	✗	✓
D	✗	✓	✓

Q20.

[0620/13/O/N/14/Q1]

A few drops of perfume were spilt on the floor. A few minutes later the perfume could be smelt a few metres away.

Which two processes had taken place?

- A distillation and condensation
- B distillation and diffusion
- C evaporation and condensation
- D evaporation and diffusion

Q21.

[0620/12/O/N/14/Q2]

Which statement is an example of diffusion?

- A A kitchen towel soaks up some spilt milk.
- B Ice cream melts in a warm room.
- C Pollen from flowers is blown by the wind.
- D The smell of cooking spreads through a house.

[0620/11/O/N/14/Q1]

Q22. Which statement is an example of diffusion?

- A A kitchen towel soaks up some spilt milk.
- B Ice cream melts in a warm room.
- C Pollen from flowers is blown by the wind.
- D The smell of cooking spreads through a house.

[0620/13/M/J/15/Q1]

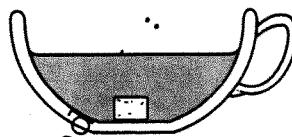
Q23. A sugar cube is dropped into a hot cup of tea.

The tea is not stirred.

Which statement explains why the tea becomes sweet?

- A The heated water molecules penetrate the sugar cube.
- B The hot tea causes the sugar to melt.
- C The sugar cube dissolves and its molecules diffuse.
- D The sugar molecules get hot and evaporate.

0620/12/M/J/15/Q1

Q24. The diagram shows a sugar lump in a cup of tea.

Which two processes must happen to spread the sugar evenly in the tea?

	first process	second process
A	diffusion	dissolving
B	dissolving	diffusion
C	dissolving	melting
D	melting	diffusion

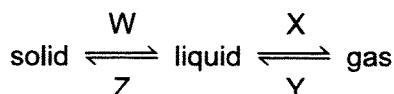
[0620/13/O/N/15/Q1]

Q25. In which process do particles move closer together but remain in motion?

- A condensation
- B diffusion
- C evaporation
- D freezing

[0620/11/M/J/15/Q1]

Q26. The changes that occur when a substance changes state are shown below.



Which process, W, X, Y or Z, is occurring in the following four situations?

- 1 Butter melts on a warm day.
- 2 Water condenses on a cold surface.
- 3 The volume of liquid ethanol in an open beaker reduces.
- 4 Ice forms inside a freezer.

	1	2	3	4
A	W	X	Y	Z
B	W	Y	X	Z
C	X	Y	Z	W
D	X	Z	Y	W

[0620/12/O/N/15/Q1]

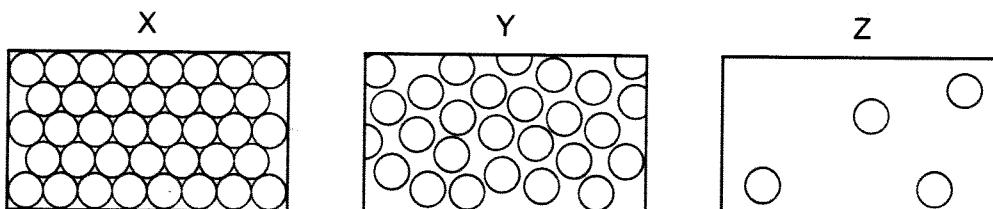
Q27. Which change of state takes place during evaporation?

- A gas to liquid
- B liquid to gas
- C liquid to solid
- D solid to gas

Compiled By
Saman Atif

[0620/11/O/N/15/Q1]

Q28. Diagrams X, Y and Z represent the three states of matter.



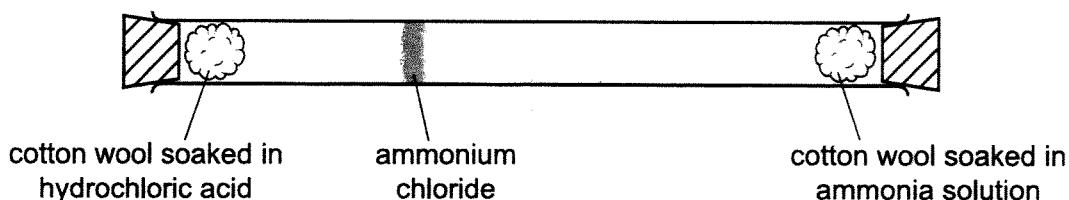
Which change occurs during boiling?

- A X to Y
- B Y to Z
- C Z to X
- D Z to Y

Q29.

[0620/23/M/J/16/Q1]

The diagram shows an experiment to demonstrate diffusion.



Which statement explains why the ring of ammonium chloride appears as shown?

- A Ammonia solution only produces a gas which moves until it meets the hydrochloric acid.
- B Both solutions produce a gas, but ammonia moves quicker than hydrogen chloride because it is lighter.
- C Hydrochloric acid produces hydrogen chloride which stays at one end of the tube until the ammonia reaches it.
- D The two solutions run along the tube until they meet.

Q30.

[062/22/M/J/16/Q1]

The particles of a substance gain energy and change from a regular ordered structure to a disordered structure with large distances between the particles.

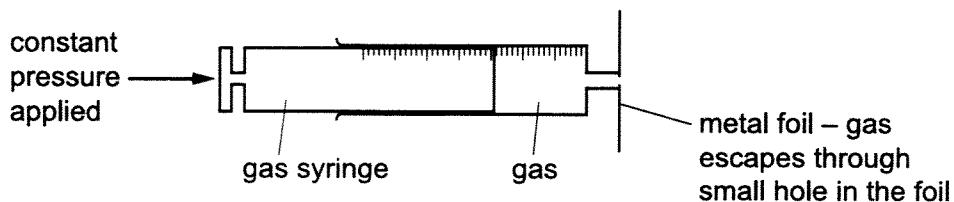
Which change of state is described?

- A boiling
- B evaporation
- C melting
- D sublimation

Q31.

[0620/21/M/J/16/Q1]

The rate of diffusion of two gases, methane, CH_4 , and ethene, C_2H_4 , is measured using the apparatus shown.



Which gas diffuses faster and why?

	gas that diffuses faster	reason
A	ethene	Ethene molecules are heavier and so move faster.
B	ethene	Ethene molecules have a double bond which makes them more reactive.
C	methane	Methane molecules are lighter and so move faster.
D	methane	Methane molecules are smaller so they can get out of the small hole more easily.

Q32.

[0620/21/O/N/16/Q1]

'Particles moving very slowly from an area of higher concentration to an area of lower concentration.'

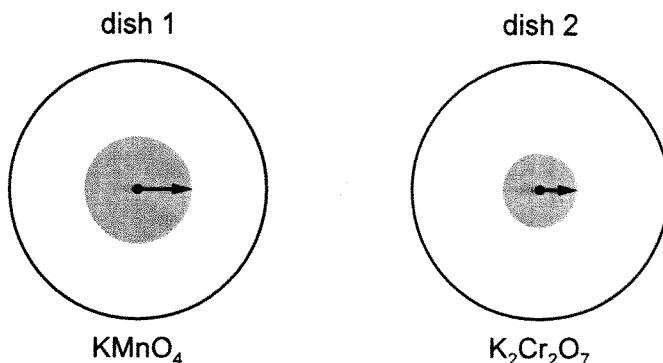
Which process is being described? *Compressed air*

- A a liquid being frozen
- B a solid melting
- C a substance diffusing through a liquid
- D a substance diffusing through the air

Q33.

Small crystals of purple KMnO_4 ($M_r = 158$) and orange $\text{K}_2\text{Cr}_2\text{O}_7$ ($M_r = 294$) were placed at the centres of separate petri dishes filled with agar jelly. They were left to stand under the same physical conditions.

After some time, the colour of each substance had spread out as shown.



The lengths of the arrows indicate the relative distances travelled by particles of each substance.

Which statement is correct?

- A Diffusion is faster in dish 1 because the mass of the particles is greater.
- B Diffusion is faster in dish 2 because the mass of the particles is greater.
- C Diffusion is slower in dish 1 because the mass of the particles is smaller.
- D Diffusion is slower in dish 2 because the mass of the particles is greater.

Q34.

Which process causes the greatest increase in the distance between particles?

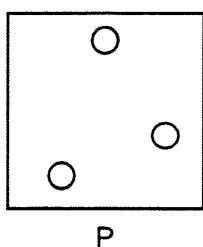
- A condensation
- B freezing
- C melting
- D sublimation

IGCSE Chemistry Topical Paper 2 Topic 1 : The Particulate Nature of Matter

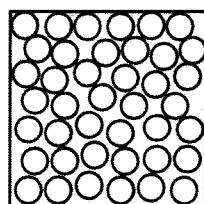
Q35.

[0620/22/O/N/17/Q1]

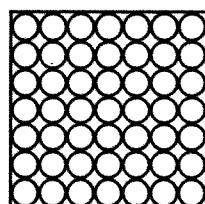
The diagram shows the arrangement of particles in the three states of matter.



P



Q



R

Solid carbon dioxide (dry ice) sublimes to gaseous carbon dioxide.

Which row describes the initial and final states?

	initial state	final state
A	P	R
B	Q	P
C	R	P
D	R	Q

Q36.

[0620/23/O/N/17/Q1]

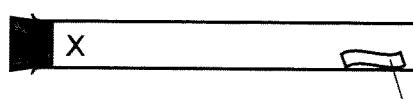
Which statement describes sublimation?

- A Particles moving slowly past each other speed up and move further apart.
- B Particles vibrating next to each other become mobile and move slowly past each other.
- C Particles vibrating next to each other start to move rapidly and move further apart.
- D Rapidly moving particles slow down and move closer together.

Q37.

[0620/22/M/J/18/Q1]

A gas is released at point X in the apparatus shown.



damp Universal Indicator paper

Which gas turns the damp Universal Indicator paper red most quickly?

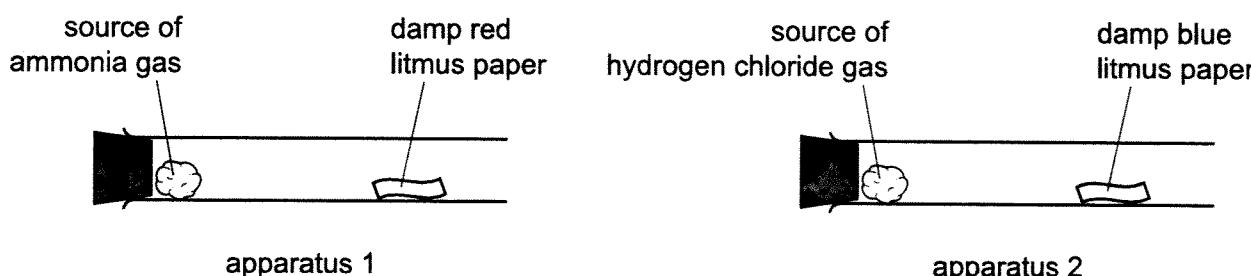
- A ammonia, NH_3
- B chlorine, Cl_2
- C hydrogen chloride, HCl
- D sulfur dioxide, SO_2

Q38.

[0620/21/M/J/18/Q1]

A student investigated the diffusion of ammonia gas, NH_3 , and hydrogen chloride gas, HCl .

Two sets of apparatus were set up as shown at room temperature and pressure.



The damp red litmus paper in apparatus 1 changed colour after 30 seconds.

How long does it take for the damp blue litmus paper to change colour in apparatus 2?

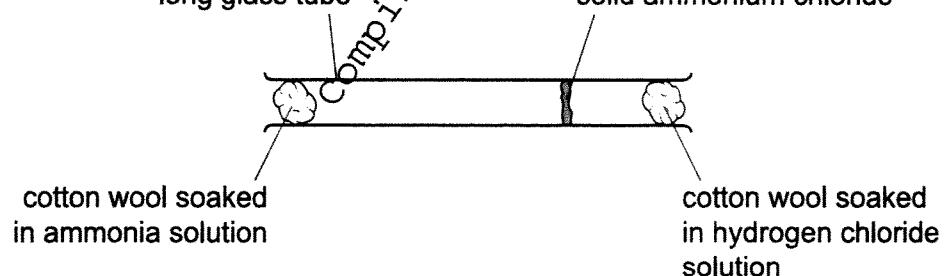
- A 64 seconds
 - B 30 seconds
 - C 21 seconds
 - D The blue litmus paper would not change colour.

Q39.

10620/23/M/J/18/0

Ammonia gas is reacted with hydrogen chloride gas using the apparatus shown.

Solid ammonium chloride is produced.



Which statement explains why the solid ammonium chloride is formed nearer to the hydrogen chloride?

- A Ammonia solution is a base and hydrogen chloride solution is an acid.
 - B Ammonia molecules diffuse more slowly than hydrogen chloride molecules.
 - C Hydrogen chloride has a greater molecular mass than ammonia.
 - D Hydrogen chloride moves by Brownian motion.

[0620/21/O/N/18/Q1]

Q40.

When smoke particles are observed with a microscope they are seen to move around randomly. This is called Brownian motion.

What causes Brownian motion?

- A diffusion of the smoke particles
- B molecules in the air hitting the smoke particles
- C sublimation of the smoke particles
- D the smoke particles hitting the walls of the container

Q41.

[0620/22/O/N/2018/Q1]

Oxygen and fluorine are gaseous elements next to each other in the Periodic Table.

Under the same conditions of temperature and pressure, oxygen diffuses1..... than fluorine because its2..... is less than that of fluorine.

Which words correctly complete gaps 1 and 2?

	1	2
A	faster	molecular mass
B	faster	reactivity
C	slower	molecular mass
D	slower	reactivity

Q42.

[0620/23/O/N/2018/Q1]

Gases are separated from liquid air by fractional distillation. The boiling points of four gases are shown.

Which gas is both monatomic and a liquid at -200°C ?

	gas	boiling point/ $^{\circ}\text{C}$
A	argon	-186
B	helium	-269
C	neon	-246
D	nitrogen	-196

Q43.

[0620/21/M/J/2019/Q1]

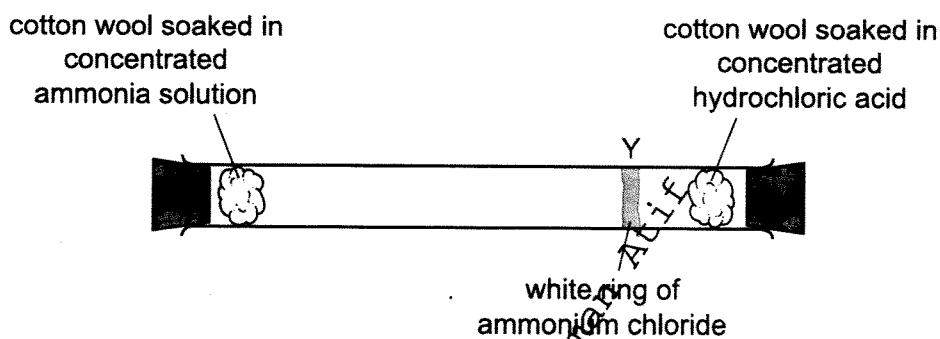
Which statement explains why ammonia gas, NH_3 , diffuses at a faster rate than hydrogen chloride gas, HCl ?

- A Ammonia expands to occupy all of the space available.
- B Ammonia has a smaller relative molecular mass than hydrogen chloride.
- C Ammonia is an alkali and hydrogen chloride is an acid.
- D Ammonia molecules diffuse in all directions at the same time.

Q44.

[0620/22/M/J/2019/Q1]

The apparatus shown is set up. After 20 minutes a white ring of ammonium chloride is seen at position Y.



Which statement about the molecules of ammonia and hydrogen chloride is correct?

- A Molecules in ammonia have a larger M_r than molecules of hydrogen chloride and so they move more slowly.
- B Molecules in ammonia have a larger M_r than molecules of hydrogen chloride and so they move more quickly.
- C Molecules in ammonia have a smaller M_r than molecules of hydrogen chloride and so they move more slowly.
- D Molecules in ammonia have a smaller M_r than molecules of hydrogen chloride and so they move more quickly.

Q45.

[0620/21/O/N/2019/Q1]

Samples of four gases are released in a room at the same time.

The gases are carbon dioxide, CO_2 , hydrogen chloride, HCl , hydrogen sulfide, H_2S , and nitrogen dioxide, NO_2 .

Which gas diffuses fastest?

- A carbon dioxide
- B hydrogen chloride
- C hydrogen sulfide
- D nitrogen dioxide

Q46.

[0620/22/O/N/2019/Q1]

The rate of diffusion of a gas depends on its molecular mass and the temperature.

Which combination of molecular mass and temperature gives the slowest rate of diffusion?

	molecular mass	temperature
A	high	high
B	high	low
C	low	high
D	low	low

Q47.

[0620/23/O/N/2019/Q1]

Which two gases will diffuse at the same rate, at the same temperature?

- A carbon monoxide and carbon dioxide
- B carbon monoxide and nitrogen
- C chlorine and fluorine
- D nitrogen and oxygen

Q48.

[0620/22/M/J/2020/Q1]

A mixture of ice and water is left to stand and the ice melts.

Which row describes what happens as the ice is melting?

	temperature of mixture	energy changes
A	increases	average kinetic energy of particles increases
B	increases	energy is used to overcome attractive forces
C	stays the same	average kinetic energy of particles increases
D	stays the same	energy is used to overcome attractive forces

Q49.

[0620/22/O/N/2020/Q1]

Which gas has the slowest rate of diffusion?

- A H₂
- B NH₃
- C CH₄
- D CO₂

Q50.

[0620/23/O/N/2020/Q2]

When a dark grey solid element is heated, it changes directly into a purple gas.

Which word describes this change?

- A boiling
- B evaporation
- C melting
- D sublimation

Q1.

[0620/13/O/N/12/Q2]

Solid W melts at exactly 54 °C and boils at exactly 302 °C.

Solid X, when dissolved in water and examined using paper chromatography, shows a blue colour and a red colour.

Which row is correct?

	contains only one substance	contains more than one substance
A	W and X	-
B	W	X
C	X	W
D	-	W and X

Q2.

[90620/12/O/N/12/Q3]

A mixture of sulfur and iron filings needs to be separated. The solubilities of sulfur and iron filings in water and carbon disulfide are shown in the table below.

	solubility in water	solubility in carbon disulfide
sulfur	x	✓
iron filings	x	x

What are possible methods of separating the sulfur and iron filings?

	using water	using carbon disulfide	using a magnet
A	✓	✓	x
B	x	✓	✓
C	✓	x	✓
D	x	✓	x

Q3.

[0620/12/O/N/12/Q2]

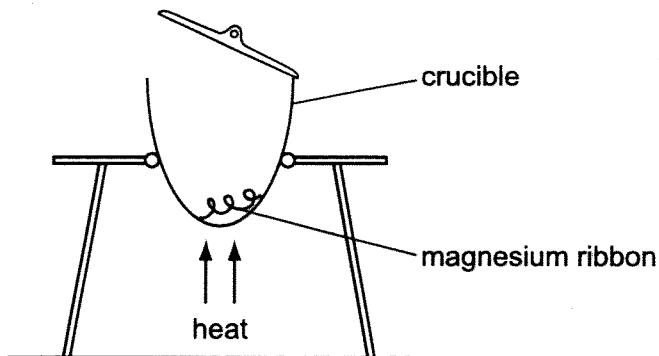
Part of the instructions in an experiment reads as follows.

Quickly add 50 cm³ of acid.

What is the best piece of apparatus to use?

- A a burette
- B a conical flask
- C a measuring cylinder
- D a pipette

Q4. The diagram shows an experiment to find the formula of magnesium oxide.



Which piece of apparatus would be needed in addition to those shown?

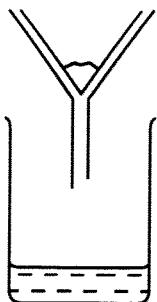
- A a balance
- B a measuring cylinder
- C a spatula
- D a thermometer

[0620/12/M/J/13/Q3]

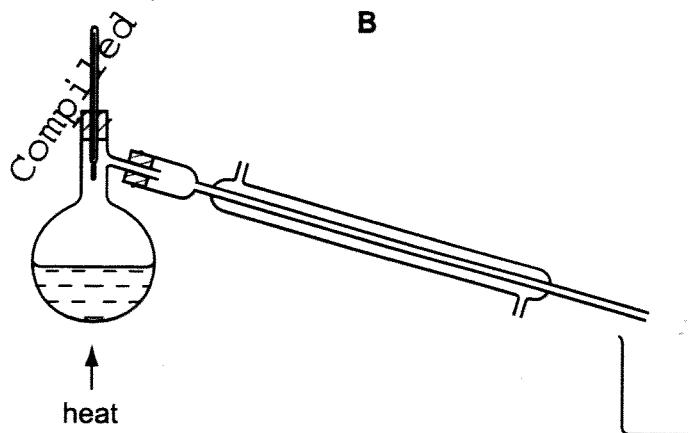
Q5. Methanol, CH_3OH , and ethanol, $\text{C}_2\text{H}_5\text{OH}$, are miscible liquids.

Which diagram shows apparatus that is used to obtain methanol from a mixture of ethanol and methanol?

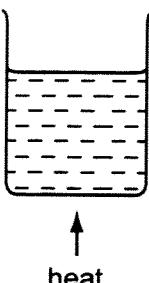
A



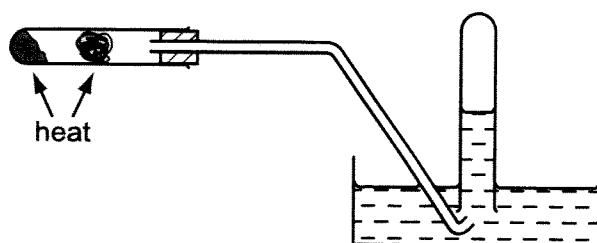
B



C



D



Q6.

Crystals of sodium chloride were prepared by the following method.

- 1 25.0 cm³ of dilute hydrochloric acid was accurately measured into a conical flask.
- 2 Aqueous sodium hydroxide was added until the solution was neutral. The volume of aqueous sodium hydroxide added was measured.
- 3 The solution was evaporated and the crystals washed with approximately 15 cm³ of water.

Which row shows the pieces of apparatus used to measure the 25.0 cm³ of hydrochloric acid, the volume of aqueous sodium hydroxide and the 15 cm³ of water?

	25.0 cm ³ of hydrochloric acid accurately	the volume of aqueous sodium hydroxide added	15 cm ³ of water approximately
A	burette	pipette	measuring cylinder
B	measuring cylinder	burette	pipette
C	pipette	burette	measuring cylinder
D	pipette	measuring cylinder	burette

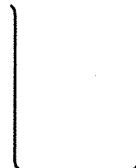
Q7.

[0620/11/M/J/13/Q2]

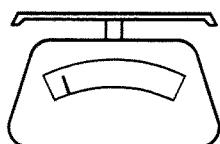
Lead iodide is insoluble in water.

Lead iodide is made by adding aqueous lead nitrate to aqueous potassium iodide.

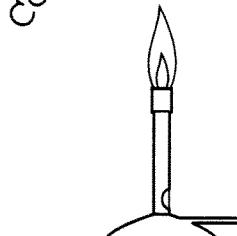
Which pieces of apparatus are needed to obtain solid lead iodide from 20 cm³ of aqueous lead nitrate?



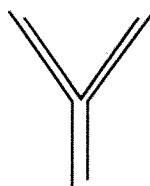
1



2



3



4



5

A 1, 2 and 4

B 1, 3 and 5

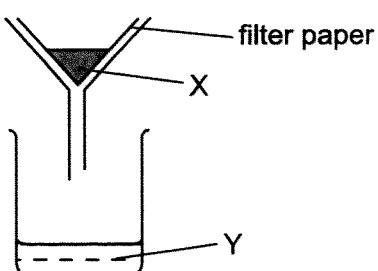
C 1, 4 and 5

D 2, 4 and 5

Q8.

[0620/13/O/N/13/Q2]

The diagram shows a method for separating a substance that contains X and Y.



Which types of substance can be separated as shown?

- A compounds
- B elements
- C mixtures
- D molecules

Q9.

[0620/12/O/N/13/Q2]

A student measures the rate of two reactions.

In one reaction, there is a change in mass of the reactants during the reaction.

In the second reaction, there is a change in temperature during the reaction.

Which piece of apparatus would be essential in both experiments?

- A balance
- B clock
- C pipette
- D thermometer

Q10.

[0620/12/M/J/14/Q3]

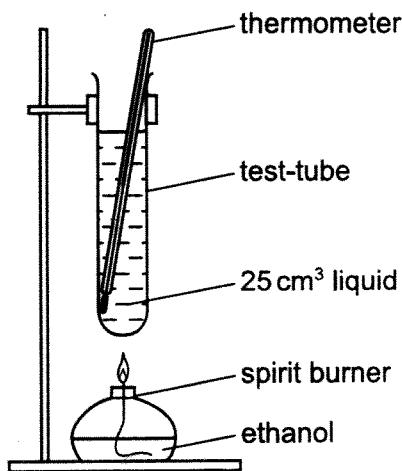
Which two methods can be used to separate a salt from its solution in water?

- 1 crystallisation
 - 2 decanting
 - 3 distillation
 - 4 filtration
- | | | | | | | | |
|----------|---------|----------|---------|----------|---------|----------|---------|
| A | 1 and 2 | B | 1 and 3 | C | 2 and 3 | D | 3 and 4 |
|----------|---------|----------|---------|----------|---------|----------|---------|

[0620/12/M/J/14/Q2]

Q11.

A liquid is heated until it boils.



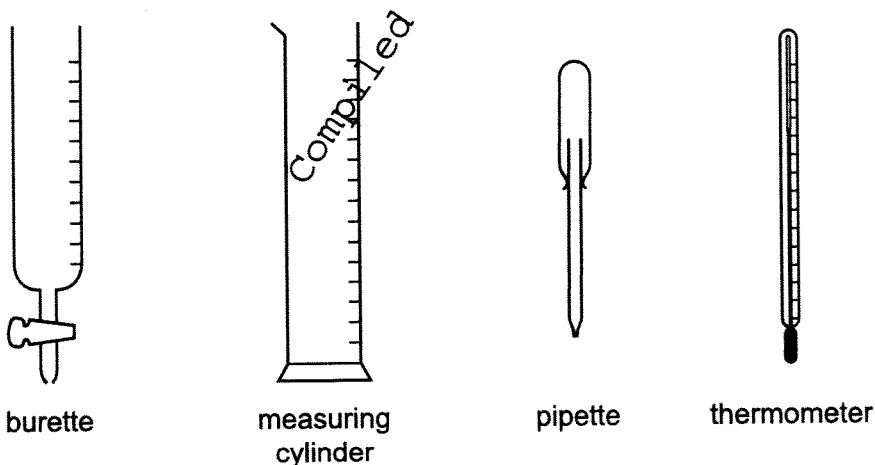
Which result shows that the liquid in the test-tube is pure water?

- A Condensation forms at the top of the test-tube.
- B Steam is produced.
- C The thermometer reads 100 °C.
- D There is nothing left behind in the test-tube.

Q12.

[0620/11/M/J/14/Q2]

The four pieces of apparatus shown below are used in chemical experiments.



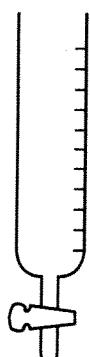
Which statement about the apparatus is correct?

- A The burette measures the volume of liquid added in a titration.
- B The measuring cylinder measures the mass of a substance used in an experiment.
- C The pipette measures the volume of gas given off in a reaction.
- D The thermometer measures the density of a solution.

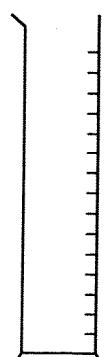
Q13.

[0620/11/M/J/14/Q2]

The four pieces of apparatus shown below are used in chemical experiments.



burette



measuring cylinder



pipette



thermometer

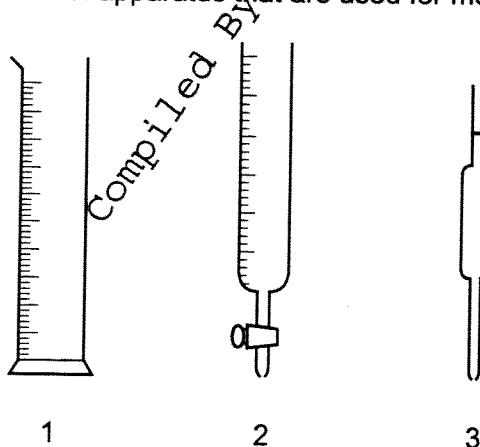
Which statement about the apparatus is correct?

- A The burette measures the volume of liquid added in a titration.
- B The measuring cylinder measures the mass of a substance used in an experiment.
- C The pipette measures the volume of gas given off in a reaction.
- D The thermometer measures the density of a solution.

Q14.

[0620/13/O/N/14/Q2]

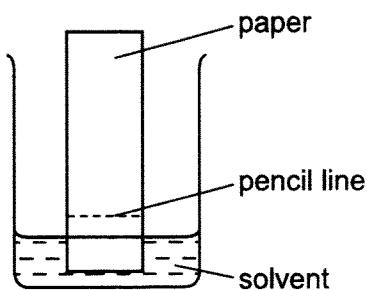
The diagram shows three pieces of apparatus that are used for measuring the volume of a liquid.



What are these pieces of apparatus?

	1	2	3
A	burette	measuring cylinder	pipette
B	burette	pipette	measuring cylinder
C	measuring cylinder	burette	pipette
D	measuring cylinder	pipette	burette

Q15. A student is investigating a coloured mixture using chromatography.

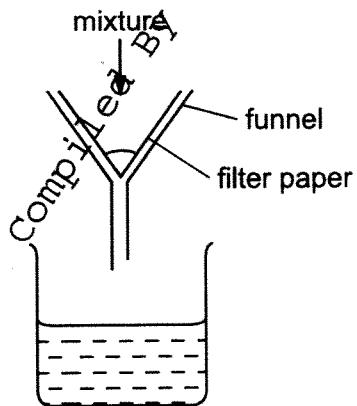


Where should he place the coloured mixture?

- A in the solvent
- B just above the pencil line
- C just below the pencil line
- D on the pencil line

[0620/12/O/N/14/Q3]

Q16. A mixture is separated using the apparatus shown.



What is the mixture?

- A aqueous copper chloride and copper
- B aqueous copper chloride and sodium chloride
- C ethane and methane
- D ethanol and water

[0620/12/O/N/14/Q1]

Q17. Ethanol is made by fermentation.

How is ethanol obtained from the fermentation mixture?

- A chromatography
- B crystallisation
- C electrolysis
- D fractional distillation

[0620/13/M/J/15/Q2]

Q18. A blue solid, X, is soluble in water.

Which method is used to obtain pure solid X from an aqueous solution?

- A chromatography
- B crystallisation
- C filtration
- D neutralisation

[0620/12/M/J/15/Q2]

Q19. The results of some tests on a colourless liquid X are shown.

- Boiling point = 102°C
- Universal Indicator turns green

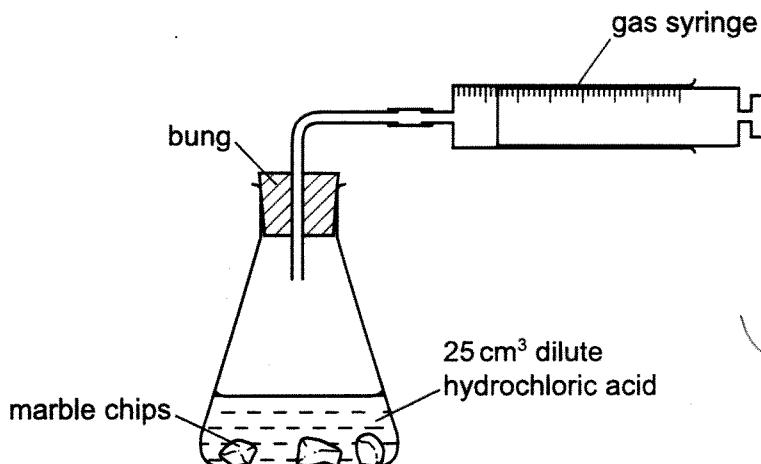
What is X?

- A ethanol
- B hydrochloric acid
- C pure water
- D sodium chloride (salt) solution

Q20.

[0620/11/M/J/15/Q2]

A student uses the apparatus shown in the diagram below to measure the volume of carbon dioxide gas made when different masses of marble chips are added to 25 cm³ of dilute hydrochloric acid.



Which other items of apparatus are needed?

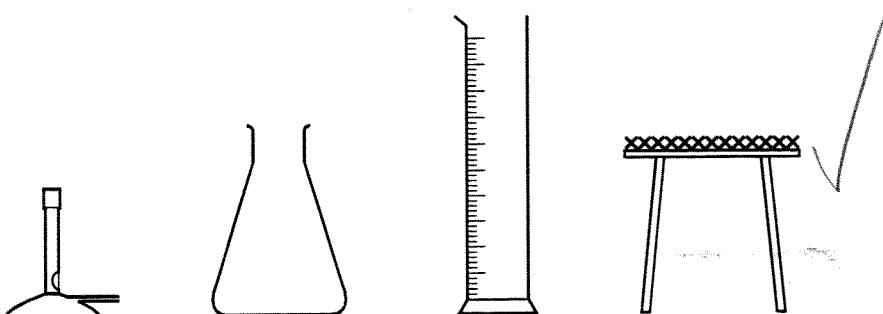
- A funnel and balance
- B funnel and stopwatch
- C measuring cylinder and balance
- D measuring cylinder and stopwatch

Q21.

[0620/13/O/N/15/Q2]

A student was asked to measure the rate of reaction between dilute hydrochloric acid and marble chips at different temperatures.

Some of the apparatus used is shown.



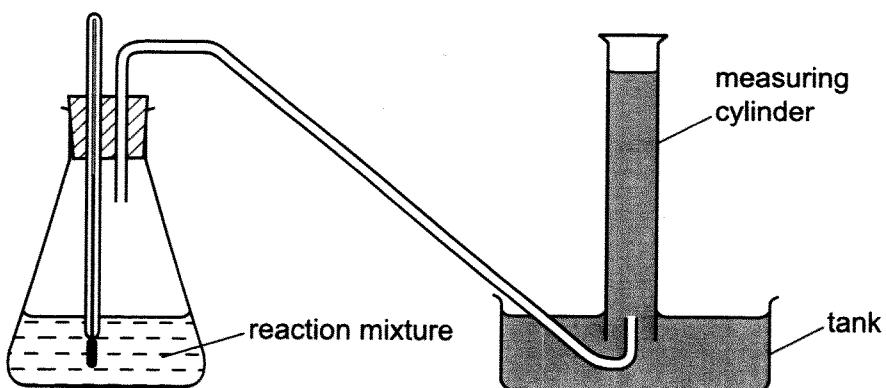
Which two other pieces of apparatus would be needed?

- A balance and pipette
- B balance and stopclock
- C beaker and stopclock
- D burette and pipette

Q22.

[0620/12/O/N/15/Q2]

The diagram shows apparatus being used to demonstrate how the rate of a chemical reaction changes with temperature.



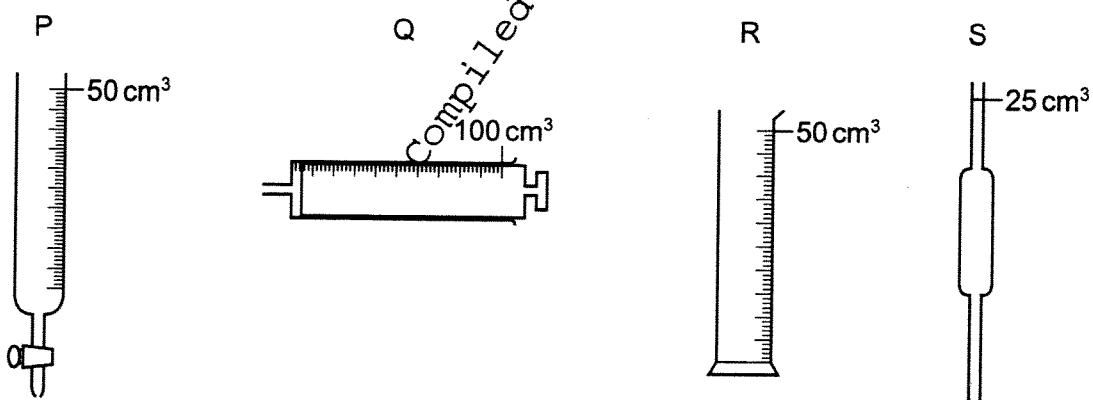
Which statement must be correct?

- A The reaction is endothermic.
- B The reaction is exothermic.
- C The reaction produces a gas.
- D The reaction produces an acid.

Q23.

[0620/11/O/N/15/Q2]

P, Q, R and S are pieces of apparatus.



Which row describes the correct apparatus for the measurement made?

	apparatus	measurement made
A	P	the volume of acid added to alkali in a titration
B	Q	1 cm ³ of acid to add to calcium carbonate in a rate-determining experiment
C	R	75 cm ³ of a gas given off in a rate-determining experiment
D	S	20 cm ³ of alkali for use in a titration

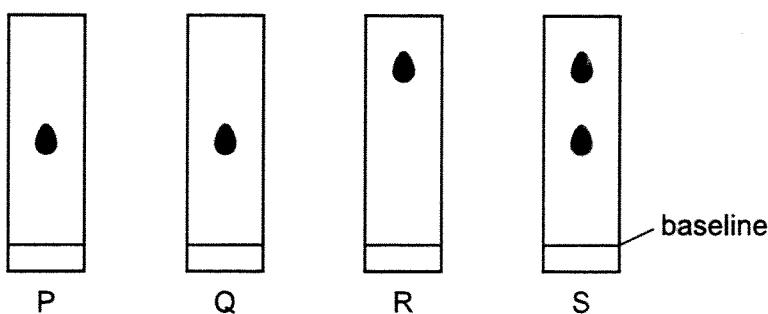
Q24.

[0620/23/M/J/16/Q2]

Chromatography experiments are carried out on four substances, P, Q, R and S.

The same solvent is used in each experiment.

The resulting chromatograms are shown below.



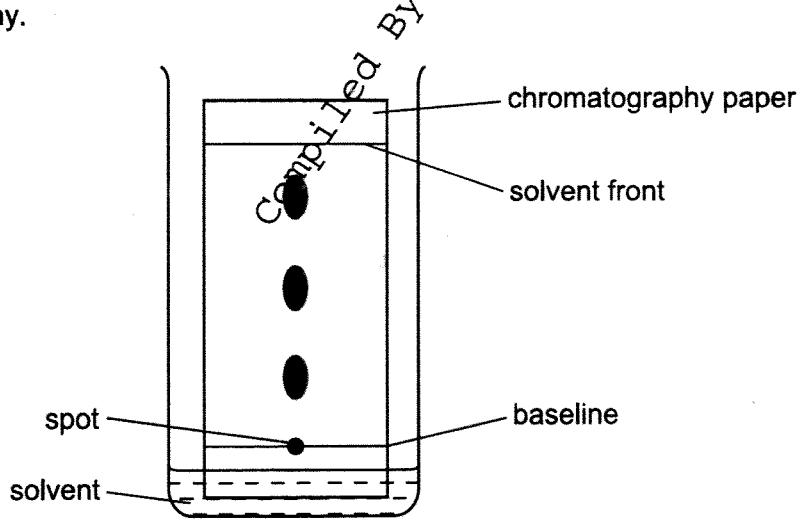
Which statement is **not** correct?

- A P and Q are pure substances.
- B P and R are different substances.
- C R and S are pure substances.
- D S is a mixture of substances.

Q25.

[0620/23/M/J/16/Q3]

The diagram shows the apparatus used to separate the different components of a mixture by chromatography.



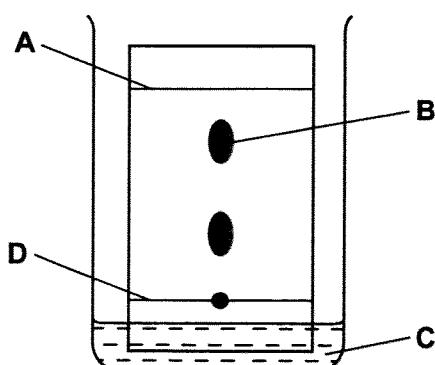
Which statement about this experiment is correct?

- A A locating agent is used to find the position of the solvent front.
- B The components to be separated must be soluble in the solvent.
- C The baseline on which the spot of the mixture is placed is drawn in ink.
- D The R_f value is calculated by $\frac{\text{the distance travelled by the solvent front}}{\text{the distance travelled by the component}}$

Q26.

[0620/22/M/J/16/Q2]

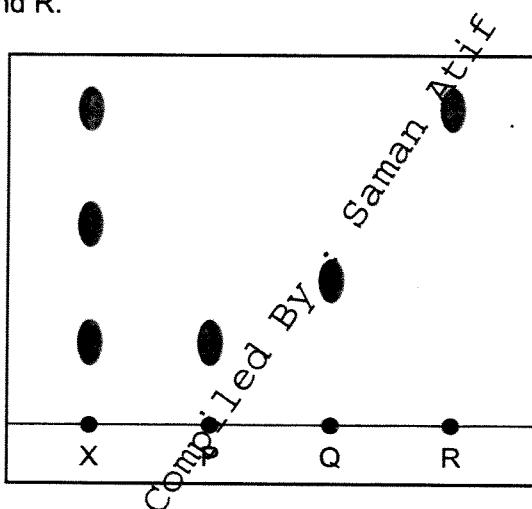
In the chromatography experiment shown, which label represents the solvent front?



Q27.

[0620/22/M/J/16/Q3]

X is a mixture of colourless compounds. The diagram shows a chromatogram of X and of three pure compounds, P, Q and R.



Which statement is **not** correct?

- A A locating agent was used to develop the chromatogram of X.
- B P and R could be present in X.
- C P and R have different solubilities in the solvent.
- D Q has a greater R_f value than R.

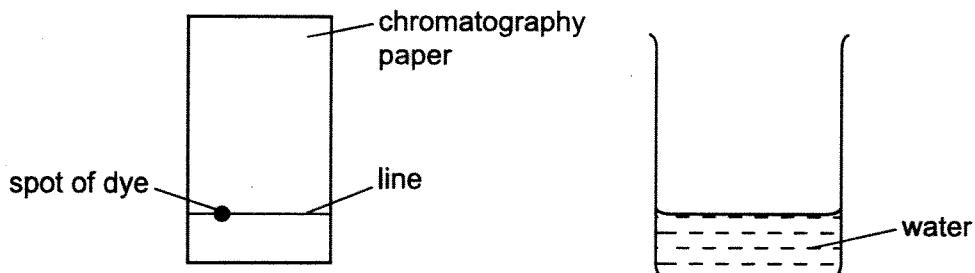
Q28.

[0620/21/M/J/16/Q2]

A sample of a dye is investigated by chromatography.

A line is drawn across a piece of chromatography paper and a spot of the dye is placed on it.

The paper is placed in water.



Which row is correct?

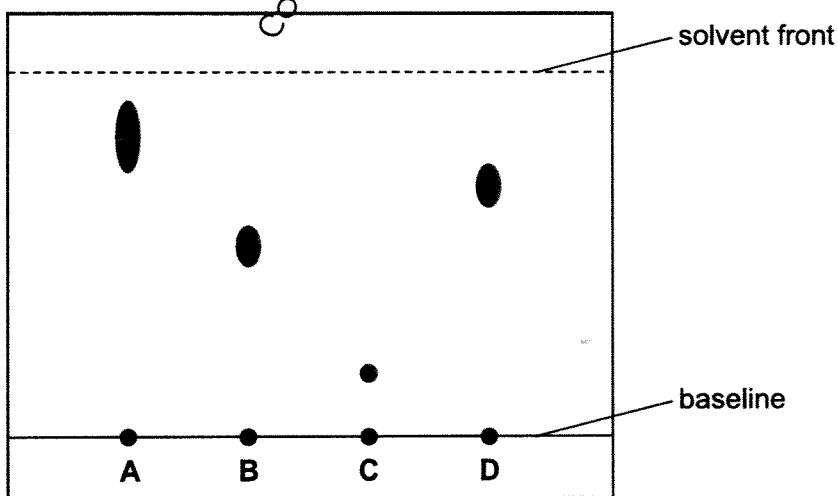
	what is used to draw the line	position of spot
A	ink	above the level of the water
B	ink	below the level of the water
C	pencil	above the level of the water
D	pencil	below the level of the water

Q29.

[0620/21/M/J/16/Q3]

The paper chromatogram below was obtained from four different dyes.

Which dye has an R_f value of 0.7?



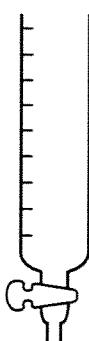
[0620/21/O/N/16/Q2]

Q30.

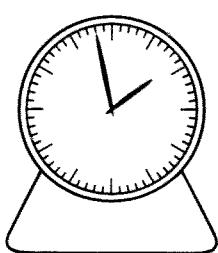
A student mixes 25 cm^3 samples of dilute hydrochloric acid with different volumes of aqueous sodium hydroxide.

In each case, the student measures the change in temperature to test if the reaction is exothermic.

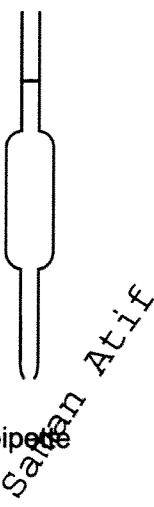
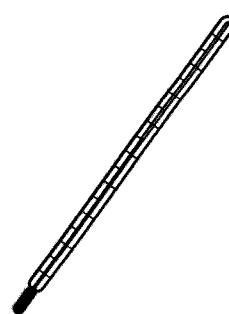
Which piece of apparatus is **not** needed?

A

burette

B

clock

Cpipette
Sameen Atif**D**

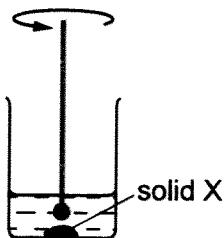
thermometer

Q31.

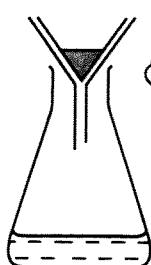
[0620/23/O/N/16/Q3]

A solid X is purified in five steps.

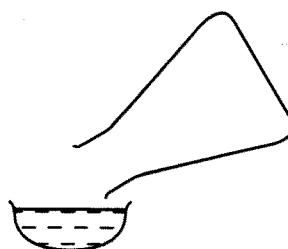
The first four steps of the purification are shown in the diagram.



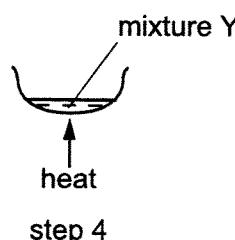
step 1



step 2



step 3



step 4

In **step 5**, how is a pure sample of solid X obtained from mixture Y?

- A** dissolving
- B** distillation
- C** evaporating
- D** filtering

Q32.

[0620/22/O/N/16/Q3]

A sample contains a mixture of powdered limestone (calcium carbonate), sugar and wax.

What is the correct way to obtain a pure sample of sugar?

- A** Dissolve the mixture in dilute hydrochloric acid, filter and wash the residue.
- B** Dissolve the mixture in hexane, filter and evaporate the filtrate.
- C** Dissolve the mixture in water, filter and evaporate the filtrate.
- D** Dissolve the mixture in water, filter and wash the residue.

Q33.

[0620/21/O/N/16/Q3]

Information about the solubility of four solids, P, Q, R and S, is given in the table.

	P	Q	R	S
solubility in water	dissolves	insoluble	insoluble	dissolves

A student attempted to separate mixtures of these solids using the following method.

- 1 Add the mixture to a beaker of water and stir.
- 2 Filter the mixture.
- 3 Crystallise one of the solids from the filtrate.

Which of the following mixtures could **not** be separated by this method?

- A** a mixture of P and R
- B** a mixture of Q and P
- C** a mixture of Q and R
- D** a mixture of R and S

Q34.

[0620/21/M/J/17/Q2]

Pure water has a boiling point of 100 °C and a freezing point of 0 °C.

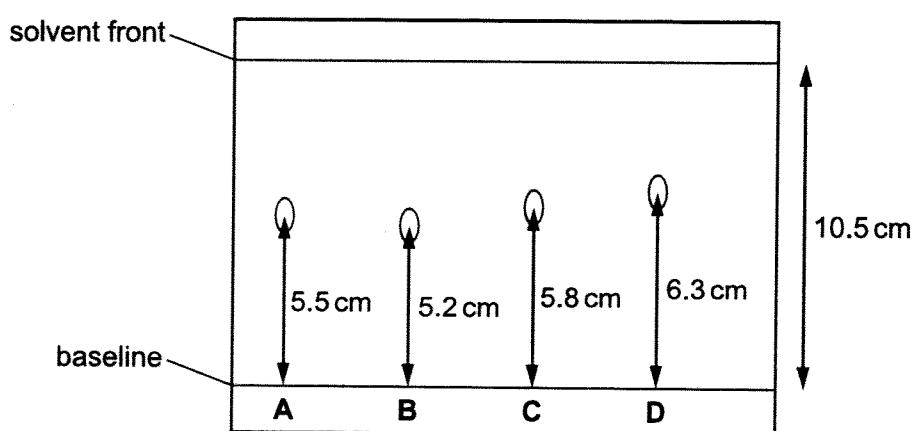
What is the boiling point and freezing point of a sample of aqueous sodium chloride?

	boiling point/°C	freezing point/°C
A	98	-2
B	98	2
C	102	-2
D	102	2

Q35.

A chromatogram obtained from the chromatography of four substances is shown.

Which substance has an R_f value of 0.6?

**Q36.**

Impurities change the melting and boiling points of substances.

Sodium chloride is added to a sample of pure water.

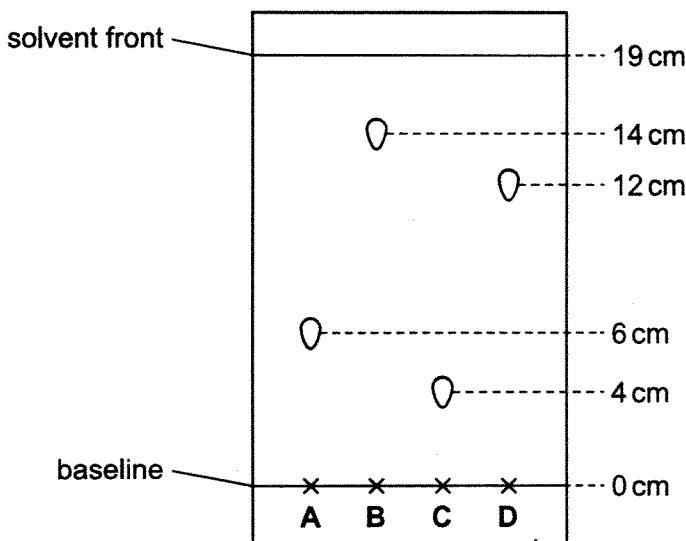
How does the addition of sodium chloride affect the melting point and boiling point of the water?

	melting point	boiling point
A	increases	increases
B	increases	decreases
C	decreases	increases
D	decreases	decreases

Q37.

The diagram shows a chromatogram of four substances.

Which substance has an R_f value of approximately 0.32?

**Q38.**

A compound, X, has a melting point of 71°C and a boiling point of 375°C .

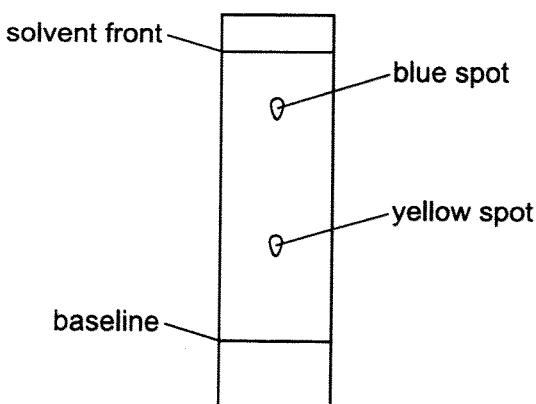
Which statement about X is correct?

- A It is a liquid at 52°C and a gas at 175°C .
- B It is a liquid at 69°C and a gas at 380°C .
- C It is a liquid at 75°C and a gas at 350°C .
- D It is a liquid at 80°C and a gas at 400°C .

Q39.

A student used chromatography to analyse a green food colouring.

The chromatogram obtained is shown.



The table lists some yellow food dyes and their R_f values.

Which yellow food dye does the green food colouring contain?

	yellow food dye	R_f value
A	Quinolene Yellow	0.48
B	Sunset Yellow	0.32
C	tartrazine	0.69
D	Yellow 2G	0.82

Q40.

A student put 25.0 cm³ of dilute hydrochloric acid into a conical flask.

The student added 2.5 g of solid sodium carbonate and measured the change in temperature of the mixture.

Which apparatus does the student need to use to obtain the most accurate results?

- A balance, measuring cylinder, thermometer
- B balance, pipette, stopwatch
- C balance, pipette, thermometer
- D burette, pipette, thermometer

[0620/21/O/N/17/Q3]

Q41.

The results obtained from a chromatogram are shown.

	distance travelled / cm
solvent	5.0
substance X	3.0
substance Y	2.5

Which row gives the R_f values of substance X and substance Y?

	R_f (X)	R_f (Y)
A	0.5	0.6
B	0.6	0.5
C	1.6	2.0
D	2.0	1.6

Q42.

[0620/22/O/N/17/Q2]

During an experiment a measurement is recorded in cm^3 .

Which apparatus is used?

- A balance
- B measuring cylinder
- C stopwatch
- D thermometer

Q43.

A student carried out paper chromatography on a mixture of amino acids.

The student sprayed the dried chromatogram with a locating agent.

What is the function of the locating agent?

- A to dissolve the amino acids
- B to form coloured spots with the amino acids
- C to preserve the amino acids
- D to stop the amino acids reacting

Q44.

[0620/23/O/N/17/Q2]

25 cm³ of an alkali are added to 20 cm³ of an acid. The temperature change is measured.

Which apparatus is not needed in the experiment?

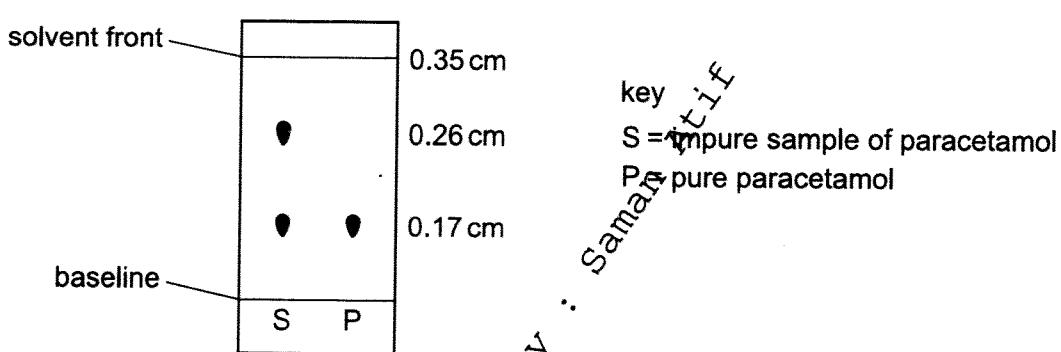
- A 25 cm³ measuring cylinder
- B 100 cm³ beaker
- C balance
- D thermometer

Q45.

[0620/23/O/N/17/Q3]

The painkiller paracetamol is synthesised from 4-aminophenol.

Chromatography was carried out on an impure sample of paracetamol. The results are shown (not drawn to scale).



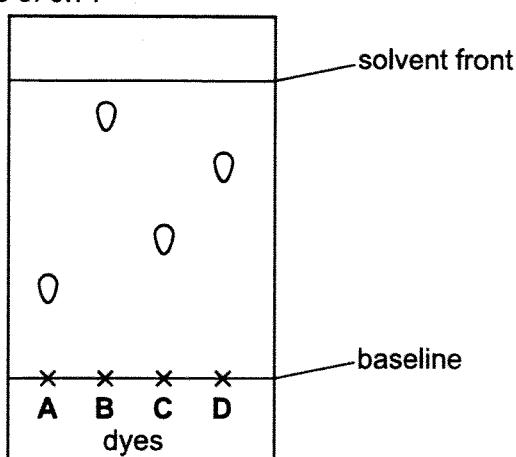
The sample of paracetamol was contaminated with 4-aminophenol only.

What is the R_f value of 4-aminophenol?

- A 0.49
- B 0.65
- C 0.74
- D 1.35

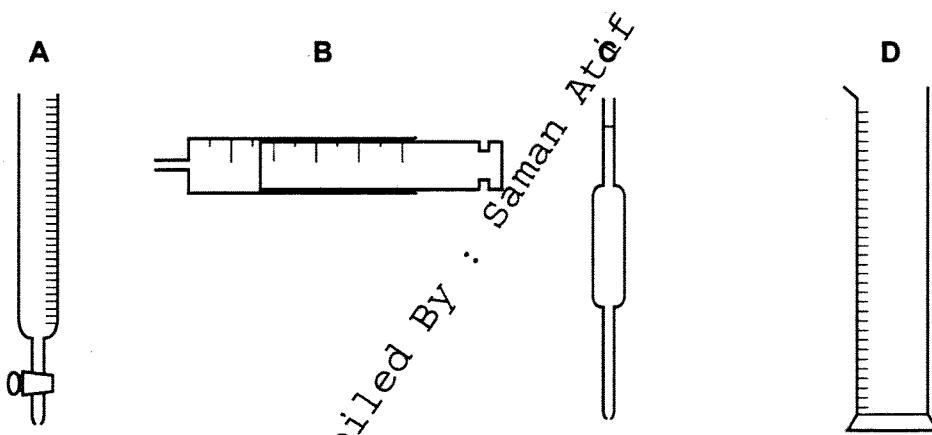
Q46. Chromatography is a technique used to separate coloured dyes.

Which dye has an R_f value of 0.7?



[0620/21/M/J/18/Q3]

Q47. Which piece of apparatus is used to measure exactly 26.3 cm^3 of a liquid?

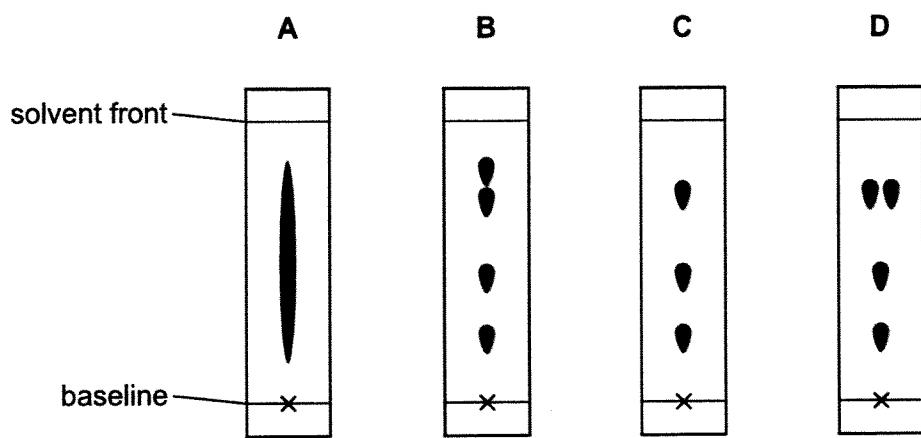


[0620/22/M/J/18/Q2]

Q48. A chromatography experiment was done to separate a mixture of four substances.

The R_f values measured for these substances were 0.3, 0.5, 0.8 and 0.8.

Which diagram shows the chromatogram obtained?



[0620/23/M/J/18/Q2]

Q49.

Paper chromatography is done in the same way with three different mixtures of dyes. Each mixture contains at least one of the dyes W, X, Y and Z.

The R_f values of the dyes in the three mixtures are shown.

dye	R_f values from mixture 1	R_f values from mixture 2	R_f values from mixture 3
W	0.15	0.15	0.15
X	0.00	0.00	0.00
Y	0.50	0.50	0.50
Z	0.00	0.91	0.91

Which conclusion is correct?

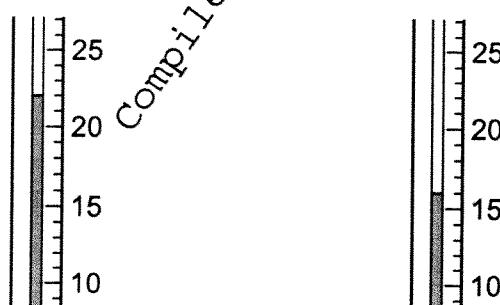
- A Dye W is nearest the solvent front and is present only in mixture 1 and mixture 3.
- B Dye X has travelled furthest up the chromatography paper.
- C Dye Y is the only dye present in all three mixtures.
- D Dye Z is nearest the solvent front and is found in only two of the mixtures.

Q50.

[0620/23/M/J/18/Q3]

Solid R reacted with dilute sulfuric acid.

The initial temperature of the dilute sulfuric acid and the final temperature of the solution are shown.



initial temperature
of the dilute
sulfuric acid (°C)

final temperature
of the solution (°C)

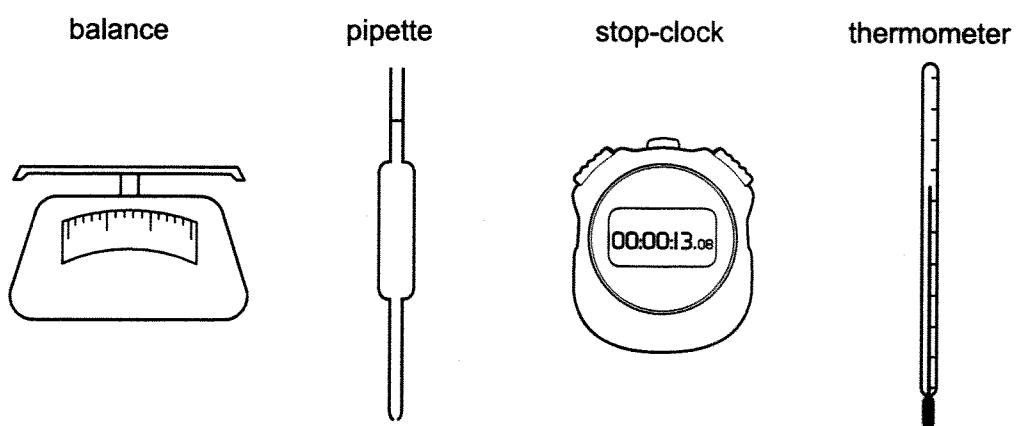
What was the change in temperature in °C?

- A -6
- B -4
- C 4
- D 6

Q51.

[0620/21/O/N/2018/Q2]

The diagrams show four pieces of laboratory equipment.



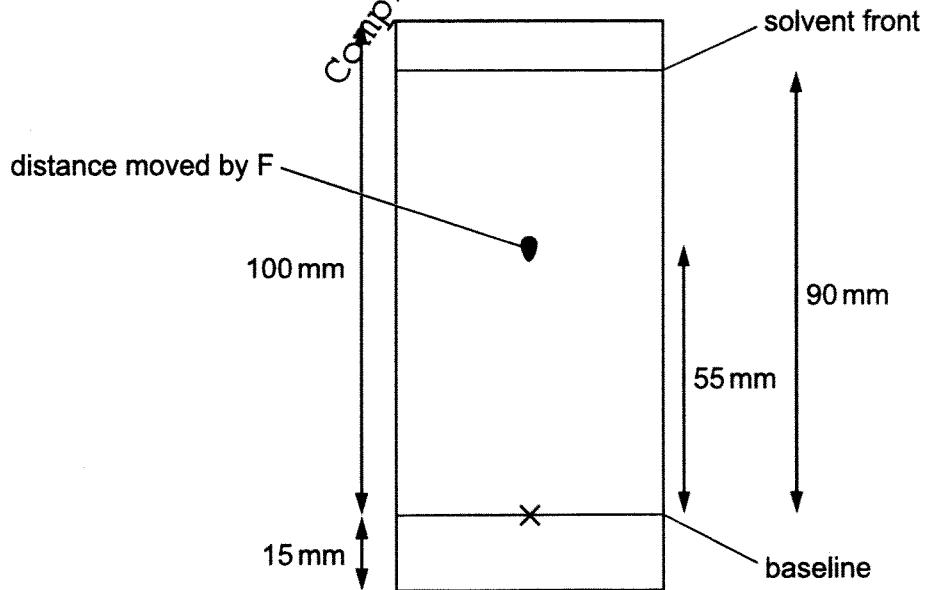
Which equipment is essential to find out if dissolving a salt in water is an exothermic process?

	balance	pipette	stop-clock	thermometer
A	x	x	x	✓
B	✓	x	x	✓
C	x	✓	x	✓
D	✓	x	✓	x

Q52.

[0620/21/O/N/2019/Q3]

The measurements from a chromatography experiment using substance F are shown. The diagram is not drawn to scale.



What is the R_f value of F?

- A 0.55 B 0.61 C 0.90 D 1.64

Q53.

[0620/21/M/J/2019/Q2]

2.00 g of powdered calcium carbonate is added to 50.0 cm³ of hydrochloric acid.

Which apparatus is used to measure the calcium carbonate and the hydrochloric acid?

	calcium carbonate	hydrochloric acid
A	balance	burette
B	balance	thermometer
C	pipette	burette
D	pipette	thermometer

Q54.

[0620/22/M/J/2019/Q2]

A student measures 25.00 cm³ of dilute hydrochloric acid accurately.

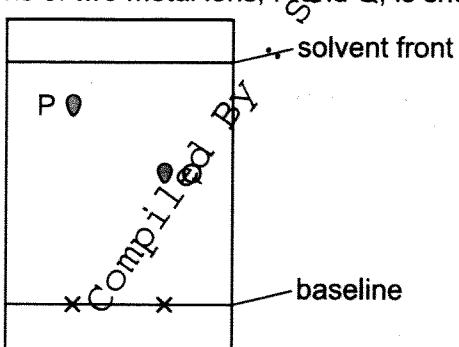
Which apparatus is most suitable?

- A beaker
- B measuring cylinder
- C burette
- D dropping pipette

Q55.

[0620/22/M/J/2019/Q3]

The chromatogram of solutions of two metal ions, P and Q, is shown.



P is coloured. A locating agent is used to find the position of Q.

The R_f value of each solution is calculated.

P is a 1..... element and has an R_f value 2..... than that of Q.

Which words complete gaps 1 and 2?

	1	2
A	non-transition	greater
B	non-transition	smaller
C	transition	greater
D	transition	smaller

Q56.

[0620/23/M/J/2019/Q2]

- Which piece of apparatus is used to measure 24.8 cm^3 of gas produced during a reaction?
- beaker
 - conical flask
 - measuring cylinder
 - pipette

Q57.

[0620/23/M/J/2019/Q3]

R_f values are used to identify unknown substances using paper chromatography.

Which statements about R_f values are correct?

- R_f values are always less than 1.0.
- R_f value = distance travelled by solvent ÷ distance travelled by unknown substance.
- The higher the R_f value, the further the unknown substance travels.
- R_f values are not affected by the solubility of the unknown substance.

A 1 and 2

B 1 and 3

C 2 and 3

D 3 and 4

Q58.

[0620/22/O/N/2019/Q2]

A student is asked to measure the time taken for 0.4 g of magnesium carbonate to react completely with 25.0 cm^3 of dilute hydrochloric acid.

Which pieces of apparatus does the student need?

- balance, stop-clock, pipette
- balance, stop-clock, thermometer
- balance, pipette, thermometer
- stop-clock, pipette, thermometer

Q59.

[0620/21/M/J/2020/Q2]

Which piece of apparatus should be used to measure exactly 21.4 cm^3 of water?

- 25 cm^3 beaker
- 25 cm^3 pipette
- 50 cm^3 burette
- 50 cm^3 measuring cylinder

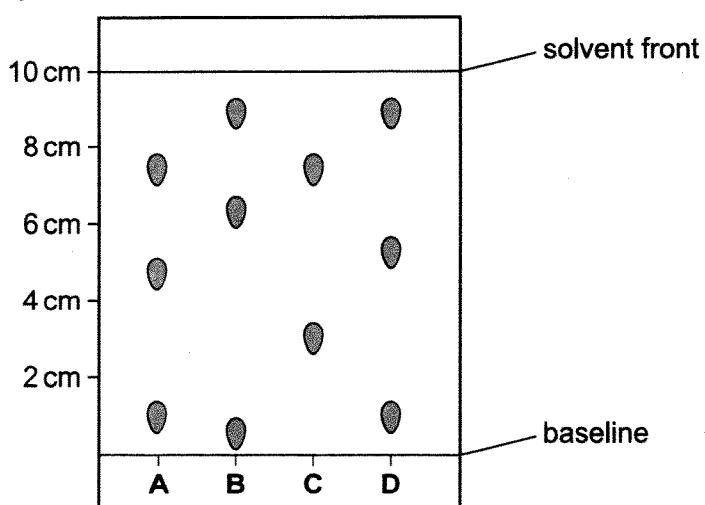
Q60.

[0620/21/O/N/2019/Q3]

Four different food colourings are analysed using chromatography.

The results are shown on the chromatogram. The diagram is not drawn to scale.

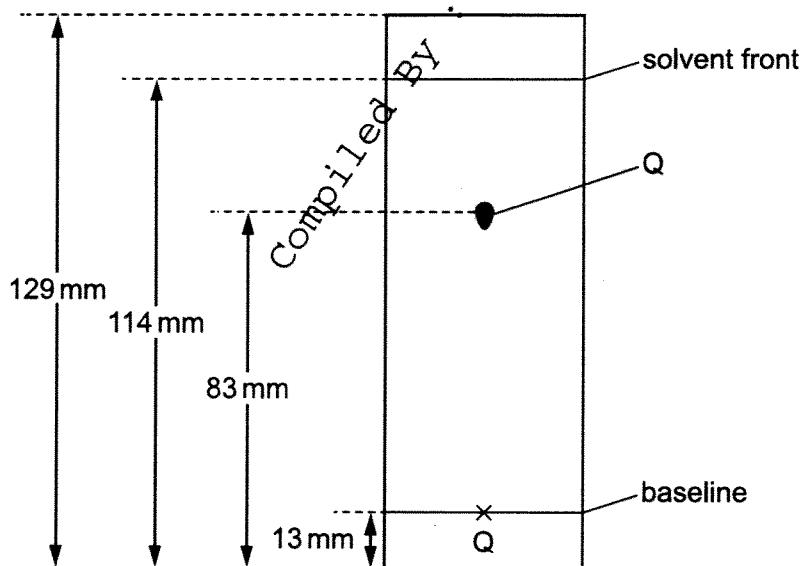
Which food colouring contains a component with an R_f value of 0.3?

**Q61.**

[0620/22/O/N/2019/Q3]

Substance Q was investigated using chromatography.

The chromatogram is shown. The diagram is not drawn to scale.



What is the R_f value of Q?

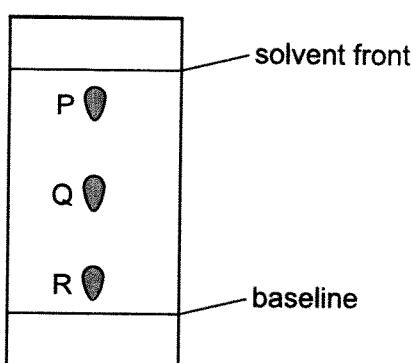
- A 0.60 B 0.64 C 0.69 D 0.72

Q62.

[0620/23/O/N/2019/Q3]

A substance is separated using chromatography.

The chromatogram is shown.



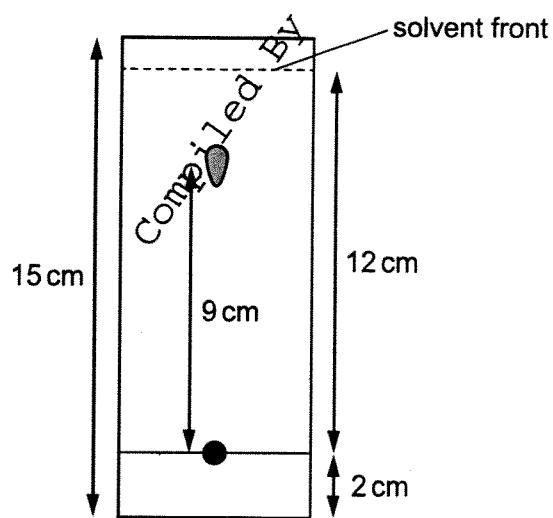
Which statement is **not** correct?

- A P has a higher R_f value than Q.
- B P, Q and R are all soluble in the solvent.
- C R is the most soluble substance.
- D The R_f value of P is less than 1.

Q63.

[0620/21/M/J/2020/Q3]

The chromatogram for an unknown dye is shown.



What is the R_f value of the dye?

- A 0.60
- B 0.64
- C 0.75
- D 0.82

Q64.

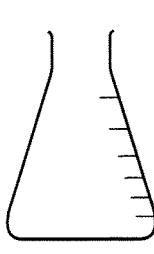
[0620/22/M/J/2020/Q2]

Which piece of apparatus is used to measure 25.0 cm^3 of aqueous sodium hydroxide?

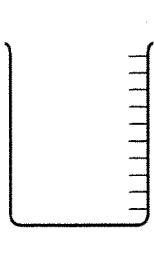
A



B



C



D

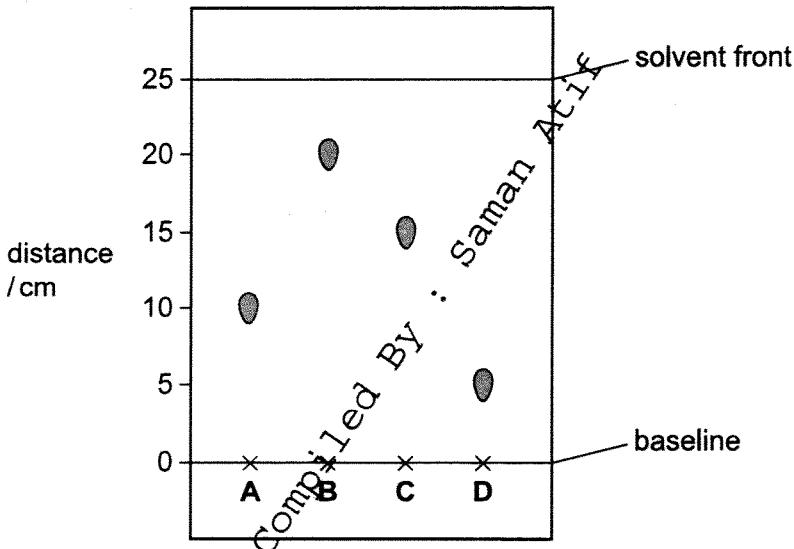


Q65.

[0620/22/M/J/2020/Q3]

Paper chromatography is used to determine the R_f values for four different food colourings.

Which food colouring has an R_f value of 0.6?



Q66.

[0620/23/M/J/2020/Q2]

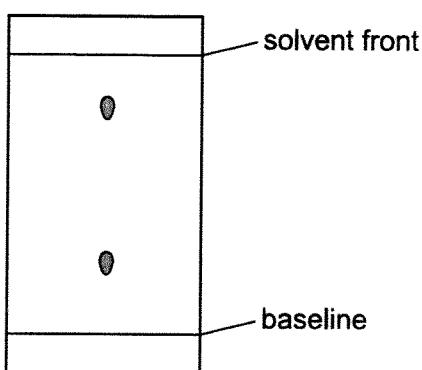
Which piece of apparatus is used to measure 13.7 cm^3 of dilute hydrochloric acid?

- A balance
- B burette
- C conical flask
- D pipette

Q67.

[0620/23/M/J/2020/Q3]

Chromatography is carried out on a mixture of three substances. The chromatogram is sprayed with a locating agent. The result is shown.



What are possible reasons why the chromatogram shows only two spots?

- 1 One of the substances in the mixture is insoluble in the solvent.
- 2 The locating agent did not react with one of the substances in the mixture.
- 3 Two of the substances in the mixture have the same R_f values.
- 4 The R_f value of one of the substances is too small.

A 1 and 2

B 1 and 4

C 2 and 3

D 3 and 4

Q68.

[0620/21/O/N/2020/Q2]

A mixture of colourless amino acids is separated using chromatography.

The solvent used is propanol.

The chromatogram is sprayed with a locating agent.

Which row describes the purpose of the propanol and the locating agent?

	purpose of propanol	purpose of locating agent
A	to make the individual amino acids visible	to prevent the amino acids moving any further
B	to move the amino acids up the chromatography paper	to make the individual amino acids visible
C	to move the amino acids up the chromatography paper	to prevent the amino acids moving any further
D	to prevent the amino acids moving too far up the paper	to make the individual amino acids visible

Q69.

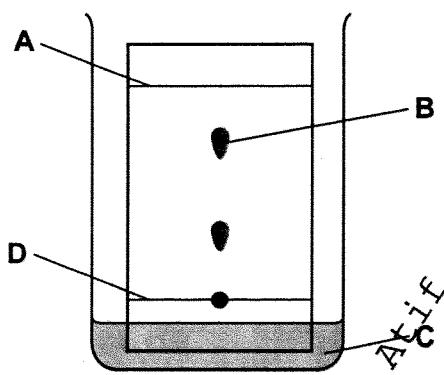
[0620/21/O/N/2020/Q3]

- Which piece of apparatus can only measure a single fixed volume?
- 250 cm³ beaker
 - 50 cm³ burette
 - 100 cm³ measuring cylinder
 - 25 cm³ pipette

Q70.

[0620/22/O/N/2020/Q4]

In the chromatography experiment shown, which label represents the solvent front?



[0620/22/O/N/2020/Q4]

Q71.

Different methods of separation rely on substances having different properties.

Which property does distillation make use of?

- boiling point
- colour
- particle size
- solubility in different solvents

Q72.

[0620/23/O/N/2020/Q3]

Nickel(II) sulfate is a green solid that is soluble in water.

Which method is used to obtain a pure sample of nickel(II) sulfate crystals from a mixture of nickel(II) sulfate and sand?

- Heat the mixture with water and distil it to give nickel(II) sulfate.
- Heat the mixture with water and leave it to crystallise.
- Heat the mixture with water and filter off the nickel(II) sulfate.
- Heat the mixture with water, filter and allow the solution to crystallise.

Q73.

[0620/22/O/N/2020/Q2]

A chromatography experiment is carried out to analyse the pigments present in four different types of leaf. The student carrying out the experiment forgot to complete his table of results, which is shown.

plant leaf	number of pigments identified	colour of identified pigments	distance travelled by the solvent front (cm)	distance travelled each pigment (cm)	R_f value
maple	F	green / yellow	3.7	green: 3.0 yellow: 3.1	green: 0.81 yellow: 0.83
laurel	2	green / yellow	G	green: 2.5 yellow: 2.5	green: 0.78 yellow: 0.78
lime	3	green / yellow / orange	3.5	green: 2.9 yellow: 3.0 orange: 2.7	green: 0.83 yellow: 0.86 orange: 0.77
ash	3	green / yellow / orange	3.5	green: 2.8 yellow: 3.0 orange: 2.7	green: 0.80 yellow: H orange: 0.77

Which row identifies the values of F, G and H?

	F	G	H
A	2	3.2	0.80
B	3	3.5	0.83
C	2	3.2	0.86
D	3	3.5	0.78

Q74.

[0620/23/O/N/2020/Q30]

Which process is used to separate oxygen from liquid air?

- A chromatography
- B distillation
- C filtration
- D fractional distillation

Compiled By : Saman Atif

[0620/13/O/N/12/Q4]

Q1. The nucleon number of an isotope of rubidium is 85.

How many protons, neutrons and electrons are present in an atom of this isotope?

	protons	neutrons	electrons
A	37	48	37
B	37	48	39
C	39	46	37
D	39	46	39

[0620/12/O/N/12/Q4]

[0620/13/O/N/12/Q5]

Q2. Which row gives the number of electrons in the outer electron shell of fluorine and of neon?

	$^{19}_9\text{F}$	$^{20}_{10}\text{Ne}$
A	7	8
B	7	10
C	9	8
D	9	10

[0620/13/O/N/12/Q6]

[0620/12/O/N/12/Q7]

Q3. In the molecules CH_4 , HCl and H_2O , which atoms use all of their outer shell electrons in bonding?

- A C and Cl B C and H C Cl and H D H and O

[0620/13/O/N/12/Q7]

[0620/12/O/N/12/Q6]

Q4. The table shows the electronic structures of four atoms.

atom	electronic structure
W	2,1
X	2,7
Y	2,8,4
Z	2,8,8

Which two atoms combine to form an ionic compound?

- A W and X B W and Y C X and Y D X and Z

Q5. Which statements comparing the properties of electrons, neutrons and protons are correct?

	neutrons and protons are both heavier than electrons	only electrons and neutrons are charged
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

[0620/12/O/N/12/Q15]

Q6. Element X forms an acidic, covalent oxide.

Which row shows how many electrons there could be in the outer shell of an atom of X?

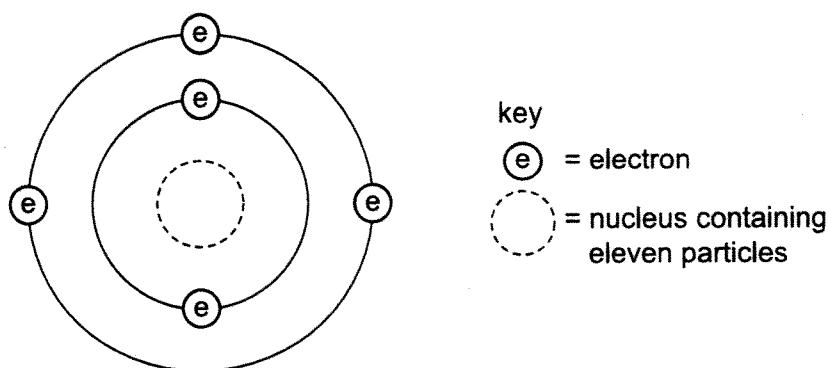
	1	2	6	7
A	✓	✓	✗	✗
B	✓	✗	✓	✗
C	✗	✗	✓	✓
D	✗	✓	✗	✓

[0620/11/M/J/12/Q6]

Q7. Which is a simple covalent molecule?

	conducts electricity		volatile
	when solid	when molten	
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

Q8. The diagram shows an atom of an element.

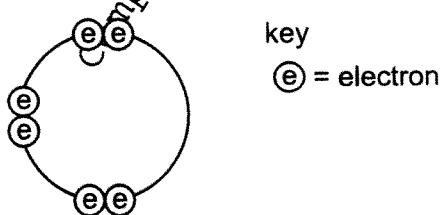


How many protons and neutrons are in the nucleus of the atom and in which group and period of the Periodic Table is the element found?

	number of protons	number of neutrons	group number	period number
A	5	6	3	2
B	5	11	2	3
C	6	5	3	2
D	6	11	2	3

[0620/12/M/J/12/Q8]

Q9. Element X has six electrons in its outer shell.



How could the element react?

- A by gaining two electrons to form a positive ion
- B by losing six electrons to form a negative ion
- C by sharing two electrons with two electrons from another element to form two covalent bonds
- D by sharing two electrons with two electrons from another element to form four covalent bonds

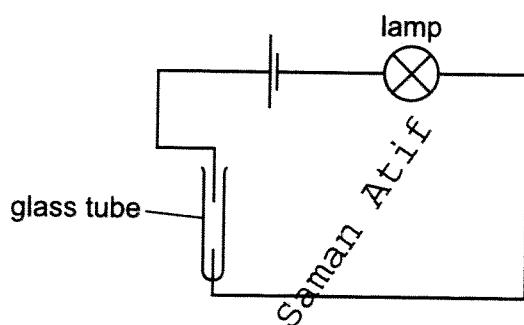
Q10. Electrons from each element are shared by both of the elements in a compound.

Which compound matches this description?

- A lead bromide
- B sodium chloride
- C water
- D zinc oxide

[0620/12/M/J/13/Q9]

Q11. The diagram shows an incomplete circuit.



Which substance causes the lamp to light when added to the glass tube?

- A aqueous sodium chloride
- B aqueous sugar
- C solid sodium chloride
- D solid sugar

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Saman Atif

[0620/11/M/J/13/Q4]

Q12. Element X is represented by $^{27}_{13}X$.

Which statement about element X is correct?

- A An atom of X contains 13 protons and 13 neutrons.
- B An atom of X contains 27 protons and 13 electrons.
- C X forms an ion by gaining electrons.
- D X is placed in Group III of the Periodic Table.

[0620/11/M/J/13/Q6]

Q13. For which substance is the type of bonding **not** correct?

	substance	type of bonding		
		ionic	covalent	metallic
A	chlorine		✓	
B	potassium bromide	✓		
C	sodium			✓
D	sodium chloride		✓	

[0620/13/O/N/13/Q4]

Q14. The atomic structures of four atoms are shown.

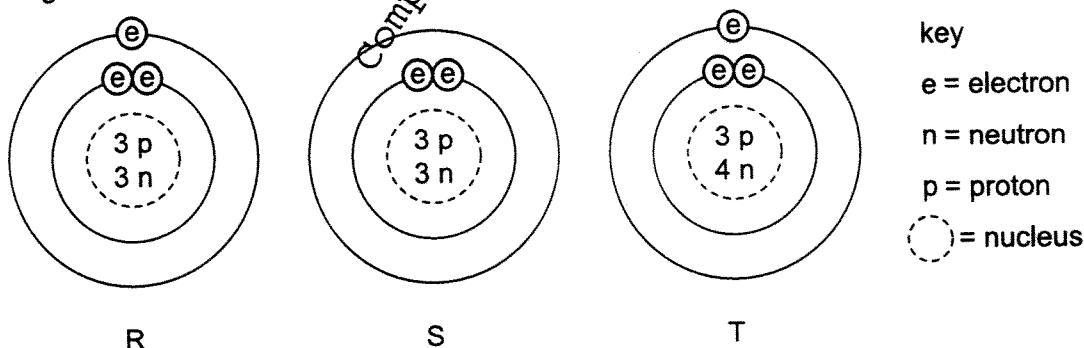
atom	number of neutrons	number of protons	number of electrons
W	6	6	6
X	7	7	7
Y	8	8	6
Z	8	8	8

Which pair of atoms are isotopes?

- A W and X B W and Y C X and Y D Y and Z

[0620/13/O/N/13/Q5]

Q15. The diagram shows the structure of three particles, R, S and T.



Which row describes these particles?

	ions	isotopes
A	R	S and T
B	R and S	T
C	S	R and T
D	T	R and S

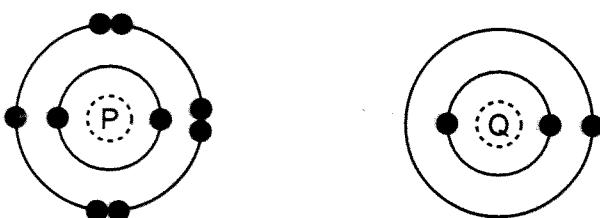
[0620/13/O/N/13/Q6]

Q16. Which statement about the bonding in a molecule of water is **not** correct?

- A Both hydrogen and oxygen have a noble gas configuration of electrons.
- B Each hydrogen shares its one electron with oxygen.
- C Oxygen shares one of its own electrons with each hydrogen.
- D Oxygen shares two of its own electrons with each hydrogen.

[0620/13/O/N/13/Q7]

Q17. The electronic structures of atoms P and Q are shown.



P and Q react to form an ionic compound.

What is the formula of the compound?

- A Q_7P
- B QP
- C QP_3
- D QP_7

[0620/12/O/N/13/Q4]

Q18. Which statements about a sodium atom, $^{23}_{11}Na$, are correct?

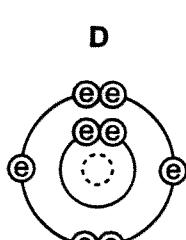
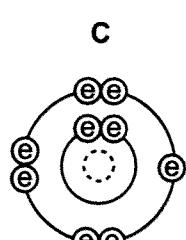
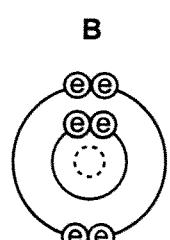
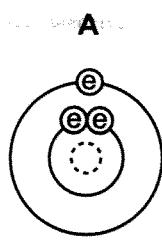
- 1 The number of protons and neutrons is the same.
 - 2 The number of protons and electrons is the same.
 - 3 The number of outer electrons is one.
- A 1, 2 and 3
 - B 1 and 2 only
 - C 1 and 3 only
 - D 2 and 3 only

[0620/12/O/N/13/Q5]

Q19. The diagrams show the electron arrangements in the atoms of four elements.

Which element does **not** form a covalent bond?

Saman Atif



key
Ⓐ electron
○ nucleus

[0620/12/O/N/13/Q6]

Q20.

Rubidium is in Group I of the Periodic Table and bromine is in Group VII.

Rubidium reacts with bromine to form an ionic compound.

Which row shows the electron change taking place for rubidium and the correct formula of the rubidium ion?

	electron change	formula of ion formed
A	electron gained	Rb^+
B	electron gained	Rb^-
C	electron lost	Rb^+
D	electron lost	Rb^-

[0620/12/O/N/13/Q7]

Q21.

Element X has 7 protons.

Element Y has 8 more protons than X.

Which statement about element Y is correct?

- A Y has more electron shells than X.
- B Y has more electrons in its outer shell than X.
- C Y is in a different group of the Periodic Table from X.
- D Y is in the same period of the Periodic Table as X

[0620/12/O/N/13/Q8]

Q22.

The formulae of compounds W, X and Y are shown.



Which statement is correct?

- A W contains twice as many hydrogen atoms as oxygen atoms.
- B X contains the most oxygen atoms.
- C Y contains the most hydrogen atoms.
- D Y contains the same number of hydrogen and oxygen atoms.

Q23. Diagram 1 shows the paper chromatogram of substance X.

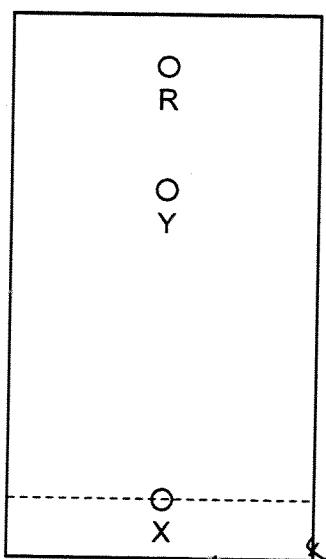


diagram 1

Diagram 2 shows the cooling curve for substance

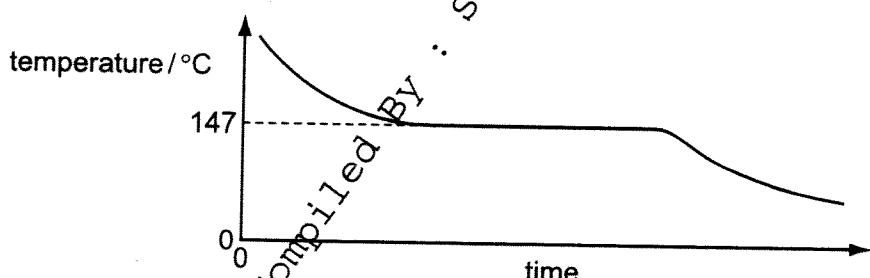


diagram 2

Which statement about X and Y is correct?

- A X is a mixture and Y is a pure substance.
- B X is a pure substance and Y is a mixture.
- C X and Y are mixtures.
- D X and Y are pure substances.

Q24. Which two methods can be used to separate a salt from its solution in water?

- 1 crystallisation
- 2 decanting
- 3 distillation
- 4 filtration

A 1 and 2

B 1 and 3

C 2 and 3

D 3 and 4

[0620/12/M/J/14/Q4]

Q25. Which statements about a phosphorus atom, $^{31}_{15}\text{P}$, are correct?

- 1 The nucleon number is 16.
- 2 The number of outer electrons is 5.
- 3 The proton number is 15.

A 1, 2 and 3

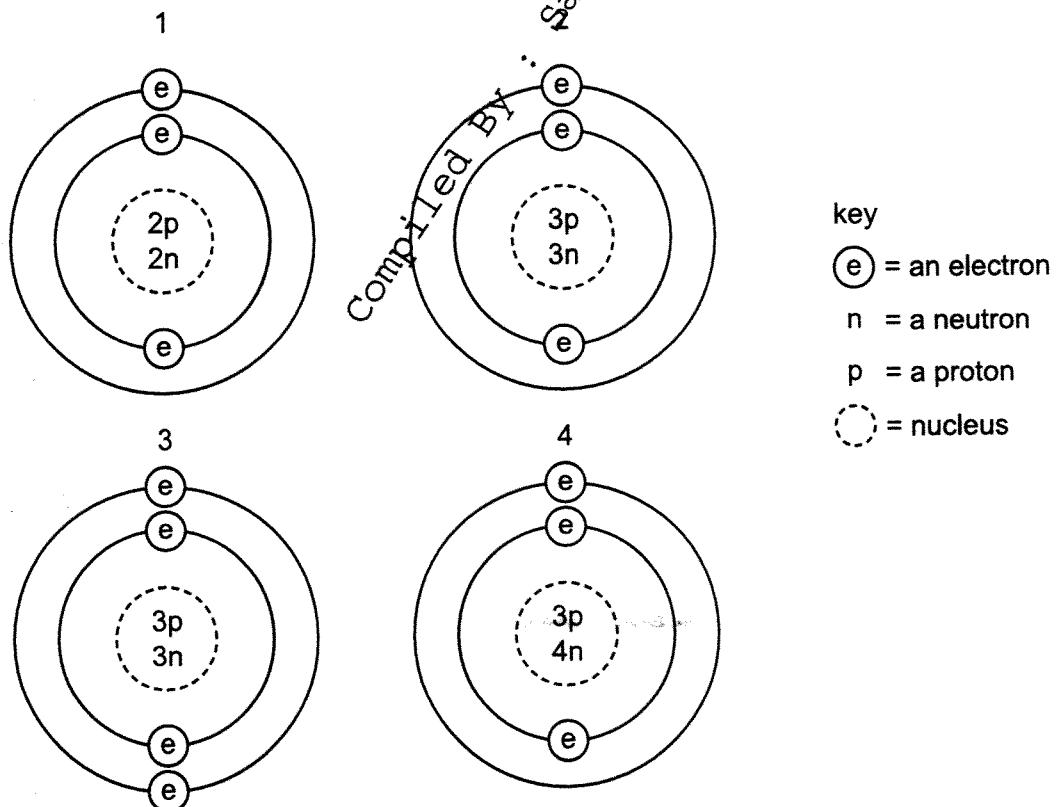
B 1 and 2 only

C 1 and 3 only

D 2 and 3 only

[0620/11/M/J/14/Q5]

Q26. The diagrams show four particles.



Which two diagrams show atoms that are isotopes of each other?

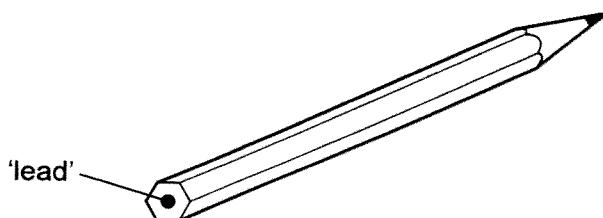
A 1 and 2

B 1 and 3

C 2 and 3

D 2 and 4

Q27. The 'lead' in a pencil is made of a mixture of graphite and clay.

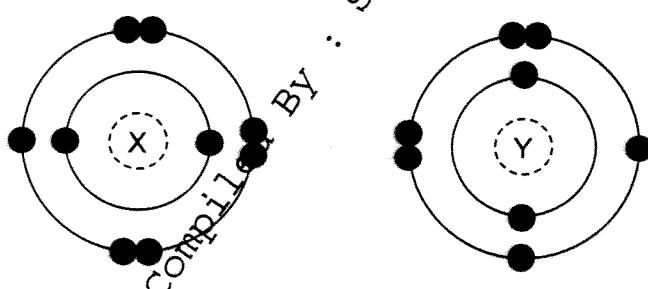


When the percentage of graphite is increased, the pencil slides across the paper more easily.

Which statement explains this observation?

- A Graphite has a high melting point.
- B Graphite is a form of carbon.
- C Graphite is a lubricant.
- D Graphite is a non-metal.

Q28. The electronic structures of two atoms, X and Y, are shown.

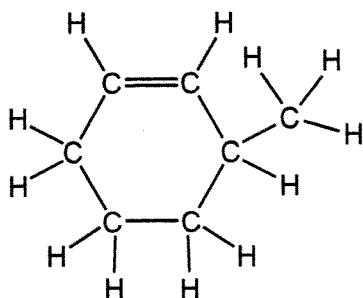


X and Y combine together to form a compound.

What is the type of bonding in the compound and what is the formula of the compound?

	type of bonding	formula
A	covalent	X_2Y
B	covalent	XY_2
C	ionic	XY_2
D	ionic	X_2Y

Q29. The structure of an organic compound, X, is shown.



What is the molecular formula of X?

A C_6H_9

B C_6H_{12}

C C_7H_{12}

D C_7H_{14}

Q30.

Electrical cables are made from either1....., because it is a very good conductor of electricity, or from.....2....., because it has a low density. Overhead cables have a3..... core in order to give the cable strength.

Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	aluminium	copper	magnesium
B	copper	aluminium	magnesium
C	copper	aluminium	steel
D	magnesium	copper	steel

Q31.

Solid F is an element.

Solid G is a compound.

Neither solid conducts electricity but G conducts electricity when dissolved in water.

These properties suggest that F is1..... and that G is2..... with3..... bonds.

Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	diamond	$AgCl$	covalent
B	diamond	$NaCl$	ionic
C	graphite	$AgCl$	ionic
D	graphite	$NaCl$	covalent

IGCSE Chemistry Topical Paper 2

Topic 3 : Atom, Elements & Compounds + Bonding

Q32.

[0620/11/M/J/14/Q3]

Alcohol and water are completely miscible. This means when mixed together they form only one liquid layer.

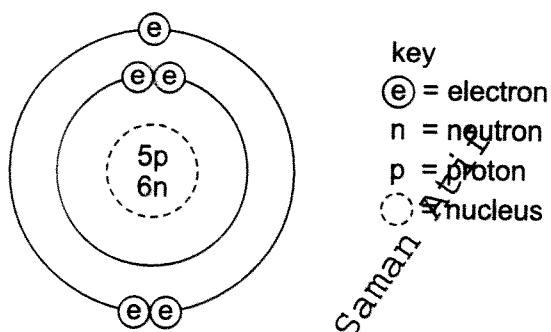
Which method is used to separate alcohol from water?

- A** crystallisation
- B** filtration
- C** fractional distillation
- D** precipitation

Q33.

[0620/11/M/J/14/Q4]

The diagram shows the structure of an atom of element X.



What is X?

- A** boron
- B** carbon
- C** sodium
- D** sulfur

Q34.

[0620/11/M/J/14/Q7]

Element X is in Group I of the Periodic Table. X reacts with element Y to form an ionic compound.

Which equation shows the process that takes place when X forms ions?

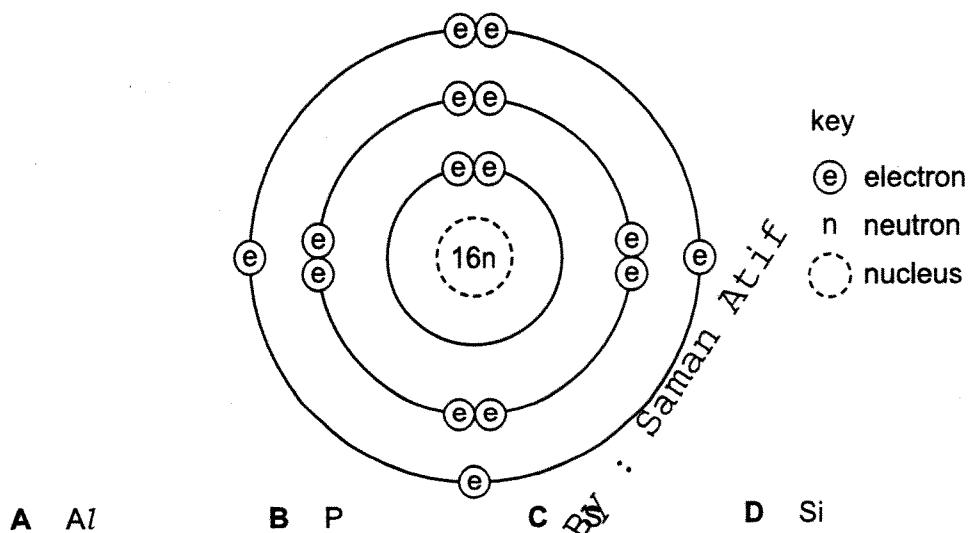
- A** $X + e^- \rightarrow X^+$
- B** $X - e^- \rightarrow X^-$
- C** $X + e^- \rightarrow X^-$
- D** $X - e^- \rightarrow X^+$

[0620/13/O/N/14/Q4]

Q35. Which statement about a neutron is **not** correct?

- A It can be present in different numbers in atoms of the same element.
- B It has no electrical charge.
- C It is always found in the nucleus of an atom.
- D It weighs much less than a proton.

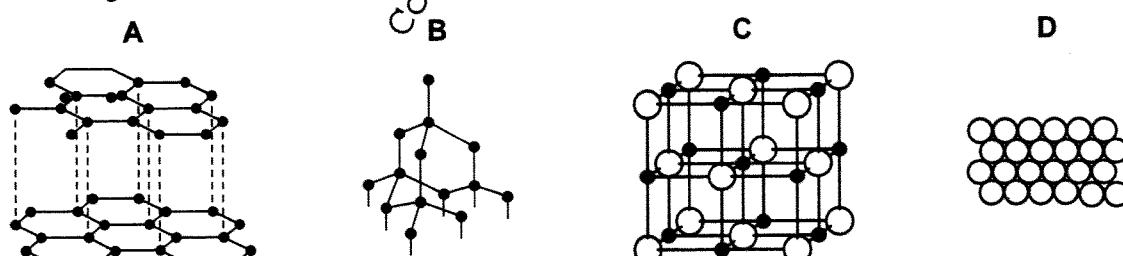
[0620/11/O/N/14/Q5]

Q36. Which element has the atomic structure shown?

[0620/11/O/N/14/Q6]

Q37. Slate has a layered structure and can easily be split into thin sheets.

Which diagram shows a structure most like that of slate?



[0620/13/O/N/14/Q7]

Q38. Element X, $^{19}_9X$, forms a compound with element Y, $^{39}_{19}Y$.

Which statement describes the bonding in the compound formed?

- A X and Y share electrons.
- B X gives away one electron to Y.
- C Y gives away one electron to X.
- D Y gives away two electrons to X.

Q39. Which substance is methane?

	volatility	electrical conductivity at room temperature	solubility in water
A	high	good	soluble
B	high	poor	insoluble
C	low	good	soluble
D	low	poor	insoluble

[0620/13/O/N/14/Q10]

Q40. An element, X, can be represented as a_bX .

Which statement is correct?

- A The number of protons in an atom of X is a.
- B The exact position of X in the Periodic Table can be found from a.
- C The relative atomic mass of X is b.
- D The total number of electrons in one atom of X is b.

[0620/11/O/N/14/Q4]

Q41. What is different for isotopes of the same element?

- A nucleon number
- B number of electron shells
- C number of electrons in the outer shell
- D proton number

[0620/12/O/N/14/Q6]

Q42. Sodium chloride is an ionic solid.

Which statement is **not** correct?

- A Ions are formed when atoms lose or gain electrons.
- B Ions in sodium chloride are strongly held together.
- C Ions with the same charge attract each other.
- D Sodium chloride solution can conduct electricity.

[0620/12/O/N/14/Q7]

Q43.

Caesium chloride and rubidium bromide are halide compounds of Group I elements.

Caesium chloride has the formula1....., a relative formula mass2..... that of rubidium bromide and bonds that are3..... .

Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	CaCl	different from	ionic
B	CaCl	the same as	covalent
C	CsCl	different from	ionic
D	CsCl	the same as	covalent

Q44.

[0620/13/M/J/15/Q3]

Two atoms, X and Y, can be represented as shown.



Which statement is **not** correct?

- A X and Y are atoms of different elements.
- B X and Y are isotopes.
- C X and Y have different mass numbers.
- D X and Y have the same number of electrons.

Q45.

[0620/13/M/J/15/Q4]

Two atoms have the same relative atomic mass but different chemical properties.

Which row about the proton and neutron numbers of these atoms is correct?

	proton numbers	neutron numbers
A	different	different
B	different	same
C	same	different
D	same	same

Q46.

Which statements comparing the properties of electrons, neutrons and protons are correct?

	neutrons and protons are both heavier than electrons	only electrons and neutrons are charged
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

Q47.

[0620/13/M/J/15/Q6]

Diamond and graphite are both macromolecules.

Which statement is **not** correct?

- A Diamond and graphite contain carbon atoms only.
- B Diamond and graphite contain charged ions.
- C Diamond and graphite have high melting points.
- D The atoms in diamond and graphite are held together by covalent bonds.

Q48.

[0620/11/M/J/15/Q7]

In which compounds are pairs of electrons shared between atoms?

- 1 methane
- 2 lead bromide
- 3 sodium chloride

- A 1 only
- B 2 only
- C 1 and 3
- D 1, 2 and 3

Q49.

[0620/12/M/J/15/Q6]

Graphite is a form of carbon.

Why can graphite be used as a lubricant?

- A Graphite contains delocalised electrons which move throughout the structure.
- B Graphite contains weak covalent bonds so the atoms move easily.
- C Graphite has a low melting point so it easily turns into a liquid.
- D Graphite has weak forces of attraction between layers so they can move.

[0620/12/M/J/15/Q3]

Q50. The atomic structures of four particles are shown.

particle	electrons	neutrons	protons
W	8	9	8
X	7	9	7
Y	8	10	8
Z	9	10	9

Which two particles are isotopes?

- A W and X B W and Y C X and Z D Y and Z

[0620/12/M/J/15/Q4]

Q51. Q^+ is an ion of element Q.

What has the highest value in the ion?

- A the nucleon number
 B the number of electrons
 C the number of neutrons
 D the proton number

[0620/11/M/J/15/Q3]

Q52. Atoms contain electrons, neutrons and protons.

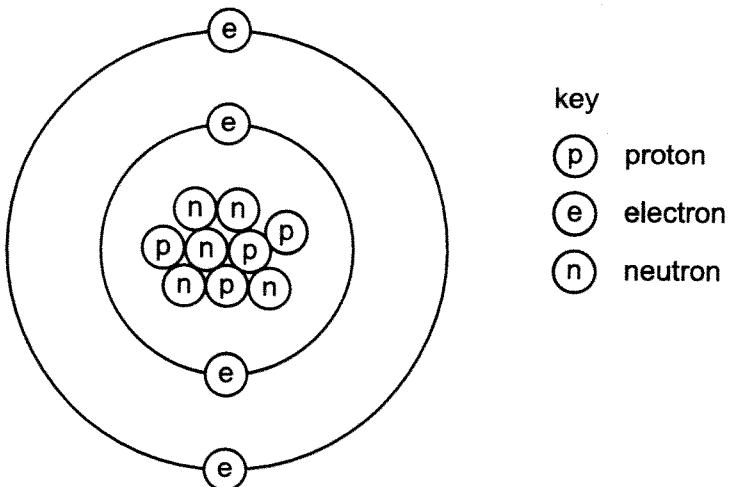
What is the definition of nucleon number?

- A the number of neutrons in the nucleus of an atom
 B the number of protons in the nucleus of an atom
 C the total number of neutrons and protons in the nucleus of an atom
 D the total number of particles in an atom

Q53.

[0620/11/M/J/15/Q4]

The diagram shows the atomic structure of an element X.



What is X?

- A aluminium
- B beryllium
- C boron
- D fluorine

Q54.

[0620/11/M/J/15/Q6]

Rescuers are drilling through fallen rock in order to rescue some men trapped in a cave. The drill needs lubricating from time to time.

The following statements were made about the materials used for the drill tip and the lubricant and the reasons for their use.

- 1 Diamond was used for the drill tip as it does not conduct electricity.
- 2 Diamond was used for the drill tip as it is very hard.
- 3 Graphite was used as the lubricant as it conducts electricity.
- 4 Graphite was used as the lubricant as it is soft and flaky.

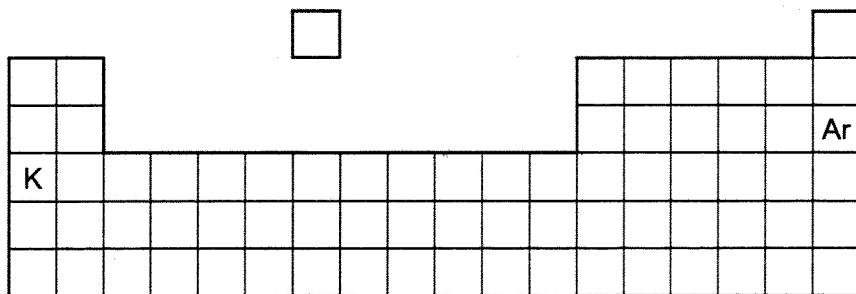
Which statements are correct?

- A 1 and 3
- B 1 and 4
- C 2 and 3
- D 2 and 4

[0620/13/O/N/15/Q3]

Q55.

Argon, Ar, has a higher relative atomic mass than potassium, K, but appears before it in the Periodic Table.



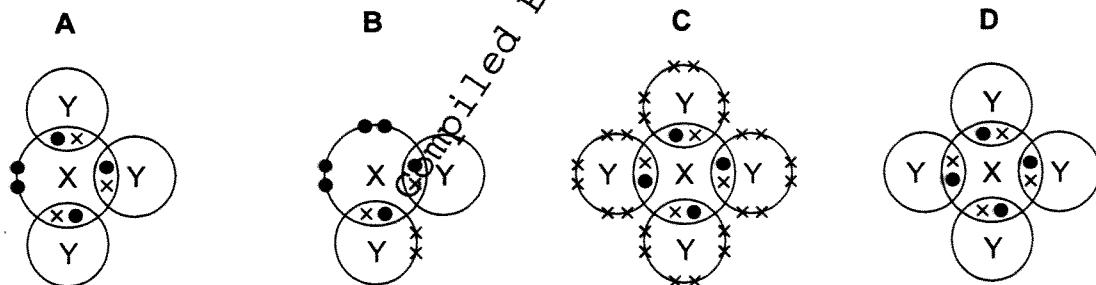
Why is argon listed before potassium in the Periodic Table?

Q56.

[0620/13/O/N/15/Q4]

In the following diagrams, X and Y are atoms of different elements.

Which diagram correctly shows the arrangement of outer electrons in a molecule of methane?



[0620/12/O/N/15/Q5]

Q57.

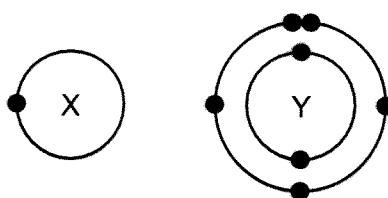
What do the nuclei of ${}^1\text{H}$ hydrogen atoms contain?

- A** electrons and neutrons
- B** electrons and protons
- C** neutrons only
- D** protons only

Q58.

[0620/11/O/N/15/Q6]

The electronic structures of atoms X and Y are shown.



X and Y form a covalent compound.

What is its formula?

A XY₅

B XY₃

C XY

D X₃Y

Q59.

[0620/12/O/N/15/Q3]

The table shows the nucleon number and the number of neutrons in one atom of isotopes W, X, Y and Z.

isotope	nucleon number	number of neutrons
W	35	18
X	37	20
Y	39	20
Z	40	22

Which statement about W, X, Y and Z is correct?

- A** W and X are isotopes of the same element.
- B** X and Y are isotopes of elements in the same group of the Periodic Table.
- C** Y and Z are isotopes of elements in the same period of the Periodic Table.
- D** Z has a higher proton number than Y.

Q60.

[0620/12/O/N/15/Q4]

Compound X melts at 801 °C and is a good electrical conductor when dissolved in water.

Compound Y boils at 77 °C, is insoluble in water and is a non-conductor of electricity.

Which type of bonding is present in X and in Y?

	X	Y
A	covalent	covalent
B	covalent	ionic
C	ionic	covalent
D	ionic	ionic

Q61.

The relative atomic mass of chlorine is 35.5.

When calculating relative atomic mass, which particle is the mass of a chlorine atom compared to?

- A a neutron
- B a proton
- C an atom of carbon-12
- D an atom of hydrogen-1

Q62.

[0620/11/O/N/15/Q5]

What do the nuclei of ${}^1\text{H}$ hydrogen atoms contain?

- A electrons and neutrons
- B electrons and protons
- C neutrons only
- D protons only

Q63.

[0620/11/O/N/15/Q7]

Two atoms of magnesium, Mg, react with one molecule of oxygen, O_2 .

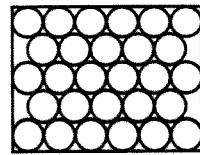
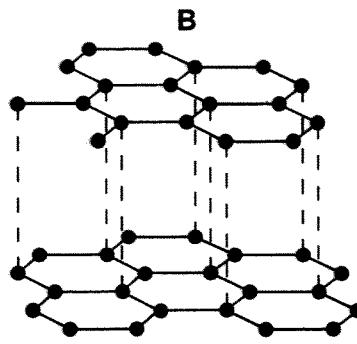
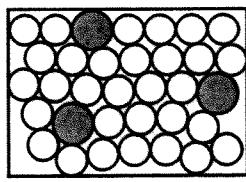
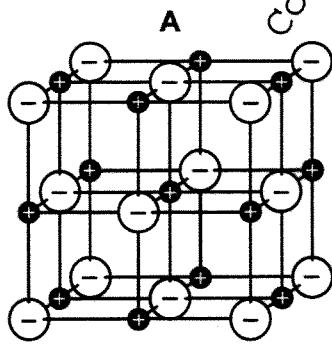
What is the formula of the product?

- A MgO
- B MgO_2
- C Mg_2O
- D Mg_2O_2

Q64.

[0620/11/O/N/15/Q23]

Which diagram shows the structure of an alloy?

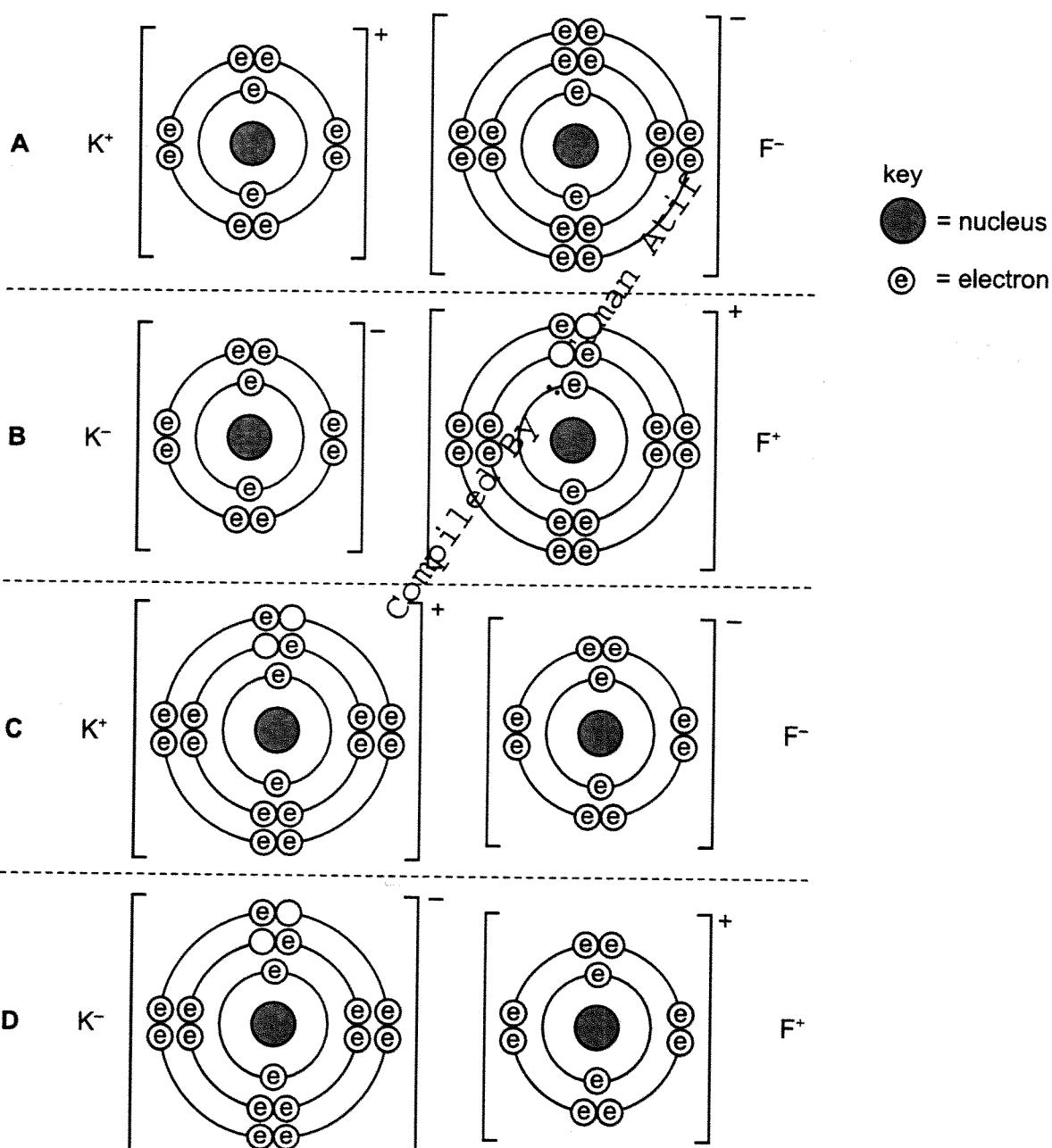


Q65. Which statement about atoms is correct?

- A Atoms contain protons and electrons in the nucleus.
- B Neutrons are negatively charged.
- C Protons are positively charged.
- D The nucleon number is the number of neutrons.

[0620/11/O/N/15/Q4]

Q66. Which diagram correctly shows the ions present in the compound potassium fluoride?



Q67.

Which statements about isotopes of the same element are correct?

- 1 They are atoms which have the same chemical properties because they have the same number of electrons in their outer shell.
- 2 They are atoms which have the same number of electrons and neutrons but different numbers of protons.
- 3 They are atoms which have the same number of electrons and protons but different numbers of neutrons.

A 1 and 2**B** 1 and 3**C** 2 only**D** 3 only**Q68.**

The table shows the electronic structure of four atoms.

atom	electronic structure
W	2,8,1
X	2,8,4
Y	2,8,7
Z	2,8,8

Which two atoms combine to form a covalent compound?

A W and X**B** W and Y**C** ~~W~~ and Y**D** X and Z**Q69.**

Which statement describes the attractive forces between molecules (intermolecular forces)?

A They are strong covalent bonds which hold molecules together.**B** They are strong ionic bonds which hold molecules together.**C** They are weak forces formed between covalently-bonded molecules.**D** They are weak forces which hold ions together in a lattice.**Q70.**

Which substance exists as a lattice of positive ions in a 'sea of electrons'?

A liquid potassium chloride**B** solid graphite**C** solid magnesium**D** solid silicon(IV) oxide

Q71.

[0620/23/M/J/16/Q25]

Some properties of substance X are listed.

- It conducts electricity when molten.
- It has a high melting point.
- It burns in oxygen and the product dissolves in water to give a solution with pH 11.

What is X?

- A a covalent compound
B a macromolecule
C a metal
D an ionic compound

Q72.

[0620/22/M/J/16/Q7]

Metals consist of a lattice of positive ions in a 'sea of electrons'.

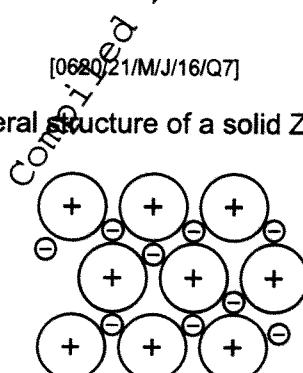
Why is aluminium malleable?

- A Its ions are attracted to the 'sea of electrons'.
B Its ions are tightly packed together.
C Its ions repel each other.
D Its layers of ions can slide over each other.

Q73.

[0620/21/M/J/16/Q7]

The diagram represents the general structure of a solid Z.



What is Z?

- A aluminium
B iodine
C silicon dioxide
D sulfur

Q74.

[0620/23/O/N/16/Q4]

An atom has three electron shells. There are three electrons in the outer shell.

How many protons and how many neutrons are in this atom?

	protons	neutrons
A	13	14
B	13	27
C	14	13
D	21	24

Q75.

[0620/23/O/N/16/Q5]

Ethanol is a liquid at room temperature and boils at 78 °C.

Sodium chloride is a solid at room temperature.

Which statement about the bonding in ethanol and sodium chloride is **not** correct?

- A Each ethanol molecule is held together by weak covalent bonds.
- B The ethanol molecules are held together by weak attractive forces.
- C The sodium ions and chloride ions are held together by strong attractive forces.
- D The sodium ions and chloride ions are held together in a giant lattice.

Q76.

[0620/23/O/N/16/Q6]

The molecules N₂, C₂H₄, CO₂ and CH₃OH all have covalent bonds.

These bonds consist of shared pairs of electrons.

Which row gives the total number of shared pairs of electrons in the molecules shown?

	molecule	total number of shared pairs of electrons
A	N ₂	2
B	C ₂ H ₄	6
C	CO ₂	2
D	CH ₃ OH	4

Q77.

[0620/23/O/N/16/Q7]

Metals are malleable.

Which statement explains why metals are malleable?

- A Metallic bonding is very strong.
- B Metals are good conductors of electricity.
- C Positive metal ions are arranged in a regular lattice structure.
- D The layers of positive metal ions can slide over each other.

Q78.

The table shows information about four different particles.

particle	proton number	nucleon number	number of protons	number of neutrons	number of electrons
Na	11	23	11	W	11
Na ⁺	11	23	11	12	X
O	8	16	8	Y	8
O ²⁻	8	16	8	8	Z

What are the values of W, X, Y and Z?

	W	X	Y	Z
A	11	10	10	8
B	11	11	8	10
C	12	10	8	10
D	12	11	10	8

Q79.

[0620/22/O/N/16/Q5]

In which ionic compound do the metal ion and the non-metal ion have the same electronic structure?

A CaO

B KBr

C MgO

D NaCl

Q80.

[0620/22/O/N/16/Q7]

Iron is a metal. Its structure consists of a giant lattice of positive ions in a 'sea of electrons'.

Which statements about solid iron are correct?

- 1 Iron conducts electricity because the electrons are free to move.
- 2 Iron conducts heat because the positive ions are free to move.
- 3 Iron has a high melting point due to the strong covalent bonds.
- 4 Iron is malleable because the layers of ions can slide over one another.

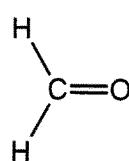
A 1 and 3

B 1 and 4

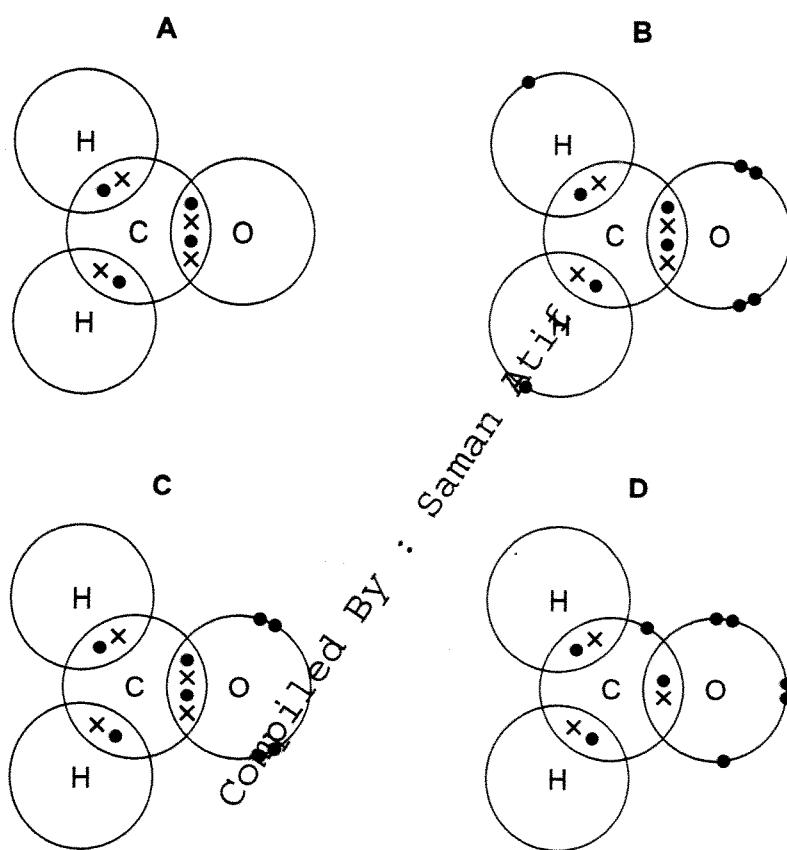
C 1 only

D 2, 3 and 4

Q81. The structure of methanal is shown.



Which diagram shows the arrangement of outer shell electrons in a molecule of methanal?



[0620/21/O/N/16/Q5]

Q82. Metal P reacts with non-metal Q to form a compound.

Which process takes place and which type of compound is formed?

	process	type of compound
A	electrons are transferred from P to Q	covalent
B	electrons are transferred from P to Q	ionic
C	electrons are transferred from Q to P	covalent
D	electrons are transferred from Q to P	ionic

Q83.

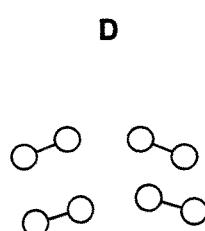
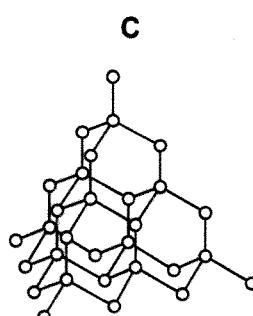
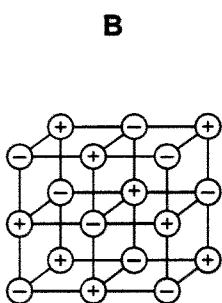
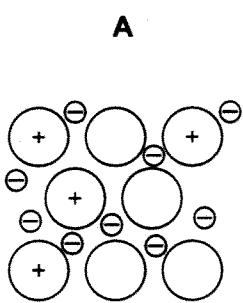
[0620/21/O/N/16/Q7]

X is a solid at room temperature.

X has a high melting point.

Solid X conducts electricity.

Which diagram shows how the particles are arranged in solid X?



Q84.

[0620/21/M/J/17/Q4]

Sodium reacts with chlorine to form sodium chloride.

Which statements describe what happens to the sodium atoms in this reaction?

- 1 Sodium atoms form positive ions.
- 2 Sodium atoms form negative ions.
- 3 Sodium atoms gain electrons.
- 4 Sodium atoms lose electrons.

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

Q85.

[0620/21/M/J/17/Q5]

Diamond is extremely hard and does not conduct electricity.

Which statement explains these properties?

- A It has a lattice of positive carbon ions in a 'sea of electrons'.
- B It has delocalised electrons and each carbon atom forms three covalent bonds with other carbon atoms.
- C It has no delocalised electrons and each carbon atom forms four covalent bonds with other carbon atoms.
- D It has strong ionic bonds between each carbon atom.

Q86.

[0620/21/M/J/17/Q6]

Which statement about metals is **not** correct?

- A Metals are malleable because the metal ions can slide over one another.
- B Metals conduct electricity because electrons can move through the lattice.
- C Metals consist of a giant lattice of metal ions in a 'sea of electrons'.
- D Metals have high melting points because of the strong attraction between the metal ions.

Q87.

[0620/22/M/J/17/Q4]

Which element does **not** form a stable ion with the same electronic structure as argon?

- A aluminium
- B chlorine
- C phosphorus
- D potassium

[0620/22/M/J/17/Q5]

Q88.

Graphite and diamond are both forms of the element carbon.

Which row shows the number of other carbon atoms that each carbon atom is covalently bonded to in graphite and diamond?

	graphite	diamond
A	3	3
B	3	4
C	4	3
D	4	4

Q89.

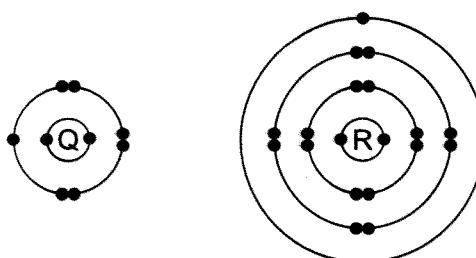
[0620/22/M/J/17/Q6]

Which statement describes metallic bonding?

- A The attraction between a lattice of negative ions and delocalised protons.
- B The attraction between a lattice of positive ions and delocalised electrons.
- C The attraction between delocalised protons and electrons.
- D The attraction between oppositely charged ions.

[0620/23/M/J/17/Q4]

Q90. The electronic structures of atoms Q and R are shown.



Q and R form an ionic compound.

What is the formula of the compound?

- A QR₇ B Q₂R₄ C QR D Q₇R

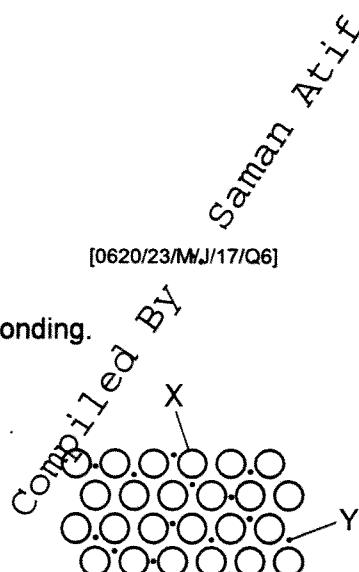
[0620/23/M/J/17/Q5]

Q91. Which substance is a macromolecule?

- A ammonia
B carbon dioxide
C diamond
D water

[0620/23/M/J/17/Q6]

Q92. The diagram shows metallic bonding.



Which labels are correct?

	X	Y
A	atomic nucleus	outer electron
B	metal atom	mobile electron
C	metal ion	mobile electron
D	positive ion	negative ion

Q93.

[0620/21/O/N/17/Q4]

Two statements about silicon(IV) oxide are given.

- 1 It is a hard substance.
- 2 It has a macromolecular structure with strong covalent bonds.

Which is correct?

- A Both statements are correct and statement 2 explains statement 1.
- B Both statements are correct but statement 2 does not explain statement 1.
- C Statement 1 is correct but statement 2 is not correct.
- D Statement 2 is correct but statement 1 is not correct.

[0620/21/O/N/17/Q5]

Q94.

Which statement explains why isotopes of the same element have the same chemical properties?

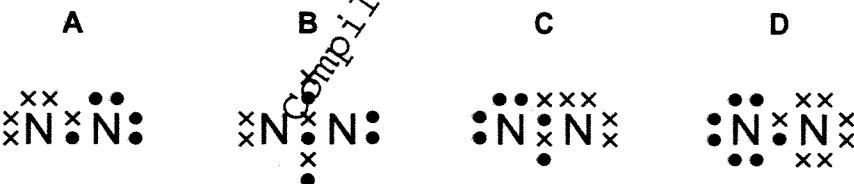
- A They have a different number of neutrons in the nucleus.
- B They have the same number of neutrons in the nucleus.
- C They have the same number of outer shell electrons.
- D They have the same number of protons as neutrons.

Sampath Afif

[0620/21/O/N/17/Q6]

Q95.

Which dot-and-cross diagram shows the outer shell electron arrangement in a molecule of nitrogen?



Q96.

Which row describes silicon(IV) oxide?

	has a giant structure	is an acidic oxide	conducts electricity
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✗
D	✗	✓	✓

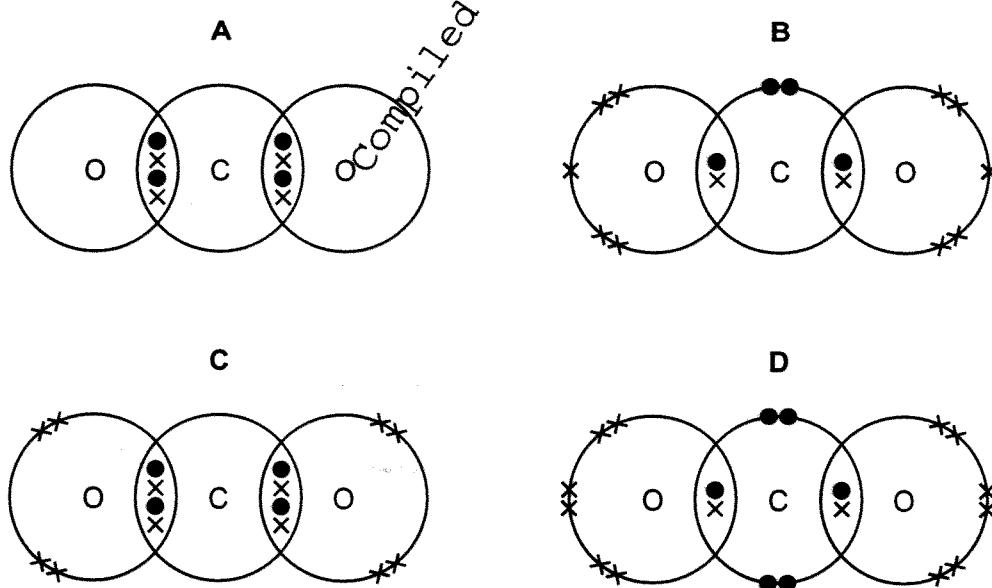
Q97.

Why do isotopes of the same element have the same chemical properties?

- A They have the same nucleon number.
 - B They have the same number of electrons in the outer shell.
 - C They have the same number of neutrons in the nucleus.
 - D They have the same number of protons as neutrons.

Q98.

Which dot-and-cross diagram shows the outer shell electron arrangement in a molecule of carbon dioxide?



Q99.

[0620/23/O/N/17/Q4]

Which compound is silicon(IV) oxide?

	melting point /°C	good electrical conductor when solid	good electrical conductor when molten
A	-73	no	no
B	801	no	yes
C	1495	yes	yes
D	1710	no	no

Q100.

[0620/23/O/N/17/Q5]

Carbon has three naturally occurring isotopes, ^{12}C , ^{13}C and ^{14}C .

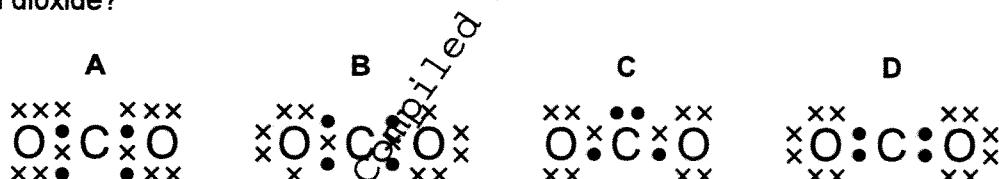
Which statement explains why the isotopes have the same chemical properties?

- A They have the same number of electrons in the first shell.
- B They have the same number of electrons in the outer shell.
- C They have the same number of neutrons in the nucleus.
- D They have the same number of protons as neutrons.

Q101.

[0620/23/O/N/17/Q6]

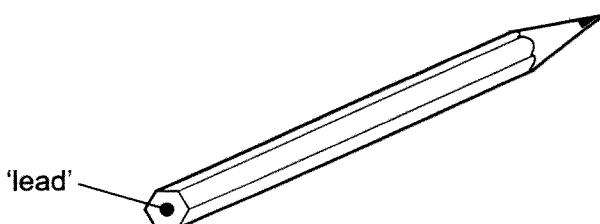
Which dot-and-cross diagram shows the outer shell electron arrangement in a molecule of carbon dioxide?



Q102.

[0620/21/M/J/18/Q4]

The 'lead' in a pencil is made of a mixture of graphite and clay.



When the percentage of graphite is increased, the pencil slides across the paper more easily.

Which statement explains this observation?

- A Graphite has a high melting point.
- B Graphite is a form of carbon.
- C Graphite is a lubricant.
- D Graphite is a non-metal.

Q103.

[0620/21/M/J/18/Q5]

Chlorine exists as two common isotopes, ^{35}Cl and ^{37}Cl .

Information about these two isotopes is shown.

	number of protons	number of neutrons	number of electron shells
^{35}Cl	17	18	3
^{37}Cl	17	20	3

Which statement explains why the two isotopes are of the same element?

- A Both have the same number of electron shells.
- B Both have the same number of protons.
- C Both have 7 outer shell electrons.
- D ^{37}Cl has 2 more neutrons than ^{35}Cl .

Q104.

[0620/21/M/J/18/Q6]

Which substance is not a macromolecule?

- A diamond
- B graphite
- C silicon(IV) oxide
- D sulfur

Q105.

[0620/21/M/J/18/Q7]

Copper is a metallic element.

Which statements about copper are correct?

- 1 Copper is malleable because layers of ions are in fixed positions and cannot move.
- 2 The structure of copper consists of negative ions in a lattice.
- 3 Copper conducts electricity because electrons can move through the metal.
- 4 Electrons hold copper ions together in a lattice by electrostatic attraction.

A 1 and 2

B 2, 3 and 4

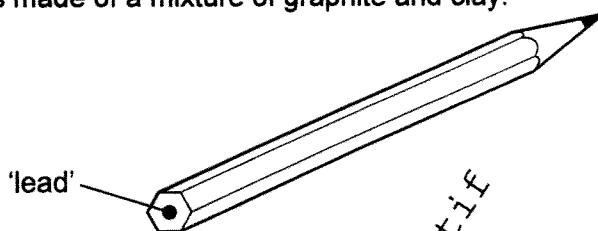
C 2 and 3 only

D 3 and 4 only

Q106.

[0620/22/M/J/18/Q4]

The 'lead' in a pencil is made of a mixture of graphite and clay.



When the percentage of graphite is increased, the pencil slides across the paper more easily.

Which statement explains this observation?

- A Graphite has a high melting point.
- B Graphite is a form of carbon.
- C Graphite is a lubricant.
- D Graphite is a non-metal.

Q107.

[0620/22/M/J/18/Q5]

Which pair shows particles with the same chemical properties?

- A $^{23}_{11}M$ and $^{23}_{11}M^+$
- B $^{23}_{11}M$ and $^{24}_{11}M$
- C $^{23}_{11}M$ and $^{23}_{12}M$
- D $^{24}_{11}M^+$ and $^{24}_{12}M^+$

Q108.

[0620/22/M/J/18/Q6]

Which substances have similar structures?

- A diamond and graphite
- B diamond and silicon(IV) oxide
- C graphite and poly(ethene)
- D graphite and silicon(IV) oxide

Q109.

[0620/22/M/J/18/Q7]

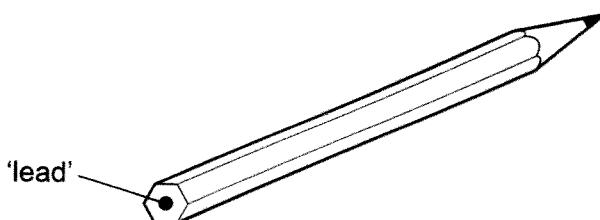
Which substance is **not** a macromolecule?

- A diamond
- B graphite
- C silicon(IV) oxide
- D sulfur

Q110.

[0620/23/M/J/18/Q4]

The 'lead' in a pencil is made of a mixture of graphite and clay.



When the percentage of graphite is increased, the pencil ~~slices~~ slides across the paper more easily.

Which statement explains this observation?

- A Graphite has a high melting point.
- B Graphite is a form of carbon.
- C Graphite is a lubricant.
- D Graphite is a non-metal.

Q111.

[0620/23/M/J/18/Q5]

Iron has an atomic number of 26. It occurs as the isotopes ^{54}Fe , ^{56}Fe , ^{57}Fe and ^{58}Fe .

Which statement explains why these isotopes have the same chemical properties?

- A They have similar mass numbers.
- B They have the same number of electrons in their outer shells.
- C They have the same number of neutrons in their nuclei.
- D They have the same number of protons in their nuclei.

Q112.

[0620/23/M/J/18/Q6]

How many silicon atoms are bonded to each oxygen atom in a crystal of silicon(IV) oxide?

- A 1
- B 2
- C 3
- D 4

Q113.

[0620/23/M/J/18/Q7]

Which substance is not a macromolecule?

- A diamond
- B graphite
- C silicon(IV) oxide
- D sulfur

[0620/21/O/N/2018/Q4]

Q114.

Which statement about the isotopes of an element is correct?

- A Their physical properties are different because they have different proton numbers.
- B Their atomic masses are different because they have different numbers of electron shells.
- C They have the same chemical properties because they have the same number of electrons in their outer shells.
- D They have the same physical properties because they have the same number of neutrons in their nuclei.

Q115.

[0620/21/O/N/2018/Q5]

Which two molecules contain the same number of electrons?

- A Cl_2 and SO_2
- B CH_4 and H_2O
- C CO and NH_3
- D CO_2 and HCl

Q116.

[0620/21/O/N/2018/Q7]

Which gas sample contains the most molecules?

- A 24 dm^3 of carbon dioxide, CO_2
- B 4 g of hydrogen, H_2
- C 36 dm^3 of hydrogen chloride, HCl
- D 14 g of nitrogen, N_2

[0620/22/O/N/2018/Q36]

Q117.

Which two compounds are molecules which both contain a double bond?

- A ethane and ethanoic acid
- B ethane and ethanol
- C ethene and ethanoic acid
- D ethene and ethanol

IGCSE Chemistry Topical Paper 2

Topic 3 : Atom, Elements & Compounds + Bonding

Q118.

[0620/22/O/N/2018/Q3]

How many neutrons are present in the atom $^{45}_{21}X$?

- A 21 B 24 C 45 D 66

Q119.

[0620/22/O/N/2018/Q4]

Two naturally occurring isotopes of oxygen are ^{16}O and ^{17}O .

Which statement is correct?

- A Both isotopes react with iron to form rust.
- B Neither isotope reacts with iron to form rust.
- C Only ^{16}O reacts with iron to form rust.
- D Only ^{17}O reacts with iron to form rust.

Q120.

[0620/22/O/N/2018/Q5]

How many electrons are used to form covalent bonds in a molecule of methanol, CH_3OH ?

- A 5 B 6 C 8 D 10

Q121.

[0620/22/O/N/2018/Q7]

Which gas sample contains the smallest number of molecules?

- A 4g of helium
- B 16g of oxygen
- C 28g of carbon monoxide
- D 28g of nitrogen

Q122.

[0620/22/O/N/2018/Q9]

The formulae of some ions are shown.

positive ion	negative ion
Ti^{4+}	PO_4^{3-}
Al^{3+}	SO_4^{2-}
Mg^{2+}	NO_3^-
K^+	Cl^-

Which formula is not correct?

- A $\text{Al}_3(\text{SO}_4)_2$ B K_3PO_4 C $\text{Mg}(\text{NO}_3)_2$ D TiCl_4

Q123.

[0620/23/O/N/2018/Q3]

Which statement describes isotopes?

- A Isotopes of the same element have different electron arrangements.
- B Isotopes of the same element have different nuclear charges.
- C Isotopes of the same element have nuclei with masses that are the same.
- D Isotopes of the same element have the same number of protons.

Q124.

[0620/23/O/N/2018/Q4]

X and Y are both atoms.

X and Y have the same chemical properties as each other.

Which row describes the atomic structures of X and Y?

	X			Y		
	protons	neutrons	electrons	protons	neutrons	electrons
A	6	6	6	6	6	7
B	6	6	6	6	6	6
C	6	6	6	16	16	16
D	7	6	7	6	6	7

Samaran Atta F

[0620/23/O/N/2018/Q5]

Q125.

Which covalent molecule contains two atoms bonded together by exactly four shared electrons?

A N₂B C₃H₈C CH₃OHD CH₃COOH

Q126.

The formula of ammonia is NH₃.

[0620/23/O/N/2018/Q6]

Which statement about a molecule of ammonia is correct?

- A The bonding in a molecule of ammonia is ionic.
- B The nitrogen atom has a noble gas configuration, the hydrogen atoms do not.
- C The nitrogen atom shares all of its electrons with hydrogen atoms.
- D There are six shared electrons in a molecule of ammonia.

[0620/23/O/N/2018/Q9]

Q127.

Iron(III) chromate is a yellow solid. It contains the ions Fe³⁺ and CrO₄²⁻.

What is the formula of iron(III) chromate?

A FeCrO₄B Fe₃(CrO₄)₂C Fe₂CrO₄D Fe₂(CrO₄)₃

Q128.

[0620/21/M/J/2019/Q4]

- Which statement about an atom of fluorine, $^{19}_9\text{F}$, is correct?
- It contains more protons than neutrons.
 - It contains a total of 28 protons, neutrons and electrons.
 - Its isotopes contain different numbers of protons.
 - Its nucleus contains 9 neutrons.

Q129.

[0620/22/M/J/2019/Q5]

Which row describes the formation of single covalent bonds in methane?

A	atoms share a pair of electrons	both atoms gain a noble gas electronic structure
B	atoms share a pair of electrons	both atoms have the same number of electrons in their outer shell
C	electrons are transferred from one atom to another	both atoms gain a noble gas electronic structure
D	electrons are transferred from one atom to another	both atoms have the same number of electrons in their outer shell

Q130.

[0620/22/M/J/2019/Q6]

Which statement describes the structure of an ionic compound?

- It is a giant lattice of oppositely charged ions.
- It is a giant lattice of positive ions in a 'sea' of electrons.
- It is a giant molecule of oppositely charged ions.
- It is a simple molecule of oppositely charged ions.

Q131.

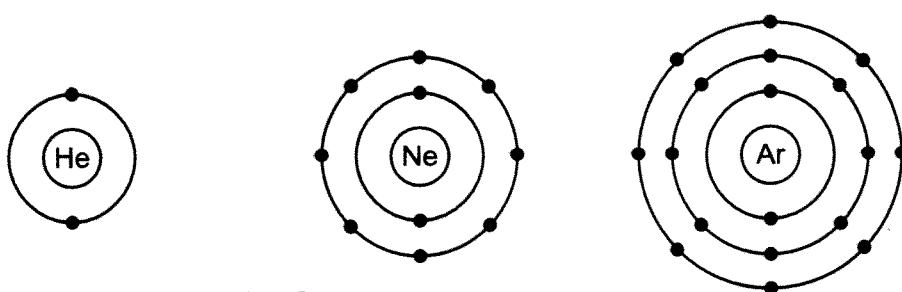
[0620/22/M/J/2019/Q4]

What is an isotope of $^{31}_{15}\text{E}$?

- $^{31}_{14}\text{E}$
- $^{33}_{15}\text{E}$
- $^{31}_{16}\text{E}$
- $^{33}_{16}\text{E}$

Q132.

The electronic structures of helium, neon and argon are shown.



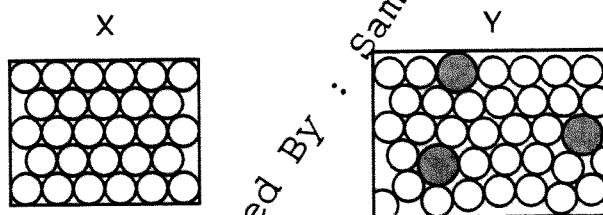
Which row describes these gases?

	reactivity	form of the gas	electronic structure
A	reactive	monoatomic	incomplete outer shell of electrons
B	unreactive	diatomic	complete outer shell of electrons
C	unreactive	diatomic	incomplete outer shell of electrons
D	unreactive	monoatomic	complete outer shell of electrons

Q133.

[0620/22/M/J/2019/Q23]

The diagrams show the structure of two substances used to make electrical conductors.



Which statement correctly describes X and Y?

- A X is a pure metal and Y is a compound.
- B X is a pure metal and Y is an alloy.
- C X is a solid and Y is a liquid.
- D X is harder and stronger than Y.

Q134.

[0620/23/M/J/2019/Q7]

When propane burns in air, carbon dioxide and water are formed.

What is the chemical equation for this reaction?

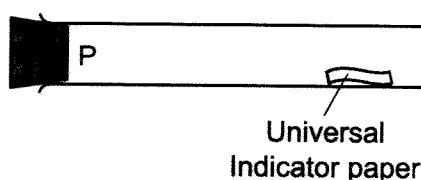
- A $\text{C}_3\text{H}_8 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
- B $\text{C}_3\text{H}_8 + 3\text{O}_2 \rightarrow 3\text{CO}_2 + \text{H}_2\text{O}$
- C $\text{C}_3\text{H}_8 + 4\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O}$
- D $\text{C}_3\text{H}_8 + 5\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O}$

IGCSE Chemistry Topical Paper 2**Topic 3 : Atom, Elements & Compounds + Bonding****Q135.**

[0620/23/M/J/2019/Q1]

Hydrogen chloride gas ($M_r = 36.5$) is released at P in the apparatus shown.

The Universal Indicator paper turns red after 38 s.

The experiment is repeated using sulfur dioxide ($M_r = 64$).

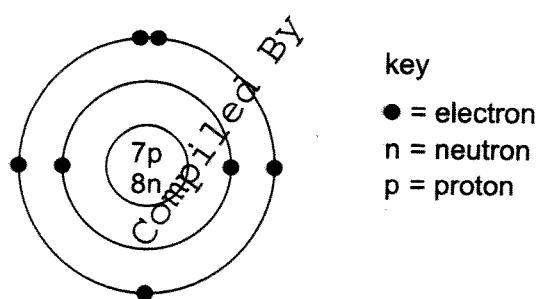
What is the result for sulfur dioxide?

	Universal Indicator turns	time for Universal Indicator to change colour/s
A	blue	26
B	blue	51
C	red	26
D	red	51

Q136.

[0620/23/M/J/2019/Q4]

The structure of an atom is shown.



Which element is the atom an isotope of?

- A nitrogen
- B oxygen
- C phosphorus
- D titanium

[0620/23/M/J/2019/Q21]

Q137.

Which statement about the properties of elements in Group I and in Group VII is correct?

- A Bromine displaces iodine from an aqueous solution of potassium iodide.
- B Chlorine, bromine and iodine are diatomic gases at room temperature.
- C Lithium, sodium and potassium are soft non-metals.
- D Lithium, sodium and potassium have an increasing number of electrons in their outer shells.

[0620/23/M/J/2019/Q22]

Q138.

Gas G has 10 electrons. Gas H has eight more electrons than gas G. Both gases are monoatomic.

Which statement about G and H is correct?

- A Both gases are in the same group of the Periodic Table.
- B Both gases are in the same period of the Periodic Table.
- C Both gases are very reactive.
- D Gas G has a higher atomic mass than gas H.

[0620/22/O/N/2019/Q4]

Q139.

Which statement about an ionic compound is not correct?

- A It conducts electricity when dissolved in water.
- B It has a high melting point due to strong attractive forces between ions.
- C It has a regular lattice of oppositely charged ions in a 'sea of electrons'.
- D The ionic bonds are formed between metallic and non-metallic elements.

[0620/21/O/N/2019/Q5]

Q140.

An isotope of chromium is represented by $^{52}_{24}\text{Cr}$.

Which statement about an atom of this isotope of chromium is correct?

- A It contains 24 electrons.
- B It contains 24 neutrons.
- C It contains 28 protons.
- D It contains 52 neutrons.

[0620/21/O/N/2019/Q7]

Q141.

How are the structures of diamond and silicon(IV) oxide similar?

- A Molecules of both diamond and silicon(IV) oxide are held together by weak attractive forces.
- B They both contain atoms arranged in planes held together by weak bonds.
- C They both contain ions that are free to move.
- D The carbon in diamond and the silicon in silicon(IV) oxide each have four covalent bonds.

Q142.

[0620/21/O/N/2019/Q6]

Element X has two isotopes, $^{12}_6\text{X}$ and $^{14}_6\text{X}$.

Which statement about these isotopes is correct?

- A They have different chemical properties because they have different numbers of neutrons.
- B They have the same chemical properties because they have the same number of outer shell electrons.
- C They have the same nucleon number because the sum of the number of protons and electrons is the same.
- D They have different positions in the Periodic Table because they have different numbers of neutrons.

Q143.

[0620/22/O/N/2019/Q8]

Which statement describes the structure of copper?

- A It has a lattice of negative ions in a 'sea of electrons'.
- B It has a lattice of negative ions in a 'sea of protons'.
- C It has a lattice of positive ions in a 'sea of electrons'.
- D It has a lattice of positive ions in a 'sea of protons'.

Q144.

[0620/22/O/N/2019/Q5]

What is the total number of electrons in one molecule of ammonia, NH_3 ?

- A 6 B 8 C 10 D 11

Q145.

[0620/22/O/N/2019/Q6]

Rubidium has two isotopes, $^{85}_{37}\text{Rb}$ and $^{87}_{37}\text{Rb}$.

Which statement explains why both isotopes have the same chemical properties?

- A They have the same number of protons.
- B They have the same number of outer shell electrons.
- C They have different numbers of neutrons.
- D They have different mass numbers.

Q146.

[0620/22/O/N/2019/Q7]

Which statement about the structure and properties of silicon(IV) oxide is **not** correct?

- A It has a giant structure similar to that of diamond.
- B It has a high melting point due to the strong attractive force between molecules.
- C There are strong covalent bonds between silicon and oxygen.
- D There are no free electrons, so silicon(IV) oxide does not conduct electricity.

Q147.

[0620/23/O/N/2019/Q5]

The numbers of protons, neutrons and electrons present in the atoms P, Q, R and S are shown.

atom	number of protons	number of neutrons	number of electrons
P	4	5	4
Q	5	6	5
R	6	6	6
S	6	7	6

Which atoms are isotopes of the same element?

- A P and Q only B Q and R only C R and S only D P and S only

Q148.

[0620/23/O/N/2019/Q6]

Carbon has three isotopes, ^{12}C , ^{13}C and ^{14}C .

Why do all three isotopes have the same chemical properties?

- A They all have the same atomic mass.
 B They all have the same number of electrons in their outer shell.
 C They all have the same number of electron shells.
 D They all have the same number of nucleons.

Q149.

[0620/23/O/N/2019/Q7]

Silicon(IV) oxide is a covalently bonded compound.

Which statements are correct?

- 1 Silicon atoms form four single bonds in silicon(IV) oxide.
 2 Oxygen atoms form two double bonds in silicon(IV) oxide.
 3 Silicon(IV) oxide has a high melting point.
 4 Silicon(IV) oxide contains one silicon atom and four oxygen atoms.

- A 1 and 2 only B 1 and 3 only C 2 and 3 only D 3 and 4 only

Q150.

[0620/21/M/J/2020/Q4]

The atomic number and nucleon number of a potassium atom are shown.

	potassium atom
atomic number	19
nucleon number	39

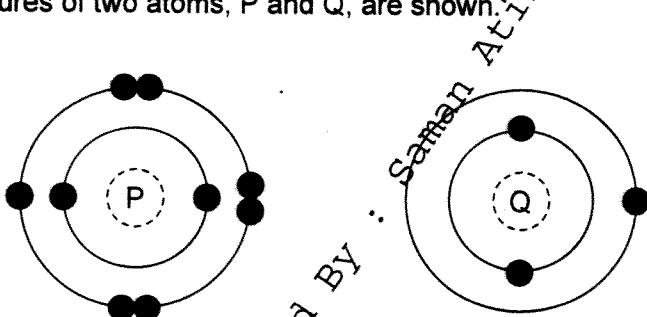
How many protons, neutrons and electrons are in a potassium ion, K⁺?

	protons	neutrons	electrons
A	19	20	18
B	19	20	20
C	20	19	18
D	20	19	19

Q151.

[0620/22/M/J/2020/Q5]

The electronic structures of two atoms, P and Q, are shown.



P and Q combine together to form a compound.

What is the type of bonding in the compound and what is the formula of the compound?

	type of bonding	formula
A	ionic	PQ
B	ionic	PQ ₂
C	covalent	PQ ₂
D	covalent	PQ

Q152.

[0620/21/M/J/2020/Q7]

Which statement explains why methane has a lower boiling point than water?

- A Methane has weaker covalent bonds than water.
- B Methane has weaker attractive forces than water.
- C Methane molecules are heavier than water molecules.
- D Methane molecules have more bonds than water molecules.

Q153.

[0620/21/M/J/2020/Q6]

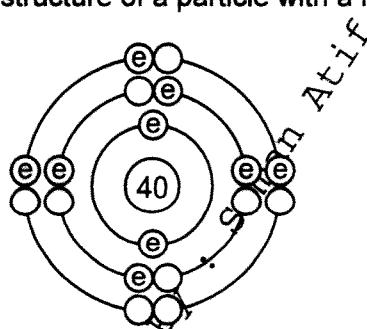
Which row contains a description of metallic bonding and a property that is explained by reference to metallic bonding?

	description of metallic bonding	property explained by metallic bonding
A	a lattice of negative ions in a sea of electrons	a metal will react with an acid, producing hydrogen
B	a lattice of negative ions in a sea of electrons	a piece of a metal can be moulded into different shapes
C	a lattice of positive ions in a sea of electrons	a metal will react with an acid, producing hydrogen
D	a lattice of positive ions in a sea of electrons	a piece of a metal can be moulded into different shapes

Q154.

[0620/22/M/J/2020/Q4]

The diagram shows the electronic structure of a particle with a nucleon number (mass number) of 40.



The table shows the suggestions that three students, 1, 2 and 3, made to identify the particle.

	student		
	1	2	3
particle	Ar	Cl	Ca ²⁺

Which students are correct?

- A 1 and 2 only B 1 and 3 only C 2 and 3 only D 1, 2 and 3

[0620/22/M/J/2020/Q6]

Q155.

Which statement about the structure of a metal explains why metals are malleable?

- A The electrons can move freely throughout the lattice.
- B The layers of metal ions can slide over each other.
- C The metal ions are positively charged.
- D There is a strong force of attraction between the metal ions and the electrons.

Q156.

[0620/22/M/J/2020/Q7]

The bonding, structure and melting point of sodium chloride and sulfur dichloride are shown.

compound	bonding	structure	melting point / °C
sodium chloride	ionic	giant lattice	801
sulfur dichloride	covalent	simple molecular	-121

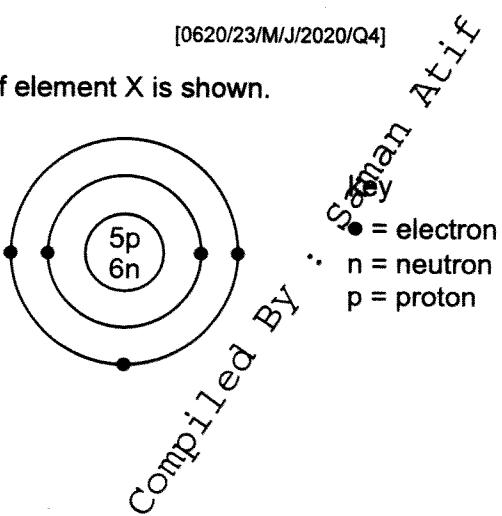
Why does sulfur dichloride have a lower melting point than sodium chloride?

- A The covalent bonds in sulfur dichloride are weaker than the attractive forces between molecules in sodium chloride.
- B The covalent bonds in sulfur dichloride are weaker than the ionic bonds in sodium chloride.
- C The attractive forces between molecules in sulfur dichloride are weaker than the attractive forces between molecules in sodium chloride.
- D The attractive forces between molecules in sulfur dichloride are weaker than the ionic bonds in sodium chloride.

Q157.

[0620/23/M/J/2020/Q4]

The structure of an atom of element X is shown.



What is element X?

- A boron
- B carbon
- C sodium
- D sulfur

Q158.

[0620/23/M/J/2020/Q6]

Caesium is a metal in Group I of the Periodic Table.

Which description of the bonding in caesium is correct?

- A electrostatic attraction between oppositely charged ions
- B electrostatic attraction between positive metal ions and mobile electrons
- C neighbouring metal atoms sharing pairs of electrons
- D strong attractive forces between atoms

[0620/23/M/J/2020/Q7]

Q159.

Why does magnesium oxide, MgO, have a very high melting point?

- A There is a very strong double bond between magnesium and oxygen.
- B There is a very strong attractive force between the magnesium oxide molecules.
- C The oxide ions are strongly attracted to positive ions.
- D The magnesium ions are strongly attracted to a sea of electrons.

[0620/21/O/N/2020/Q5]

Q160.

The atomic structure of four particles are shown.

	electrons	protons	neutrons
P	18	17	18
Q	18	17	20
R	17	17	18
S	17	17	20

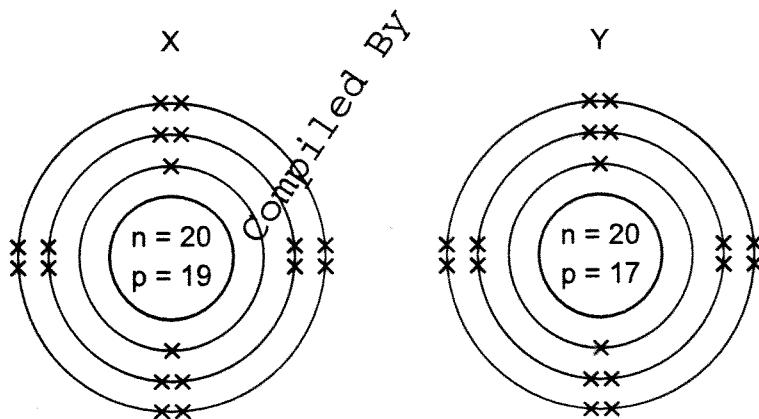
Which particles have the same chemical properties?

- A P and R only
- B P and S
- C P, Q and R
- D R and S

[0620/22/O/N/2020/Q6]

Q161.

The arrangements of the electrons in two ions formed from elements X and Y are shown.



Which equation represents the reaction between elements X and Y?

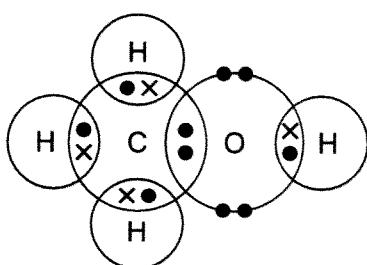
- A $X_2 + 2Y \rightarrow 2X^+ + 2Y^-$
- B $X_2 + 2Y \rightarrow 2X^- + 2Y^+$
- C $2X + Y_2 \rightarrow 2X^+ + 2Y^-$
- D $2X + Y_2 \rightarrow 2X^- + 2Y^+$

Q162.

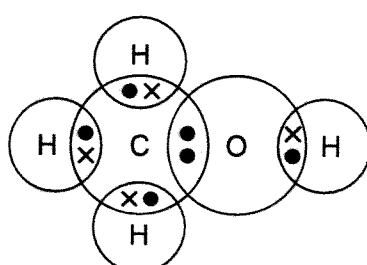
[0620/21/O/N/2020/Q7]

Which diagram shows the outer shell electron arrangement in a molecule of methanol, CH₃OH?

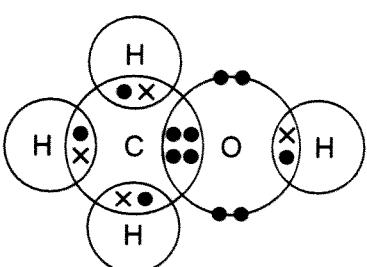
A



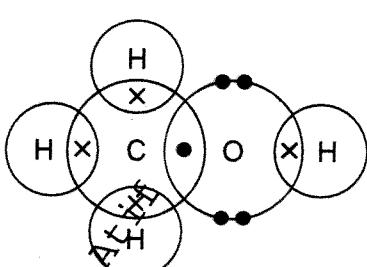
B



C



D



Q163.

[0620/21/O/N/2020/Q8]

Which statement about silicon dioxide, SiO₂, is correct?

- A It conducts electricity because it contains free electrons.
- B It is a macromolecule with four oxygen atoms bonded to each silicon atom.
- C It is a simple covalent molecule.
- D Its structure is similar to graphite.

Q164.

[0620/22/O/N/2020/Q10]

Which statement explains why graphite is used as a lubricant?

- A All bonds between the atoms are weak.
- B It conducts electricity.
- C It has a low melting point.
- D Layers in the structure can slide over each other.

Q165.

[0620/22/O/N/2020/Q3]

Which statement about isotopes is correct?

- A They have different proton numbers.
- B They have different chemical properties.
- C They have the same nucleon number.
- D They have the same number of electrons in their outer shell.

Q166.

[0620/22/O/N/2020/Q7]

Which row identifies compounds that contain single covalent bonds only, double covalent bonds only or both single and double covalent bonds?

	single covalent bonds only	double covalent bonds only	both single and double covalent bonds
A	C_2H_4	CH_3OH	CO_2
B	CH_3OH	C_2H_4	CO_2
C	CH_3OH	CO_2	C_2H_4
D	CO_2	C_2H_4	CH_3OH

Q167.

[0620/22/O/N/2020/Q9]

Rubidium is in Group I of the Periodic Table and bromine is in Group VII.

Rubidium reacts with bromine to form an ionic compound.

Which row shows the electron change taking place for rubidium and the correct formula of the rubidium ion?

	electron change	formula of ion formed
A	electron gained	Rb^+
B	electron gained	Rb^-
C	electron lost	Rb^+
D	electron lost	Rb^-

Q168.

[0620/23/O/N/2020/Q5]

Molecules containing only non-metal atoms are covalently bonded.

The formulae of four covalently bonded molecules are given below:

- 1 nitrogen, N_2
- 2 carbon dioxide, CO_2
- 3 ethene, C_2H_4
- 4 methanol, CH_3OH

Which of the molecules contain double bonds?

- A 1 and 4 B 2 and 3 C 2 and 4 D 4 only

IGCSE Chemistry Topical Paper 2**Q169.**

[0620/23/O/N/2020/Q8]

Sodium reacts with chlorine to form sodium chloride.

Topic 3 : Atom, Elements & Compounds + Bonding

Which row describes the bonding in the three substances?

	sodium	chlorine	sodium chloride
A	covalent	covalent	covalent
B	covalent	metallic	ionic
C	metallic	covalent	ionic
D	metallic	metallic	covalent

[0620/01/M/J/07/Q10]

Q1. Boron, B, forms an oxide.

Which equation is correctly balanced?

- A $2B + 3O_2 \rightarrow B_2O_3$
 B $2B + 3O_2 \rightarrow 2B_2O_3$
 C $4B + 2O_2 \rightarrow 2B_2O_3$
 D $4B + 3O_2 \rightarrow 2B_2O_3$

[0620/01/M/J/07/Q11]

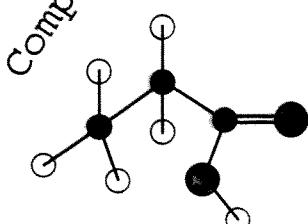
Q2. Students are asked to state

- the number of atoms in one molecule of ethanoic acid,
- the relative molecular mass, M_r , of this acid.

Which line is correct?

	number of atoms	M_r
A	8	32
B	8	60
C	9	26
D	9	46

[0620/01/O/N/07/Q10]

Q3. The diagram shows a model of a molecule of an organic acid.

What is the relative molecular mass of this acid?

- A 11 B 40 C 58 D 74

[0620/01/O/N/07/Q11]

Q4. For complete combustion, one molecule of an organic compound needs 8 molecules of oxygen.

What could the formula of this compound be?

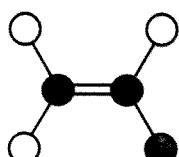
- A $C_5H_{11}OH$
 B C_6H_9OH
 C $C_6H_{11}OH$
 D C_6H_{12}

[0620/01/M/J/08/Q10]

Q5. For which compound is the formula correct?

	compound	formula
A	ammonium chloride	NH_3Cl
B	copper(II) sulphide	CuS
C	iron(II) sulphide	Fe_3S
D	silver nitrate	Ag_2NO_3

[0620/01/M/J/08/Q11]

Q6. The diagram shows a molecule of vinyl chloride (used to make pvc).

key

- a carbon atom
- a chlorine atom
- a hydrogen atom

What is the formula of vinyl chloride?

- A CH_2Cl_3 B CH_3Cl_2 C C_2HCl_3 D $\text{C}_2\text{H}_3\text{Cl}$

[0620/01/M/J/08/Q12]

Q7. When written as formulae, which compound has the greatest number of oxygen atoms?

- A calcium oxide
 B copper(II) oxide
 C iron(III) oxide
 D potassium oxide

[0620/01/O/N/08/Q10]

Q8. Lead(II) nitrate can be decomposed as shown.

Which numbers x, y and z balance the equation?

	x	y	z
A	2	2	2
B	2	2	4
C	2	4	4
D	4	4	2

[0620/01/O/N/08/Q11]

Q9. Carbon and chlorine form a chloride.

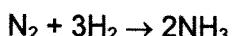
What is the formula of this chloride?

- A CCl_2 B CCl_4 C CaCl_2 D CaCl_4

Q10.

[0620/12/M/J/09/Q10]

Nitrogen and hydrogen react together to form ammonia.



When completely converted, 7 tonnes of nitrogen gives 8.5 tonnes of ammonia.

How much nitrogen will be needed to produce 34 tonnes of ammonia?

- A 7 tonnes B 8.5 tonnes C 28 tonnes D 34 tonnes

Q11.

[0620/12/M/J/09/Q11]

Which relative molecular mass, M_r , is **not** correct for the molecule given?

	molecule	M_r
A	ammonia, NH_3	17
B	carbon dioxide, CO_2	44
C	methane, CH_4	16
D	oxygen, O_2	16

Q12.

[0620/12/O/N/09/Q10]

For each atom of carbon present in a molecule, there is an equal number of atoms of oxygen but twice as many atoms of hydrogen.

What is the formula of the molecule?

- A $\text{C}_2\text{H}_2\text{O}_2$ B $\text{C}_2\text{H}_2\text{O}_4$ C $\text{C}_2\text{H}_4\text{O}_2$ D $\text{C}_2\text{H}_6\text{O}$

Q13.

[0620/12/O/N/09/Q11]

Water is formed when 48 g of oxygen combine with 6 g of hydrogen.

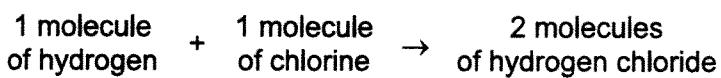
What mass of oxygen combines with 2 g of hydrogen?

- A 12 g B 16 g C 96 g D 144 g

Q14.

[0620/12/M/J/10/Q12]

Hydrogen and chlorine react as shown.

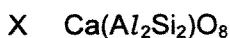
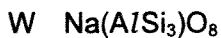


What is the equation for this reaction?

- A $2\text{H} + 2\text{Cl} \rightarrow 2\text{HCl}$
 B $2\text{H} + 2\text{Cl} \rightarrow \text{H}_2\text{Cl}_2$
 C $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$
 D $\text{H}_2 + \text{Cl}_2 \rightarrow \text{H}_2\text{Cl}_2$

[0620/12/O/N/10/Q5]

Q15. The chemical compositions of two substances, W and X, are given.



Which statements are correct?

- 1 W and X contain the same amount of oxygen.
- 2 W contains three times as much silicon as X.
- 3 X contains twice as much aluminium as W.

A 1 and 2

B 1 and 3

C 2 and 3

D 1, 2 and 3

[0620/12/M/J/11/Q12]

Q16. What is the relative molecular mass (M_r) of HNO_3 ?

A 5

B 31

C 32

D 63

[0620/12/O/N/11/Q6]

Q17. The relative formula mass, M_r , of copper(II) sulfate, CuSO_4 , is 160.

Which mass of sulfur is present in 160 g of copper(II) sulfate?

A 16 g

B 32 g

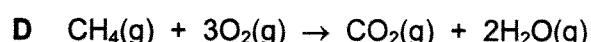
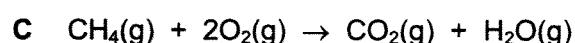
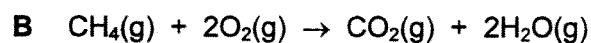
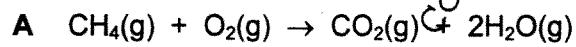
C 64 g

D 128 g

[0620/12/M/J/12/Q9]

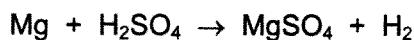
Q18. Methane, CH_4 , burns in the air to form carbon dioxide and water.

What is the balanced equation for this reaction?



[0620/11/M/J/12/Q9]

Q19. The equation for the reaction between magnesium and dilute sulfuric acid is shown.



M_r of MgSO_4 is 120

Which mass of magnesium sulfate will be formed if 12 g of magnesium are reacted with sulfuric acid?

A 5 g

B 10 g

C 60 g

D 120 g

[0620/12/O/N/12/Q8]

Q20. A compound has the formula $\text{CH}_3\text{CO}_2\text{H}$.How should the relative molecular mass, M_r , of this compound be calculated?

- A $12 + 1 + 16$
 B $3(12 + 1) + 2(12 + 16) + 1$
 C $(4 \times 12) + (2 \times 1) + 16$
 D $(2 \times 12) + (4 \times 1) + (2 \times 16)$

[0620/12/M/J/13/Q7]

Q21. The equation shows the reaction between magnesium and sulfuric acid.

(Mg = 24, H = 1, S = 32, O = 16)

In this reaction, what mass of magnesium sulfate will be formed when 6 g of magnesium reacts with excess sulfuric acid?

- A 8 B 24 C 30 D 60

Saman At

[0620/11/M/J/13/Q10]

Q22. What is the balanced chemical equation for the reaction between calcium and water?

- A $\text{Ca} + \text{H}_2\text{O} \rightarrow \text{CaOH} + \text{H}_2$
 B $\text{Ca} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{H}_2$
 C $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{CaOH} + \text{H}_2$
 D $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{H}_2$

[0620/11/M/J/13/Q9]

Q23. A compound with the formula XF_2 has a relative formula mass of 78.

What is element X?

- A argon
 B calcium
 C neon
 D zirconium

[0620/12/O/N/13/Q11]

Q24. Which relative molecular mass, M_r , is **not** correct for the molecule given?

	molecule	M_r
A	ammonia, NH_3	17
B	carbon dioxide, CO_2	44
C	methane, CH_4	16
D	oxygen, O_2	16

[0620/12/M/J/14/Q9]

Q25. What is the relative molecular mass, M_r , of nitrogen dioxide?

- A 15 B 23 C 30 D 46

[0620/11/M/J/14/Q9]

Q26. A compound contains one atom of calcium, two atoms of hydrogen and two atoms of oxygen.

What is the correct chemical formula of the compound?

- A CaO_2H_2 B HOCaOH C H_2CaO_2 D $\text{Ca}(\text{OH})_2$

[0620/11/M/J/14/Q10]

Q27. In athletics, banned drugs such as nandrolone have been taken illegally to improve performance. Nandrolone has the molecular formula $\text{C}_{18}\text{H}_{26}\text{O}_2$.

What is the relative molecular mass, M_r , of nandrolone?

(Relative atomic mass: H = 1; C = 12; O = 16)

- A 46 B 150 C 274 D 306

[0620/13/O/N/14/Q9]

Q28. The table shows the numbers of atoms present in the formula of some compounds.

Which row is **not** correct?

	numbers of atoms	formula
A	1 × calcium, 1 × carbon, 3 × oxygen	CaCO_3
B	1 × carbon, 5 × hydrogen, 1 × oxygen	$\text{C}_2\text{H}_5\text{OH}$
C	1 × hydrogen, 1 × oxygen, 1 × sodium	NaOH
D	2 × hydrogen, 4 × oxygen, 1 × sulfur	H_2SO_4

[0620/13/O/N/14/Q11]

Q29. A student wishes to electroplate an object with copper.

Which row is correct?

	object is made the	a suitable electrolyte is
A	anode	CuO(s)
B	anode	CuSO ₄ (aq)
C	cathode	CuO(s)
D	cathode	CuSO ₄ (aq)

[0620/11/O/N/14/Q9]

Q30. How many atoms of hydrogen are there in a molecule of ethanol, C₂H₅OH?

A 1

B 2

C 5

D 6

[0620/11/O/N/14/Q10]

Q31. Iron forms an oxide with the formula Fe₂O₃.

What is the relative formula mass of this compound?

A 76

B 100

C 136

D 160

[0620/13/M/J/15/Q8]

Q32. Aluminium oxide has the formula Al₂O₃.

Which statement about aluminium oxide is correct?

- A 2g of aluminium atoms are combined with 3g of oxygen atoms.
- B 2g of aluminium atoms are combined with 3g of oxygen molecules.
- C Aluminium oxide has a relative molecular mass of 102.
- D Pure aluminium oxide contains a higher mass of oxygen than of aluminium.

[0620/11/M/J/15/Q8]

Q33. What is the relative formula mass, M_r, of CaCO₃?

A 50

B 68

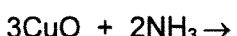
C 100

D 204

[0620/13/O/N/15Q7]

Q34. Copper(II) oxide reacts with ammonia.

The left hand side of the balanced equation for this reaction is:



What completes the equation?

- A $3\text{Cu} + 2\text{HNO}_3$
 B $3\text{Cu} + 2\text{N} + 3\text{H}_2\text{O}$
 C $3\text{Cu} + \text{N}_2 + 3\text{H}_2\text{O}$
 D $3\text{Cu} + 2\text{NO} + 3\text{H}_2\text{O}$

[0620/23/M/J/16/Q8]

Q35. Analysis of a compound formed between magnesium and nitrogen showed it contained 14.4 g of magnesium and 5.6 g of nitrogen.

What is the empirical formula of the compound?

- A Mg_2N_3 B Mg_3N_2 C Mg_4N_6 D Mg_6N_4

[0620/23/M/J/16/Q9]

Q36. An excess of zinc is added to 100 cm³ of 1.0 mol/dm³ hydrochloric acid.

The equation for the reaction is:



What is the maximum volume of hydrogen evolved at room temperature and pressure?

- A 1.2 dm^3 B 2.0 dm^3 C 2.4 dm^3 D 24 dm^3

[0620/22/M/J/16/Q8]

Q37. A sample of 16.0 g of a metal oxide, MO, is reduced to 12.8 g of the metal, M.What is the relative atomic mass, A_r , of M?

- A 32 B 64 C 80 D 128

[0620/22/M/J/16/Q9]

Q38. The equation for the reaction between calcium carbonate and hydrochloric acid is shown.How many moles of calcium carbonate will give 24 cm³ of carbon dioxide when reacted with an excess of the acid?

- A 1 mol B 0.1 mol C 0.01 mol D 0.001 mol

[0620/21/M/J/16/Q8]

Q39. A compound, X, contains 40.0% carbon, 6.7% hydrogen and 53.3% oxygen by mass.

The relative molecular mass, M_r , of X is 60.

What is the molecular formula of X?

A CH_2O

B CH_4O

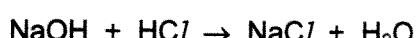
C $\text{C}_2\text{H}_4\text{O}$

D $\text{C}_2\text{H}_4\text{O}_2$

[0620/21/M/J/16/Q9]

Q40. 25 cm^3 of 0.1 mol/dm^3 hydrochloric acid exactly neutralise 20 cm^3 of aqueous sodium hydroxide.

The equation for this reaction is:



What is the concentration of the sodium hydroxide solution?

A 0.080 mol/dm^3

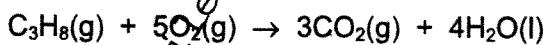
B 0.800 mol/dm^3

C 0.125 mol/dm^3

D 1.25 mol/dm^3

[0620/23/O/N/16/Q8]

Q41. The equation shows the complete combustion of propane.



Which statement is correct?

A 10 cm^3 of propane cannot burn if less than 50 cm^3 of oxygen is present.

B 10 cm^3 of propane would produce 40 cm^3 of liquid water.

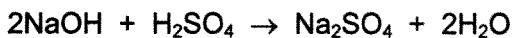
C 100 cm^3 of oxygen would be sufficient to react completely with 20 cm^3 of propane.

D This reaction would result in an increase in the volume of gas.

[0620/23/O/N/16/Q9]

Q42. Sodium hydroxide reacts with sulfuric acid.

The equation for the reaction is shown.



Which volume of 0.4 mol/dm^3 sodium hydroxide reacts with 50.0 cm^3 of 0.1 mol/dm^3 sulfuric acid?

A 12.5 cm^3

B 25.0 cm^3

C 50.0 cm^3

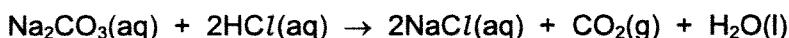
D 100.0 cm^3

[0620/22/O/N/16/Q8]

Q43. Which sample contains the greatest number of molecules?

- A 4 g of hydrogen
- B 18 g of water
- C 24 dm³ of oxygen
- D 66 g of carbon dioxide

[0620/22/O/N/16/Q9]

Q44. Sodium carbonate solution reacts with dilute hydrochloric acid. The equation for the reaction is shown.Excess sodium carbonate is added to 10.0 cm³ of 0.10 mol / dm³ hydrochloric acid.

Which volume of carbon dioxide gas is made?

- A 12 cm³
- B 24 cm³
- C 12 000 cm³
- D 24 000 cm³

[0620/21/O/N/16/Q8]

Q45. Benzene is a liquid with molecular formula C₆H₆.Ethene is a gas with molecular formula C₂H₄.

Which statement is correct?

- A 1 mole of benzene and 1 mole of ethene contain the same number of atoms.
- B 1 mole of benzene and 1 mole of ethene both have a volume of 24 dm³ at room temperature and pressure.
- C Both benzene and ethene have the same empirical formula.
- D The number of carbon atoms in 0.5 moles of ethene is equal to the Avogadro constant.

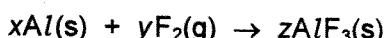
[0620/21/O/N/16/Q9]

Q46. Sodium hydrogencarbonate undergoes thermal decomposition as shown.

What is the maximum mass of sodium carbonate that can be made from 0.100 moles of sodium hydrogencarbonate?

- A 4.15 g
- B 5.30 g
- C 10.6 g
- D 21.2 g

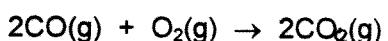
[0620/21/M/J/17/Q7]

Q47. Aluminium reacts with fluorine.

Which values of x, y and z balance the equation?

	x	y	z
A	1	2	1
B	2	3	2
C	3	2	3
D	4	3	4

[0620/21/M/J/17/Q8]

Q48. Carbon monoxide burns in oxygen to produce carbon dioxide.

Which mass of carbon dioxide is produced from 14 g of carbon monoxide?

- A 22 g B 28 g C 44 g D 88 g

[0620/22/M/J/17/Q9]

Q49. Which equations are balanced?

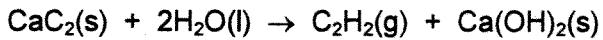
- 1 $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
- 2 $ZnCO_3 + 2HCl \rightarrow ZnCl_2 + CO_2 + 2H_2O$
- 3 $Mg(NO_3)_2 + NaOH \rightarrow Mg(OH)_2 + 2NaNO_3$
- 4 $CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$

- A 1 and 2 B 1 and 4 C 2 and 3 D 3 and 4

[0620/22/M/J/17/Q8]

Q50. Calcium carbide, CaC_2 , reacts with water to form ethyne, C_2H_2 , and calcium hydroxide.

The equation for the reaction is shown.



Which volume of ethyne is produced when 6 g of water react completely with calcium carbide?

- A 4 dm^3 B 8 dm^3 C 36 dm^3 D 72 dm^3

[0620/23/M/J/17/Q7]

Q51. Aqueous iron(III) sulfate and aqueous sodium hydroxide react to give a precipitate of iron(III) hydroxide and a solution of sodium sulfate.

What is the balanced equation for this reaction?

- A $\text{Fe}_2(\text{SO}_4)_3(\text{aq}) + 2\text{NaOH}(\text{aq}) \rightarrow \text{Fe(OH)}_3(\text{s}) + \text{Na}_2\text{SO}_4(\text{aq})$
- B $\text{Fe}_2(\text{SO}_4)_3(\text{aq}) + 3\text{NaOH}(\text{aq}) \rightarrow \text{Fe(OH)}_3(\text{s}) + 3\text{Na}_2\text{SO}_4(\text{aq})$
- C $\text{Fe}_2(\text{SO}_4)_3(\text{aq}) + 6\text{NaOH}(\text{aq}) \rightarrow 2\text{Fe(OH)}_3(\text{s}) + 3\text{Na}_2\text{SO}_4(\text{aq})$
- D $2\text{Fe}_2(\text{SO}_4)_3(\text{aq}) + 6\text{NaOH}(\text{aq}) \rightarrow 4\text{Fe(OH)}_3(\text{s}) + 6\text{Na}_2\text{SO}_4(\text{aq})$

[0620/23/M/J/17/Q8]

Q52. The equation for the reaction between sodium carbonate and dilute hydrochloric acid is shown.



What is the maximum volume of carbon dioxide produced when 26.5 g of sodium carbonate react with dilute hydrochloric acid?

- A 6 dm^3
- B 12 dm^3
- C 18 dm^3
- D 24 dm^3

[0620/21/O/N/17/Q7]

Q53. The equation for the reaction between barium chloride solution and dilute sulfuric acid is shown.



Which row shows the state symbols for this equation?

	BaCl_2	H_2SO_4	BaSO_4	2HCl
A	(aq)	(aq)	(s)	(aq)
B	(aq)	(l)	(s)	(aq)
C	(l)	(aq)	(s)	(l)
D	(aq)	(l)	(aq)	(l)

[0620/21/O/N/17/Q8]

Q54. A compound is analysed and found to contain 85.7% carbon and 14.3% hydrogen.

What is its empirical formula?

- A CH
- B CH_2
- C C_2H_4
- D C_6H

[0620/22/O/N/17/Q7]

Q55. The equation for the reaction between phosphorus and oxygen is shown.



Which values of x , y and z balance the equation?

	x	y	z
A	1	5	2
B	1	10	2
C	2	5	2
D	2	10	1

[0620/22/O/N/17/Q8]

Q56. The relative molecular mass of an alcohol is 88.

Its percentage composition by mass is: C, 54.5%; H, 9.1%; O, 36.4%.

Which row shows the empirical formula and molecular formula for this alcohol?

	empirical formula	molecular formula
A	C ₂ H ₄ O	C ₂ H ₄ O
B	C ₂ H ₄ O	C ₄ H ₈ O ₂
C	C ₄ H ₈ O ₂	C ₄ H ₈ O ₂
D	C ₄ H ₈ O ₂	C ₂ H ₄ O

[0620/23/O/N/17/Q7]

Q57. The equation represents the reaction between solid magnesium oxide and dilute hydrochloric acid to form magnesium chloride and water.



Which row shows the state symbols for hydrochloric acid, magnesium chloride and water?

	HC _l	MgCl ₂	H ₂ O
A	(aq)	(aq)	(l)
B	(aq)	(l)	(l)
C	(l)	(aq)	(aq)
D	(l)	(l)	(aq)

[0620/23/O/N/17/Q8]

Q58. A compound contains 34.5% calcium, 24.1% silicon and 41.4% oxygen by mass.

What is its empirical formula?

- A Ca_2SiO_3 B CaSiO_3 C CaSi_2O_3 D CaSiO_6

[0620/21/M/J/18/Q8]

Q59. The equation for the combustion of ethane is shown.

Which volume of carbon dioxide, at room temperature and pressure, is formed when 0.5 moles of ethane burn?

- A 48 dm^3 B 24 dm^3 C 12 dm^3 D 6 dm^3

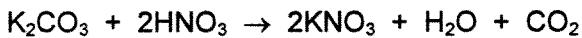
[0620/21/M/J/18/Q9]

Q60. A solution of ethanoic acid, CH_3COOH , has a concentration of ~~of~~^{at} 2 mol/dm^3 .

Which statement about this solution is correct?

- A 20 g of ethanoic acid is dissolved in 10 cm^3 of water.
 B 30 g of ethanoic acid is dissolved in 250 cm^3 of water.
 C 60 g of ethanoic acid is dissolved in 1 dm^3 of water.
 D 120 g of ethanoic acid is dissolved in 2 dm^3 of water.

[0620/22/M/J/18/Q8]

Q61. The equation for the reaction between potassium carbonate and nitric acid is shown.

Which volume of carbon dioxide is produced from 69 g of potassium carbonate?

- A 6 dm^3 B 12 dm^3 C 24 dm^3 D 48 dm^3

[0620/22/M/J/18/Q9]

Q62. A solution of sodium carbonate, Na_2CO_3 , has a concentration of 0.03 mol/dm^3 .Which mass of sodium carbonate is dissolved in 1 dm^3 of this solution?

- A 1.06 g B 3.18 g C 10.60 g D 31.80 g

Q63.

[0620/23/M/J/18/Q8]

An experiment was done to determine the formula of a hydrocarbon, C_xH_y .

10 cm^3 of the gaseous hydrocarbon, C_xH_y , was burned in an excess of oxygen to form 20 cm^3 of carbon dioxide and 30 cm^3 of water vapour.

What is C_xH_y ?

- A CH_4 B C_2H_4 C C_2H_6 D C_3H_8

Q64.

[0620/23/M/J/18/Q9]

4.00 g of solid sodium hydroxide is added to water to make a solution with a concentration of 0.200 mol/dm^3 .

What is the volume of water used?

- A 0.5 cm^3 B 20 cm^3 C 500 cm^3 D 2000 cm^3

Q65.

[0620/21/O/N/2018/Q8]

A student mixed together 25.0 cm^3 of 1.00 mol/dm^3 hydrochloric acid and 25.0 g of calcium carbonate.



What is the maximum volume of carbon dioxide gas that could be collected at room temperature and pressure?

- A 300 dm^3 B 6.00 dm^3 C 0.600 dm^3 D 0.300 dm^3

Q66.

[0620/21/O/N/2018/Q9]

Iron can react with sulfur to form two ionic compounds.

The iron is present as Fe^{2+} in one compound and as Fe^{3+} in the other compound.

The sulfur ion is present as S^{2-} in both compounds.

What are the formulae of the two compounds?

- A FeS and Fe_2S_3
 B FeS and Fe_3S_2
 C FeS_2 and Fe_3S_2
 D FeS_2 and Fe_2S_3

Q67.

Hydrogen peroxide, H—O—O—H, decomposes to form water and oxygen.



The bond energies are shown in the table. The reaction is exothermic.

bond	bond energy in kJ/mol
O—H	+460
O—O	+150
O=O	+496

What is the energy change for the reaction?

- A -346 kJ/mol B -196 kJ/mol C +196 kJ/mol D +346 kJ/mol

Q68.

[0620/23/O/N/2018/Q7]

Which gas sample has the greatest mass?

- A 5.0 moles of Cl₂
 B 10.0 moles of O₂
 C 15.0 moles of N₂
 D 20.0 moles of H₂

Q69.

[0620/23/O/N/2018/Q8]

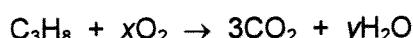
Which sample of magnesium chloride, MgCl₂, contains the same number of moles as 69.6 g of potassium sulfate, K₂SO₄?

- A 19.0 g B 28.5 g C 38.0 g D 47.5 g

Q70.

[0620/21/M/J/2019/Q7]

Propane burns in oxygen.



Which values of x and y balance the equation?

	x	y
A	5	4
B	7	4
C	10	8
D	13	8

Q71.

[0620/21/M/J/2019/Q8]

A tablet contains 0.080 g of ascorbic acid ($M_r = 176$).

What is the concentration of ascorbic acid when one tablet is dissolved in 200 cm³ of water?

- A 9.1×10^{-5} mol/dm³
- B 4.5×10^{-4} mol/dm³
- C 9.1×10^{-2} mol/dm³
- D 2.3×10^{-3} mol/dm³

Q72.

[0620/22/M/J/2019/Q8]

25.0 cm³ of 0.100 mol/dm³ aqueous sodium hydroxide is neutralised by 24.6 cm³ of dilute sulfuric acid.

What is the concentration of the dilute sulfuric acid?

- A 0.0508 mol/dm³
- B 0.0984 mol/dm³
- C 0.102 mol/dm³
- D 0.203 mol/dm³

Q73.

[0620/23/M/J/2019/Q9]

What is the concentration of a solution that contains 25.0 g NaOH in 500 cm³ of water?

- A 0.125 mol/dm³
- B 0.800 mol/dm³
- C 1.25 mol/dm³
- D 3.20 mol/dm³

Q74.

Four fertilisers are each supplied in 100 kg bags.

Which fertiliser supplies the greatest mass of nitrogen per 100 kg bag?

- A ammonium nitrate, NH₄NO₃
- B ammonium phosphate, (NH₄)₃PO₄
- C ammonium sulfate, (NH₄)₂SO₄
- D urea, CO(NH₂)₂

Q75.

[0620/21/O/N/2019/Q10]

Calcium carbonate reacts with dilute hydrochloric acid.

The equation for the reaction is shown.



1.00 g of calcium carbonate is added to 50.0 cm³ of 0.0500 mol/dm³ hydrochloric acid.

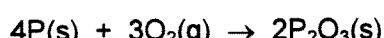
Which volume of carbon dioxide is made in this reaction?

- A 30 cm³ B 60 cm³ C 120 cm³ D 240 cm³

Q76.

[0620/22/O/N/2019/Q9]

Phosphorus reacts with oxygen to form phosphorus(III) oxide as shown.



Which mass of phosphorus(III) oxide is produced from 6.2 g of phosphorus?

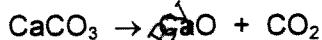
- A 1.1 g B 5.5 g C 11.0 g D 22.0 g

Q77.

[0620/22/O/N/2019/Q10]

Calcium carbonate is heated. Calcium oxide and carbon dioxide gas are formed.

The equation for the reaction is shown.



225 kg of calcium carbonate is heated until there is no further change in mass.

The yield of calcium oxide is 85 kg.

What is the percentage yield?

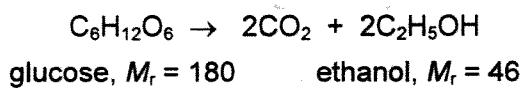
- A 37.8% B 47.2% C 67.5% D 85.0%

Q78.

[0620/23/O/N/2019/Q10]

90 g of glucose is dissolved in water.

The glucose solution is fermented.



After the fermentation finishes, 6.8 g of ethanol is obtained from the solution.

What is the percentage yield of ethanol?

- A 7.4 B 7.6 C 14.8 D 29.6

Q79.

[0620/23/O/N/2019/Q9]

Magnesium carbonate decomposes on heating to form magnesium oxide and carbon dioxide as shown.



How much magnesium carbonate is needed to make 5.0 g of magnesium oxide?

A 3.5 g

B 4.0 g

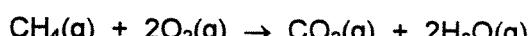
C 6.5 g

D 10.5 g

Q80.

[0620/21/M/J/2020/Q12]

The equation for the complete combustion of methane gas is shown.



Bond energies are shown.

bond	bond energy in kJ/mol
C-H	412
H-O	463
C=O	743
O=O	498

What is the overall energy change, in kJ/mol, for the above reaction?

A -1192

B -694

C +694

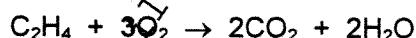
D +1192

Q81.

[0620/23/M/J/2020/Q12]

Ethene gas, C_2H_4 , is completely burned in excess oxygen to form carbon dioxide and water.

The equation for this exothermic reaction is shown.



The table shows the bond energies involved in the reaction.

bond	bond energy (kJ/mol)
C=C	614
C-H	413
O=O	495
C=O	799
O-H	467

What is the total energy change in this reaction?

A -954 kJ/mol

B -1010 kJ/mol

C -1313 kJ/mol

D -1369 kJ/mol

Q82.

[0620/21/O/N/2020/Q11]

Sodium carbonate reacts with sulfuric acid to form carbon dioxide, water and a sodium salt.

An incomplete equation for the reaction is shown.



What is the formula of the sodium salt?

- A $\text{Na}_2(\text{SO}_4)_2$ B $\text{Na}(\text{SO}_4)_2$ C Na_2SO_4 D NaSO_4

Q83.

[0620/21/O/N/2020/Q12]

The relative atomic mass of chlorine is 35.5.

When calculating relative atomic mass, which particle is the mass of a chlorine atom compared to?

- A a neutron
B a proton
C an atom of carbon-12
D an atom of hydrogen-1

Q84.

[0620/21/O/N/2020/Q8]

What is the empirical formula of an oxide of iron, formed by reacting 2.24 g of iron with 0.96 g of oxygen?

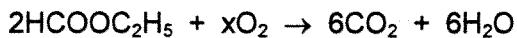
- A FeO B Fe_2O C $\text{Fe}_2\overset{\text{O}}{\underset{2}{\text{O}}}_3$ D Fe_3O_4

Q85.

[0620/22/O/N/2020/Q8]

Ethyl methanoate, HCOOC_2H_5 , burns in excess oxygen to produce carbon dioxide and water.

The equation is shown.



What is the value of x?

- A 2 B 7 C 9 D 18

Q86.

[0620/22/O/N/2020/Q11]

The relative atomic mass of chlorine is 35.5.

When calculating relative atomic mass, which particle is the mass of a chlorine atom compared to?

- A a neutron
B a proton
C an atom of carbon-12
D an atom of hydrogen-1

Q87.

[0620/22/O/N/2020/Q34]

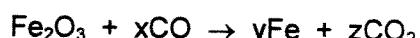
The element sulfur is found in a number of different minerals.
 Which mineral contains the greatest percentage by mass of sulfur?

- A barite, BaSO_4
- B galena, PbS
- C gypsum, CaSO_4
- D pyrite, FeS_2

Q88.

[0620/23/O/N/2020/Q29]

The equation for the reaction between iron(III) oxide and carbon monoxide is shown.



Which values of x, y and z balance the equation?

	x	y	z
A	2	2	2
B	2	3	3
C	3	1	3
D	3	2	3

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Q1.

[0620/13/O/N/12/Q9]

In separate experiments, electricity was passed through concentrated aqueous sodium chloride and molten lead bromide.

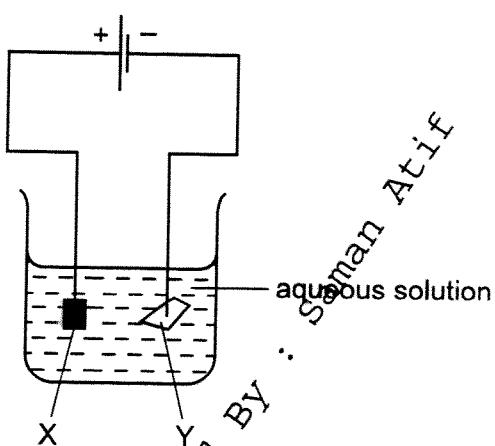
What would happen in **both** experiments?

- A A halogen would be formed at the anode.
- B A metal would be formed at the cathode.
- C Hydrogen would be formed at the anode.
- D Hydrogen would be formed at the cathode.

Q2.

[0620/13/O/N/12/Q10]

The diagram shows an electrolysis experiment using metals X and Y as electrodes.



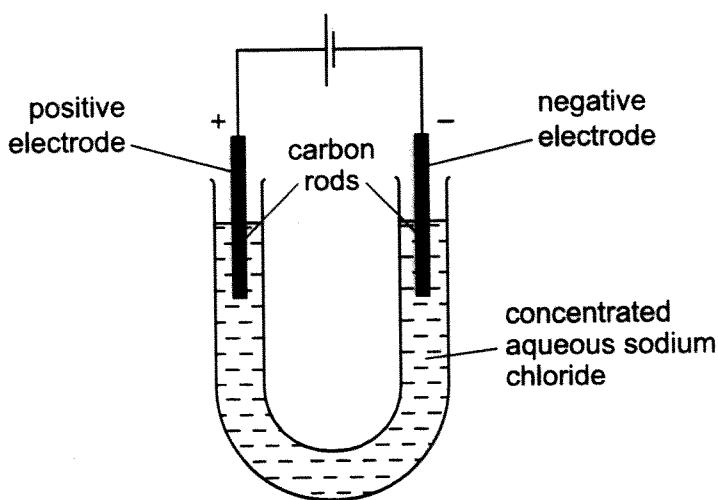
One of the metals becomes coated with copper.

Which metal becomes coated and which aqueous solution is used?

	metal	aqueous solution
A	X	CrCl_3
B	X	CuCl_2
C	Y	CrCl_3
D	Y	CuCl_2

[0620/12/O/N/12/Q10]

Q3. The diagram shows the electrolysis of concentrated aqueous sodium chloride.

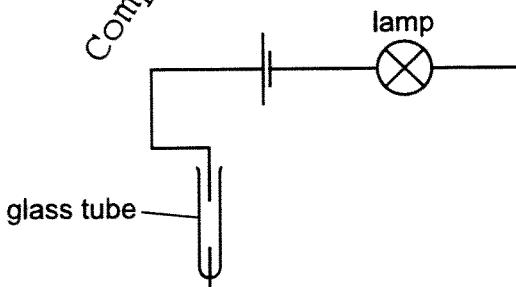


What is produced at each of the electrodes?

	product at cathode	product at anode
A	hydrogen	chlorine
B	hydrogen	oxygen
C	sodium	chlorine
D	sodium	oxygen

[0620/11/M/J/13/Q8]

Q4. The diagram shows an incomplete circuit.



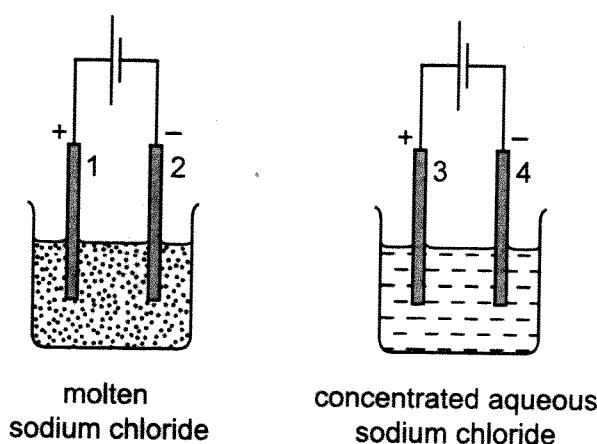
Which substance causes the lamp to light when added to the glass tube?

- A aqueous sodium chloride
- B aqueous sugar
- C solid sodium chloride
- D solid sugar

[0620/13/O/N/13/Q10]

Q5. Two electrolysis experiments were carried out as shown in the diagram below.

The graphite electrodes are labelled 1-4.



Which row describes the products at the electrodes in these experiments?

	electrode 1	electrode 2	electrode 3	electrode 4
A	chlorine	hydrogen	chlorine	hydrogen
B	chlorine	sodium	chlorine	hydrogen
C	chlorine	sodium	hydrogen	chlorine
D	sodium	chlorine	sodium	chlorine

[0620/13/O/N/13/Q11]

Q6. One molten compound and two aqueous solutions were electrolysed.

The table gives the compounds electrolysed and the electrodes used.

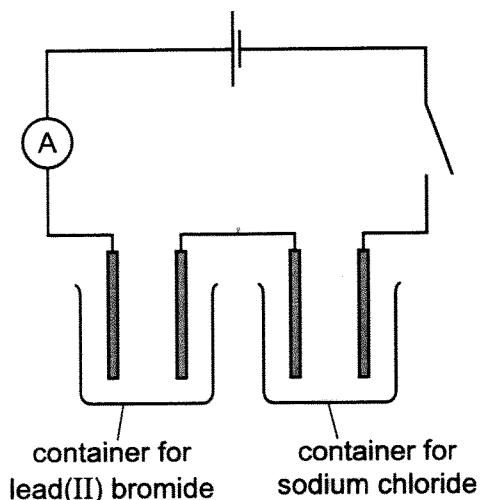
	substance electrolysed	electrodes
1	concentrated hydrochloric acid	carbon
2	concentrated sodium chloride	platinum
3	molten lead bromide	platinum

In which experiments is a gas evolved at the cathode?

- A 1, 2 and 3 B 1 and 2 only C 1 only D 3 only

[0620/12/O/N/13/Q10]

- Q7.** The diagram shows the circuit for electrolysing lead(II) bromide and sodium chloride to liberate the metal.



In what form are these salts electrolysed for liberating the metal?

	lead(II) bromide	sodium chloride
A	concentrated solution	concentrated solution
B	concentrated solution	molten
C	molten	concentrated solution
D	molten	molten

[0620/12/M/J/14Q10]

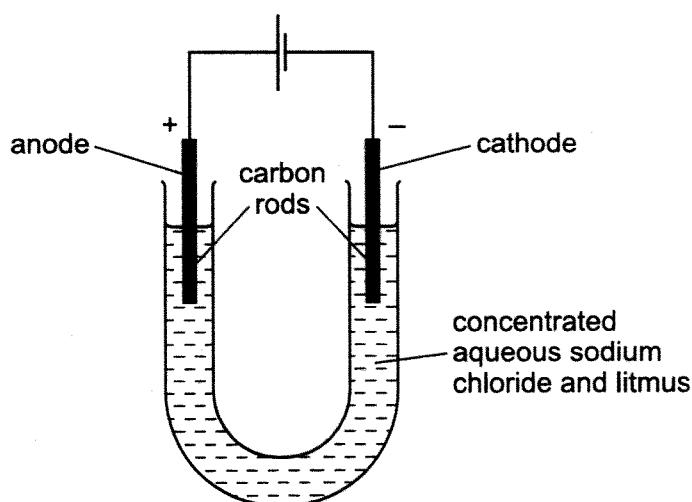
- Q8.** Electrical cables are made from either1....., because it is a very good conductor of electricity, or from.....2....., because it has a low density.
Overhead cables have a3..... core in order to give the cable strength.

Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	aluminium	copper	magnesium
B	copper	aluminium	magnesium
C	copper	aluminium	steel
D	magnesium	copper	steel

[0620/12/O/N/13/Q13]

Q9. The diagram shows the electrolysis of concentrated aqueous sodium chloride.



What is the colour of the litmus at each electrode after five minutes?

	colour at anode	colour at cathode
A	blue	red
B	red	blue
C	red	colourless
D	colourless	blue

Q10.

[0620/12/M/J/14/Q11]

What will be produced at the anode and at the cathode, if molten potassium chloride is electrolysed?

	anode (+)	cathode (-)
A	chlorine	hydrogen
B	chlorine	potassium
C	hydrogen	chlorine
D	potassium	chlorine

Q11.

[0620/11/M/J/14/Q11]

Which substance will **not** conduct electricity?

- A aluminium
- B copper
- C plastic
- D steel

Q12.

[0620/11/M/J/14/Q12]

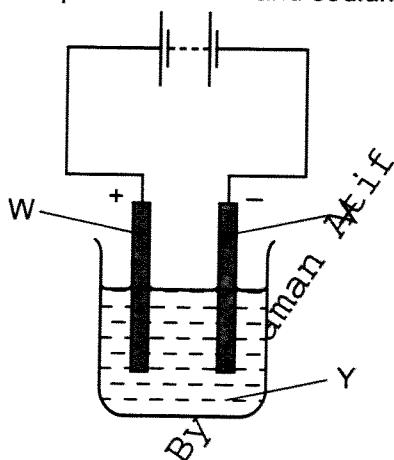
Which products are formed at the anode and cathode when electricity is passed through molten lead(II) bromide?

	anode (+)	cathode (-)
A	bromide ions	lead ions
B	bromine molecules	lead atoms
C	lead atoms	bromine molecules
D	lead ions	bromide ions

Q13.

[0620/13/O/N/14/Q12]

In the electrolysis shown, chlorine is produced at W and sodium at X.



Which labels are correct?

	W	X	
A	anode	cathode	NaCl(l)
B	anode	cathode	NaCl(aq)
C	cathode	anode	NaCl(l)
D	cathode	anode	NaCl(aq)

Q14.

[0620/11/O/N/14/Q11]

Which metal could **not** be used for electroplating by using an aqueous solution?

- A chromium
- B copper
- C silver
- D sodium

Q15.

[0620/11/O/N/14/Q12]

Which products are formed at the electrodes when a concentrated solution of sodium chloride is electrolysed?

	cathode (-)	anode (+)
A	hydrogen	chlorine
B	hydrogen	oxygen
C	sodium	chlorine
D	sodium	oxygen

Q16.

[0620/11/M/J/15/Q9]

Copper and hydrogen can each be formed by electrolysis.

At which electrodes are these elements formed?

	copper	hydrogen
A	anode	anode
B	anode	cathode
C	cathode	anode
D	cathode	cathode

Q17.

[0620/13/M/J/15/Q10]

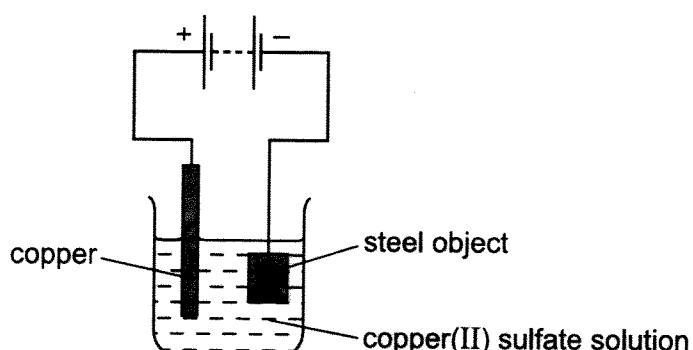
An object is electroplated with silver using an aqueous silver salt as the electrolyte.

Which set of conditions is used?

	the object to be electroplated is the	the other electrode is made from
A	anode	carbon
B	anode	silver
C	cathode	carbon
D	cathode	silver

[0620/12/M/J/15/Q10]

Q18. The diagram shows the electroplating of a steel object.



A student made the following statements.

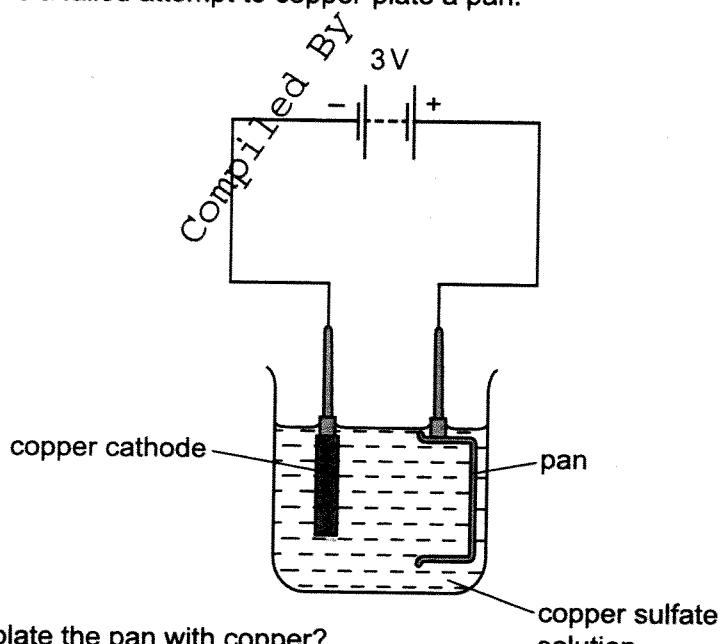
- 1 The object turns a reddish-brown colour.
- 2 The copper sulfate solution changes to a paler blue colour.
- 3 The copper electrode becomes smaller.

Which statements are correct?

- Complied BY*
Fahim Ali Khan Atif
- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

[0620/11/M/J/15/Q10]

Q19. The diagram shows a failed attempt to copper-plate a pan.



Which action will plate the pan with copper?

- A** cooling the copper sulfate solution in an ice bath
B heating the copper sulfate solution to boiling point
C increasing the voltage from 3 V to 6 V
D making the pan the cathode and the copper the anode

Q20.

[0620/13/O/N/15/Q8]

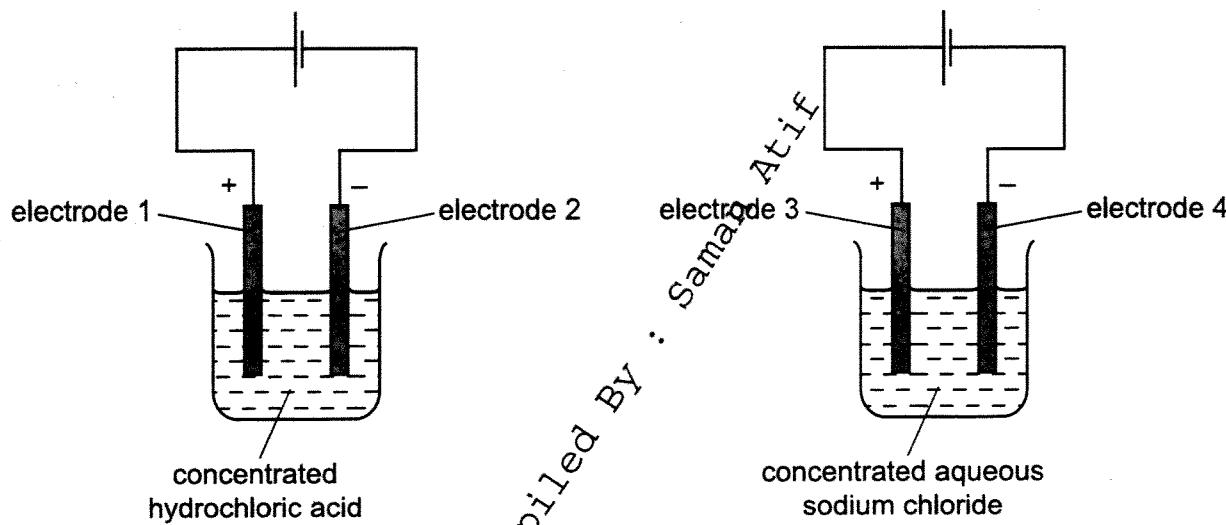
What are the electrode products when molten silver iodide is electrolysed between inert electrodes?

	cathode	anode
A	hydrogen	iodine
B	iodine	silver
C	silver	iodine
D	silver	oxygen

Q21.

[0620/12/O/N/15/Q8]

The diagram shows the electrolysis of concentrated hydrochloric acid and concentrated aqueous sodium chloride using carbon electrodes.



At which electrode(s) is hydrogen produced?

- A electrode 1 only
- B electrodes 1 and 3
- C electrode 2 only
- D electrodes 2 and 4

Q22.

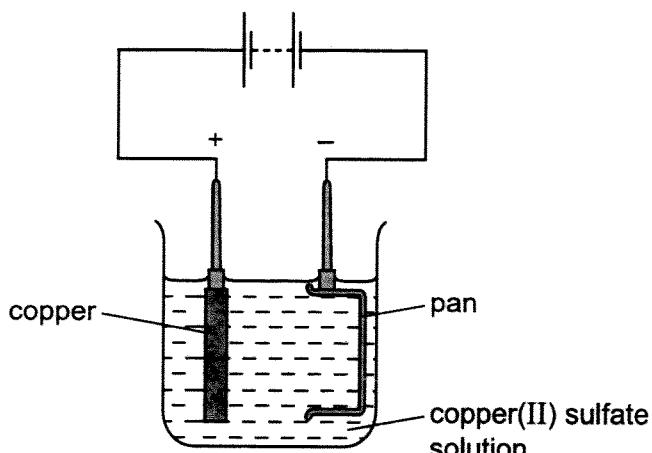
[0620/11/O/N/15/Q8]

Which row describes the electrolysis of molten potassium bromide?

	product at anode	product at cathode
A	bromine	hydrogen
B	bromine	potassium
C	hydrogen	bromine
D	potassium	bromine

[0620/23/M/J/16/Q10]

Q23. The diagram shows a method used to copper-plate a pan



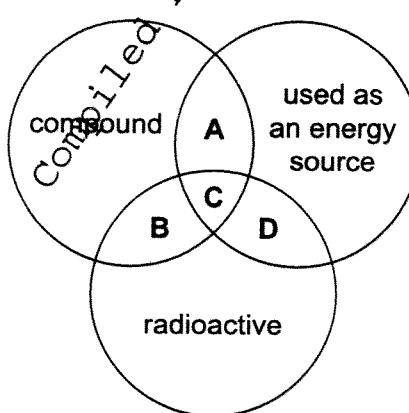
Which equation represents the reaction at the cathode?

- A $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$
- B $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$
- C $4\text{OH}^- \rightarrow \text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^-$
- D $2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$

[0620/23/M/J/16/Q11]

Q24. The diagram shows some properties that substances may have.

To which labelled part of the diagram does ${}^{235}\text{U}$ belong?



[0620/21/M/J/16/Q10]

Q25. Which reactions could take place at the anode during electrolysis?

- 1 $4\text{OH}^-(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g}) + 4\text{e}^-$
- 2 $2\text{Cl}^-(\text{aq}) \rightarrow \text{Cl}_2(\text{g}) + 2\text{e}^-$
- 3 $\text{Cu}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Cu}(\text{s})$
- 4 $2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$

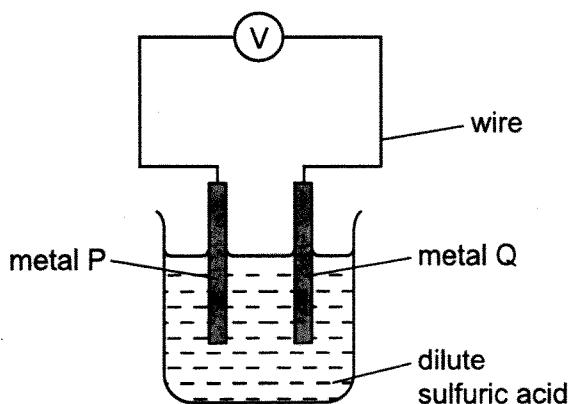
A 1 and 2

B 1 and 4

C 2 and 4

D 3 and 4

Q26. The diagram shows a simple cell.

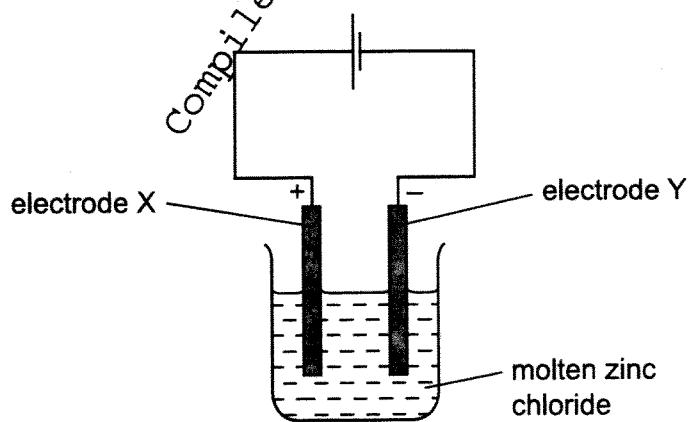


Which pair of metals produces the largest voltage?

	metal P	metal Q
A	iron	copper
B	magnesium	copper
C	magnesium	zinc
D	zinc	copper

Saman Atif

Q27. The diagram shows the electrolysis of molten zinc chloride, $ZnCl_2$.

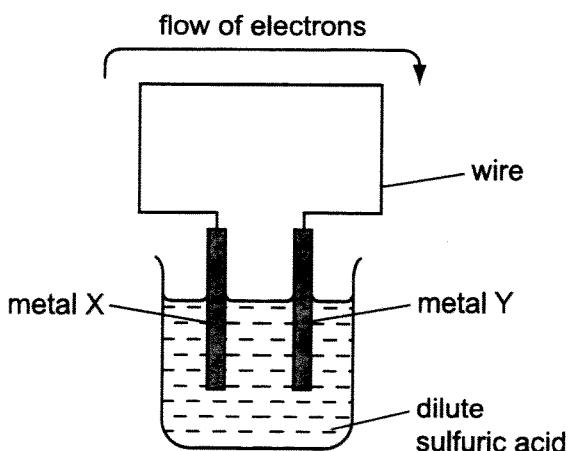


Which statement is correct?

- A Oxidation occurs at electrode X and the equation is: $2Cl^- \rightarrow Cl_2 + 2e^-$.
- B Oxidation occurs at electrode Y and the equation is: $Zn^{2+} + 2e^- \rightarrow Zn$.
- C Reduction occurs at electrode X and the equation is: $Zn^{2+} + 2e^- \rightarrow Zn$.
- D Reduction occurs at electrode Y and the equation is: $2Cl^- \rightarrow Cl_2 + 2e^-$.

[0620/22/M/J/16/Q12]

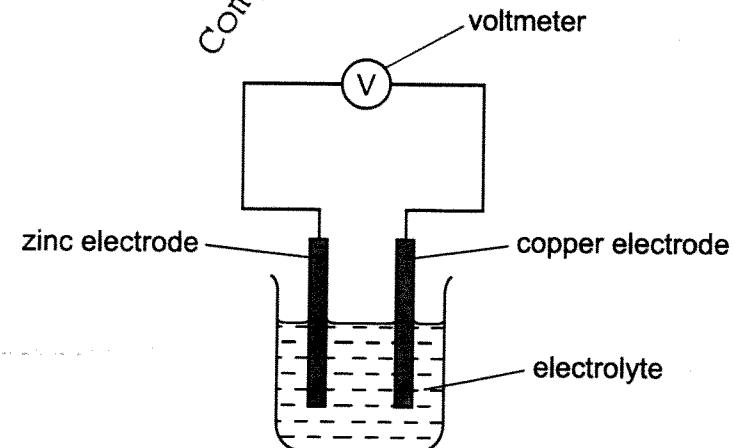
Q28. The diagram shows a simple cell.



For which pair of metals would electrons flow from metal X to metal Y?

	X	Y
A	copper	iron
B	copper	zinc
C	iron	zinc
D	zinc	iron

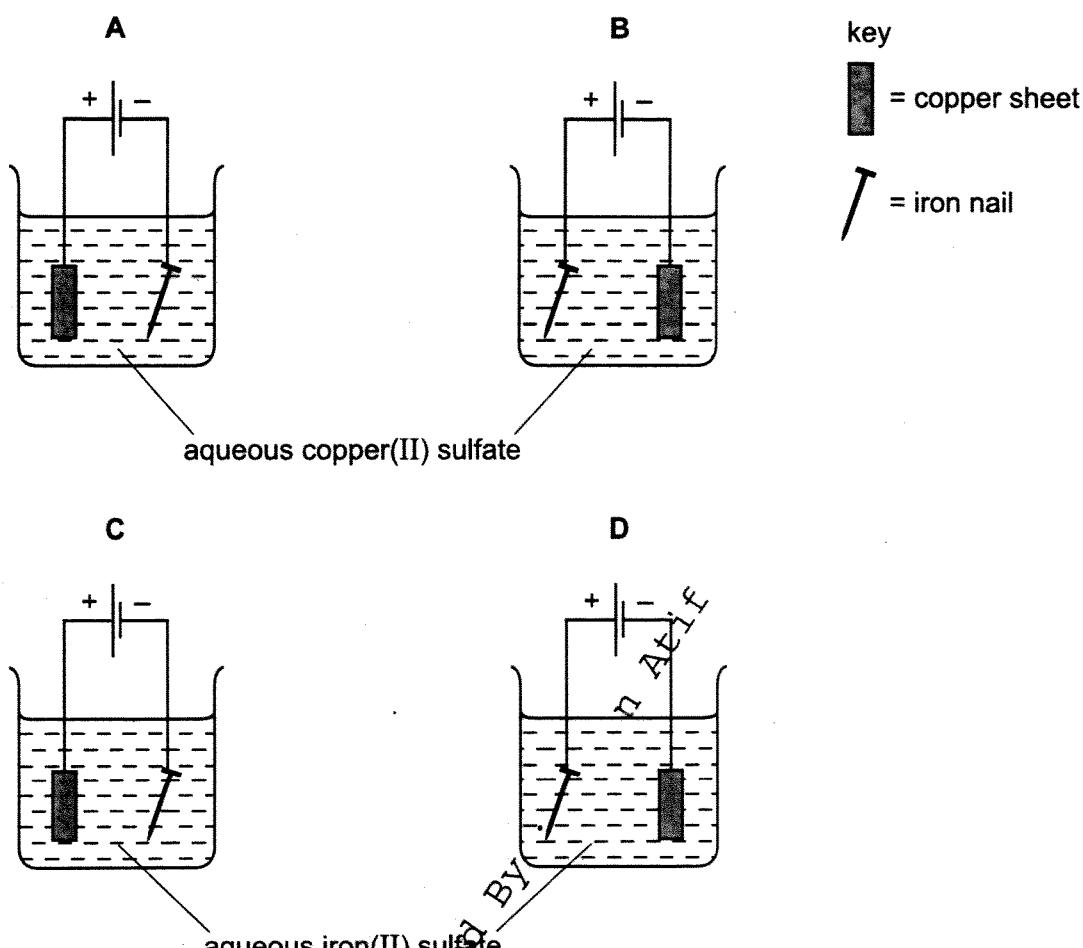
Q29. The diagram shows a simple cell.



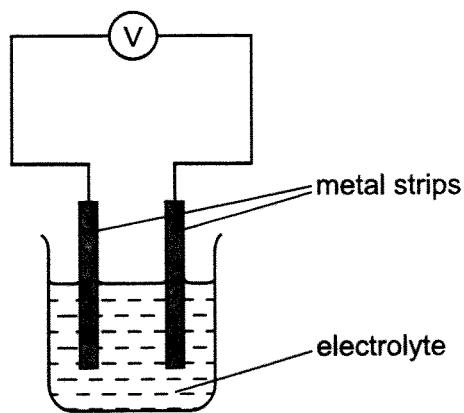
Which statement about the process occurring when the cell is in operation is correct?

- A Cu²⁺ ions are formed in solution.
- B Electrons travel through the solution.
- C The reaction Zn → Zn²⁺ + 2e⁻ occurs.
- D The zinc electrode increases in mass.

Q30. Which apparatus could be used to electroplate an iron nail with copper?



Q31. The diagram shows two different metal strips dipped into an electrolyte.



Which pair of metals produces the highest voltage?

- A** copper and iron
- B** copper and magnesium
- C** copper and zinc
- D** magnesium and iron

[0620/22/O/N/16/Q11]

Q32.

A student sets up a number of simple cells by putting strips of two different metals into dilute sulfuric acid.

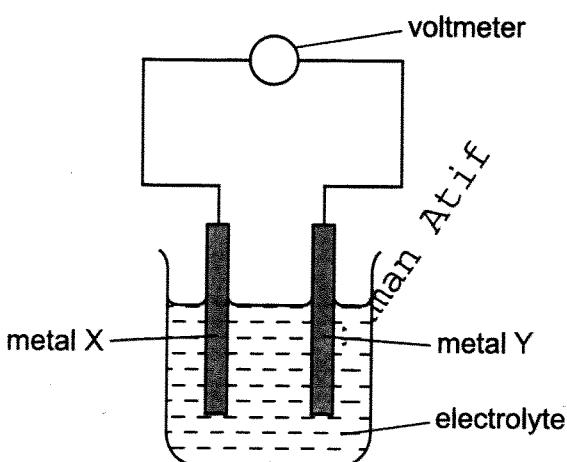
Which cell produces the highest voltage?

- A** copper and magnesium
- B** copper and zinc
- C** iron and copper
- D** magnesium and zinc

Q33.

[0620/21/O/N/16/Q11]

The diagram shows a simple cell.



Which two metals produce the highest reading on the voltmeter?

	X	Y
A	magnesium	copper
B	magnesium	iron
C	zinc	copper
D	zinc	iron

Q34.

[0620/21/M/J/17/Q9]

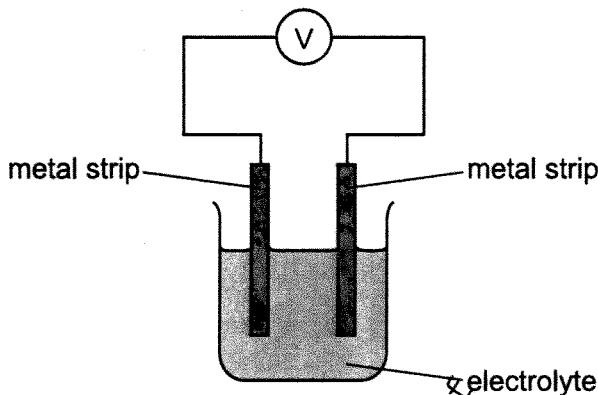
Which statement about electrolysis is correct?

- A** Electrons move through the electrolyte from the cathode to the anode.
- B** Electrons move towards the cathode in the external circuit.
- C** Negative ions move towards the anode in the external circuit.
- D** Positive ions move through the electrolyte towards the anode during electrolysis.

Q35. The reactivity series for a number of different metals is shown.

most reactive				least reactive
magnesium	zinc	iron	copper	silver

The diagram shows different metal strips dipped into an electrolyte.



Which pair of metals produces the highest voltage?

- A copper and magnesium
- B magnesium and platinum
- C magnesium and zinc
- D silver and platinum

Q36. Which statement about electrolysis is correct?

- A Electrons move through the electrolyte from the cathode to the anode.
- B Electrons move towards the cathode in the external circuit.
- C Negative ions move towards the anode in the external circuit.
- D Positive ions move through the electrolyte towards the anode during electrolysis.

[0620/21/O/N/17/Q9]

Q37. Which statements about the electrolysis of concentrated copper(II) chloride are correct?

- 1 Electrons are transferred from the cathode to the copper(II) ions.
- 2 Electrons move round the external circuit from the cathode to the anode.
- 3 Chloride ions are attracted to the anode.
- 4 Hydroxide ions transfer electrons to the cathode.

A 1 and 3

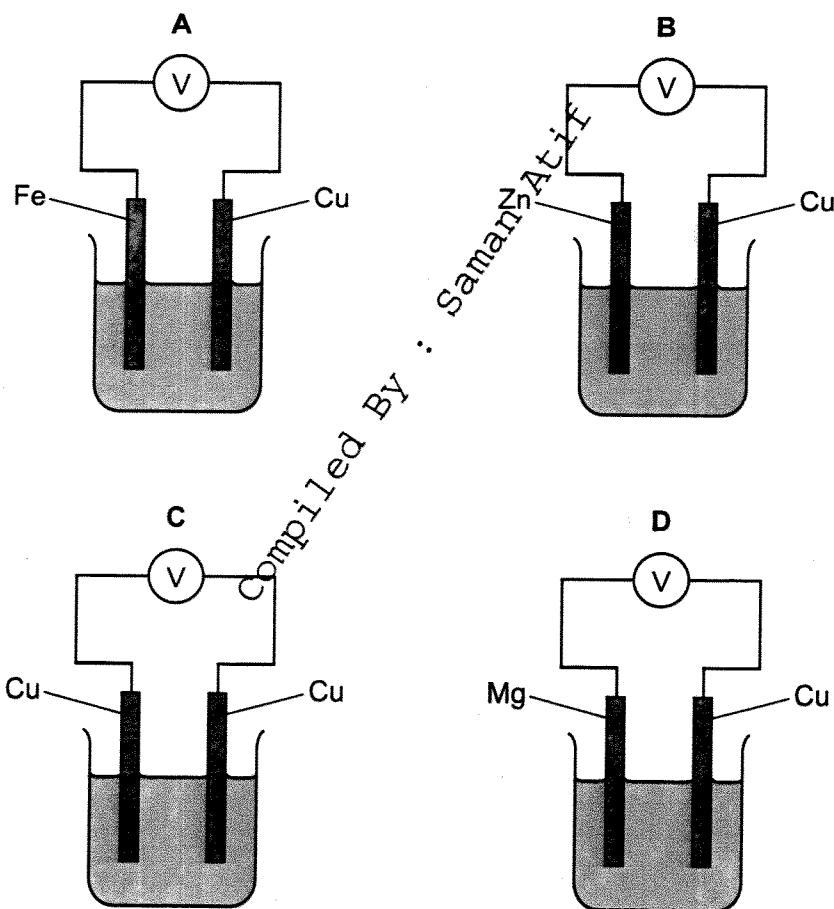
B 1 and 4

C 2 and 3

D 2 and 4

[0620/21/O/N/17/Q10]

Q38. Which metal combination produces the highest voltage reading in the cells shown?



[0620/23/O/N/17/Q9]

Q39. Which statements about the electrolysis of concentrated copper(II) chloride are correct?

- 1 Electrons are transferred from the cathode to the copper(II) ions.
- 2 Electrons move round the external circuit from the cathode to the anode.
- 3 Chloride ions are attracted to the anode.
- 4 Hydroxide ions transfer electrons to the cathode.

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

[0620/21/M/J/18/Q10]

Q40. Aqueous copper(II) sulfate is electrolysed using copper electrodes.

Which statement is correct?

- A A reduction reaction occurs at the positive electrode.
- B The blue colour of the solution becomes darker.
- C The concentration of copper ions in the solution decreases.
- D The mass of the negative electrode increases.

[0620/21/M/J/18/Q11]

Q41. Dilute sulfuric acid is electrolysed using inert electrodes.

What are the ionic half-equations for the reactions that take place at each electrode?

	positive electrode	negative electrode
A	$2H^+ + 2e^- \rightarrow H_2$	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$
B	$2H^+ + 2e^- \rightarrow H_2$	$4OH^- + 4H^+ \rightarrow 4H_2O$
C	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$	$2H^+ + 2e^- \rightarrow H_2$
D	$4OH^- + 4H^+ \rightarrow 4H_2O$	$2H^+ + 2e^- \rightarrow H_2$

[0620/21/O/N/2018/Q10]

Q42. Aqueous copper(II) sulfate is electrolysed using carbon electrodes.

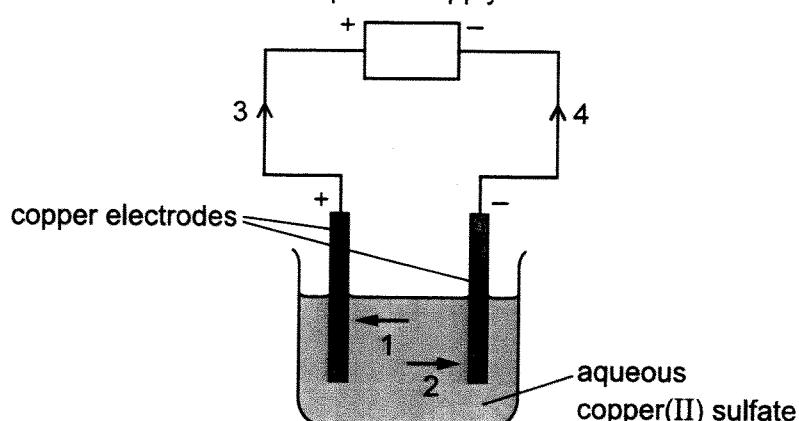
What is the product at each electrode?

	product at the positive electrode	product at the negative electrode
A	copper	oxygen
B	hydrogen	oxygen
C	oxygen	copper
D	oxygen	hydrogen

Q43.

[0620/21/O/N/2018/Q11]

The diagram shows a circuit used to electrolyse aqueous copper(II) sulfate.



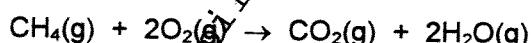
Which arrows indicate the movement of the copper ions in the electrolyte and of the electrons in the external circuit?

	copper ions	electrons
A	1	3
B	1	4
C	2	3
D	2	4

Q44.

[0620/21/O/N/2018/Q12]

Methane burns in an excess of oxygen. The equation is shown.



The bond energies are shown in the table.

bond	bond energy in kJ/mol
C-H	+410
C=O	+805
O-H	+460
O=O	+496

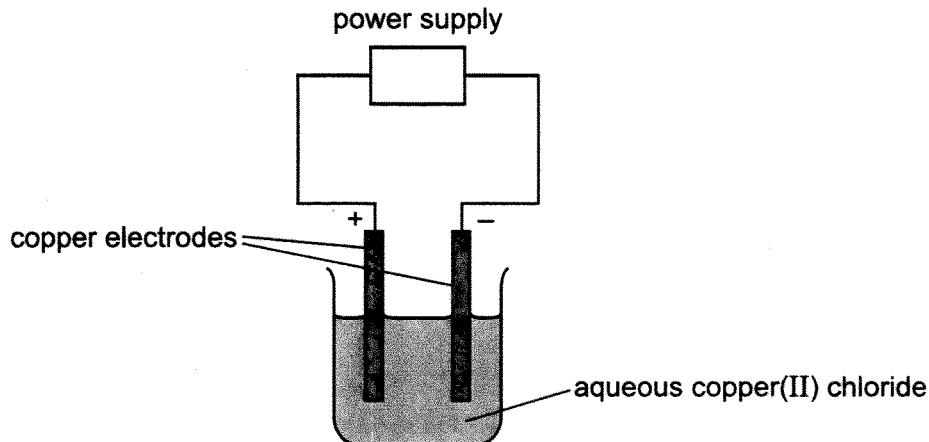
What is the energy change for the reaction?

- A +818 kJ/mol
- B +102 kJ/mol
- C -359 kJ/mol
- D -818 kJ/mol

Q45.

[0620/22/O/N/2018/Q10]

Concentrated aqueous copper(II) chloride is electrolysed using copper electrodes as shown.



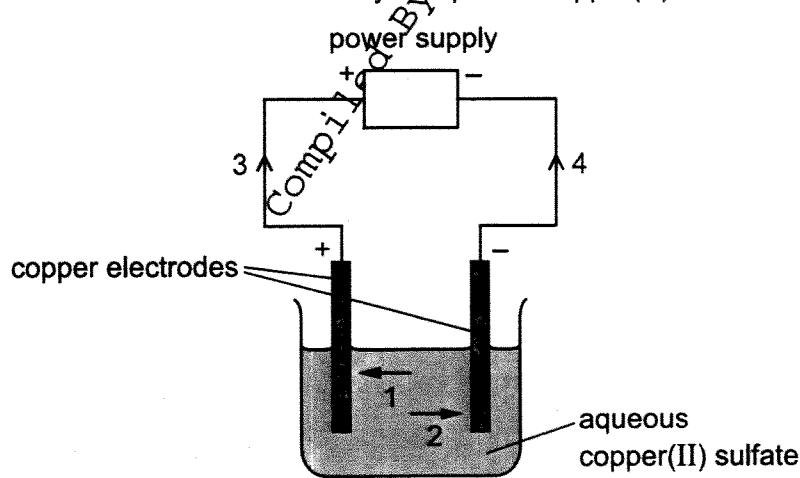
What happens to the mass of each electrode during this process?

	positive electrode	negative electrode
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

Q46.

[0620/22/O/N/2018/Q11]

The diagram shows a circuit used to electrolyse aqueous copper(II) sulfate.



Which arrows indicate the movement of the copper ions in the electrolyte and of the electrons in the external circuit?

	copper ions	electrons
A	1	3
B	1	4
C	2	3
D	2	4

Q47.

[0620/23/O/N/2018/Q10]

Electrolysis of copper(II) sulfate can be done using either carbon electrodes or copper electrodes.

Which statement describes what happens at the positive electrode?

- A Copper is deposited if the electrode is made from carbon.
- B Copper is deposited if the electrode is made from copper.
- C Oxygen gas is produced if the electrode is made from carbon.
- D Oxygen gas is produced if the electrode is made from copper.

Q48.

[0620/23/O/N/2018/Q16]

The equation for the reaction between zinc and copper(II) oxide is shown.



Which row shows the oxidising agent and the reducing agent?

	oxidising agent	reducing agent
A	CuO	Cu
B	CuO	Zn
C	Zn	CuO
D	Zn	ZnO

∴ Saman Atif

Q49.

[0620/23/O/N/2018/Q27]

Which statement about the manufacture of aluminium by electrolysis is correct?

- A Aluminium ions are oxidised to aluminium by gaining electrons.
- B Aluminium is extracted from its ore hematite.
- C Molten cryolite is used to dissolve the aluminium oxide.
- D Oxygen is formed at the negative electrode.

Q50.

[0620/21/M/J/2019/Q9]

Which statement about the electrolysis of copper(II) sulfate solution using carbon electrodes is correct?

- A A colourless gas is produced at the anode.
- B A colourless gas is produced at the cathode.
- C The colour of the electrolyte remains the same.
- D The mass of both electrodes remains constant.

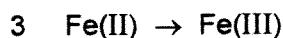
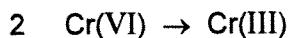
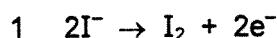
[0620/21/M/J/2019/Q10]

Q51. Aluminium metal is extracted from aluminium oxide by electrolysis.

Which ionic half-equation describes a reaction that occurs at the named electrode?

	ionic half-equation	electrode
A	$2O^{2-} \rightarrow O_2 + 2e^-$	anode
B	$Al^{3+} + 3e^- \rightarrow Al$	anode
C	$2O^{2-} \rightarrow O_2 + 4e^-$	cathode
D	$Al^{3+} + 3e^- \rightarrow Al$	cathode

[0620/21/M/J/2019/Q16]

Q52. Which changes represent oxidation?

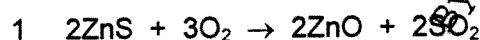
A 1 and 2

B 1 and 3

C 1 only

D 2 only

[0620/21/M/J/2019/Q25]

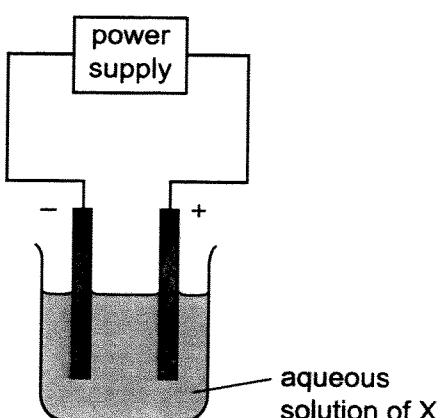
Q53. Zinc is extracted from its ore, zinc blende, using two chemical reactions.

Which substance is reduced in reactions 1 and 2?

	reaction 1	reaction 2
A	O_2	C
B	O_2	ZnO
C	ZnS	C
D	ZnS	ZnO

[0620/22/M/J/2019/Q9]

Q54. The diagram shows the electrolysis of an aqueous solution of X using inert electrodes.



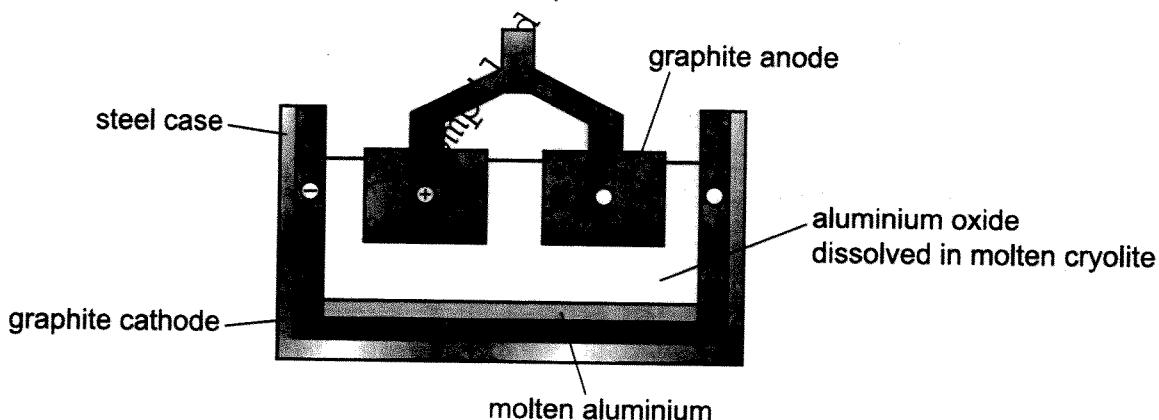
Hydrogen is produced at the cathode and chlorine is produced at the anode.

What is X?

- A concentrated copper(II) chloride solution
- B concentrated hydrochloric acid
- C dilute hydrochloric acid
- D dilute sodium chloride solution

[0620/22/M/J/2019/Q10]

Q55. Aluminium is extracted by electrolysis as shown.

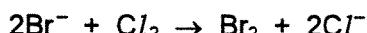


Which row shows the ionic half-equations at the cathode and the anode?

	cathode	anode
A	$\text{Al}^{3+} \rightarrow \text{Al} + 3\text{e}^-$	$2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$
B	$\text{Al}^{3+} \rightarrow \text{Al} + 3\text{e}^-$	$2\text{O}^{2-} + 4\text{e}^- \rightarrow \text{O}_2$
C	$\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$	$2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$
D	$\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$	$2\text{O}^{2-} + 4\text{e}^- \rightarrow \text{O}_2$

[0620/22/M/J/2019/Q16]

Q56. The ionic equation for the reaction of aqueous potassium bromide with chlorine gas is shown.

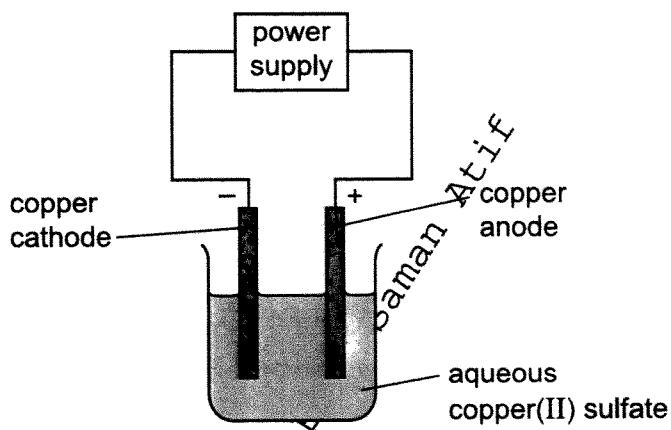


Which statement is correct?

- A Bromide ions are oxidised by gaining electrons.
- B Bromide ions are oxidised by losing electrons.
- C Chlorine is oxidised by gaining electrons.
- D Chlorine is oxidised by losing electrons.

[0620/23/M/J/2019/Q9]

Q57. An aqueous solution of copper(II) sulfate was electrolysed using copper electrodes.



Which equation for the reaction at the anode is correct?

- A $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$
- B $\text{Cu} + 2\text{e}^- \rightarrow \text{Cu}^{2+}$
- C $\text{Cu}^{2+} \rightarrow \text{Cu} + 2\text{e}^-$
- D $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$

[0620/23/M/J/2019/Q10]

Q58. In the manufacture of aluminium by electrolysis, aluminium oxide is dissolved in molten cryolite.

Why is cryolite used?

- A It lowers the melting point of the aluminium.
- B It makes the aluminium a better conductor.
- C It removes impurities from the aluminium.
- D The mixture has a lower melting point than pure aluminium oxide.

[0620/23/M/J/2019/Q16]

Q59.

Which changes represent reduction?

- 1 $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$
- 2 $\text{Mn(VII)} \rightarrow \text{Mn(II)}$
- 3 sulfate(IV) \rightarrow sulfate(VI)

- A 1 and 2 B 1 and 3 C 1 only D 2 only

Q60.

[0620/21/O/N/2019/Q11]

Which rows correctly show cathode and anode products from the electrolysis of the named electrolyte?

	electrolyte	cathode product	anode product
1	copper(II) sulfate solution using copper electrodes	copper	oxygen
2	molten lead(II) bromide	lead	bromine
3	dilute sodium bromide solution	hydrogen	oxygen
4	copper(II) sulfate solution using carbon electrodes	hydrogen	oxygen

- A 1 and 2 only B 1 and 4 only C 2 and 3 only D 3 and 4 only

Q61.

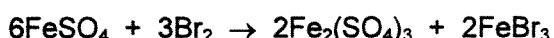
[0620/22/O/N/2019/Q12]

What are the ionic half-equations for the electrode reactions during the electrolysis of concentrated aqueous sodium chloride?

	anode	cathode
A	$\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$	$\text{H}_2 \rightarrow 2\text{H}^+ + 2\text{e}^-$
B	$2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$
C	$\text{H}_2 \rightarrow 2\text{H}^+ + 2\text{e}^-$	$\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$
D	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$	$2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$

[0620/21/O/N/2019/Q18]

Q62. The equation for the reaction between iron(II) sulfate and bromine is shown.

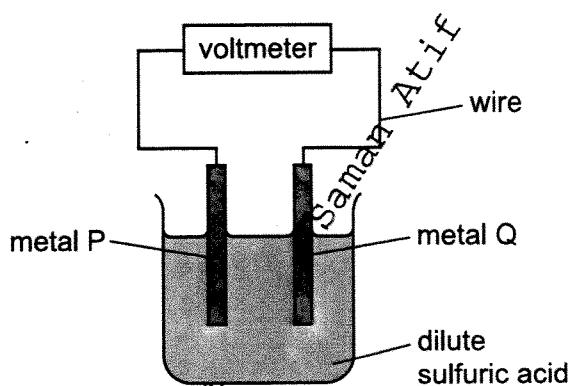


Which row identifies the oxidising agent and the reducing agent?

	oxidising agent	reducing agent
A	Br_2	FeSO_4
B	FeSO_4	Br_2
C	FeBr_3	$\text{Fe}_2(\text{SO}_4)_3$
D	$\text{Fe}_2(\text{SO}_4)_3$	FeBr_3

[0620/22/O/N/2019/Q11]

Q63. The diagram shows a simple cell.



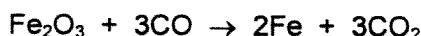
Which pair of metals produces the largest voltage?

	metal P	metal Q
A	magnesium	iron
B	magnesium	copper
C	zinc	iron
D	zinc	copper

Q64.

[0620/22/O/N/2019/Q18]

In the blast furnace, iron is formed when iron(III) oxide reacts with carbon monoxide in a redox reaction.



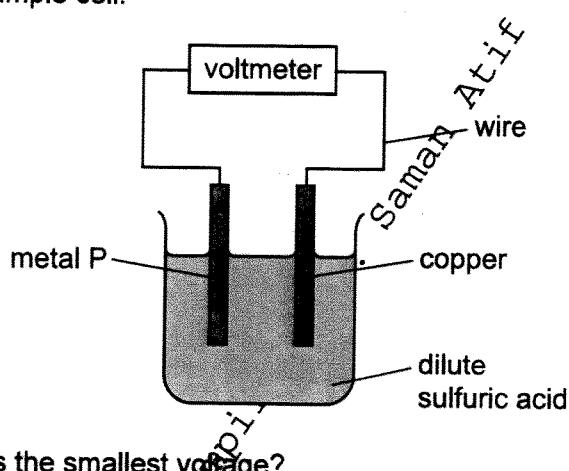
Which substance is the oxidising agent and which substance is the reducing agent?

	oxidising agent	reducing agent
A	CO	Fe_2O_3
B	CO_2	Fe
C	Fe	CO_2
D	Fe_2O_3	CO

Q65.

[0620/23/O/N/2019/Q11]

The diagram shows a simple cell.



Which metal P produces the smallest voltage?

- A calcium
- B iron
- C magnesium
- D zinc

Q66.

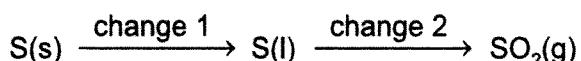
[0620/21/M/J/2020/Q10]

Dilute aqueous sodium chloride is electrolysed using platinum electrodes.

What is the half-equation for the reaction at the cathode?

- A $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$
- B $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$
- C $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$
- D $4\text{OH}^- \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^-$

[0620/23/O/N/2019/Q15]

Q67. A sequence of changes involving sulfur is shown.

Which row describes the changes?

	change 1	change 2
A	chemical	chemical
B	chemical	physical
C	physical	chemical
D	physical	physical

[0620/23/O/N/2019/Q18]

Q68. Chlorine displaces bromine from aqueous potassium bromide.

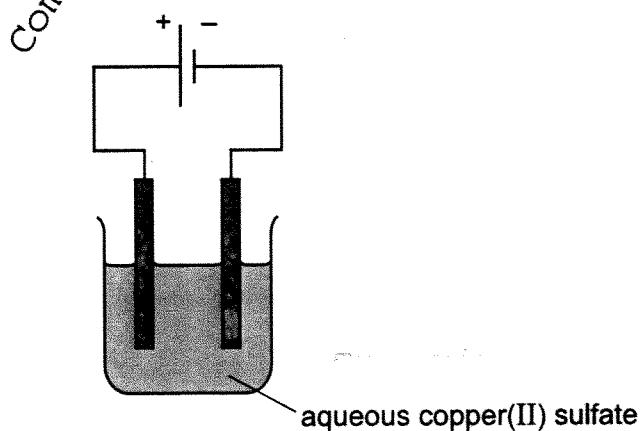
The ionic equation for the reaction is shown.



Which statement about this reaction is correct?

- A Bromide ions act as an oxidising agent.
 B Bromide ions are oxidised when electrons are lost.
 C Chlorine acts as a reducing agent.
 D Chlorine is reduced when electrons are lost.

[0620/23/M/J/2020/Q11]

Q69. The electrolysis of aqueous copper(II) sulfate, using inert electrodes, is shown.

Which statement about a reaction at an electrode is correct?

- A Copper ions gain electrons at the negative electrode.
 B Copper ions gain electrons at the positive electrode.
 C Hydrogen ions gain electrons at the negative electrode.
 D Hydrogen ions gain electrons at the positive electrode.

Q70.

[0620/22/M/J/2020/Q10]

Electrolytes can be broken down by electrolysis.

Which rows are correct for each electrolyte?

	electrolyte	reaction at cathode	product at anode
1	dilute aqueous sodium chloride	$2H^+ + 2e^- \rightarrow H_2$	oxygen
2	concentrated hydrochloric acid	$2H^+ + 2e^- \rightarrow H_2$	chlorine
3	molten aluminium oxide	$2O^{2-} \rightarrow O_2 + 4e^-$	aluminium
4	concentrated aqueous sodium bromide	$Na^+ + e^- \rightarrow Na$	bromine

A 1 and 2

B 1 and 4

C 2 and 3

D 3 and 4

Q71.

[0620/23/M/J/2020/Q10]

Which row describes the reactions during the electrolysis of dilute aqueous sodium chloride?

	anode (+) reaction	cathode (-) reaction
A	$H_2 \rightarrow 2H^+ + 2e^-$	$2H_2O + O_2 + 4e^- \rightarrow 4OH^-$
B	$2H^+ + 2e^- \rightarrow H_2$	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$
C	$2H_2O + O_2 + 4e^- \rightarrow 4OH^-$	$H_2 \rightarrow 2H^+ + 2e^-$
D	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$	$2H^+ + 2e^- \rightarrow H_2$

Q72.

[0620/21/O/N/2020/Q14]

Which reaction takes place at the cathode during the electrolysis of molten nickel(II) chloride?

A $Cl_2 + 2e^- \rightarrow 2Cl^-$ B $2Cl^- \rightarrow Cl_2 + 2e^-$ C $Ni \rightarrow Ni^{2+} + 2e^-$ D $Ni^{2+} + 2e^- \rightarrow Ni$

Q73.

[0620/21/O/N/2020/Q21]

The reaction between chlorine and bromide ions is a redox reaction.



What is the change in oxidation state of the reducing agent in this reaction?

A -2 to 0

B -1 to 0

C 0 to -1

D 0 to +1

Q74.

[0620/22/O/N/2020/Q12]

Universal indicator solution is added to a neutral solution of concentrated aqueous sodium chloride.

The solution, which contains H^+ (hydrogen), Na^+ (sodium), Cl^- (chloride) and OH^- (hydroxide) ions, is electrolysed.

The product at the cathode is hydrogen gas and the product at the anode is chlorine gas.

What happens to the colour of the indicator in the solution during electrolysis?

- A The colour changes from blue to green.
- B The colour changes from blue to red.
- C The colour changes from green to blue.
- D The colour changes from green to red.

Q75.

[0620/22/O/N/2020/Q13]

What is the empirical formula of an oxide of iron, formed by reacting 2.24 g of iron with 0.96 g of oxygen?

- A FeO
- B Fe_2O
- C Fe_2O_3
- D Fe_3O_4

Q76.

[0620/23/O/N/2020/Q19]

Electrolysis is carried out on dilute aqueous potassium bromide.

Which products are formed at the anode and the cathode?

	anode	cathode
A	bromine	hydrogen
B	bromine	potassium
C	hydrogen	bromine
D	hydrogen	potassium

Q77.

[0620/23/O/N/2020/Q17]

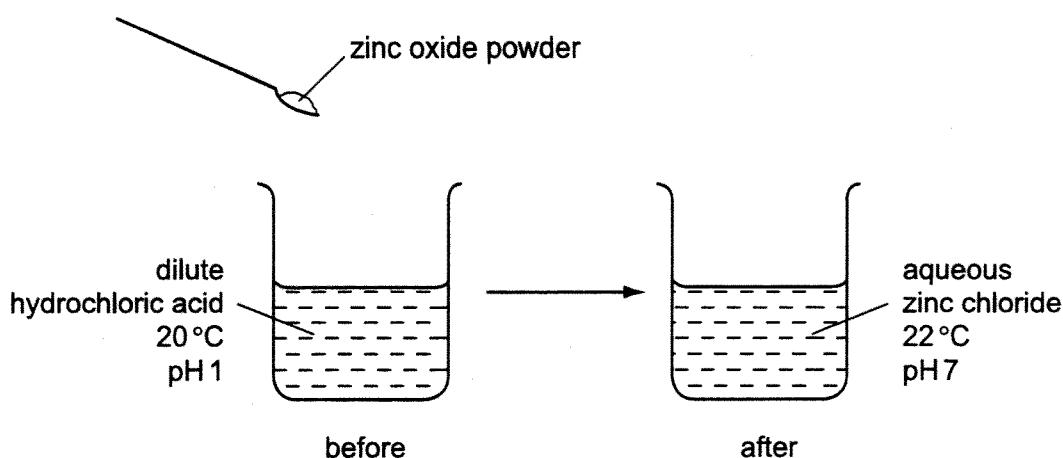
Which reaction of hydrochloric acid is a redox reaction?

- A $2Na + 2HCl \rightarrow 2NaCl + H_2$
- B $Na_2O + 2HCl \rightarrow 2NaCl + H_2O$
- C $NaOH + HCl \rightarrow NaCl + H_2O$
- D $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$

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[0620/12/M/J/12/Q14]

Q1. The diagram shows the reaction between zinc oxide and dilute hydrochloric acid.



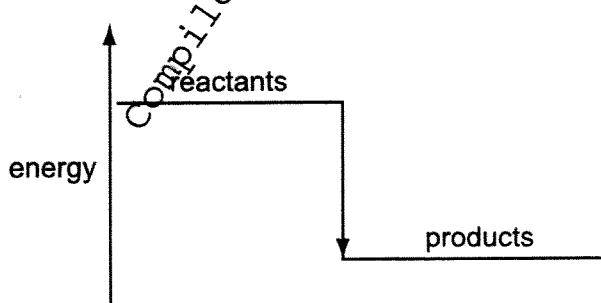
Which terms describe the reaction?

	endothermic	neutralisation
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

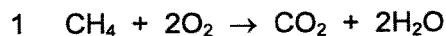
: Saman Atif

[0620/13/Q11/12/Q11]

Q2. A diagram for the energy change during an exothermic reaction is shown.



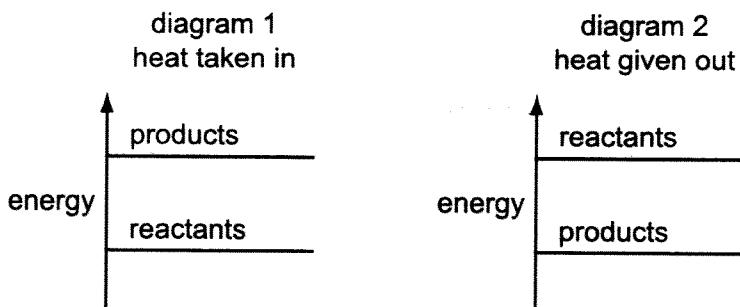
For which reactions would this be an appropriate diagram?



- A none of them
- B 1 and 2 only
- C 2 and 3 only
- D all of them

[0620/12/O/N/12/Q11]

Q3. The diagrams show the difference in energies of the reactants and products in two types of reaction.



Which diagram and which type of energy change apply to a fuel burning in air?

	diagram	type of energy change
A	1	endothermic
B	1	exothermic
C	2	endothermic
D	2	exothermic

[0620/12/M/J/13/Q12]

Q4. Statement 1 Hydrogen is used as a fuel.

Statement 2 When hydrogen burns in the air to form water, heat energy is produced.

Which is correct?

- A Both statements are correct and statement 2 explains statement 1.
- B Both statements are correct but statement 2 does not explain statement 1.
- C Statement 1 is correct but statement 2 is incorrect.
- D Statement 2 is correct but statement 1 is incorrect.

[0620/12/M/J/13/Q13]

Q5. Which substance does **not** require oxygen in order to produce energy?

- A coal
- B hydrogen
- C natural gas
- D ^{235}U

[0620/11/M/J/13/Q13]

Q6. Some white anhydrous copper(II) sulfate powder is put into a beaker of water and stirred.

What would show that the process was exothermic?

- A A blue solution is formed.
- B The beaker feels cooler.
- C The beaker feels warmer.
- D The powder dissolves in the water.

[0620/13/O/N/13/Q12]

Q7. When ammonium nitrate is added to water the temperature of the water decreases.

The ammonium nitrate can be recovered by evaporating the water added.

Which explains these observations?

- A The ammonium nitrate dissolves in the water and the process is endothermic.
- B The ammonium nitrate reacts with the water and the process is endothermic.
- C The ammonium nitrate dissolves in the water and the process is exothermic.
- D The ammonium nitrate reacts with the water and the process is exothermic.

[0620/13/O/N/13/Q13]

Q8. Which substance could **not** be used as a fuel to heat water in a boiler?

- A ethanol
- B hydrogen
- C methane
- D oxygen

[0620/13/O/N/13/Q14]

Q9. Which substance is not a fossil fuel?

- A coal
- B kerosene
- C gasoline
- D wood

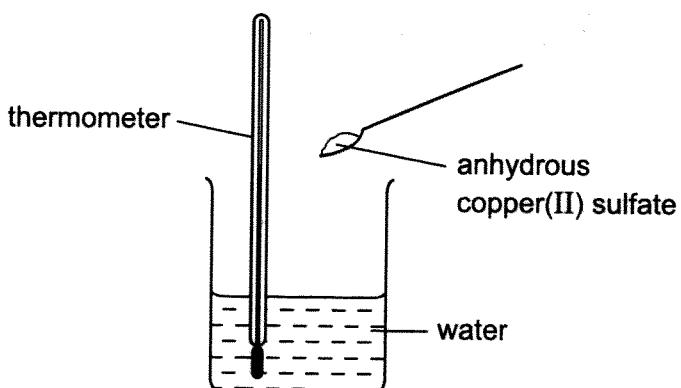
[0620/12/O/N/13/Q15]

Q10. Which fuel does **not** produce carbon dioxide when it burns?

- A coal
- B hydrogen
- C methane
- D petrol

[0620/21/O/N/16/Q12]

Q11. When anhydrous copper(II) sulfate is added to water a solution is formed and heat is given out.



Which row correctly shows the temperature change and the type of reaction taking place?

	temperature change	type of reaction
A	decreases	endothermic
B	decreases	exothermic
C	increases	endothermic
D	increases	exothermic

[0620/12/M/J/14/Q12]

Q12. Solutions of two chemicals are mixed.

A reaction occurs and the temperature change is measured.

Which statement is correct?

- A If the reaction is endothermic, the temperature decreases and energy is taken in.
- B If the reaction is endothermic, the temperature increases and energy is given out.
- C If the reaction is exothermic, the temperature decreases and energy is given out.
- D If the reaction is exothermic, the temperature increases and energy is taken in.

[0620/12/M/J/14/Q13]

Q13. Power stations produce electrical energy from different fuels.

Which fuel causes least pollution to the atmosphere?

- A coal
- B fuel oil
- C natural gas
- D radioactive isotopes

[0620/11/M/J/14/Q13]

Q14. Some reactions are endothermic.

How does the temperature and energy change in an endothermic reaction?

	temperature change	energy change
A	decreases	energy taken in
B	decreases	energy given out
C	increases	energy taken in
D	increases	energy given out

[0620/11/M/J/14/Q14]

Q15. Two chemical processes are described below.

- In the combustion of methane, energy is 1..... .
- In the electrolysis of molten lead(II) bromide, energy is 2..... .

Which words correctly complete gaps 1 and 2?

	1	2
A	given out	given out
B	given out	taken in
C	taken in	given out
D	taken in	taken in

[0620/13/O/N/14/Q13]

Q16. What occurs when a fuel burns?

	fuel reacts with oxygen	energy change
A	no	endothermic
B	no	exothermic
C	yes	endothermic
D	yes	exothermic

[0620/13/O/N/14/Q14]

Q17. Which fuel does **not** produce air pollution when it burns?

- A coal
 B diesel oil
 C hydrogen
 D gasoline (petrol)

[0620/12/O/N/14/Q13]

Q18. Which statements about exothermic and endothermic reactions are correct?

- 1 During an exothermic reaction, heat is given out.
- 2 The temperature of an endothermic reaction goes up because heat is taken in.
- 3 Burning methane in the air is an exothermic reaction.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

[0620/12/O/N/14/Q14]

Q19. A power station was designed to burn gaseous fuels only.

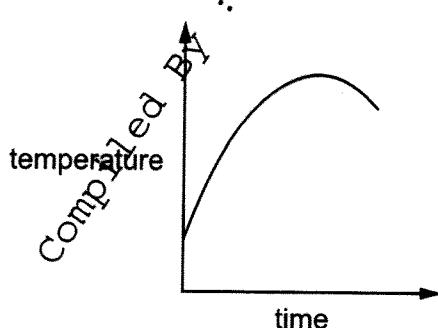
Which two substances could be used?

- A** carbon dioxide and hydrogen
B carbon dioxide and ^{235}U
C hydrogen and methane
D methane and ^{235}U

[0620/13/O/N/15/Q11]

Q20. A metal reacts with an aqueous solution.

The graph shows the temperature before, during and after the reaction.

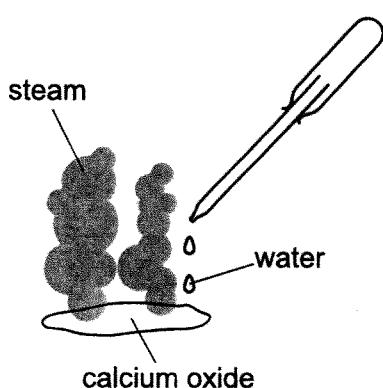


Which row describes the reaction?

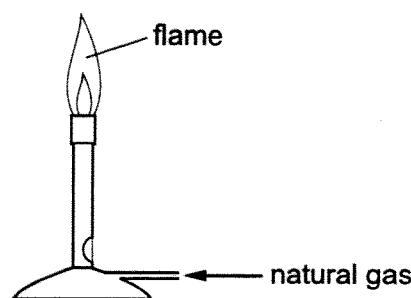
	reaction	energy change
A	combustion	endothermic
B	combustion	exothermic
C	thermal decomposition	endothermic
D	thermal decomposition	exothermic

Q21. The diagrams show four chemical reactions.

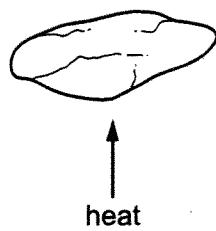
Which reaction is endothermic?

A

addition of water to calcium oxide

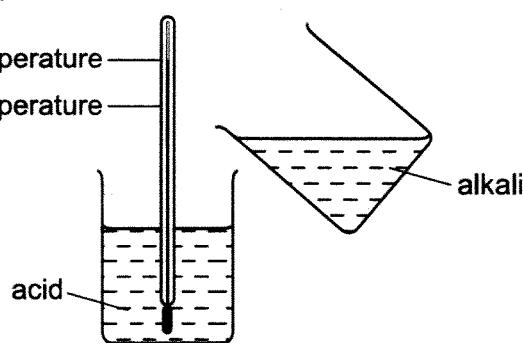
B

combustion of natural gas

C

thermal decomposition of limestone

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Saman Atif

D

reaction of acid with alkali

Q22. Which reaction is endothermic?

- A** the burning of magnesium ribbon
- B** the combustion of methane
- C** the decomposition of calcium carbonate
- D** the reaction of water with anhydrous copper(II) sulfate

[0620/12/O/N/15/Q10]

Q23. Hydrogen can be used as a fuel.

Which properties of hydrogen would be advantages and which would be disadvantages?

- 1 Hydrogen is expensive to produce.
- 2 Hydrogen reacts exothermically with oxygen.
- 3 When hydrogen burns, a greenhouse gas is not formed.

	advantages	disadvantages
A	1	2 and 3
B	1 and 2	3
C	1 and 3	2
D	2 and 3	1

[0620/12/O/N/15/Q11]

Q24. Which row correctly describes whether the reaction is exothermic or endothermic?

	reaction	exothermic	endothermic
A	calcium carbonate \rightarrow calcium oxide + carbon dioxide	✓	✗
B	carbon + oxygen \rightarrow carbon dioxide	✓	✗
C	methane + oxygen \rightarrow carbon dioxide + water	✗	✓
D	sodium + water \rightarrow sodium hydroxide + hydrogen	✗	✓

[0620/11/O/N/15/Q10]

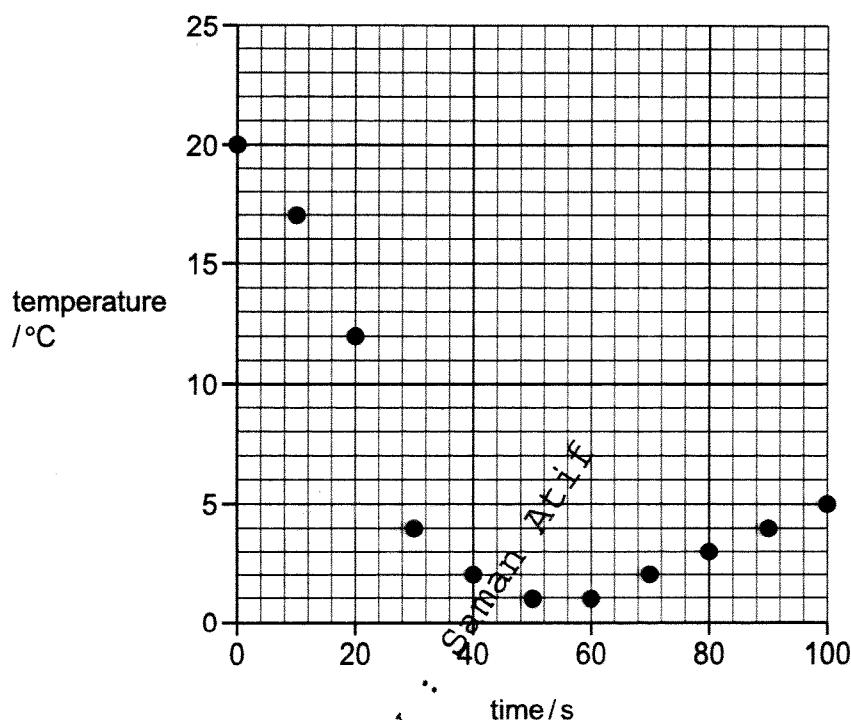
Q25. Which reaction is endothermic?

- A acid neutralising alkali causing a temperature increase
- B adding magnesium to hydrochloric acid
- C calcium carbonate decomposing when heated
- D combustion of fossil fuels

Q26. Solid hydrated sodium carbonate was added to solid citric acid.

The mixture was stirred and the temperature recorded every 10 seconds.

The results are shown on the graph:

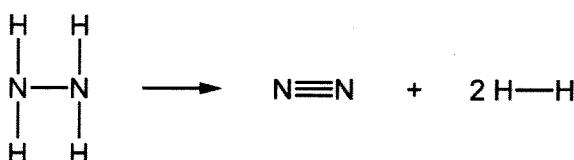


Which row describes the reaction?

	reaction type	energy change
A	neutralisation	endothermic
B	neutralisation	exothermic
C	thermal decomposition	endothermic
D	thermal decomposition	exothermic

[0620/23/M/J/16/Q13]

Q27. Hydrazine, N_2H_4 , decomposes as shown.



The energy change for this reaction is -95 kJ/mol .

The table shows some bond energies involved.

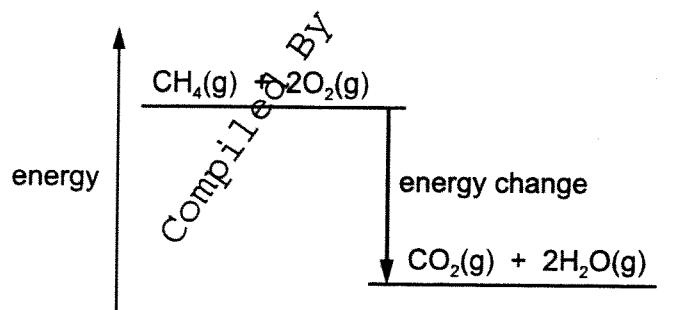
bond	bond energy in kJ/mol
$\text{N}\equiv\text{N}$	945
$\text{N}-\text{H}$	391
$\text{H}-\text{H}$	436

What is the bond energy of the $\text{N}-\text{N}$ bond?

- A 158 kJ/mol B 315 kJ/mol C 348 kJ/mol D 895 kJ/mol

[0620/22/M/J/16/Q13]

Q28. The energy level diagram for the combustion of methane is shown.



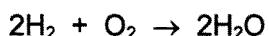
Which row gives the equation and energy change for this reaction?

	equation	energy change in kJ/mol
A	$\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$	+891
B	$\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$	-891
C	$\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$	+891
D	$\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$	-891

[0620/21/M/J/16/Q13]

Q29. Hydrogen burns exothermically in oxygen.

The equation for the reaction is:



The table shows the bond energies involved.

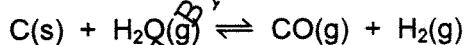
bond	bond energy in kJ/mol
H-H	436
O=O	498
O-H	464

What is the energy given out during the reaction?

- A -3226 kJ/mol
- B -884 kJ/mol
- C -486 kJ/mol
- D -442 kJ/mol

[0620/21/M/J/16/Q13]

Q30. Steam reacts with carbon in an endothermic reaction.



Which conditions of temperature and pressure would give the largest yield of hydrogen?

	temperature	pressure
A	high	high
B	high	low
C	low	high
D	low	low

[0620/23/O/N/16/Q12]

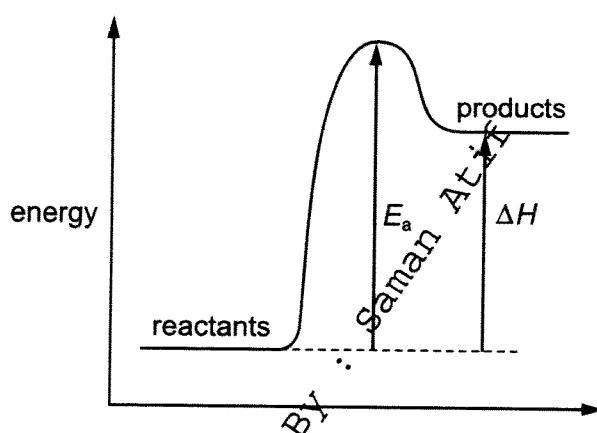
Q31. 10 g of ammonium nitrate are added to water at 25°C and the mixture stirred. The ammonium nitrate dissolves and, after one minute, the temperature of the solution is 10°C.

Which word describes this change?

- A endothermic
- B exothermic
- C neutralisation
- D reduction

[0620/22/O/N/16/Q13]

Q32. The energy level diagram for a reaction is shown.



Which row is correct?

	sign of ΔH	overall energy change	sign of E_a
A	-	exothermic	-
B	+	endothermic	+
C	+	endothermic	-
D	+	exothermic	+

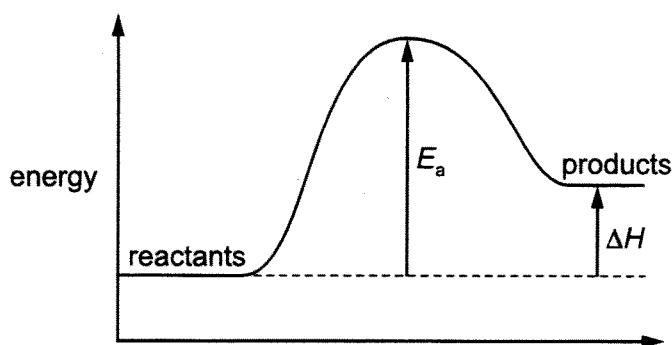
[0620/22/O/N/16/Q12]

Q33. Which experiment is the most exothermic?

	initial temperature / °C	final temperature / °C
A	20	5
B	20	32
C	25	12
D	25	34

[0620/21/O/N/16/Q13]

Q34. The energy level diagram for a reaction is shown.



Which statement is **not** correct for this energy level diagram?

- A It could be the energy level diagram for the reaction when petrol is burnt.
- B Less energy is released in bond forming than is needed for bond breaking.
- C The activation energy, E_a , has a positive value.
- D The energy change, ΔH , for the reaction is positive.

[0620/21/M/J/17/Q11]

Q35. Some properties of four fuels are shown in the table.

Which fuel is a gas at room temperature and makes two products when it burns in a plentiful supply of air?

	fuel	formula	melting point /°C	boiling point /°C
A	hydrogen	H ₂	-259	-253
B	methane	CH ₄	-182	-164
C	octane	C ₈ H ₁₈	-57	126
D	wax	C ₃₁ H ₆₄	60	400

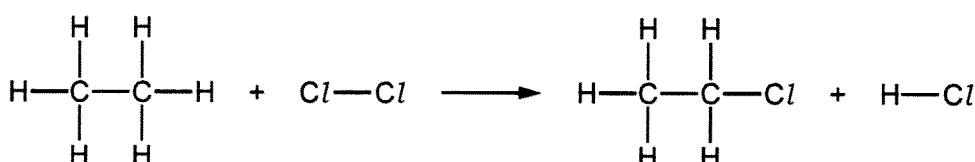
[0620/21/M/J/17/Q12]

Q36. Which statements about exothermic and endothermic reactions are correct?

- 1 During an exothermic reaction, heat is given out.
 - 2 The temperature of an endothermic reaction goes up because heat is taken in.
 - 3 Burning methane in the air is an exothermic reaction.
- A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

[0620/21/M/J/17/Q13]

Q37. Chlorine reacts with ethane to produce chloroethane and hydrogen chloride.



The reaction is exothermic.

The bond energies are shown in the table.

bond	bond energy in kJ/mol
C-Cl	+340
C-C	+350
C-H	+410
Cl-Cl	+240
H-Cl	+430

What is the energy change for the reaction?

- A -1420 kJ/mol
- B -120 kJ/mol
- C $+120 \text{ kJ/mol}$
- D $+1420 \text{ kJ/mol}$

[0620/22/M/J/17/Q11]

Q38. Which statement about fuels is correct?

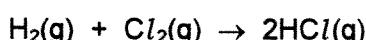
- A Heat energy can only be produced by burning fuels.
- B Hydrogen is used as a fuel although it is difficult to store.
- C Methane is a good fuel because it produces only water when burned.
- D Uranium is burned in air to produce energy.

[0620/22/M/J/17/Q12]

Q39. Which statements about exothermic and endothermic reactions are correct?

- 1 During an exothermic reaction, heat is given out.
 - 2 The temperature of an endothermic reaction goes up because heat is taken in.
 - 3 Burning methane in the air is an exothermic reaction.
- A 1, 2 and 3
 - B 1 and 2 only
 - C 1 and 3 only
 - D 2 and 3 only

Q40. The equation for the reaction between hydrogen and chlorine is shown.



The reaction is exothermic.

The bond energies are shown in the table.

bond	bond energy in kJ/mol
Cl-Cl	+240
H-Cl	+430
H-H	+436

What is the energy change for the reaction?

- A -1536 kJ/mol
- B -184 kJ/mol
- C +184 kJ/mol
- D +246 kJ/mol

Q41. Heat energy is produced when hydrocarbons burn in air.

Which equations represent this statement?

- 1 $\text{C}_2\text{H}_5\text{OH} + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 3\text{H}_2\text{O}$
- 2 $\text{C}_2\text{H}_4 + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 2\text{H}_2\text{O}$
- 3 $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

- A 1, 2 and 3
- B 1 and 2 only
- C 1 and 3 only
- D 2 and 3 only

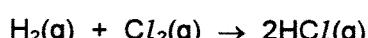
Q42. Which statements about exothermic and endothermic reactions are correct?

- 1 During an exothermic reaction, heat is given out.
- 2 The temperature of an endothermic reaction goes up because heat is taken in.
- 3 Burning methane in the air is an exothermic reaction.

- A 1, 2 and 3
- B 1 and 2 only
- C 1 and 3 only
- D 2 and 3 only

Q43. Hydrogen and chlorine react to form hydrogen chloride.

The reaction is exothermic.



The overall energy change for this reaction is -184 kJ/mol .

The table gives some of the bond energies involved.

bond	bond energy in kJ/mol
H-Cl	+430
H-H	+436

What is the energy of the Cl-Cl bond?

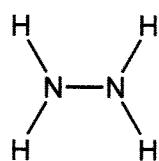
- A -240 kJ/mol
- B -190 kJ/mol
- C $+190 \text{ kJ/mol}$
- D $+240 \text{ kJ/mol}$

[0620/23/M/J/17/Q14]

Q44. Which changes are physical changes?

- 1 melting ice to form water
 2 burning hydrogen to form water
 3 adding sodium to water
 4 boiling water to form steam
- A 1 and 2
 - B 1 and 4
 - C 2 and 3
 - D 3 and 4

Q45. The compound hydrazine is used as a rocket fuel. It has the structural formula shown.



One of the reactions of hydrazine is shown. This reaction is exothermic.



The bond energies are shown in the table.

	bond energy in kJ/mol
H-H	+436
N-H	+390
N-N	+160
N≡N	+945

What is the energy change for this reaction?

- A -339 kJ/mol B -97 kJ/mol C +97 kJ/mol D +339 kJ/mol

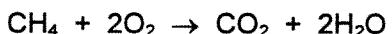
Q46.

Which statement describes an exothermic reaction?

- A The energy absorbed for bond breaking is greater than the energy released by bond formation.
- B The energy absorbed for bond breaking is less than the energy released by bond formation.
- C The energy released by bond breaking is greater than the energy absorbed for bond formation.
- D The energy released by bond breaking is less than the energy absorbed for bond formation.

[0620/22/O/N/17/Q11]

Q47. The equation for the combustion of methane is shown.



The energy change for the combustion of methane is -890 kJ/mol .

The bond energies are shown in the table.

bond	bond energy in kJ/mol
C-H	+410
O=O	+496
H-O	+460

What is the bond energy of the C=O bond?

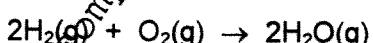
- A +49 kJ/mol B +841 kJ/mol C +1301 kJ/mol D +1335 kJ/mol

[0620/23/O/N/17/Q11]

Q48. Some bond energies are shown in the table.

bond	bond energy 45 kJ/mol
H-H	+436
O=O	+496
H-O	+460

Hydrogen reacts with oxygen. The reaction is exothermic.



What is the energy change for the reaction?

- A -3208 kJ/mol
 B -908 kJ/mol
 C -472 kJ/mol
 D -448 kJ/mol

Q49.

[0620/23/O/N/17/Q12]

Which statement describes an exothermic reaction?

- A The energy absorbed for bond breaking is greater than the energy released by bond formation.
 B The energy absorbed for bond breaking is less than the energy released by bond formation.
 C The energy released by bond breaking is greater than the energy absorbed for bond formation.
 D The energy released by bond breaking is less than the energy absorbed for bond formation.

Q50.

[0620/21/M/J/18/Q12]

Plant cells use energy from sunlight for photosynthesis.

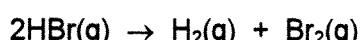
Which row describes and explains the energy change that occurs?

	type of energy change	explanation
A	endothermic	less energy is released making bonds than is absorbed to break bonds
B	endothermic	more energy is released making bonds than is absorbed to break bonds
C	exothermic	less energy is released making bonds than is absorbed to break bonds
D	exothermic	more energy is released making bonds than is absorbed to break bonds

Q51.

[0620/21/M/J/18/Q13]

Hydrogen bromide decomposes to form hydrogen and bromine. The equation is shown.



The bond energies are shown in the table. The reaction is endothermic.

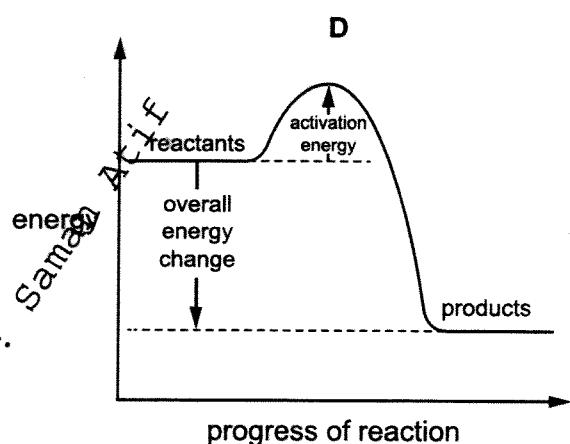
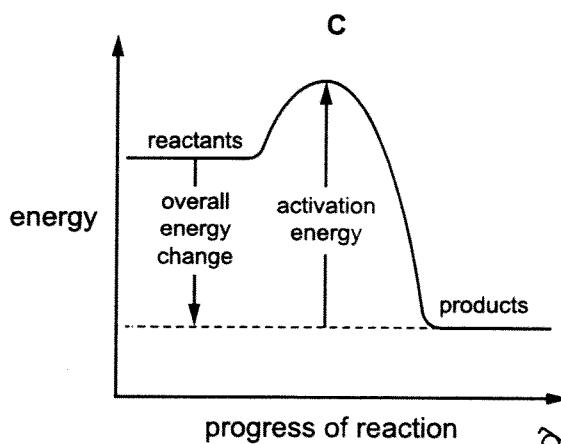
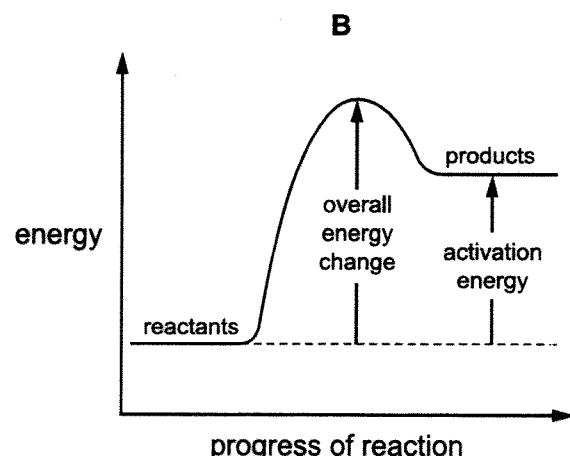
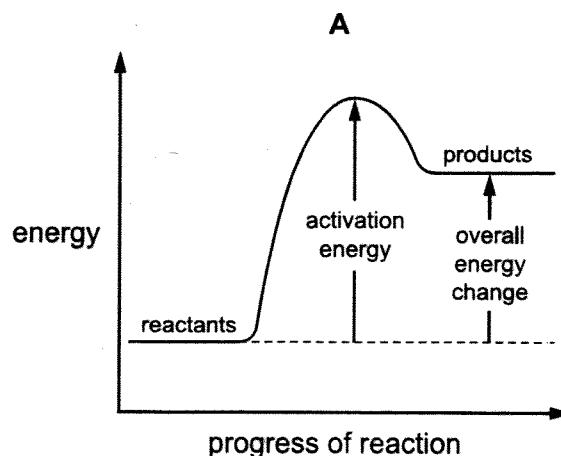
bond	bond energy in kJ/mol
Br-Br	+193
H-Br	+366
H-H	+436

What is the energy change for the reaction?

- A +263 kJ/mol B +103 kJ/mol C -103 kJ/mol D -263 kJ/mol

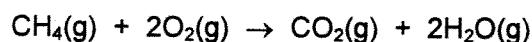
[0620/22/M/J/18/Q12]

Q52. Which diagram is a correctly labelled energy level diagram for an endothermic reaction?



[0620/22/M/J/18/Q13]

Q53. The equation for the complete combustion of methane is shown.



The bond energies are shown in the table.

bond	bond energy in kJ/mol
C-H	+410
C=O	+805
O-H	+460
O=O	+496

What is the energy change for the reaction?

- A -818 kJ/mol B -359 kJ/mol C -323 kJ/mol D +102 kJ/mol

Q54.

[0620/23/M/J/18/Q12]

Information about two reactions is given.

- The neutralisation reaction between citric acid and sodium hydrogencarbonate is endothermic.
- The displacement reaction between magnesium and carbon dioxide is exothermic.

Which statements about the two reactions are correct?

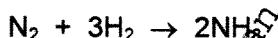
- The energy of the products formed in the neutralisation reaction is greater than the energy of the reactants.
- The energy of magnesium and carbon dioxide is greater than the energy of magnesium oxide and carbon.
- In an exothermic reaction, the energy required to break the bonds is greater than the energy released when the new bonds are formed.

A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

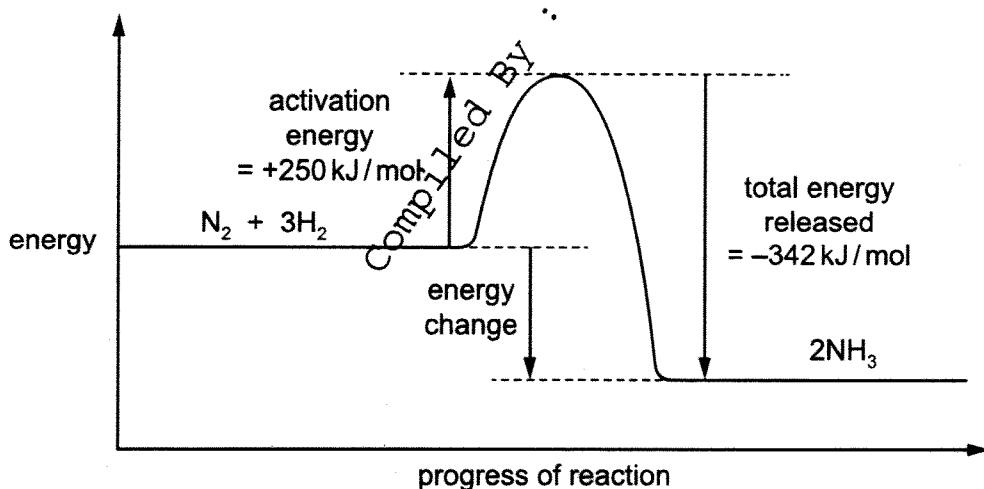
Q55.

[0620/21/O/N/2018/Q13]

The equation for the formation of ammonia is shown.



The energy level diagram for the reaction is shown.

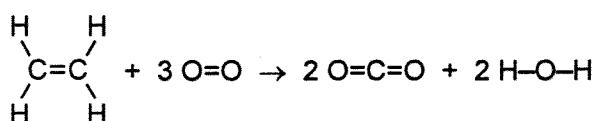


What is the energy change for the reaction?

- 592 kJ/mol
- 92 kJ/mol
- +92 kJ/mol
- +592 kJ/mol

[0620/23/O/N/2018/Q12]

Q56. Ethene burns in oxygen to form carbon dioxide and water vapour.



The bond energies are shown in the table.

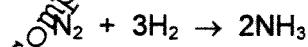
bond	bond energy in kJ/mol
C=C	+610
C-H	+410
O=O	+497
C=O	+805
O-H	+460

What is the energy change for the reaction?

- A -2959 kJ/mol
- B -2313 kJ/mol
- C -1319 kJ/mol
- D -399 kJ/mol

[0620/24/M/J/2019/Q12]

Q57. Nitrogen reacts with hydrogen to produce ammonia.



The reaction is exothermic. The bond energies are shown in the table.

bond	bond energy in kJ/mol
N≡N	945
H-H	436
N-H	390

What is the energy change for this reaction?

- A -1473 kJ/mol
- B -87 kJ/mol
- C 87 kJ/mol
- D 1473 kJ/mol

[0620/21/M/J/2019/Q11]

Q58. Which statement about the hydrogen fuel cell is not correct?

- A Chemical energy is converted into electrical energy.
- B Hydrogen is oxidised.
- C The reaction that takes place is endothermic.
- D Water is the only product.

[0620/22/M/J/2019/Q11]

Q59. Fuel cells are used as energy sources in cars.

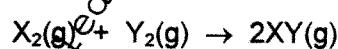
Which row gives a fuel used in a fuel cell and the products formed?

	fuel in a fuel cell	products formed
A	hydrogen	carbon dioxide and water
B	hydrogen	water only
C	petrol	carbon dioxide and water
D	petrol	water only

[0620/22/M/J/2019/Q12]

Q60. Two elements, X and Y, react together to form a covalent molecule as shown.

The reaction is exothermic.



The bond energies are shown in the table.

bond	bond energy in kJ/mol
X-X	436
Y-Y	242
X-Y	431

What is the energy change for the reaction?

- A +184 kJ/mol
- B -184 kJ/mol
- C +247 kJ/mol
- D -247 kJ/mol

Q61.

[0620/23/M/J/2019/Q11]

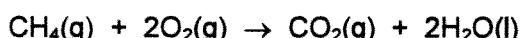
Which statement about a fuel cell in a car is correct?

- A The fuel cell produces heat, which powers the car.
- B The fuel cell is supplied with hydrogen directly from the air.
- C The only emission from a fuel cell is nitrogen gas, which is non-polluting.
- D The fuel cell produces electricity, which powers an electric motor.

Q62.

[0620/23/M/J/2019/Q12]

Methane burns in oxygen to form carbon dioxide and water.



The bond energies are shown in the table.

bond	bond energy in kJ/mol
C—H	410
C—O	360
C=O	805
O—H	460
O—O	146
O=O	496

What is the energy change for this reaction?

- A -818 kJ/mol B -102 kJ/mol C $+102 \text{ kJ/mol}$ D $+818 \text{ kJ/mol}$

Q63.

[0620/23/M/J/2019/Q13]

Which change in reaction conditions increases both the collision rate and the proportion of molecules with sufficient energy to react?

- A addition of a catalyst
- B increasing the concentration of a reactant
- C increasing the surface area of a reactant
- D increasing the temperature of the reaction

[0620/21/O/N/2019/Q13]

Q64. Which statements about endothermic reactions are correct?

- 1 The energy of the products is greater than the energy of the reactants.
- 2 The energy of the reactants is greater than the energy of the products.
- 3 The temperature of the surroundings increases during the reaction.
- 4 The temperature of the surroundings decreases during the reaction.

A 1 and 3 only B 1 and 4 only C 2 and 3 only D 2 and 4 only

[0620/22/O/N/2019/Q14]

Q65. Which gases are used to generate electricity in a fuel cell?

- A carbon dioxide and oxygen
- B hydrogen and methane
- C hydrogen and oxygen
- D methane and carbon dioxide

[0620/21/O/N/2019/Q15]

Q66. Which is a chemical change?

- A boiling water
- B cooking an egg
- C dissolving sugar
- D melting ice cubes

[0620/21/O/N/2019/Q17]

Q67. Dinitrogen tetroxide, N_2O_4 , is converted into nitrogen dioxide, NO_2 , in a reversible reaction.

The forward reaction is endothermic.

Which conditions give the highest equilibrium yield of nitrogen dioxide?

	pressure / atmospheres	temperature
A	2	high
B	2	low
C	50	high
D	50	low

[0620/22/O/N/2019/Q13]

Q68.

The temperature of the water in two beakers, X and Y, is measured as 21.5 °C.

5 g of sodium chloride is dissolved in the water in beaker X. The temperature changes to 18.0 °C.

5 g of calcium oxide is dissolved in the water in beaker Y. The temperature changes to 29.4 °C.

Which types of process are occurring in beakers X and Y?

	X	Y
A	endothermic	endothermic
B	endothermic	exothermic
C	exothermic	endothermic
D	exothermic	exothermic

Q69.

[0620/22/O/N/2019/Q15]

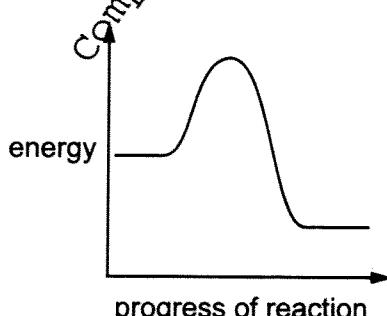
Which row identifies a chemical and a physical change?

	chemical change	physical change
A	boiling ethanol	burning ethanol
B	burning ethanol	evaporating ethanol
C	dissolving ethanol in water	burning ethanol
D	evaporating ethanol	dissolving ethanol in water

Q70.

[0620/22/O/N/2019/Q13]

An energy level diagram for a reaction is shown.



Which statement and explanation about this reaction are correct?

	statement	explanation
A	the reaction is endothermic	the products have more energy than the reactants
B	the reaction is endothermic	the products have less energy than the reactants
C	the reaction is exothermic	the products have more energy than the reactants
D	the reaction is exothermic	the products have less energy than the reactants

Q71.

[0620/22/M/J/2020/Q13]

Which statements about hydrogen fuel cells are correct?

- 1 Water is formed as the only waste product.
- 2 Both water and carbon dioxide are formed as waste products.
- 3 The overall reaction is $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$.
- 4 The overall reaction is endothermic.

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

Q72.

[0620/21/O/N/2020/Q15]

Sodium nitrate is added to water in a beaker and stirred until it dissolves.

At the end of the experiment, the beaker feels cold.

Which row describes the reaction?

	temperature of solution	type of reaction
A	decreases	endothermic
B	decreases	exothermic
C	increases	endothermic
D	increases	exothermic

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Q73.

[0620/22/O/N/2020/Q16]

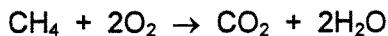
Which substance does not require oxygen in order to produce energy?

- A coal
- B hydrogen
- C natural gas
- D ^{235}U

[0620/22/O/N/2020/Q14]

Q74.

The combustion of methane is exothermic.



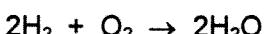
Which statement about this reaction is correct?

- A The energy needed to break the bonds in methane and oxygen is greater than the energy released in making new bonds in carbon dioxide and water.
- B The energy needed to break the bonds in methane and oxygen is less than the energy released in making new bonds in carbon dioxide and water.
- C The energy released in breaking bonds in methane and oxygen is greater than the energy needed to make new bonds in carbon dioxide and water.
- D The energy released in breaking bonds in methane and oxygen is less than the energy needed to make new bonds in carbon dioxide and water.

Q75.

Hydrogen reacts with oxygen in a fuel cell.

[0620/22/O/N/2020/Q15]



The reaction is exothermic.

286 kJ of energy is released for every mole of water formed.

Which volume of hydrogen gas, measured at room temperature and pressure, would react with oxygen with the release of 7000 J of energy?

- A 587 cm³ B 1175 cm³ C 587 dm³ D 1175 dm³

Q76.

[0620/23/O/N/2020/Q15]

Ethanol is used as a fuel.



Which statements are correct?

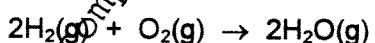
- 1 The reaction is endothermic.
 2 The products have more energy than the reactants.
 3 The oxygen for this reaction comes from the air.
 4 The temperature of the reaction mixture rises during this reaction.

- A 1 and 2 B 1 and 3 C 2 and 4 D 3 and 4

Q77.

[0620/23/O/N/2020/Q16]

The reaction between hydrogen and oxygen releases 486 kJ/mol of energy.



The bond energy of H-H is 436 kJ/mol and that of H-O is 464 kJ/mol.

What is the bond energy of O=O?

- A 430 kJ/mol
 B 458 kJ/mol
 C 498 kJ/mol
 D 984 kJ/mol

{0620/12/M/J/13Q14}

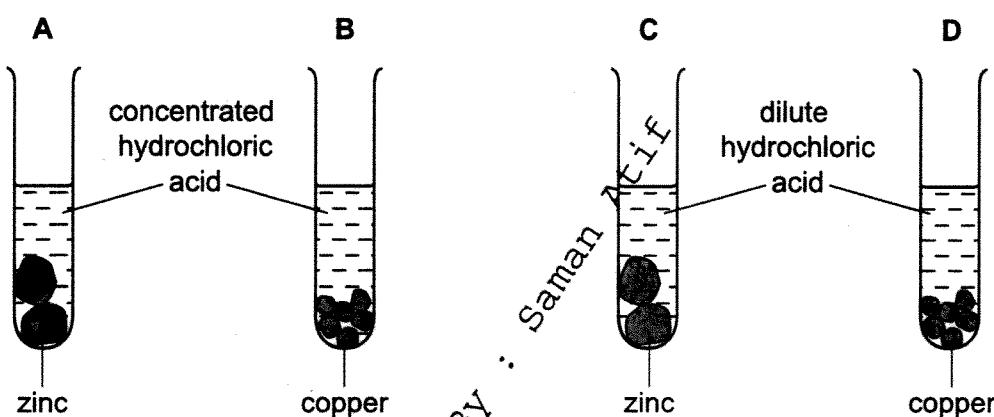
Q1. In which equation is the underlined substance acting as a reducing agent?

- A $3\text{CO} + \text{Fe}_2\text{O}_3 \rightarrow 2\text{Fe} + 3\text{CO}_2$
- B $\text{CO}_2 + \text{C} \rightarrow 2\text{CO}$
- C $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$
- D $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$

{0620/12/M/J/13Q15}

Q2. The diagram shows an experiment to compare the rate of reaction when a metal is added to hydrochloric acid.

In which test-tube is the reaction fastest?



{0620/12/M/J/13Q17}

Q3. Heating pink cobalt(II) chloride crystals forms a blue solid and steam.

The blue solid turns pink when water is added.

Which terms describe the pink cobalt(II) chloride and the reaction?

	pink cobalt(II) chloride is	the reaction is reversible
A	anhydrous	yes
B	anhydrous	no
C	hydrated	yes
D	hydrated	no

Q4. The equation shows the formation of anhydrous copper(II) sulfate from hydrated copper(II) sulfate.



Statements 1, 2 and 3 refer to this reaction.

- 1 Hydrated copper(II) sulfate is reduced to anhydrous copper(II) sulfate.
- 2 The (II) in the name copper(II) sulfate refers to the oxidation state of the metal.
- 3 The reaction is reversible.

Which statements are correct?

- A 1 only B 1 and 2 C 2 and 3 D 3 only

{0620/11/M/J/13Q16}

Q5. Calcium carbonate reacts with hydrochloric acid to form carbon dioxide.

Which changes would slow this reaction down?

- 1 decreasing the concentration of hydrochloric acid
- 2 decreasing the particle size of calcium carbonate
- 3 decreasing the temperature

- A 1 and 2 only B 1 and 3 only C 2 and 3 only D 1, 2 and 3

{0620/11/M/J/13Q17}

Q6. The equations represent redox reactions.

In which equation is the underlined substance acting as a reducing agent?

- A 3CO + Fe₂O₃ → 2Fe + 3CO₂
- B CO₂ + C → 2CO
- C CuO + H₂ → Cu + H₂O
- D CaO + H₂O → Ca(OH)₂

{0620/13/O/N/13Q16}

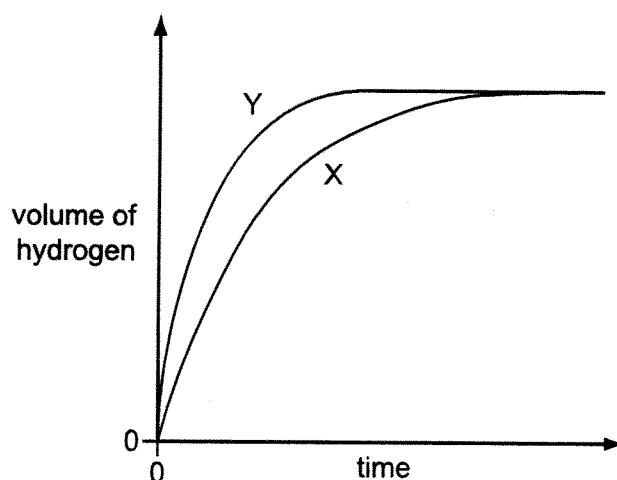
Q7. When green iron(II) sulfate is heated, it turns white and a colourless liquid is produced. When the liquid is put back into the white solid it changes back to green.

What type of reaction takes place and what is the name of the liquid?

	type of reaction	name of liquid
A	redox	sulfuric acid
B	redox	water
C	reversible	sulfuric acid
D	reversible	water

Q8. A student investigates the rate of reaction between zinc and an excess of sulfuric acid.

The graph shows the results of two experiments, X and Y.

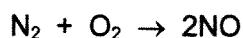


Which change explains the difference between X and Y?

- A A catalyst is added in Y.
- B A lower temperature is used in Y.
- C Larger pieces of zinc are used in Y.
- D Less concentrated acid is used in Y.

{0620/13/O/N/13Q17}

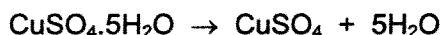
Q9. The reactions shown may occur in the air during a thunder storm.



Which row shows what happens to the reactant molecules in each of these reactions?

	N_2	NO	O_3
A	oxidised	oxidised	oxidised
B	oxidised	oxidised	reduced
C	reduced	reduced	oxidised
D	reduced	reduced	reduced

Q10. Anhydrous copper(II) sulfate can be made by heating hydrated copper(II) sulfate.

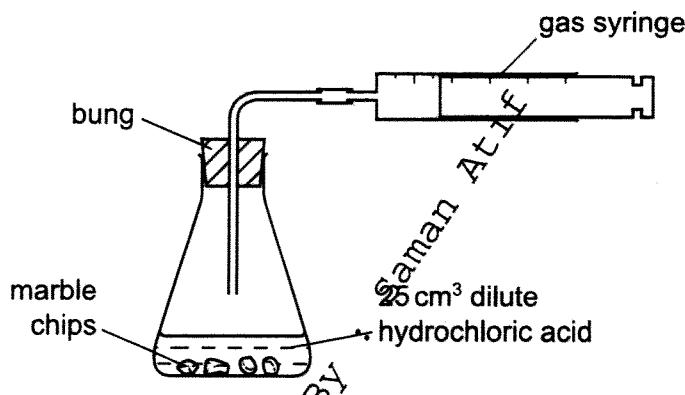


What can be added to anhydrous copper(II) sulfate to turn it into hydrated copper(II) sulfate?

- A concentrated sulfuric acid
- B sodium hydroxide powder
- C sulfur dioxide
- D water

{0620/12/M/J/14Q14}

Q11. A student was investigating the reaction between marble chips and dilute hydrochloric acid.



Which changes would reduce the rate of reaction?

	temperature of acid	concentration of acid	surface area of marble chips
A	decrease	decrease	decrease
B	decrease	decrease	increase
C	increase	decrease	decrease
D	increase	increase	increase

{0620/12/M/J/14Q15}

Q12. Which equation shows an oxidation reaction?

- A $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$
- B $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- C $\text{CaO} + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O}$
- D $\text{N}_2\text{O}_4 \rightarrow 2\text{NO}_2$

Q13.

In separate experiments, a catalyst is added to a reaction mixture and the temperature of the mixture is decreased.

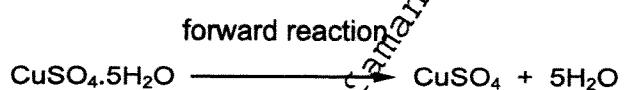
What are the effects of these changes on the rate of the reaction?

	catalyst added	temperature decreased
A	faster	faster
B	faster	slower
C	slower	faster
D	slower	slower

Q14.

{0620/12/M/J/14Q18}

The equation shows a reaction that is reversed by changing the conditions.



How can the forward reaction be reversed?

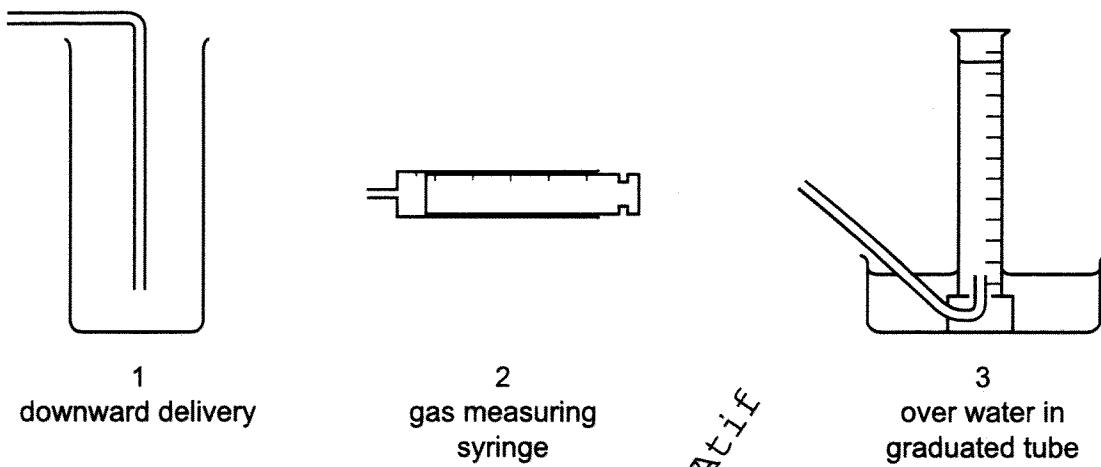
	by adding water	by heating
A	✓	
B	✓	
C	✗	✓
D	✗	✗

Q15.

An experiment is carried out to investigate the rate of reaction when calcium carbonate is reacted with hydrochloric acid.

The volume of carbon dioxide gas given off is measured at different intervals of time.

The diagram shows pieces of apparatus used to collect gases.



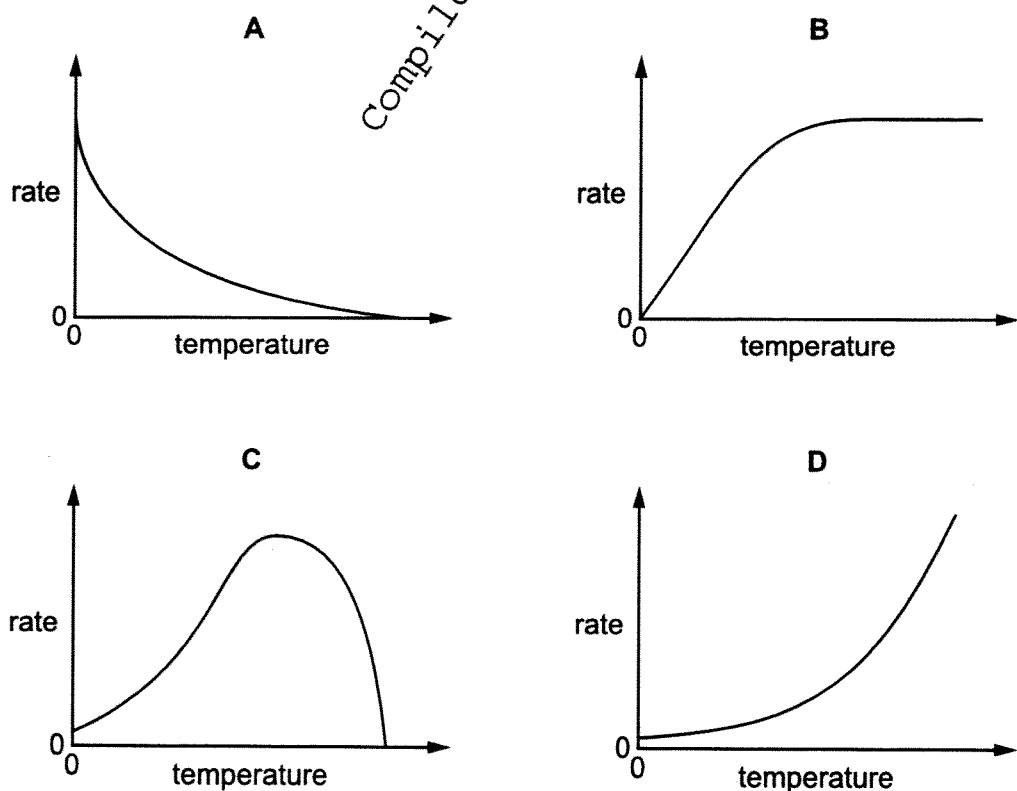
Which apparatus is suitable to collect and measure the volume of the carbon dioxide?

- A 1, 2 and 3 B 2 and 3 only C 1 only D 3 only

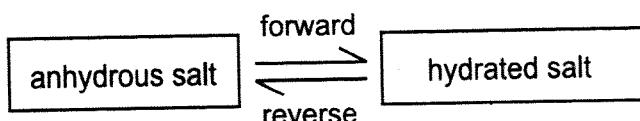
Q16.

{0620/13/O/N/14Q15}

Which graph shows the effect of increasing temperature on the rate of reaction of calcium carbonate with dilute hydrochloric acid?



Q17. The diagram shows the change from an anhydrous salt to its hydrated form.

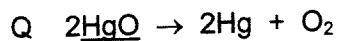
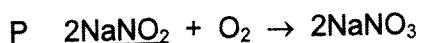


Which statement is correct?

- A forward reaction requires heat and water
- B forward reaction requires water only
- C reverse reaction requires heat and water
- D reverse reaction requires water only

{0620/13/O/N/14Q17}

Q18. The equations for two reactions P and Q are given.



In which of these reactions does oxidation of the underlined substance occur?

	P	Q
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

Compiled By Saman Atif

{0620/13/O/N/14Q18}

Q19. Which changes decrease the rate of reaction between magnesium and air?

- 1 heating the magnesium to a higher temperature
 - 2 using a higher proportion of oxygen in the air
 - 3 using magnesium ribbon instead of powdered magnesium
- | | | | |
|--------------|----------|----------|----------|
| A 1, 2 and 3 | B 1 only | C 2 only | D 3 only |
|--------------|----------|----------|----------|

{0620/13/O/N/14Q31}

Q20. Which process does **not** involve oxidation?

- A burning a fossil fuel
- B conversion of iron from the blast furnace into steel
- C distillation of crude oil
- D rusting of iron

Q21. The rate of a reaction depends on temperature, concentration, particle size and catalysts.

Which statement is **not** correct?

- A Catalysts can be used to increase the rate of reaction.
- B Higher concentration decreases the rate of reaction.
- C Higher temperature increases the rate of reaction.
- D Larger particle size decreases the rate of reaction.

{0620/12/O/N/14Q30}

Q22. Which reaction involves oxidation?

- A heating hydrated copper(II) sulfate in the air
- B polymerisation of ethene
- C rusting of iron
- D thermal decomposition of calcium carbonate

{0620/12/O/N/14Q13}

Q23. Which statements about exothermic and endothermic reactions are correct?

- 1 During an exothermic reaction, heat is given out.
- 2 The temperature of an endothermic reaction goes up because heat is taken in.
- 3 Burning methane in the air is an exothermic reaction.

- A 1, 2 and 3
- B 1 and 2 only
- C 1 and 3 only
- D 2 and 3 only

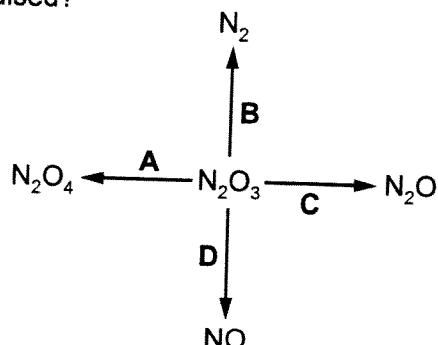
{0620/13/M/J/15Q11}

Q24. Which substance does **not** use oxygen to produce energy?

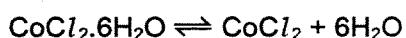
- A coal
- B hydrogen
- C natural gas
- D uranium

{0620/13/M/J/15Q12}

Q25. In which change is N_2O_3 oxidised?



Q26. When pink crystals of cobalt(II) chloride are heated, steam is given off and the colour of the solid changes to blue.

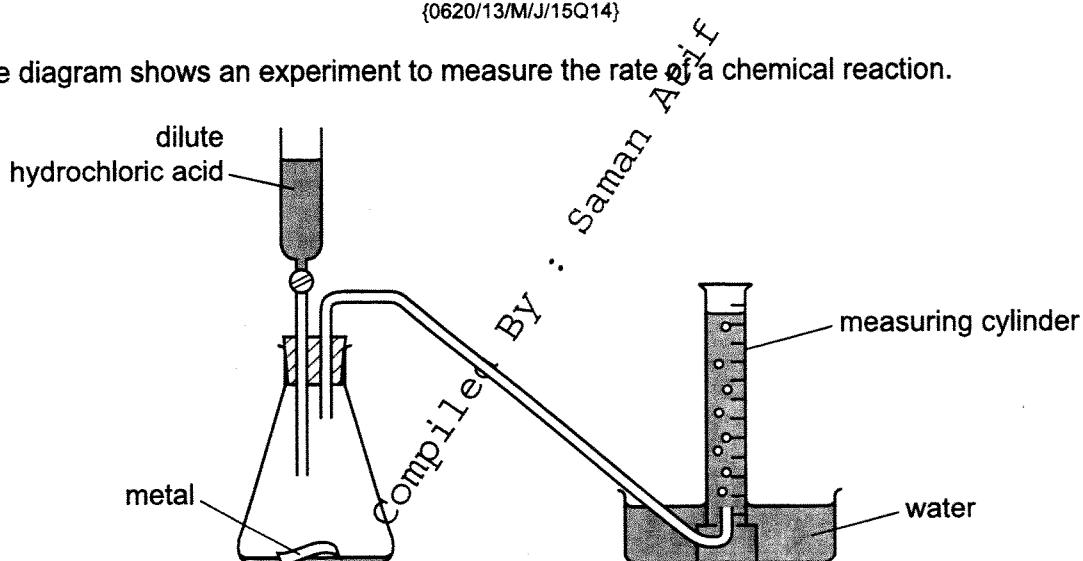


What happens when water is added to the blue solid?

	colour	temperature
A	changes to pink	decreases
B	changes to pink	increases
C	remains blue	decreases
D	remains blue	increases

{0620/13/M/J/15Q14}

Q27. The diagram shows an experiment to measure the rate of a chemical reaction.



Which change decreases the rate of reaction?

- A adding water to the flask
- B heating the flask during the reaction
- C using more concentrated acid
- D using powdered metal

{0620/12/M/J/15Q12}

Q28. In which equation does the oxidation of the underlined compound occur?

- A $2\text{CuO} + \text{C} \rightarrow \text{CO}_2 + \underline{\text{Cu}}$
- B $\text{Fe}_2\text{O}_3 + \underline{3\text{CO}} \rightarrow 2\text{Fe} + 3\text{CO}_2$
- C $2\text{Mg} + \text{O}_2 \rightarrow \underline{2\text{MgO}}$
- D $\underline{\text{MnO}_2} + 4\text{HCl} \rightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$

Q29. A simple way of making bread includes

- 1 Mixing flour with a small amount of yeast and some water to make a 'dough'.
- 2 Leaving the dough in a warm place for the yeast to act on the dough to form carbon dioxide which increases the volume of the dough.

Which factors affecting a reaction rate are involved in bread making?

	temperature	use of an enzyme
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

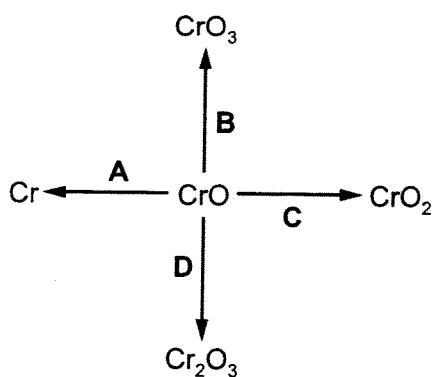
{0620/12/M/J/15Q15}

Q30. Which statement is **not** correct?

- Complicated But Searan Atif*
- A When a base reacts with an ammonium salt, ammonia is given off.
 - B When an acid reacts with a base, neutralisation takes place.
 - C When an acid reacts with a carbonate, carbon dioxide is given off.
 - D When the acidity of a solution increases, the pH increases.

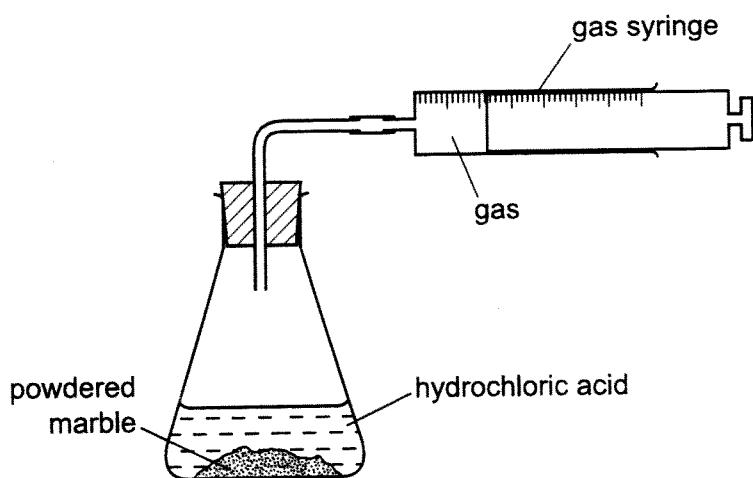
{0620/11/M/J/15Q14}

Q31. In which change is chromium(II) oxide, CrO, reduced?



Q32. Powdered marble reacts with hydrochloric acid using the apparatus shown.

The gas syringe fills in 36 seconds.



The experiment is repeated using marble chips in place of powdered marble.

How long does it take to fill the gas syringe in this experiment?

- A 9 seconds
- B 18 seconds
- C 36 seconds
- D 72 seconds

{0620/13/O/N/15Q12}

Q33. Which of the following changes decreases the rate of the reaction between magnesium and dilute hydrochloric acid?

- 1 diluting the acid
 - 2 using larger pieces of magnesium
 - 3 cooling the mixture
- A 1, 2 and 3
 - B 1 and 2 only
 - C 1 and 3 only
 - D 2 and 3 only

IGCSE Chemistry Topical Paper 2

{0620/13/O/N/15Q13}

Topic 7 : Chemical Reaction Speed of Reaction + Reversible

Q34.

The element vanadium, V, forms several oxides.

In which change is oxidation taking place?

- A $\text{VO}_2 \rightarrow \text{V}_2\text{O}_3$
- B $\text{V}_2\text{O}_5 \rightarrow \text{VO}_2$
- C $\text{V}_2\text{O}_3 \rightarrow \text{VO}$
- D $\text{V}_2\text{O}_3 \rightarrow \text{V}_2\text{O}_5$

{0620/12/O/N/15Q14}

Q35.

Which reaction is **not** a reversible reaction?

- A combustion of alkanes
- B hydration of anhydrous copper(II) sulfate
- C melting lead(II) bromide
- D thermal decomposition of hydrated cobalt(II) chloride

Q36.

{0620/12/O/N/15Q15}

The reaction between magnesium and carbon dioxide is represented by the following equation.



Which statement describes what happens in this reaction?

- A Carbon is oxidised.
- B Magnesium is reduced.
- C Neither oxidation nor reduction happens.
- D The carbon in carbon dioxide is reduced.

{0620/11/O/N/15Q12}

Q37.

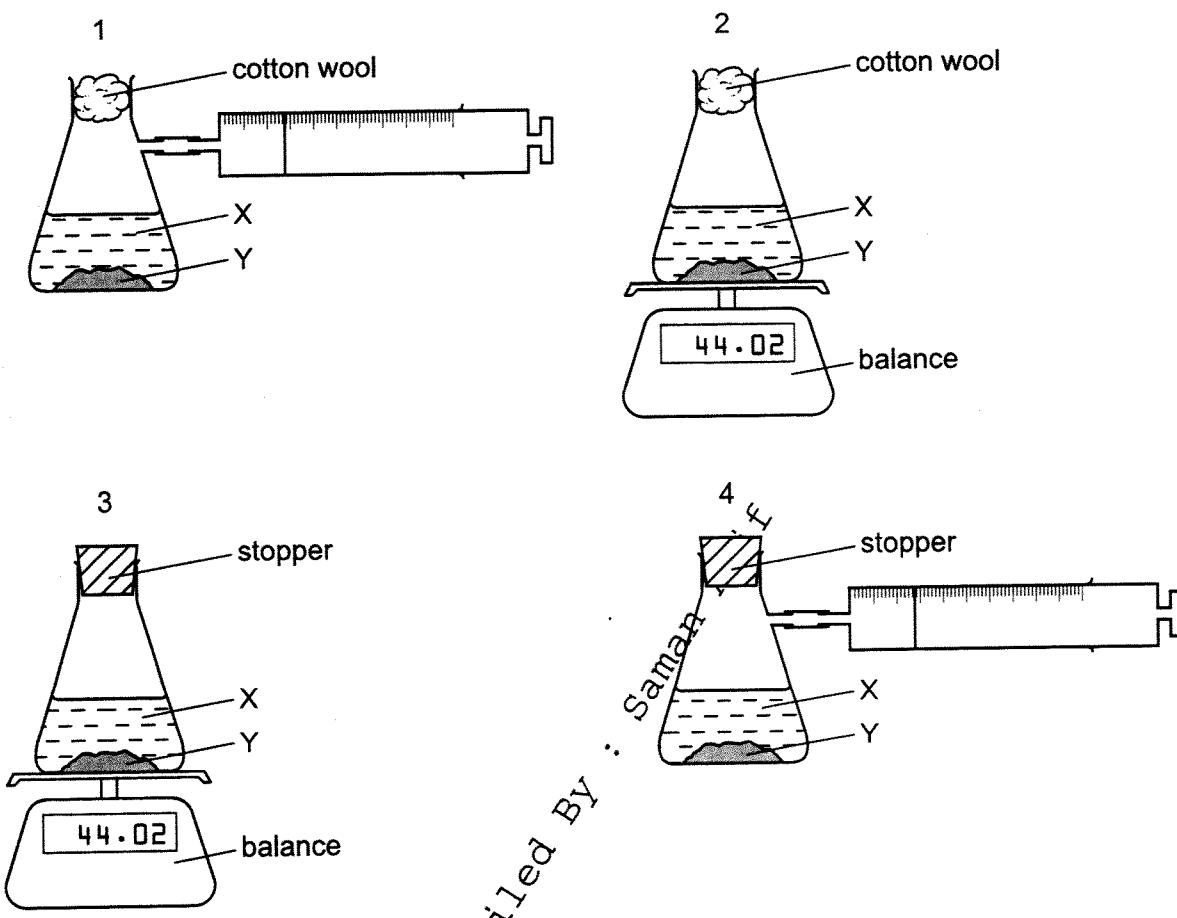
The effect of temperature on the rate of the reaction between marble chips and hydrochloric acid can be investigated by measuring the production of carbon dioxide.

Which item of equipment is **not** required for the investigation?

- A condenser
- B gas syringe
- C stopwatch
- D thermometer

Q38. A liquid X reacts with solid Y to form a gas.

Which two diagrams show suitable methods for investigating the rate (speed) of the reaction?



{0620/23/M/J/16Q15}

Q39. Which row explains why increasing temperature increases the rate of reaction?

	particles collide more often	particles collide with more energy
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

IGCSE Chemistry Topical Paper 2

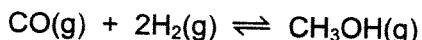
Topic 7 : Chemical Reaction Speed of Reaction + Reversible

Q40.

{0620/23/M/J/16Q16}

Methanol is manufactured by reacting carbon monoxide and hydrogen together in the presence of an aluminium oxide catalyst.

The equation for the reaction is shown.



The reaction is a reversible reaction.

The forward reaction is exothermic.

Which change in conditions increases the yield of methanol?

- A decreasing the concentration of the carbon monoxide
- B increasing the pressure
- C increasing the rate of the reaction
- D increasing the temperature

Q41.

{0620/23/M/J/16Q17}

Which equation represents a reduction reaction?

- A $\text{Fe}^{2+} + \text{e}^- \rightarrow \text{Fe}^{3+}$
- B $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}^-$
- C $\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+}$
- D $\text{Fe}^{3+} \rightarrow \text{Fe}^{2+} + \text{e}^-$

Q42.

{0620/22/M/J/16Q15}

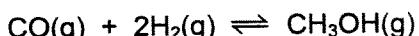
Which row describes how the energy of collision between particles changes when concentration and temperature are increased?

	concentration	temperature
A	increases	increases
B	increases	no change
C	no change	increases
D	no change	no change

Q43. Methanol is made by reacting carbon monoxide with hydrogen.

The reaction is exothermic and is a chemical equilibrium.

The equation for the reaction is shown.

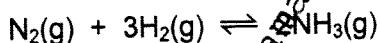


Which changes in temperature and pressure increase the yield of methanol?

	temperature	pressure
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

{0620/22/M/J/16Q32}

Q44. Ammonia is manufactured by a reversible reaction.



The forward reaction is exothermic.

What is the effect of increasing the pressure on the percentage yield and rate of formation of ammonia?

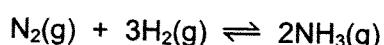
	percentage yield	rate of formation
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

{0620/21/M/J/16Q15}

Q45. Which statements explain why increasing temperature increases the rate of a chemical reaction?

- 1 Heat makes the molecules move faster and collide more often.
- 2 Heat makes the molecules collide with more energy so they are more likely to react.
- 3 Increasing temperature lowers the activation energy for the reaction.

A 1 and 2 B 1 and 3 C 1 only D 2 only

Q46. Ammonia is formed by a reversible reaction.

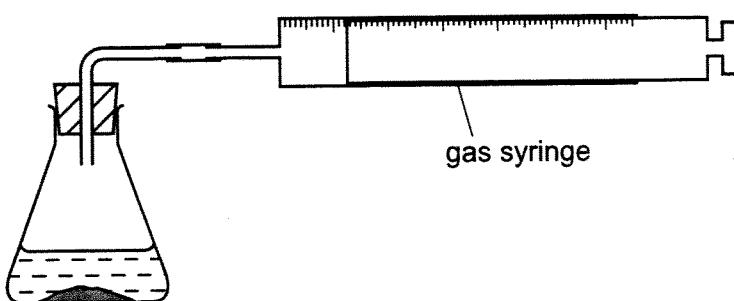
The forward reaction is exothermic.

Which changes in conditions would increase the yield of ammonia?

	increase in pressure	increase in temperature
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

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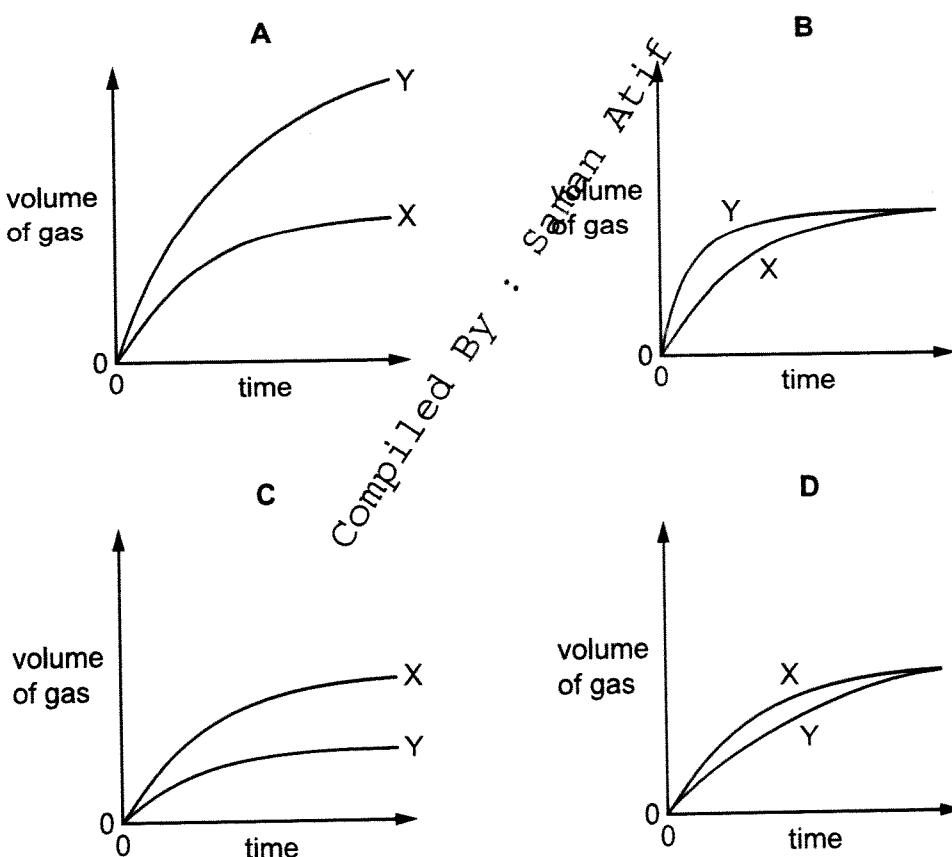
Q47. An experiment X is carried out between a solid and a solution using the apparatus shown.



The volume of gas given off is measured at different times and the results plotted on a graph.

In a second experiment Y, the surface area of the solid is increased but all other factors remain the same.

Which graph shows the results of experiments X and Y?

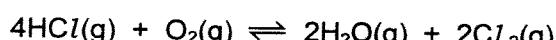


{0620/23/O/N/16Q15}

Q48. Which change in conditions increases the energy of the particles in a reaction?

- A addition of a catalyst
- B increase in concentration
- C increase in surface area
- D increase in temperature

Q49. Chlorine can be manufactured by the following reaction. The reaction is exothermic.



Which change increases the yield of chlorine at equilibrium?

- A adding more HCl(g)
- B adding more $\text{H}_2\text{O(g)}$
- C decreasing the pressure
- D increasing the temperature

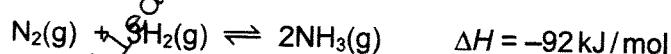
{0620/23/O/N/16Q17}

Q50. Which change represents an oxidation reaction?

- A chlorine changes to chlorate(I) ions
- B chlorine changes to chloride ions
- C copper(II) ions change to copper
- D potassium manganate(VII) ions change to potassium manganate(VI) ions

{0620/23/O/N/16Q32}

Q51. The Haber process for the manufacture of ammonia occurs at 450°C and 250 atmospheres. The nitrogen and hydrogen are supplied in a 1:3 ratio by volume. The reaction is exothermic.



Which change causes an increase in the yield of ammonia?

- A decreasing the concentration of nitrogen
- B decreasing the pressure
- C decreasing the temperature
- D using equal amounts of the two reactants

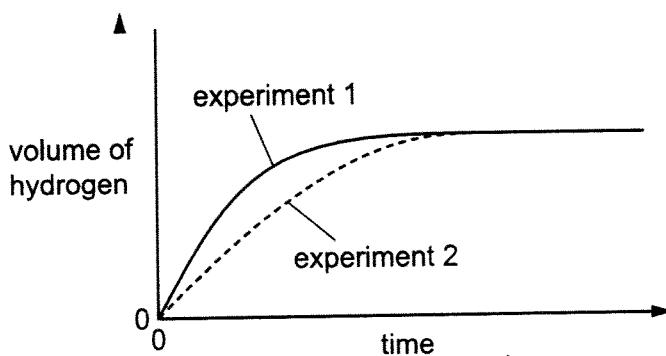
Q52.

Zinc granules are reacted with excess dilute hydrochloric acid.

The volume of hydrogen given off is measured at different times.

The results are shown on the graph, labelled experiment 1.

The results for a second experiment are also shown on the graph, labelled experiment 2.



Which change to the conditions was made in experiment 2?

- A The concentration of the hydrochloric acid was decreased.
- B The size of the zinc granules was decreased.
- C The surface area of the zinc granules was increased.
- D The temperature was increased.

{0620/22/O/N/16Q15}

Q53.

In an experiment nitric acid is added to excess marble chips and the volume of carbon dioxide formed is measured.

The experiment is repeated using smaller marble chips. All other conditions remain the same.

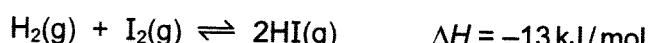
Which statement about the second experiment is correct?

- A The collisions are more frequent and higher energy.
- B The collisions are more frequent and the same energy.
- C The collisions are the same frequency and the same energy.
- D The collisions are the same frequency and higher energy.

{0620/22/O/N/16Q16}

Q54.

At 400 °C the reaction between hydrogen and iodine reaches an equilibrium. The reaction is exothermic.



Which change in conditions would increase the percentage of hydrogen iodide in the equilibrium mixture?

- A a decrease in pressure
- B a decrease in temperature
- C an increase in pressure
- D an increase in temperature

{0620/22/O/N/16Q17}

Q55.

Chromium forms the compound chromium(III) sulfate.

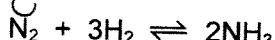
What does the (III) represent?

- A the charge on a sulfate ion
- B the number of chromium ions combined with one sulfate ion
- C the number of sulfate ions combined with one chromium ion
- D the oxidation state of chromium

{0620/22/O/N/16Q32}

Q56.

Ammonia is manufactured by the Haber process, using an iron catalyst.



It is not possible to obtain 100% yield.

What is the reason for this?

- A A high pressure is used.
- B Ammonia decomposes at high temperature.
- C Some of the ammonia is recycled.
- D The ammonia reacts with the catalyst.

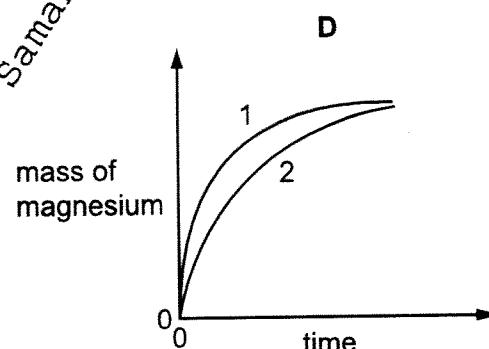
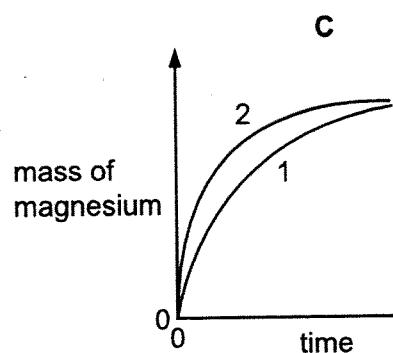
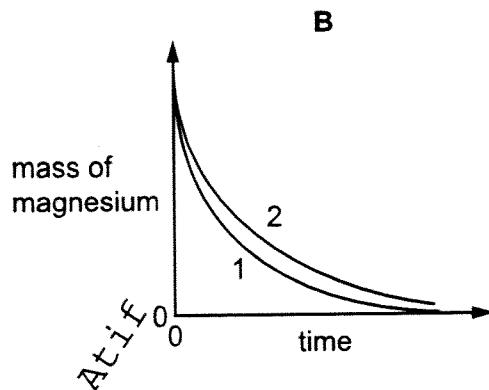
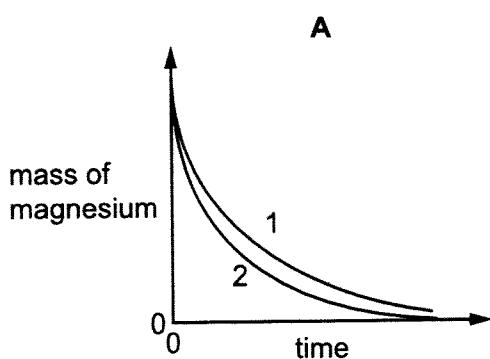
Q57.

The rate of reaction between magnesium and excess dilute hydrochloric acid was followed by measuring the mass of magnesium present at regular time intervals.

Two experiments were performed.

Both experiments used 0.1 g of magnesium ribbon. The acid in experiment 1 was less concentrated than in experiment 2.

Which graph shows the results of the experiments?



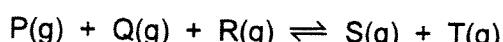
Compiled By : Saman Atif

Q58.

{0620/21/O/N/16Q15}

- Which statement explains why coal dust forms an explosive mixture with air?
- Coal dust catalyses the explosion.
 - Coal dust has a large surface area.
 - Crushing coal increases the concentration of the coal.
 - Crushing coal increases the temperature of the coal.

Q59. The following reversible reaction takes place in a closed vessel at constant temperature.



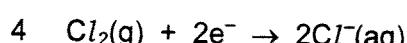
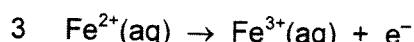
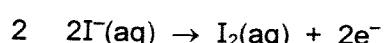
When the system has reached equilibrium, more T is added.

After the addition of T, which substances increase in concentration?

- A P, Q, R and S
- B P and Q only
- C P, Q and R only
- D S only

{0620/21/O/N/16Q17}

Q60. Four ionic half-equations are shown.



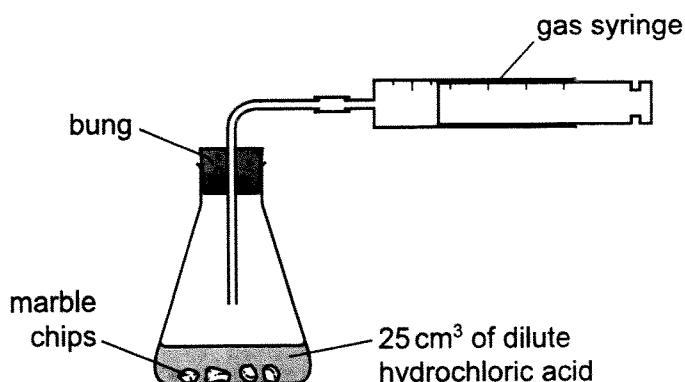
Saman Atif
BY
Omar Tahir

Which statement is correct?

- A In equation 1, copper(II) ions are oxidised to copper.
- B In equation 2, iodide ions are reduced to iodine.
- C In equation 3, iron(II) ions are oxidised to iron(III) ions.
- D In equation 4, chlorine is oxidised to chloride ions.

Q61.

A student was investigating the reaction between marble chips and dilute hydrochloric acid.



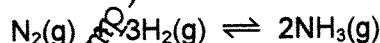
Which changes slow down the rate of reaction?

	temperature of acid	concentration of acid	surface area of marble chips
A	decrease	decrease	decrease
B	decrease	decrease	increase
C	increase	decrease	decrease
D	increase	increase	increase

Q62.

[0620/21/M/J/17/Q16]

Nitrogen, hydrogen and ammonia gases are placed inside a container. The container is then sealed. After some time, an equilibrium forms.



Which statement describes the equilibrium in this container?

- A The amount of ammonia remains constant from the moment the container is sealed.
- B The amounts of ammonia, nitrogen and hydrogen in the container are always equal.
- C The rate of formation of ammonia is equal to the rate of decomposition of ammonia.
- D The rate of formation of ammonia is faster than the rate of decomposition of ammonia.

Q63. An example of a redox reaction is shown.



Which statement about the reaction is correct?

- A Zn is the oxidising agent and it oxidises Cu²⁺.
- B Zn is the oxidising agent and it reduces Cu²⁺.
- C Zn is the reducing agent and it oxidises Cu²⁺.
- D Zn is the reducing agent and it reduces Cu²⁺.

[0620/21/M/J/17/Q32]

Q64. Which row gives the conditions for the Haber process?

	temperature / °C	pressure / atm	catalyst
A	200	2	V ₂ O ₅
B	200	450	Fe Active
C	450	200	Same Fe
D	500	250	S V ₂ O ₅

[0620/22/M/J/17/Q16]

Q65. The reaction used to manufacture ammonia from nitrogen and hydrogen is reversible. An equilibrium can be established between ammonia, nitrogen and hydrogen.

Which statement describes the equilibrium?

- A Both the forward reaction and the backward reaction have the same rate.
- B The rate of the backward reaction is greater than the rate of the forward reaction.
- C The rate of the forward reaction is greater than the rate of the backward reaction.
- D The forward and backward reactions have both stopped.

[0620/22/M/J/17/Q17]

Q66. An example of a redox reaction is shown.



Which statement about the reaction is correct?

- A Zn is the oxidising agent and it oxidises Cu²⁺.
- B Zn is the oxidising agent and it reduces Cu²⁺.
- C Zn is the reducing agent and it oxidises Cu²⁺.
- D Zn is the reducing agent and it reduces Cu²⁺.

Q67.

Which statement about the conditions used in the Haber process is not correct?

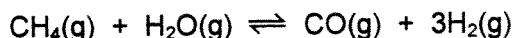
- A A high temperature is used because the forward reaction is exothermic.
- B A high pressure is used because there are fewer moles of gas in the products than in the reactants.
- C An iron catalyst is used to increase the rate of the forward reaction.
- D The unreacted hydrogen and nitrogen are recycled to increase the amount of ammonia produced.

[0620/23/M/J/17/16]

Q68.

Hydrogen is produced when methane reacts with steam.

The equation for the reaction is shown.



The forward reaction is endothermic.

Which conditions produce the highest yield of hydrogen?

	pressure	temperature
A	high	high
B	high	low
C	low	high
D	low	low

Q69.

[0620/23/M/J/17/31]

Which row gives the catalyst for the Haber process and the sources of the raw materials?

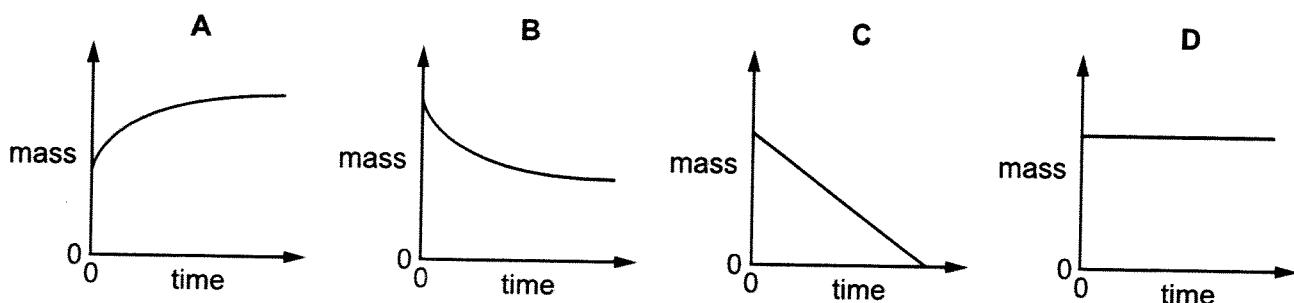
	catalyst	source of hydrogen	source of nitrogen
A	iron	electrolysis	fertiliser
B	iron	methane	air
C	vanadium pentoxide	methane	air
D	vanadium pentoxide	methane	fertiliser

Q70.

[0620/21/O/N/17/Q13]

The mass of a beaker and its contents is plotted against time.

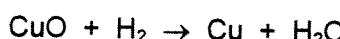
Which graph represents what happens when sodium carbonate reacts with an excess of dilute hydrochloric acid in an open beaker?



Q71.

[0620/21/O/N/17/Q14]

Copper(II) oxide reacts with hydrogen.



Which row is correct?

	oxidising agent	reducing agent
A	H ₂	CuO
B	CuO	H ₂
C	H ₂ O	Cu
D	Cu	H ₂ O

Q72.

[0620/21/O/N/17/Q15]

Ethanoic acid reacts slowly with calcium carbonate.

Which statements explain why an increase in temperature increases the rate of the reaction?

- 1 The activation energy of the reaction is decreased.
- 2 There is an increase in collision rate.
- 3 The particles have more energy.
- 4 There will be fewer successful collisions.

A 1 and 2

B 1 and 3

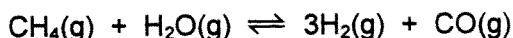
C 2 and 3

D 2 and 4

Q73.

Methane reacts with steam to produce hydrogen and carbon monoxide.

The equation for the reaction is shown.



The reaction is reversible. The forward reaction is endothermic.

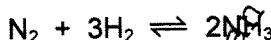
Which changes in temperature and pressure increase the equilibrium yield of carbon monoxide?

	temperature	pressure
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

[0620/21/O/N/17/Q31]

Q74.

Ammonia is made by the Haber process.



What are the sources of the nitrogen and hydrogen used in the Haber process?

	nitrogen	hydrogen
A	fertilisers	reacting methane with steam
B	fertilisers	the air
C	the air	reacting methane with steam
D	the air	the air

[0620/21/O/N/17/Q34]

Q75.

Some marble chips (calcium carbonate) are heated strongly and substances X and Y are formed.

Substance X is a white solid that reacts with water, giving out heat. Substance Y is a colourless gas.

What are substances X and Y?

	X	Y
A	calcium chloride	oxygen
B	calcium hydroxide	carbon dioxide
C	calcium oxide	carbon dioxide
D	calcium sulfate	oxygen

[0620/22/O/N/17/Q14]

Q76. Copper metal donates electrons to silver ions.

Zinc metal donates electrons to copper ions.

What is the strongest reducing agent?

- A copper ions
- B copper metal
- C silver ions
- D zinc metal

[0620/22/O/N/17/Q15]

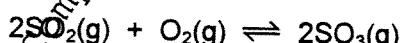
Q77. Four statements about the effect of increasing temperature on a reaction are shown.

- 1 The activation energy becomes lower.
- 2 The particles move faster.
- 3 There are more collisions between reacting particles.
- 4 There are more collisions which have energy greater than the activation energy.

Which statements are correct?

- A 1, 2 and 3
- B 1, 3 and 4
- C 2, 3 and 4
- D 2 and 3 only

[0620/22/O/N/17/Q16]

Q78. The formation of sulfur trioxide from sulfur dioxide is a reversible reaction.

The forward reaction is exothermic.

Which changes would increase the equilibrium yield of SO_3 ?

- 1 increasing the pressure
 - 2 lowering the temperature
 - 3 decreasing the concentration of oxygen
- A 1, 2 and 3
 - B 1 and 2 only
 - C 1 only
 - D 2 and 3 only

Q79.

Which metal is used as a catalyst in the Haber process for the manufacture of ammonia?

- A iron
- B nickel
- C platinum
- D vanadium

Q80.

[0620/22/O/N/17/Q33]

Which row shows the conditions used in the manufacture of sulfuric acid by the Contact process?

	temperature /°C	pressure /atm	catalyst
A	40	200	Fe
B	40	200	V ₂ O ₅
C	400	2	Fe
D	400	2	V ₂ O ₅

Q81.

[0620/22/O/N/17/Q34]

Some marble chips (calcium carbonate) are heated strongly and substances X and Y are formed. Substance X is a white solid that reacts with water, giving out heat. Substance Y is a colourless gas.

What are substances X and Y?

	X	
A	calcium chloride	oxygen
B	calcium hydroxide	carbon dioxide
C	calcium oxide	carbon dioxide
D	calcium sulfate	oxygen

Q82.

[0620/23/O/N/17/Q14]

Silver chloride reacts when it is exposed to light.

Which row shows what happens to the silver in this process?

	half-equation	type of reaction
A	Ag → Ag ⁺ + e ⁻	oxidation
B	Ag → Ag ⁺ + e ⁻	reduction
C	Ag ⁺ + e ⁻ → Ag	oxidation
D	Ag ⁺ + e ⁻ → Ag	reduction

Q83.

[0620/23/O/N/17/Q15]

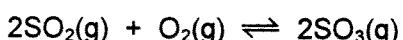
Which statement about the effect of concentration and temperature on the rate of a reaction is not correct?

- A If the concentration of a reactant is increased, the rate of reaction increases because more particles have sufficient energy to react.
- B If the concentration of a reactant is increased, the rate of reaction increases because there are more collisions between particles per second.
- C If the temperature is increased, the rate of reaction increases because there are more collisions between particles per second.
- D If the temperature is increased, the rate of reaction increases because more particles have sufficient energy to react.

Q84.

[0620/23/O/N/17/Q16]

The following reaction has reached equilibrium in a closed system.



The forward reaction is exothermic.

Which row shows the effect of increasing the pressure on the equilibrium mixture?

	reaction rate	amount of SO_2	amount of SO_3
A	increases	decreases	increases
B	increases	increases	decreases
C	unchanged	decreases	increases
D	unchanged	increases	decreases

Q85.

Which row describes the effects of increasing both concentration and temperature on the collisions between reacting particles?

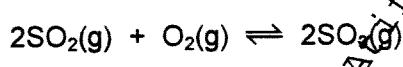
	increasing concentration	increasing temperature
A	more collisions per second only	more collisions per second only
B	more collisions per second and more collisions with sufficient energy to react	more collisions per second only
C	more collisions per second only	more collisions per second and more collisions with sufficient energy to react
D	more collisions per second and more collisions with sufficient energy to react	more collisions per second and more collisions with sufficient energy to react

[0620/21/M/J/18/Q15]

Q86.

The formation of sulfur trioxide is a reversible reaction.

The equation is shown.



The forward reaction is exothermic.

Which conditions produce the highest equilibrium yield of sulfur trioxide?

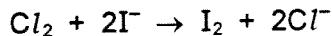
	pressure	temperature
A	high	high
B	high	low
C	low	high
D	low	low

Compiled By Sajman Afzal

[0620/21/M/J/18/Q16]

Q87.

Chlorine displaces iodide ions from potassium iodide.



What is the oxidising agent?

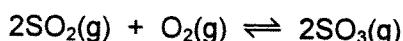
- A chloride ions
- B chlorine
- C iodide ions
- D iodine

IGCSE Chemistry Topical Paper 2**Topic 7 : Chemical Reaction
Speed of Reaction + Reversible****Q88.**

[0620/22/M/J/18/Q15]

Sulfur dioxide reacts with oxygen at 2 atmospheres pressure. The forward reaction is exothermic.

The equation for the reaction is shown.



The reaction reaches equilibrium. The pressure is then doubled.

How and why does the amount of sulfur trioxide formed change?

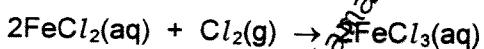
	amount of sulfur trioxide	reason
A	decreases	the forward reaction is exothermic
B	decreases	there are fewer molecules on the right
C	increases	the forward reaction is exothermic
D	increases	there are fewer molecules on the right

Q89.

[0620/22/M/J/18/Q16]

Iron(II) chloride solution reacts with chlorine gas.

The equation is shown.



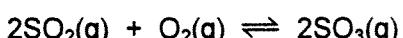
Which statements about this reaction are correct?..

- 1 Fe^{2+} ions are reduced to Fe^{3+} ions.
- 2 Chlorine acts as a reducing agent.
- 3 Fe^{2+} ions each lose an electron.
- 4 Cl_2 molecules are reduced to Cl^- ions.
- A 1 and 2 B 2 and 3 C 2 and 4 D 3 and 4

Q90.

[0620/23/M/J/18/Q15]

In the Contact process, sulfur dioxide is converted into sulfur trioxide in a reversible reaction.



The forward reaction is exothermic.

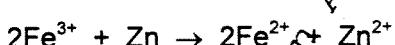
Which conditions give the highest yield of sulfur trioxide at equilibrium?

	pressure / atmospheres	temperature
A	0.5	high
B	0.5	low
C	1.5	high
D	1.5	low

Q91.

[0620/23/M/J/18/Q16]

The equation for a redox reaction is shown.



Which statements are correct?

- 1 Fe^{3+} is reduced to form Fe^{2+} . ∵
- 2 Zn oxidises the Fe^{3+} ions.
- 3 Fe^{3+} is an oxidising agent.
- A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

Q92.

[0620/21/O/N/2018/Q14]

The effects of a change in conditions on a chemical reaction are listed.

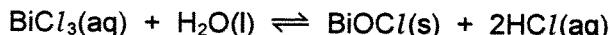
- 1 The total number of collisions per minute increased.
- 2 The number of effective collisions per minute increased.
- 3 The average energy of the particles increased.

Which change in conditions caused all of these effects?

- A addition of a catalyst
- B increasing the concentration of a solution of a reactant
- C increasing the surface area of a solid reactant
- D increasing the temperature

IGCSE Chemistry Topical Paper 2**Topic 7 : Chemical Reaction
Speed of Reaction + Reversible****Q93.**

When BiCl_3 reacts with water, a white precipitate of BiOCl is formed. The equation for the reaction is shown.



Which statements are correct?

- 1 The reaction is reversible.
 - 2 When dilute hydrochloric acid is added to the reaction mixture, more of the white precipitate forms.
 - 3 When aqueous sodium hydroxide is added to the reaction mixture, more of the white precipitate forms.
- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

Q94.

[0620/21/O/N/2018/Q34]

Which reaction is endothermic?

- A** $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- B** $\text{CaO} + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O}$
- C** $2\text{Ca} + \text{O}_2 \rightarrow 2\text{CaO}$
- D** $\text{Ca} + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2$

Q95.

[0620/22/O/N/2018/Q37]

Ethanol can be formed by:

- 1 fermentation
- 2 reaction between steam and ethene.

Which of these processes use a catalyst?

	1	2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

Q96.

The equation for the reaction between calcium carbonate and dilute nitric acid is shown.



25 g of calcium carbonate is reacted with an excess of dilute nitric acid.

Which mass of calcium nitrate and which volume of carbon dioxide is produced at room temperature and pressure?

	mass of calcium nitrate / g	volume of carbon dioxide / dm ³
A	29	6
B	29	12
C	41	6
D	41	12

Q97.

[0620/22/O/N/2018/Q14]

The rate of reaction between magnesium ribbon and 2 mol/dm³ hydrochloric acid at 25 °C to produce hydrogen gas is measured.

In another experiment, either the concentration of the hydrochloric acid or the temperature is changed. All other conditions are kept the same.

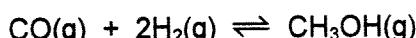
Which conditions increase the rate of reaction? ∵

- A 1 mol/dm³ hydrochloric acid at 25 °C
- B 2 mol/dm³ hydrochloric acid at 10 °C
- C 2 mol/dm³ hydrochloric acid at 20 °C
- D 3 mol/dm³ hydrochloric acid at 25 °C

Q98.

[0620/22/O/N/2018/Q15]

Methanol is prepared by the reversible reaction shown.



The forward reaction is exothermic.

Which conditions produce the highest equilibrium yield of methanol?

	temperature	pressure
A	high	high
B	high	low
C	low	high
D	low	low

[0620/22/O/N/2018/Q16]

Q99. The thermite reaction can be used to produce iron from iron(III) oxide.

The equation for the reaction is shown.



Which statements about this reaction are correct?

- 1 Aluminium is the oxidising agent.
- 2 Aluminium is less reactive than iron.
- 3 Electrons are transferred from aluminium to iron.
- 4 The iron in the iron(III) oxide is reduced.

A 1 and 3**B** 1 and 4**C** 2 and 3**D** 3 and 4

[0620/22/O/N/2018/Q28]

Q100.

Which statement about the Haber process is correct?

- A The hydrogen used is obtained from the air.
- B The nitrogen used is obtained from nitrates in the soil.
- C Nitrogen reacts with hydrogen to make ammonia.
- D The reaction takes place at room temperature and pressure.

[0620/22/O/N/2018/Q14]

Q101.

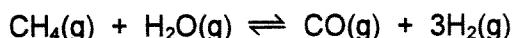
Dilute hydrochloric acid reacts with limestone.

Which conditions produce the fastest rate of reaction?

- A 2 mol/dm³ hydrochloric acid and a single lump of limestone
- B 4 mol/dm³ hydrochloric acid and a single lump of limestone
- C 4 mol/dm³ hydrochloric acid and small pieces of limestone
- D 4 mol/dm³ hydrochloric acid and powdered limestone

Q102.

The reversible reaction between methane and steam is shown.



The forward reaction is endothermic.

Which changes in pressure and temperature move the equilibrium to the right?

	pressure	temperature
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

[0620/23/O/N/2018/Q28]

Q103.

Ammonia is manufactured by the Haber process from nitrogen and hydrogen.

Which row gives the main sources of these two gases?

	hydrogen	nitrogen
A	air	air
B	air	natural gas
C	natural gas	air
D	natural gas	natural gas

[0620/21/M/J/2019/Q13]

Q104.

Which change in reaction conditions increases both the collision rate and the proportion of molecules with sufficient energy to react?

- A addition of a catalyst
- B increasing the concentration of a reactant
- C increasing the surface area of a reactant
- D increasing the temperature of the reaction

[0620/22/M/J/2019/Q14]

Q105.

When blue-green crystals of nickel(II) sulfate are heated, water is produced and a yellow solid remains. When water is added to the yellow solid, the blue-green colour returns.

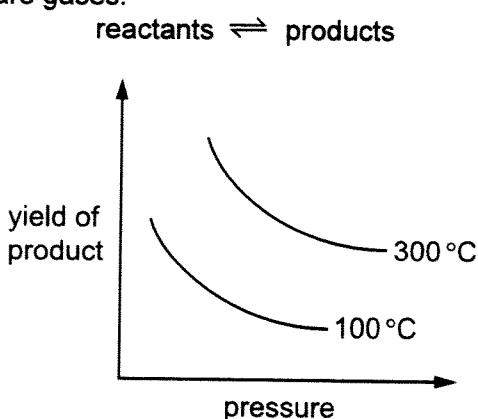
Which process describes these changes?

- A combustion
- B corrosion
- C neutralisation
- D reversible reaction

Q106.

The graph shows how the yield of product in a reversible reaction changes as the temperature and pressure are changed.

All reactants and products are gases.



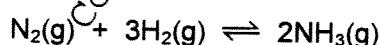
Which row is correct for this reversible reaction?

	side of reaction with fewer moles	forward reaction
A	reactant	exothermic
B	reactant	endothermic
C	product	endothermic
D	product	exothermic

Q107.

[0620/21/M/J/2019/Q31]

Ammonia is manufactured by the Haber Process.



The forward reaction is exothermic.

Which conditions maximise the yield of ammonia?

	pressure	temperature
A	high	high
B	high	low
C	low	high
D	low	low

Q108.

[0620/22/M/J/2019/Q13]

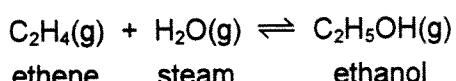
Which change in reaction conditions increases both the collision rate and the proportion of molecules with sufficient energy to react?

- A addition of a catalyst
- B increasing the concentration of a reactant
- C increasing the surface area of a reactant
- D increasing the temperature of the reaction

[0620/22/M/J/2019/Q15]

Q109.

The equation for the manufacture of ethanol is shown.



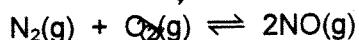
What is the effect of doubling the pressure on this reaction?

- A decreases the rate of formation of ethanol
- B increases the yield of ethene
- C decreases the rate of formation of ethene
- D increases the yield of ethanol

[0620/23/M/J/2019/Q15]

Q110.

A reaction between nitrogen and oxygen is shown. The forward reaction is endothermic.



Which change increases the equilibrium yield of nitrogen monoxide, NO?

- A decreasing the pressure
- B decreasing the temperature
- C increasing the pressure
- D increasing the temperature

Q111.

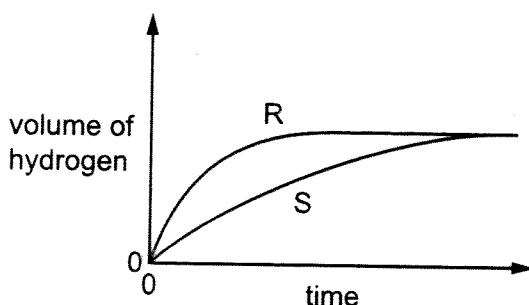
[0620/23/M/J/2019/Q19]

Solutions of acid R and acid S have the same concentration.

The same volume of each acid at the same temperature is reacted with the same mass of magnesium ribbon.

The volume of hydrogen produced is measured.

The results are shown.



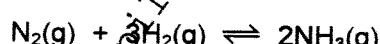
Which statement about the reactions is correct?

- A Acid S reacts faster than acid R.
- B The final volume of hydrogen produced in each reaction is different.
- C Acid R is a stronger acid than acid S.
- D Acid S is a stronger acid than acid R.

Q112.

[0620/23/M/J/2019/Q32]

Ammonia is manufactured in an exothermic reaction.



What is the effect of lowering the temperature on the rate of formation and equilibrium yield of ammonia?

	rate of formation	equilibrium yield
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

Q113.

The rate of reaction between magnesium and dilute hydrochloric acid is increased by increasing the concentration of the acid.

How does this affect the reacting particles?

	collision rate of particles	proportion of particles with sufficient energy to react
A	increases	increases
B	increases	stays the same
C	stays the same	increases
D	stays the same	stays the same

[0620/22/O/N/2019/Q16]

Q114.

A sample of dilute nitric acid is added to lumps of limestone in a conical flask. The conical flask is placed on a balance and the loss in mass is measured.

A second sample of nitric acid of a different concentration is separately tested. All other conditions are kept the same.

The loss in mass in 1 minute at each concentration of nitric acid is shown.

concentration in mol/dm ³	loss in mass in 1 minute/g
0.5	0.15
1.0	0.25

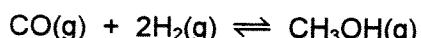
Which row describes and explains the results obtained using 1.0 mol/dm³ nitric acid compared with 0.5 mol/dm³ nitric acid?

	description	explanation
A	decrease in reaction rate	decrease in particle collision energy
B	decrease in reaction rate	increase in particle collision rate
C	increase in reaction rate	increase in particle collision rate
D	increase in reaction rate	increase in particle collision rate and collision energy

Q115.

[0620/22/O/N/2019/Q17]

When carbon monoxide reacts with hydrogen, methanol is formed.



The forward reaction is exothermic.

Which statements are correct?

- 1 There are more moles of gas on the left-hand side of the reaction.
- 2 Increasing the temperature increases the amount of methanol at equilibrium.
- 3 Increasing the pressure increases the amount of methanol at equilibrium.
- 4 Increasing the initial amount of hydrogen decreases the amount of methanol at equilibrium.

A 1 and 2 only **B** 1 and 3 only **C** 2 and 4 only **D** 3 and 4 only

[0620/23/O/N/2019/Q16]

Q116.

Magnesium reacts with dilute hydrochloric acid.

Which statement about the particles in the reaction is correct?

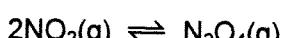
- A** Increasing the concentration of dilute hydrochloric acid increases the collision rate but has no effect on the activation energy.
- B** Increasing the concentration of dilute hydrochloric acid increases the collision rate and the activation energy.
- C** Increasing the temperature of the reaction increases the activation energy.
- D** Increasing the temperature of the reaction causes all collisions to lead to a reaction.

Q117.

[0620/23/O/N/2019/Q17]

Two molecules of nitrogen dioxide combine in a reversible reaction to form dinitrogen tetroxide.

The forward reaction is exothermic.



Which changes in reaction conditions would both increase the amount of dinitrogen tetroxide at equilibrium?

- A** decreasing the temperature and decreasing the pressure
- B** decreasing the temperature and increasing the pressure
- C** increasing the temperature and decreasing the pressure
- D** increasing the temperature and increasing the pressure

[0620/21/M/J/2020/Q8]

Q118.

A solution of iron(III) sulfate reacts with aqueous sodium hydroxide to form a red-brown precipitate.

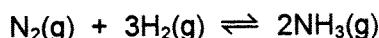
What is the balanced equation, including state symbols, for the reaction?

- A $\text{FeSO}_4(\text{aq}) + 2\text{NaOH}(\text{aq}) \rightarrow \text{Fe(OH)}_2(\text{s}) + \text{Na}_2\text{SO}_4(\text{aq})$
- B $\text{FeSO}_4(\text{l}) + 2\text{NaOH}(\text{l}) \rightarrow \text{Fe(OH)}_2(\text{s}) + \text{Na}_2\text{SO}_4(\text{l})$
- C $\text{Fe}_2(\text{SO}_4)_3(\text{aq}) + 6\text{NaOH}(\text{aq}) \rightarrow 2\text{Fe(OH)}_3(\text{s}) + 3\text{Na}_2\text{SO}_4(\text{aq})$
- D $\text{Fe}_2(\text{SO}_4)_3(\text{l}) + 6\text{NaOH}(\text{aq}) \rightarrow 2\text{Fe(OH)}_3(\text{s}) + 3\text{Na}_2\text{SO}_4(\text{l})$

[0620/22/M/J/2020/Q9]

Q119.

The Haber process is a reversible reaction.



The reaction has a 30% yield of ammonia.

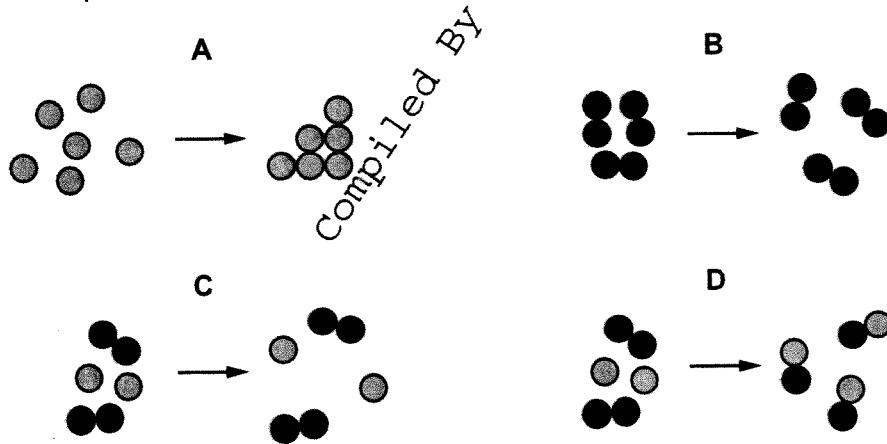
Which volume of ammonia gas, NH_3 , measured at room temperature and pressure, is obtained by reacting 0.75 moles of hydrogen with excess nitrogen? *At room temperature and pressure*

- A 3600 cm^3
- B 5400 cm^3
- C 12000 cm^3
- D 18000 cm^3

[0620/21/M/J/2020/Q14]

Q120.

Which diagram represents a chemical change? *∴*

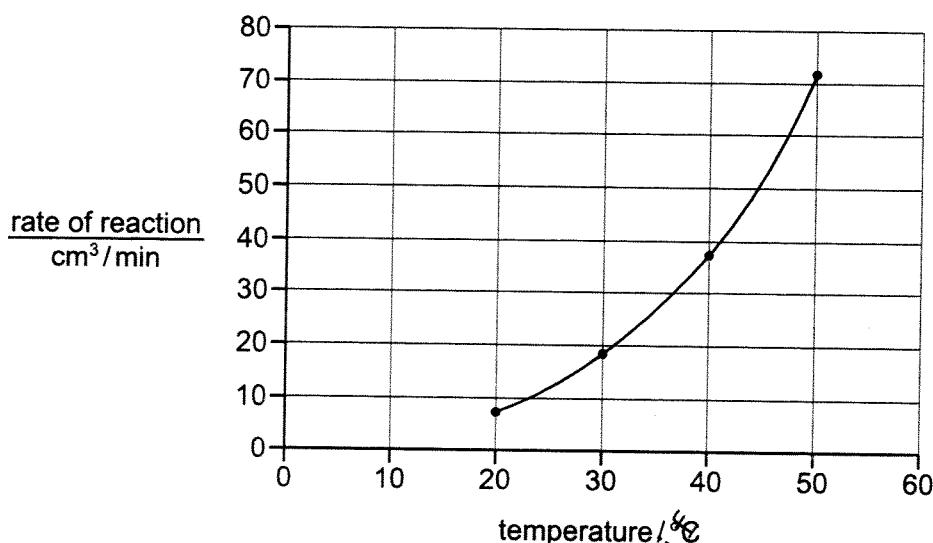


[0620/21/M/J/2020/Q15]

Q121.

The rate of reaction between calcium carbonate chips and hydrochloric acid is studied by collecting the volume of gas released in one minute at different temperatures.

A graph of rate of reaction against temperature is shown.



Which statement fully explains why increasing the temperature has this effect on the rate?

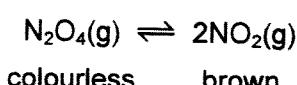
- A The kinetic energy of the particles increases so the collisions are harder.
- B The number of collisions between particles increases.
- C The activation energy needed for the particles to react is reduced.
- D There are more frequent collisions between particles with enough energy to react.

Q122.

[0620/21/M/J/2020/Q16]

The equation shows the equilibrium between dinitrogen tetroxide, N_2O_4 , and nitrogen dioxide, NO_2 .

The colours of the reactant and product are also shown.



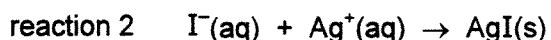
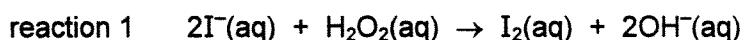
The forward reaction is endothermic.

Which statement is **not** correct?

- A At equilibrium the concentrations of the reactant and the product are constant.
- B At equilibrium the rate of the forward reaction is equal to the rate of the reverse reaction.
- C When the pressure is increased a darker brown colour is seen.
- D When the temperature is increased a darker brown colour is seen.

Q123.

The equations for two reactions of iodide ions are shown.



Which statement is correct?

- A Both reactions are redox reactions.
- B Neither reaction is a redox reaction.
- C Only reaction 1 is a redox reaction.
- D Only reaction 2 is a redox reaction.

Q124.

Element Y reacts with copper(II) oxide to form copper.

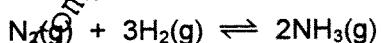
Element Y will not react with zinc oxide. Copper has no reaction with zinc oxide.

What is the order of reactivity of these three elements, most reactive first?

- A $\text{Cu} \rightarrow \text{Y} \rightarrow \text{Zn}$
- B $\text{Cu} \rightarrow \text{Zn} \rightarrow \text{Y}$
- C $\text{Zn} \rightarrow \text{Cu} \rightarrow \text{Y}$
- D $\text{Zn} \rightarrow \text{Y} \rightarrow \text{Cu}$

Q125.

Ammonia is manufactured by the Haber process.



What are the conditions used in the Haber process?

	temperature / °C	pressure / atm
A	400	100
B	400	300
C	20	300
D	20	100

Q126.

[0620/22/M/J/2020/Q8]

Lead(II) nitrate, $\text{Pb}(\text{NO}_3)_2$, reacts with potassium iodide, KI, to form a yellow precipitate, PbI_2 , and a soluble salt, KNO_3 .

What is the equation for the reaction?

- A $\text{Pb}(\text{NO}_3)_2 + \text{KI} \rightarrow \text{PbI}_2 + \text{KNO}_3$
- B $\text{Pb}(\text{NO}_3)_2 + 2\text{KI} \rightarrow \text{PbI}_2 + \text{KNO}_3$
- C $2\text{Pb}(\text{NO}_3)_2 + 2\text{KI} \rightarrow \text{PbI}_2 + 2\text{KNO}_3$
- D $\text{Pb}(\text{NO}_3)_2 + 2\text{KI} \rightarrow \text{PbI}_2 + 2\text{KNO}_3$

Q127.

[0620/22/M/J/2020/Q14]

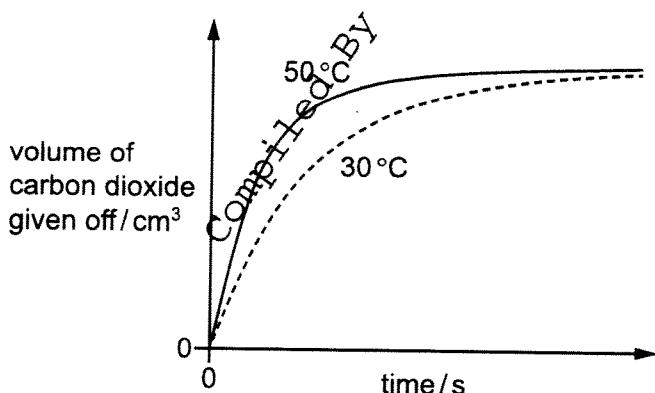
Which list contains **only** chemical changes?

- A melting, evaporating, dissolving
- B rusting, freezing, subliming
- C neutralisation, polymerisation, combustion
- D boiling, condensing, distillation

Q128.

[0620/22/M/J/2020/Q15]

The results of adding excess marble chips (calcium carbonate) to hydrochloric acid at 50 °C and at 30 °C are shown. Only the temperature is changed.



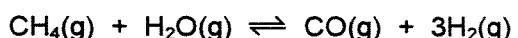
Which row describes the reacting particles at 30 °C compared to those at 50 °C?

	collision rate	collision energy
A	higher	higher
B	higher	lower
C	lower	higher
D	lower	lower

[0620/22/M/J/2020/Q16]

Q129.

Methane reacts with steam and an equilibrium is reached.



The forward reaction is endothermic.

Which row shows how the amount of hydrogen at equilibrium changes when the pressure or temperature is changed as indicated?

	change in temperature	change in pressure	amount of hydrogen
A	decrease	no change	increase
B	increase	no change	decrease
C	no change	increase	decrease
D	no change	decrease	decrease

[0620/22/M/J/2020/Q17]

Q130.

When aqueous iron(III) chloride is added to aqueous potassium iodide a chemical reaction occurs and iodine is formed.

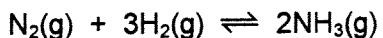
Which statement is correct?

- A Iodide ions are oxidised, they gain electrons in this reaction.
- B Iodide ions are oxidised, they lose electrons in this reaction.
- C Iron(III) chloride is oxidised in this reaction.
- D Neither iodide ions nor iron(III) chloride is oxidised in this reaction.

[0620/22/M/J/2020/Q31]

Q131.

In the Haber process, nitrogen and hydrogen are reacted to make ammonia.



The forward reaction is exothermic.

Which conditions produce the maximum yield of ammonia?

	pressure	temperature
A	high	high
B	high	low
C	low	high
D	low	low

Q132.

[0620/22/M/J/2020/Q34]

One of the reactions used in the manufacture of sulfuric acid is shown.



Which catalyst is used to increase the rate of this reaction?

- A iron
- B manganese(IV) oxide
- C vanadium(V) oxide
- D nickel

Q133.

[0620/23/M/J/2020/Q8]

Aluminium metal reacts with iron(III) oxide to form aluminium oxide and iron.

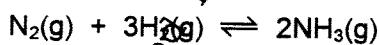
Which chemical equation for the reaction between aluminium and iron(III) oxide is correct?

- A $\text{FeO} + \text{Al} \rightarrow \text{AlO} + \text{Fe}$
- B $\text{Fe}_2\text{O} + 2\text{Al} \rightarrow \text{Al}_2\text{O} + 2\text{Fe}$
- C $\text{Fe}_2\text{O}_3 + \text{Al} \rightarrow \text{Al}_2\text{O}_3 + \text{Fe}$
- D $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$

[0620/23/M/J/2020/Q9]

Q134.

The Haber process is a reversible reaction.



The reaction has a 30% yield of ammonia.

Which volume of ammonia gas, NH_3 , measured at room temperature and pressure, is obtained by reacting 0.75 moles of hydrogen with excess nitrogen?

- A 3600 cm^3
- B 5400 cm^3
- C $12\,000 \text{ cm}^3$
- D $18\,000 \text{ cm}^3$

Q135.

[0620/23/M/J/2020/Q15]

A chemical reaction occurs when the reacting particles collide.

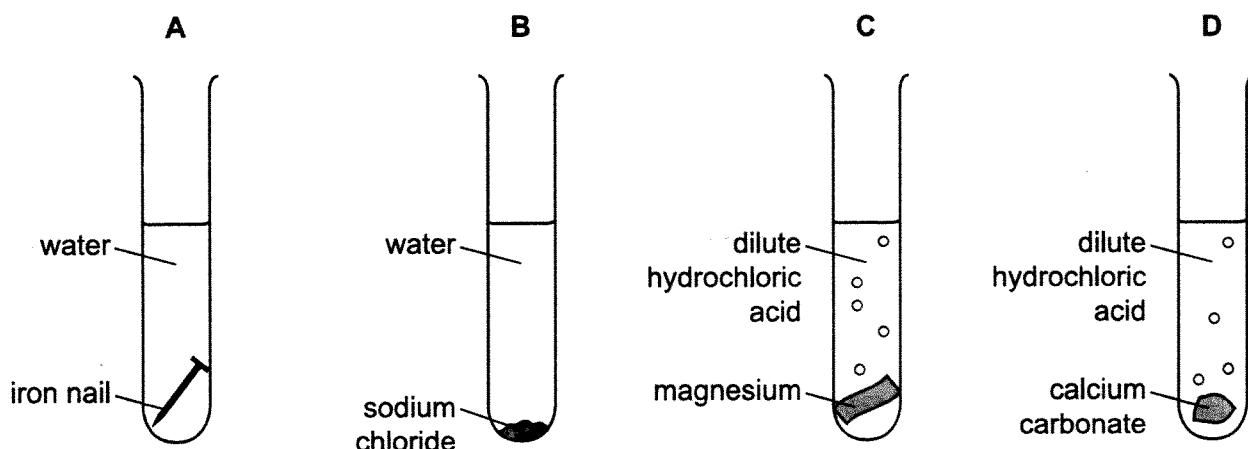
Which reaction conditions would produce the greatest rate of particle collisions?

	concentration of acid	reaction temperature
A	decrease	decrease
B	no change	increase
C	increase	increase
D	increase	no change

Q136.

[0620/23/M/J/2020/Q14]

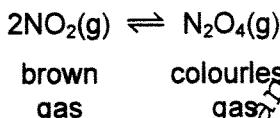
In which tube is a physical change taking place?



Q137.

[0620/23/M/J/2020/Q16]

At room temperature, the conversion of nitrogen dioxide, NO_2 , into dinitrogen tetroxide, N_2O_4 , is reversible.



The forward reaction is exothermic.

Which changes cause the equilibrium to shift to the left?

	pressure	temperature
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

Q138.

[0620/23/M/J/2020/Q17]

The equation for the reaction between zinc and aqueous copper(II) sulfate is shown.



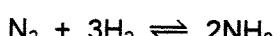
Which statement is correct?

- A The oxidation state of the oxidising agent has changed from 0 to +2.
- B The oxidation state of the reducing agent has changed from 0 to +2.
- C The oxidation state of the reducing agent has changed from +2 to 0.
- D This is not a redox reaction. The solution changes from colourless to blue.

Q139.

[0620/23/M/J/2020/Q31]

Hydrogen and nitrogen react to form ammonia in the Haber process.



The forward reaction is exothermic.

Which statements about the process are correct?

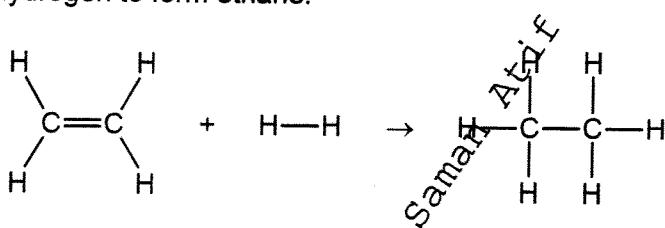
- 1 Nitrogen is obtained from the air.
- 2 Increasing the temperature of the reaction increases the yield of ammonia.
- 3 Increasing the reaction pressure increases the yield of ammonia.
- 4 Vanadium(V) oxide is used as a catalyst.

A 1 and 2 B 1 and 3 C 2 and 3 D 3 and 4

Q140.

[0620/21/O/N/2020/Q17]

Ethene reacts with hydrogen to form ethane.



The bond energies are shown in the table.

bond	bond energy in kJ/mol
C-C	+350
C=C	+614
H-H	+436
Q	-410

What is the energy change for the reaction?

- A -290 kJ/mol
- B -120 kJ/mol
- C +120 kJ/mol
- D +290 kJ/mol

Q141.

A sign displayed in a flour mill is shown.



Which statement explains why there is a danger of explosion in a flour mill?

- A Flour burns very quickly because it is a fine powder.
- B Flour is a catalyst for combustion.
- C Flour mills get hot and speed up the rate of combustion.
- D The combustion of flour is exothermic.

Q142.

A student investigates the effect of concentration on the rate of reaction between calcium carbonate and hydrochloric acid. He follows the method shown.

- Place 1 g of calcium carbonate in a conical flask.
- Add excess hydrochloric acid.
- Let the reaction continue until no more gas is made.
- Repeat the experiment with different concentrations of hydrochloric acid.

Which essential step has been left out of the method if he is to work out the rate of the reaction?

- A heating the reaction mixture
- B placing a bung in the flask
- C timing the reaction
- D using a catalyst

Q143.

Ammonia is manufactured using the Haber process.

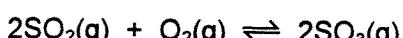
Which statement about this process is correct?

- A The catalyst used for this reaction is vanadium pentoxide.
- B The hydrogen used is extracted from air.
- C Using a high pressure increases the yield of ammonia.
- D Using a high temperature increases the yield of ammonia.

Q144.

[0620/21/O/N/2020/Q20]

The reaction between sulfur dioxide and oxygen is shown.



The reaction is exothermic.

Which of the changes shifts the position of equilibrium to the right?

- 1 Increase the concentration of oxygen.
 - 2 Increase the pressure.
 - 3 Increase the temperature.
- A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 only

Q145.

[0620/22/O/N/2020/Q17]

Nitrogen, N₂, and hydrogen, H₂, can be converted into ammonia, NH₃, using a catalyst.

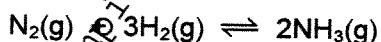
What is the purpose of the catalyst?

- A to increase the amount of ammonia produced
B to increase the rate of reaction
C to reduce the amount of reactants needed
D to reduce the rate of reaction

Q146.

[0620/22/O/N/2020/Q18]

Ammonia is produced by the Haber process. The equation is shown.



The forward reaction is exothermic.

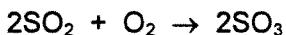
Which statement is correct?

- A Increasing pressure decreases the yield of ammonia, but speeds up the reaction.
B Increasing temperature decreases the yield of ammonia, but speeds up the reaction.
C Increasing the concentration of hydrogen and nitrogen results in a lower yield of ammonia.
D Increasing the temperature increases the yield of ammonia and speeds up the reaction.

[0620/22/O/N/2020/Q19]

Q147.

During the manufacture of sulfuric acid, sulfur dioxide is converted to sulfur trioxide.



Which type of reaction is this?

- A displacement
- B neutralisation
- C oxidation
- D thermal decomposition

Q148.

[0620/22/O/N/2020/Q20]

The equation for a redox reaction is shown.



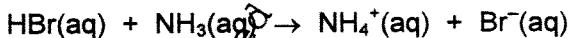
Which element is reduced?

- A chlorine
- B iron
- C oxygen
- D sulfur

Q149.

[0620/22/O/N/2020/Q21]

The equation shows a reaction between aqueous hydrogen bromide and aqueous ammonia.



Which statement describes the role of aqueous hydrogen bromide?

- A It is a catalyst.
- B It is a reducing agent.
- C It is a proton acceptor.
- D It is a proton donor.

Q150.

[0620/23/O/N/2020/Q18]

Which reaction is an example of a photochemical reaction?

- A glucose forming carbon dioxide and water
- B magnesium reacting with oxygen
- C potassium reacting with water
- D silver chloride forming silver metal

Q151.

[0620/23/O/N/2020/Q19]

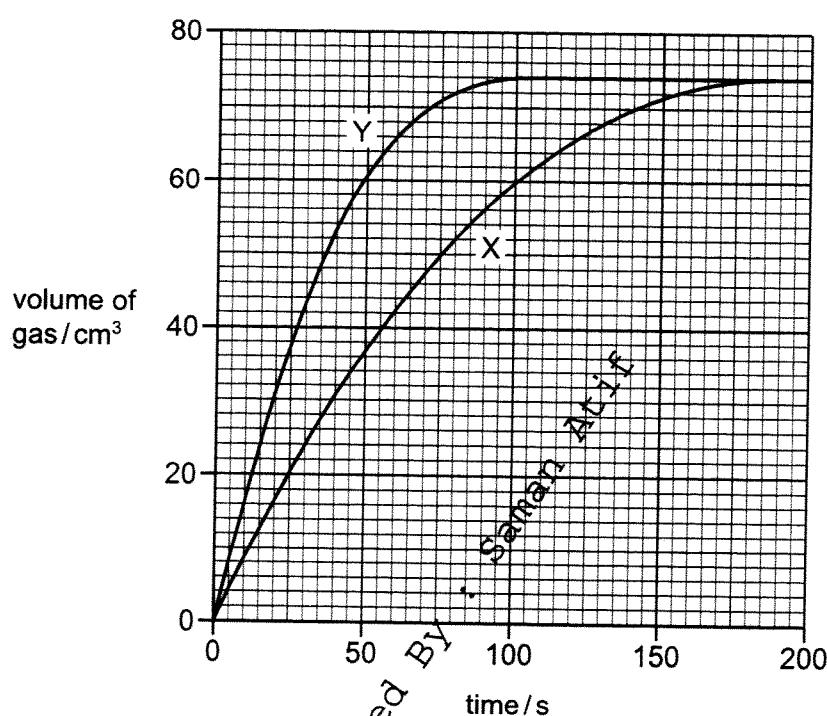
An excess of calcium carbonate is added to dilute hydrochloric acid, X.

The carbon dioxide gas given off is collected and its volume recorded at regular time intervals.

Line X on the graph shows the results obtained.

The experiment is repeated using dilute hydrochloric acid, Y.

Line Y on the graph shows the results obtained.



Which statement about the two hydrochloric acid samples, X and Y, is correct?

- A They had the same volume but Y had higher concentration.
- B They had the same concentration but Y had a larger volume.
- C X had a higher concentration but Y had a larger volume.
- D Y had a higher concentration but X had a larger volume.

Q152.

[0620/23/O/N/2020/Q31]

What is the catalyst in the Haber process?

A Fe

B Ni

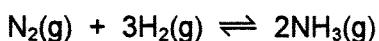
C Pt

D V₂O₅

Q153.

[0620/23/O/N/2020/Q32]

Ammonia is manufactured in an exothermic reaction.



What is the effect of lowering the pressure on the rate of formation of ammonia and percentage yield of ammonia at equilibrium?

	rate of formation	percentage yield
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

Q154.

[0620/23/O/N/2020/Q34]

Which row shows the conditions used for the manufacture of sulfuric acid in the Contact process?

	pressure / atm	temperature / °C	catalyst
A	250	200	vanadium(V) oxide
B	2	450	vanadium(IV) oxide
C	250	200	iron
D	2	450	iron

Q155.

[0620/23/O/N/2020/Q35]

Which calcium compound does not neutralise an acid soil?

- Complaints
Satisfied
By
- A calcium oxide
 - B calcium sulfate
 - C calcium hydroxide
 - D calcium carbonate

Compiled BY : Saman Atif

[0620/12/M/J/13/Q16]

Q1. Two oxides, X and Y, are added separately to dilute sulfuric acid and dilute sodium hydroxide.

X reacts with dilute sulfuric acid but Y does not react.

Y reacts with aqueous sodium hydroxide but X does not react.

Which type of oxide are X and Y?

	acidic oxide	basic oxide	metallic oxide
A	X	Y	X
B	X	Y	Y
C	Y	X	X
D	Y	X	Y

[0620/12/M/J/13/Q19]

Q2. Which statement about the reaction of acids is correct?

- A They react with ammonium salts to form a salt and ammonia only.
- B They react with metal carbonates to give a salt and carbon dioxide only.
- C They react with metal hydroxides to give a salt and water only.
- D They react with metals to give a salt, hydrogen and water only.

[0620/12/M/J/13/Q21]

Q3. Two indicators, bromophenol blue and Congo red, show the following colours in acidic solutions and in alkaline solutions.

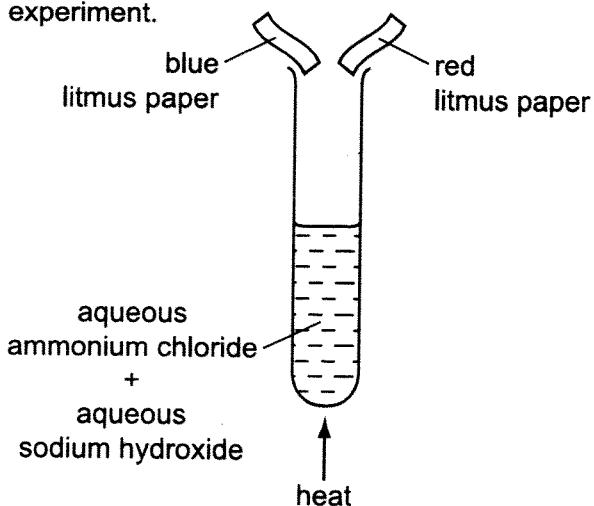
indicator	acid	alkali
bromophenol blue	yellow	blue
Congo red	violet	red

A few drops of each indicator are added to separate samples of a solution of pH 2.

What are the colours of the indicators in this solution?

	in a solution of pH 2	
	bromophenol blue is	Congo red is
A	blue	red
B	blue	violet
C	yellow	red
D	yellow	violet

[0620/12/M/J/13/Q20]

Q4. The diagram shows an experiment.

What happens to the pieces of litmus paper?

	blue litmus paper	red litmus paper
A	changes colour	changes colour
B	changes colour	no colour change
C	no colour change	changes colour
D	no colour change	no colour change

[0620/11/M/J/13/Q18]

Q5. Ant stings hurt because of the methanoic acid produced by the ant.Which substance could, ~~most safely~~, be used to neutralise the acid?

	substance	pH
A	baking soda	8
B	car battery acid	1
C	lemon juice	3
D	oven cleaner	14

[0620/11/M/J/13/Q19]

Q6. The diagram shows one period of the Periodic Table.

Li	Be	B	C	N	O	F	Ne
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Which two elements form acidic oxides?

- A carbon and lithium
- B carbon and neon
- C carbon and nitrogen
- D nitrogen and neon

[0620/13/O/N/13/Q18]

Q7. Which are properties of an acid?

- 1 reacts with ammonium sulfate to form ammonia
- 2 turns red litmus blue

	1	2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

[0620/13/O/N/13/Q19]

Q8. Which of the following are properties of the oxides of non-metals?

	property 1	property 2
A	acidic	covalent
B	acidic	ionic
C	basic	covalent
D	basic	ionic

[0620/13/O/N/13/Q20]

Q9. The cations shown are identified by the colour of the precipitates formed when an excess of an aqueous solution of X is added.

cations present	effect of adding an excess of aqueous X
iron(II) (Fe^{2+})	green precipitate
copper(II) (Cu^{2+})	light blue precipitate
iron(III) (Fe^{3+})	red-brown precipitate

What is X?

- A ammonia
- B limewater
- C silver nitrate
- D sodium hydroxide

[0620/12/O/N/13/Q21]

Q10. Compound X is tested and the results are shown in the table.

test	result
aqueous sodium hydroxide is added, then heated gently	gas given off which turns damp red litmus paper blue
dilute hydrochloric acid is added	effervescence, gas given off which turns limewater milky

Which ions are present in compound X?

- A ammonium ions and carbonate ions
- B ammonium ions and chloride ions
- C calcium ions and carbonate ions
- D calcium ions and chloride ions

[0620/12/M/J/14/Q17]

Q11. Different plants grow best under different pH conditions.

Which plant grows best in alkaline soil?

	plant	grows best in soil at pH
A	cabbage	6-8
B	potato	4-7
C	strawberry	4-7
D	wheat	6-7

[0620/12/M/J/14/Q19]

Q12. Element X forms an oxide, XO, that neutralises sulfuric acid.

Which row describes X and XO?

	element X	nature of oxide, XO
A	metal	acidic
B	metal	basic
C	non-metal	acidic
D	non-metal	basic

Q13. Copper carbonate reacts with dilute sulfuric acid to make copper sulfate.



Which row gives the correct order of steps for making copper sulfate crystals?

	step 1	step 2	step 3	step 4
A	add excess acid to the copper carbonate	filter	evaporate filtrate to point of crystallisation	leave to cool
B	add excess acid to the copper carbonate	filter	evaporate to dryness	leave to cool
C	add excess copper carbonate to the acid	evaporate to point of crystallisation	leave to cool	filter
D	add excess copper carbonate to the acid	filter	evaporate filtrate to point of crystallisation	leave to cool

Q14. Aqueous sodium hydroxide is added to solid X and the mixture is heated.

A green precipitate is formed and an alkaline gas is given off.

Which ions are present in X?

- A NH_4^+ and Fe^{2+}
- B NH_4^+ and Fe^{3+}
- C OH^- and Fe^{2+}
- D OH^- and Fe^{3+}

[0620/11/M/J/14/Q19]

Q15. Which statements about alkalis are correct?

- 1 When reacted with an acid, the pH of the alkali increases.
- 2 When tested with litmus, the litmus turns blue.
- 3 When warmed with an ammonium salt, ammonia gas is given off.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

[0620/11/M/J/14/Q20]

Q16. Only two elements are liquid at 20 °C. One of these elements is shiny and conducts electricity.

This suggests that this element is a1..... and therefore its oxide is2..... .

Which words correctly complete gaps 1 and 2?

	1	2
A	metal	acidic
B	metal	basic
C	non-metal	acidic
D	non-metal	basic

[0620/11/M/J/14/Q21]

Q17. Which acid reacts with ammonia to produce the salt ammonium sulfate?

- A** hydrochloric
B nitric
C phosphoric
D sulfuric

[0620/11/M/J/14/Q22]

Q18. Aqueous sodium hydroxide is added to solid X and the mixture is heated.

A green precipitate is formed and an alkaline gas is given off.

Which ions are present in X?

- A** NH_4^+ and Fe^{2+}
B NH_4^+ and Fe^{3+}
C OH^- and Fe^{2+}
D OH^- and Fe^{3+}

[0620/13/O/N/14/Q19]

Q19. A colourless solution is tested by the following reactions.

Which reaction is **not** characteristic of an acid?

- A A piece of magnesium ribbon is added. Bubbles are seen and the magnesium disappears.
- B A pungent smelling gas is produced when ammonium carbonate is added.
- C Copper oxide powder is added and the mixed is warmed. The solution turns blue.
- D The solution turns blue litmus red.

[0620/13/O/N/14/Q20]

Q20. Which statement about oxides is correct?

- A A solution of magnesium oxide will have a pH less than 7.
- B A solution of sulfur dioxide will have a pH greater than 7.
- C Magnesium oxide will react with nitric acid to make a salt.
- D Sulfur dioxide will react with hydrochloric acid to make a salt.

[0620/13/O/N/14/Q21]

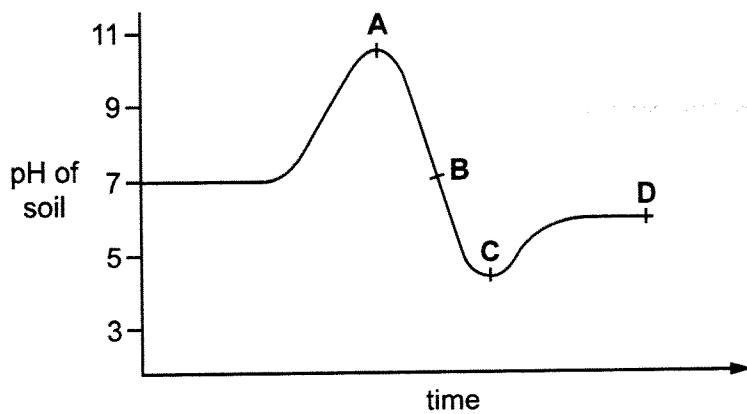
Q21. Which salt preparation uses a burette and a pipette?

- A calcium nitrate from calcium carbonate and nitric acid
- B copper(II) sulfate from copper(II) hydroxide and sulfuric acid
- C potassium chloride from potassium hydroxide and hydrochloric acid
- D zinc chloride from zinc and hydrochloric acid

[0620/13/O/N/14/Q22]

Q22. The graph shows how the pH of soil in a field changes over time.

At which point was the soil neutral?



[0620/12/O/N/14/Q18]

Q23. Which substance is the most acidic?

	substance	pH
A	calcium hydroxide	12
B	lemon juice	4
C	milk	6
D	washing up liquid	8

Q24.

[0620/12/O/N/14/Q21]

How many different salts could be made from a supply of dilute sulfuric acid, dilute hydrochloric acid, copper, magnesium oxide and zinc carbonate?

A 3

B 4

C 5

D 6

[0620/13/M/J/15/Q15]

Q25. Which reaction is **not** characteristic of an acid?

- A It dissolves magnesium oxide.
- B It produces ammonia from ammonium compounds.
- C It produces carbon dioxide from a carbonate.
- D It produces hydrogen from zinc metal.

[0620/13/M/J/15/Q16]

Q26. Hydrochloric acid is used to clean metals.

The acid reacts with the oxide layer on the surface of the metal, forming a salt and water.

Which word describes the metal oxide?

- A alloy
- B base
- C element
- D indicator

[0620/13/M/J/15/Q18]

Q27. Which gas relights a glowing splint?

- A ammonia
- B carbon dioxide
- C hydrogen
- D oxygen

[0620/13/M/J/15/Q17]

Q28. Which of the following methods are suitable for preparing both zinc sulfate and copper sulfate?

- 1 Reacting the metal oxide with warm dilute aqueous sulfuric acid.
 - 2 Reacting the metal with dilute aqueous sulfuric acid.
 - 3 Reacting the metal carbonate with dilute aqueous sulfuric acid.
- A 1 and 2 only
B 1 and 3 only
C 2 and 3 only
D 1, 2 and 3

[0620/12/M/J/15/Q17]

Q29. Which method is used to make the salt copper sulfate?

- A dilute acid + alkali
B dilute acid + carbonate
C dilute acid + metal
D dilute acid + non-metal oxide

[0620/12/M/J/15/Q18]

Q30. Two tests are carried out to identify an aqueous solution of X.

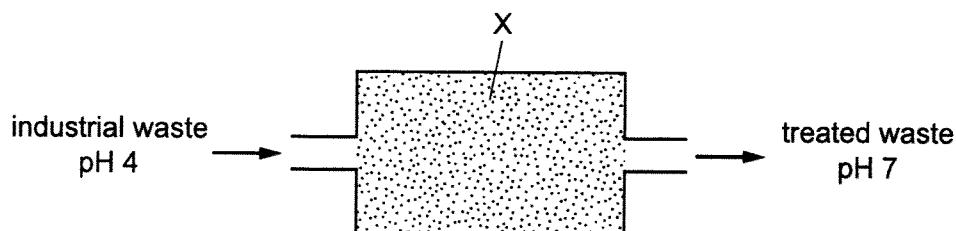
- test 1 Aqueous sodium hydroxide is added and a blue precipitate is produced.
test 2 Dilute nitric acid is added followed by aqueous silver nitrate and a white precipitate is produced.

What is X?

- A copper carbonate
B copper chloride
C iron(III) carbonate
D iron(III) chloride

[0620/12/M/J/15/Q34]

Q31. Substance X is used to treat industrial waste.



What is X and which type of reaction occurs during the treatment?

	X	type of reaction
A	calcium oxide (lime)	neutralisation
B	calcium oxide (lime)	redox
C	carbon	neutralisation
D	carbon	redox

[0620/11/M/J/15/Q15]

Q32. The table shows the pH of four aqueous solutions W, X, Y and Z.

Solved Atif

substance .	pH
W BY	7
Y	9
Z	2
W	5

Compiled By

Universal Indicator is added to each solution.

Which row shows the colour of each solution after the indicator is added?

	W	X	Y	Z
A	blue	green	orange	red
B	green	blue	red	orange
C	orange	red	blue	green
D	red	orange	green	blue

Q33. Four steps to prepare a salt from an excess of a solid base and an acid are listed.

- 1 crystallisation
- 2 evaporation
- 3 filtration
- 4 neutralisation

In which order are the steps carried out?

- A $2 \rightarrow 3 \rightarrow 4 \rightarrow 1$
- B $3 \rightarrow 1 \rightarrow 2 \rightarrow 4$
- C $4 \rightarrow 2 \rightarrow 1 \rightarrow 3$
- D $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$

[0620/13/O/N/15/Q15]

Q34. Element X is in Group I of the Periodic Table.

Which row shows the type of oxide and whether element X is metallic or non-metallic?

	type of oxide	metallic or non-metallic
A	acidic	metallic
B	acidic	non-metallic
C	basic	metallic
D	basic	non-metallic

Q35.

[0620/13/O/N/15/Q16]

Three liquids, P, Q and R, are added to a mixture of hydrochloric acid and Universal Indicator solution.

The following observations are made.

- P the colour of the indicator turns purple.
- Q the colour of the indicator does not change.
- R there is effervescence and the indicator turns blue.

What are P, Q and R?

	P	Q	R
A	sodium carbonate solution	water	sodium hydroxide solution
B	sodium hydroxide solution	water	sodium carbonate solution
C	water	sodium carbonate solution	sodium hydroxide solution
D	water	sodium hydroxide solution	sodium carbonate solution

Q36.

[0620/13/O/N/15/Q17]

Which property is **not** characteristic of a base?

- A It reacts with a carbonate to form carbon dioxide.
- B It reacts with an acid to form a salt.
- C It reacts with an ammonium salt to form ammonia.
- D It turns universal indicator paper blue.

Q37.

[0620/13/O/N/15/Q18]

Zinc sulfate is a soluble salt and can be prepared by reacting excess zinc carbonate with dilute sulfuric acid.

Which piece of equipment would **not** be required in the preparation of zinc sulfate crystals?

- A beaker
- B condenser
- C evaporating dish
- D filter funnel

[0620/12/O/N/15/Q18]

Q38. A sting from insect X has a pH of 6 and a sting from insect Y has a pH of 8.

The table shows the pH of four substances.

substance	pH
hydrochloric acid	1
sodium hydrogen carbonate	8
sodium hydroxide	14
vinegar	5

Which substances are used to treat the two stings?

	X	Y
A	hydrochloric acid	sodium hydroxide
B	sodium hydrogen carbonate	vinegar
C	sodium hydroxide	hydrochloric acid
D	vinegar	sodium hydrogen carbonate

[0620/12/O/N/15/Q19]

Q39. A salt is produced in each of the following reactions.

- P magnesium + dilute hydrochloric acid
- Q zinc oxide + dilute sulfuric acid
- R sodium hydroxide + dilute hydrochloric acid
- S copper carbonate + dilute sulfuric acid

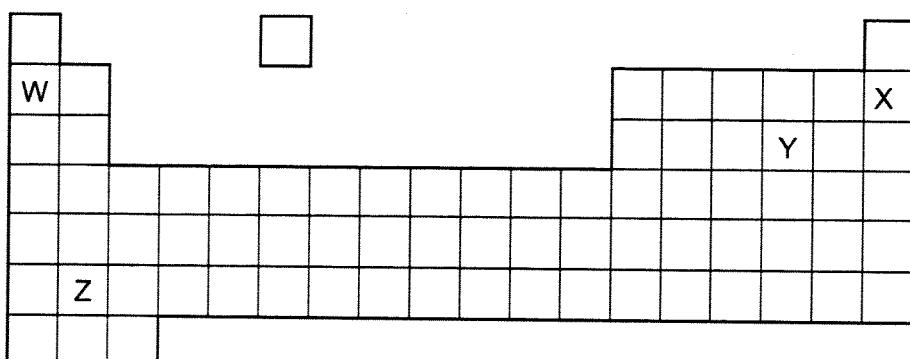
Which statements about the products of the reactions are correct?

- 1 A flammable gas is produced in reaction P.
 - 2 Water is formed in all reactions.
 - 3 All the salts formed are soluble in water.
- A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

Q40.

[0620/11/O/N/15/Q15]

The diagram shows a simplified form of the Periodic Table:



Which elements will form an acidic oxide?

- A W and Z B W only C X and Y only D Y only

Q41.

[0620/11/O/N/15/Q16]

A white solid is insoluble in water.

When it is added to hydrochloric acid, bubbles of gas are formed.

Adding aqueous ammonia to the solution formed gives a white precipitate. Adding excess aqueous ammonia causes the precipitate to re-dissolve.

What is the white solid?

- A aluminium nitrate
B ammonium nitrate
C calcium carbonate
D zinc carbonate

Q42.

[0620/11/O/N/15/Q18]

Four stages in the preparation of a salt from an acid and a solid metal oxide are listed.

- 1 Add excess solid.
- 2 Evaporate half the solution and leave to cool.
- 3 Filter to remove unwanted solid.
- 4 Heat the acid.

In which order should the stages be carried out?

- A $1 \rightarrow 3 \rightarrow 4 \rightarrow 2$
B $2 \rightarrow 1 \rightarrow 3 \rightarrow 4$
C $4 \rightarrow 1 \rightarrow 3 \rightarrow 2$
D $4 \rightarrow 2 \rightarrow 1 \rightarrow 3$

[0620/23/M/J/16/Q18]

Q43. Which statements are properties of an acid?

- 1 reacts with ammonium sulfate to form ammonia
- 2 turns red litmus blue

	1	2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

[0620/23/M/J/16/Q19]

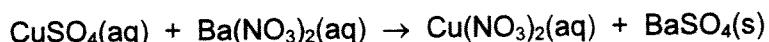
Q44. Which row describes whether an amphoteric oxide reacts with acids and bases?

	reacts with acids	reacts with bases
A	no	no
B	no	yes
C	yes	no
D	yes	yes

[0620/23/M/J/16/Q20]

Q45. Barium sulfate is an insoluble salt.

It can be made by reacting copper(II) sulfate solution with barium nitrate solution.



What is the correct order of steps to obtain a pure, dry sample of barium sulfate from the reaction mixture?

	step 1	step 2	step 3
A	filter	evaporate the filtrate to dryness	leave the solid formed to cool
B	filter	evaporate the filtrate to the point of crystallisation	leave the filtrate to cool
C	filter	leave the residue in a warm place to dry	wash the residue with water
D	filter	wash the residue with water	leave the residue in a warm place to dry

[0620/22/M/J/16/Q20]

Q46. Silver chloride is insoluble in water and is prepared by precipitation.

Which two substances can be used to make silver chloride?

- A barium chloride and silver nitrate
- B hydrochloric acid and silver
- C hydrochloric acid and silver bromide
- D sodium chloride and silver iodide

[0620/22/M/J/16/Q34]

Q47. Lime (calcium oxide) is used to treat waste water from a factory.

Which substance is removed by the lime?

- A ammonia
- B sodium chloride
- C sodium hydroxide
- D sulfuric acid

[0620/21/M/J/16/Q20]

Q48.

Which substance reacts with dilute sulfuric acid to form a salt that can be removed from the resulting mixture by filtration?

- A aqueous barium chloride
- B aqueous sodium hydroxide
- C copper
- D copper(II) carbonate

[0620/21/O/N/16/Q18]

Q49. Germanium oxide is a white powder.

Germanium oxide reacts with concentrated hydrochloric acid.

Germanium oxide reacts with concentrated aqueous sodium hydroxide.

Germanium oxide does not dissolve when added to water.

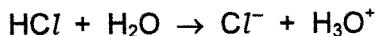
Which type of oxide is germanium oxide?

- A acidic
- B amphoteric
- C basic
- D neutral

[0620/21/O/N/16/Q19]

Q50.

Hydrogen chloride gas reacts with water to produce an acidic solution. The equation for the reaction is shown.



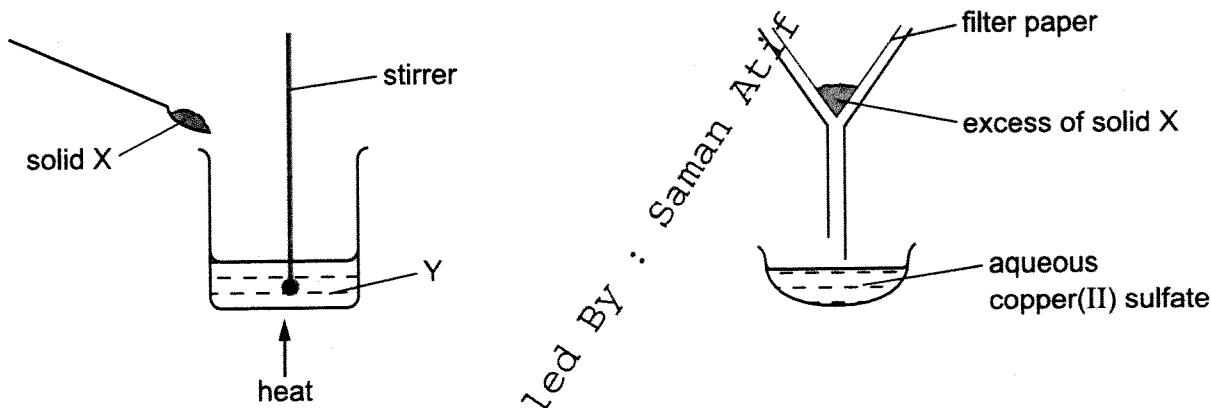
Which statement describes what happens during the reaction?

- A The chloride ion is formed by accepting an electron from the water.
- B The hydrogen chloride loses an electron to form the chloride ion.
- C The water accepts a proton from the hydrogen chloride.
- D The water donates a proton to the hydrogen chloride.

[0620/21/O/N/16/Q20]

Q51.

The apparatus shown is used to prepare aqueous copper(II) sulfate.



What are X and Y?

	X	Y
A	copper	aqueous iron(II) sulfate
B	copper(II) chloride	sulfuric acid
C	copper(II) oxide	sulfuric acid
D	sulfur	aqueous copper(II) chloride

Q52.

[0620/21/O/N/16/Q21]

Information about some silver compounds is shown in the table.

compound	formula	solubility in water
silver carbonate	Ag_2CO_3	insoluble
silver chloride	AgCl	insoluble
silver nitrate	AgNO_3	soluble
silver oxide	Ag_2O	insoluble

Which equation shows a reaction which **cannot** be used to make a silver salt?

- A $\text{AgNO}_3(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow \text{AgCl}(\text{s}) + \text{HNO}_3(\text{aq})$
- B $\text{Ag}_2\text{O}(\text{s}) + 2\text{HNO}_3(\text{aq}) \rightarrow 2\text{AgNO}_3(\text{aq}) + \text{H}_2\text{O}(\text{l})$
- C $\text{Ag}_2\text{CO}_3(\text{s}) + 2\text{HNO}_3(\text{aq}) \rightarrow 2\text{AgNO}_3(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
- D $2\text{Ag}(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow 2\text{AgCl}(\text{s}) + \text{H}_2(\text{g})$

Q53.

[0620/23/O/N/16/Q23]

Compound T is added to dilute hydrochloric acid and warmed gently.

The mixture gives off a gas which turns acidified aqueous potassium manganate(VII) from purple to colourless.

A flame test on compound T gives a lilac flame.

What is compound T?

- A sodium sulfate
- B sodium sulfite
- C potassium sulfate
- D potassium sulfite

[0620/22/O/N/16/Q23]

Q54.

Aqueous sodium hydroxide was added slowly, until in excess, to separate solutions of W, X, Y and Z.

The results are shown.

solution	initial observation with aqueous sodium hydroxide	final observation with excess aqueous sodium hydroxide
W	white precipitate formed	precipitate dissolves
X	white precipitate formed	no change
Y	pale blue precipitate formed	no change
Z	green precipitate formed	no change

Which row identifies the metal ions in the solutions?

	metal ion in solution W	metal ion in solution X	metal ion in solution Y	metal ion in solution Z
A	aluminium	calcium	copper(II)	iron(II)
B	aluminium	calcium	iron(II)	copper(II)
C	aluminium	iron(II)	calcium	copper(II)
D	calcium	aluminium	copper(II)	iron(II)

[0620/21/O/N/16/Q23]

Q55.

Four substances, P, Q, R and S, are tested as shown.

test	substance			
	P	Q	R	S
dilute hydrochloric acid added	gas given off which 'pops' with a lighted splint	gas given off which turns limewater milky	no reaction	no reaction
dilute aqueous sodium hydroxide added and warmed gently	no reaction	no reaction	gas given off which turns damp, red litmus paper blue	no reaction

What are P, Q, R and S?

	P	Q	R	S
A	Mg	Na_2CO_3	NH_4Cl	NaCl
B	Mg	NH_4Cl	Na_2CO_3	NaCl
C	Mg	Na_2CO_3	NaCl	NH_4Cl
D	Na_2CO_3	Mg	NaCl	NH_4Cl

Q56.

[0620/21/M/J/17/Q18]

Zinc oxide is amphoteric.

Which row describes the reactions of zinc oxide?

	reaction with hydrochloric acid	reaction with aqueous sodium hydroxide	
A	✓	✓	key
B	✓	✗	✓ = reaction occurs
C	✗	✓	✗ = reaction does not occur
D	✗	✗	

Q57.

[0620/21/M/J/17/Q19]

Which row shows how the hydrogen ion concentration and pH of ethanoic acid compare to those of hydrochloric acid of the same concentration?

	ethanoic acid compared to hydrochloric acid	
	hydrogen ion concentration	pH
A	higher	higher
B	higher	lower
C	lower	higher
D	lower	lower

Q58.

[0620/21/M/J/17/Q20]

A pure sample of the insoluble salt barium carbonate can be made using the method given.

- step 1 Dissolve barium chloride in water.
- step 2 Separately dissolve sodium carbonate in water.
- step 3 Mix the two solutions together.
- step 4 Filter the mixture.
- step 5
- step 6 Dry the residue between two sheets of filter paper.

Which instruction is missing from step 5?

- A Heat the residue to dryness.
- B Heat the residue to the point of crystallisation.
- C Place the filtrate in an evaporating basin.
- D Wash the residue with water.

[0620/21/M/J/17/Q21]

Q59.

Substance X reacts with warm dilute hydrochloric acid to produce a gas which decolourises acidified aqueous potassium manganate(VII).

Substance X gives a yellow flame in a flame test.

What is X?

- A potassium chloride
- B potassium sulfite
- C sodium chloride
- D sodium sulfite

[0620/22/M/J/17/Q18]

Q60.

Which type of oxide is aluminium oxide?

- A acidic
- B amphoteric
- C basic
- D neutral

[0620/22/M/J/17/Q19]

Q61.

Which statements about a weak acid, such as ethanoic acid, are correct?

- 1 It reacts with a carbonate.
- 2 It does not neutralise aqueous sodium hydroxide solution.
- 3 It turns red litmus blue.
- 4 It is only partially ionised in aqueous solution.

- A 1 and 2
- B 1 and 4
- C 2 and 3
- D 3 and 4

[0620/22/M/J/17/Q20]

Q62.

Silver chloride is a white solid which is insoluble in water.

Which statement describes how a sample of pure silver chloride can be made?

- A Add aqueous silver nitrate to aqueous sodium chloride and then filter.
- B Add aqueous silver nitrate to dilute hydrochloric acid, evaporate and then crystallise.
- C Add silver carbonate to dilute hydrochloric acid, evaporate and then crystallise.
- D Add silver to dilute hydrochloric acid, filter and then wash the residue.

Q63.

[0620/22/M/J/17/Q21]

Dilute sulfuric acid is added to two separate aqueous solutions, X and Y. The observations are shown.

solution X	white precipitate
solution Y	bubbles of a colourless gas

Which row shows the ions present in the solutions?

	solution X	solution Y
A	Ba^{2+}	CO_3^{2-}
B	Ca^{2+}	Cl^-
C	Cu^{2+}	CO_3^{2-}
D	Fe^{2+}	NO_3^-

Q64.

[0620/23/M/J/17/18]

Which oxide is amphoteric?

A Al_2O_3 B CaO C Na_2O D SO_2

Q65.

[0620/23/M/J/17/19]

Chloric(I) acid, HClO , is formed when chlorine dissolves in water. It is a weak acid.

What is meant by the term *weak acid*?

- A It contains fewer hydrogen atoms than a strong acid.
- B It is easily neutralised by a strong alkali.
- C It is less concentrated than a strong acid.
- D It is only partially ionised in solution.

Q66.

[0620/23/M/J/17/20]

Silver nitrate reacts with sodium chloride to produce silver chloride and sodium nitrate. The equation for the reaction is shown.



How is silver chloride separated from the reaction mixture?

- A crystallisation
- B distillation
- C evaporation
- D filtration

[0620/23/M/J/17/21]

Q67.

Aqueous sodium hydroxide reacts with an aqueous solution of compound Y to give a green precipitate.

Aqueous ammonia also reacts with an aqueous solution of compound Y to give a green precipitate.

In each case the precipitate is insoluble when an excess of reagent is added.

Which ion is present in Y?

- A chromium(III)
- B copper(II)
- C iron(II)
- D iron(III)

[0620/21/O/N/17/17]

Q68.

Some properties of four oxides are listed.

Oxide 1 reacts with both acids and alkalis to form salts.

Oxide 2 reacts with acids to form salts but does not react with alkalis.

Oxide 3 reacts with alkalis to form salts but does not react with acids.

Oxide 4 does not react with acids or alkalis.

Which row describes the oxides?

	oxide 1	oxide 2	oxide 3	oxide 4
A	amphoteric	acidic	basic	neutral
B	amphoteric	basic	acidic	neutral
C	neutral	acidic	basic	amphoteric
D	neutral	basic	acidic	amphoteric

[0620/21/O/N/17/18]

Q69.

What is not a typical characteristic of acids?

- A They react with alkalis producing water.
- B They react with all metals producing hydrogen.
- C They react with carbonates producing carbon dioxide.
- D They turn blue litmus paper red.

[0620/21/O/N/17/19]

Q70. Zinc sulfate is made by reacting an excess of zinc oxide with dilute sulfuric acid.

The excess zinc oxide is then removed from the solution.

Which process is used to obtain solid zinc sulfate from the solution?

- A crystallisation
- B dissolving
- C filtration
- D fractional distillation

[0620/21/O/N/17/20]

Q71. What is used to test for chlorine?

- A a glowing splint
- B damp litmus paper
- C limewater
- D potassium manganate(VII) solution

[0620/22/O/N/17/Q18]

Q72. What is **not** a typical characteristic of acids?

- A They react with alkalis producing water.
- B They react with all metals producing hydrogen.
- C They react with carbonates producing carbon dioxide.
- D They turn blue litmus paper red.

[0620/22/O/N/17/Q19]

Q73. Copper(II) sulfate can be prepared by adding excess copper(II) carbonate to sulfuric acid.

Why is an **excess** of copper(II) carbonate added?

- A to ensure all the copper(II) carbonate has reacted
- B to ensure all the sulfuric acid has reacted
- C to increase the rate of reaction
- D to increase the yield of copper(II) sulfate

[0620/22/O/N/17/Q20]

Q74. Compound P reacts with hydrochloric acid to produce a gas that turns limewater milky.

What is P?

- A sodium carbonate
- B sodium chloride
- C sodium hydroxide
- D sodium sulfate

[0620/23/O/N/17/Q17]

Q75. Some properties of four oxides are listed.

Oxide 1 reacts with both acids and alkalis to form salts.

Oxide 2 reacts with acids to form salts but does not react with alkalis.

Oxide 3 reacts with alkalis to form salts but does not react with acids.

Oxide 4 does not react with acids or alkalis.

Which row describes the oxides?

	oxide 1	oxide 2	oxide 3	oxide 4
A	amphoteric	acidic	basic	neutral
B	amphoteric	basic	acidic	neutral
C	neutral	acidic	basic	amphoteric
D	neutral	basic	acidic	amphoteric

[0620/23/O/N/17/Q18]

Q76. What is not a typical characteristic of acids?

- A They react with alkalis producing water.
- B They react with all metals producing hydrogen.
- C They react with carbonates producing carbon dioxide.
- D They turn blue litmus paper red.

Q77.

[0620/23/O/N/17/Q20]

Which ion forms a green precipitate with aqueous sodium hydroxide that dissolves in an excess of aqueous sodium hydroxide?

- A Ca^{2+}
- B Cr^{3+}
- C Cu^{2+}
- D Fe^{2+}

[0620/22/M/J/18/Q17]

Q78. Which statement about oxides is correct?

- A A solution of magnesium oxide has a pH less than pH 7.
- B A solution of sulfur dioxide has a pH greater than pH 7.
- C Magnesium oxide reacts with nitric acid to make a salt.
- D Sulfur dioxide reacts with hydrochloric acid to make a salt.

[0620/21/M/J/18/Q18]

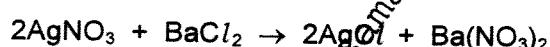
Q79. Which solution has the lowest pH?

- A 0.1 mol/dm³ ammonia solution
- B 0.1 mol/dm³ ethanoic acid
- C 0.1 mol/dm³ lithium hydroxide
- D 0.1 mol/dm³ nitric acid

[0620/21/M/J/18/Q19]

Q80.

A student mixes silver nitrate and barium chloride to form a white precipitate of silver chloride. The equation is shown.



Which row describes the solubility of the salts? ..

	soluble	insoluble
A	silver nitrate	barium chloride, barium nitrate and silver chloride
B	silver nitrate and barium chloride	barium nitrate and silver chloride
C	silver nitrate, barium chloride and barium nitrate	silver chloride
D	silver nitrate, barium chloride and silver chloride	barium nitrate

[0620/22/M/J/18/Q20]

Q81. Which methods are suitable for preparing both zinc sulfate and copper(II) sulfate?

- 1 reacting the metal oxide with warm dilute aqueous sulfuric acid
 2 reacting the metal with dilute aqueous sulfuric acid
 3 reacting the metal carbonate with dilute aqueous sulfuric acid
- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

[0620/22/M/J/18/Q18]

Q82. Which statement about acids and bases is correct?

- A** A base is a donor of hydrogen ions.
B An acid is an acceptor of protons.
C A strong acid is fully ionised in aqueous solution.
D A weak acid cannot be used to neutralise a strong base.

[0620/22/M/J/18/Q19]

Q83. The solubility of some salts is shown.

	chloride	nitrate	sulfate	carbonate
barium	soluble	soluble	insoluble	insoluble
lead(II)	insoluble	soluble	insoluble	insoluble
potassium	soluble	soluble	soluble	soluble
zinc	soluble	soluble	soluble	insoluble

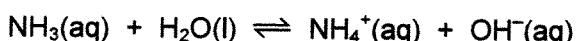
Which two aqueous solutions produce an insoluble salt when mixed together?

- A** barium chloride and zinc nitrate
B barium nitrate and lead(II) nitrate
C lead(II) nitrate and potassium carbonate
D potassium nitrate and zinc sulfate

Q84.

[0620/23/M/J/18/Q18]

The equation represents an equilibrium in aqueous ammonia.



How does aqueous ammonia behave in this reaction?

- A as a strong acid
- B as a strong base
- C as a weak acid
- D as a weak base

Q85.

[0620/23/M/J/18/Q19]

An excess of aqueous sodium sulfate was added to aqueous barium chloride and the mixture was filtered.

Which row shows the identity of the residue and the substances present in the filtrate?

	residue	substances in filtrate
A	barium sulfate	barium chloride and sodium chloride
B	barium sulfate	sodium chloride and sodium sulfate
C	sodium chloride	barium chloride and sodium sulfate
D	sodium chloride	barium sulfate and sodium sulfate

Q86.

[0620/21/O/N/2018/Q16]

An excess of iron(II) chloride is added to acidified potassium manganate(VII).

Which statements are correct?

- 1 The purple colour disappears.
 2 Iron(II) is reduced to iron(III).
 3 Manganate(VII) ions are oxidised to manganese(II) ions.
 4 Potassium manganate(VII) is an oxidising agent.
- A 1 and 2 B 1 and 4 C 2 and 3 D 3 and 4

Q87.

[0620/21/O/N/2018/Q18]

Aqueous sodium hydroxide is added to solid Q in a test-tube.

A gas is produced which turns damp red litmus blue.

What is Q?

- A aluminium
- B ammonia
- C ammonium chloride
- D sodium nitrate

Q88.

[0620/21/O/N/2018/Q19]

Potassium hydroxide is a base.

Which statement describes a reaction of potassium hydroxide?

- A Chlorine is formed when it is heated with ammonium chloride.
- B It turns Universal Indicator green.
- C It reacts with an acid to produce a salt and water.
- D It turns methyl orange red.

Q89.

[0620/22/O/N/2018/Q20]

Some general rules for the solubility of salts in water are listed.

- Carbonates are insoluble (except ammonium carbonate, potassium carbonate and sodium carbonate).
- Chlorides are soluble (except lead(II) chloride and silver chloride).
- Nitrates are soluble.
- Sulfates are soluble (except barium sulfate, calcium sulfate and lead(II) sulfate).

Which substances produce an insoluble salt when aqueous solutions of them are mixed?

- A barium chloride and magnesium nitrate
- B calcium chloride and ammonium nitrate
- C silver nitrate and zinc chloride
- D sodium carbonate and potassium sulfate

Q90.

[0620/22/O/N/2018/Q33]

- Which statement about sulfur or one of its compounds is correct?
- Sulfur occurs naturally as the element sulfur.
 - Sulfur dioxide is used to kill bacteria in drinking water.
 - Sulfuric acid is a weak acid.
 - Dilute sulfuric acid is a dehydrating agent.

Q91.

[0620/22/O/N/2018/Q17]

In which row are the oxides correctly identified?

	acidic	basic
A	magnesium oxide, calcium oxide	sulfur dioxide, carbon dioxide
B	magnesium oxide, sulfur dioxide	carbon dioxide, calcium oxide
C	sulfur dioxide, carbon dioxide	calcium oxide, magnesium oxide
D	sulfur dioxide, magnesium oxide	calcium oxide, carbon dioxide

Q92.

[0620/22/O/N/2018/Q18]

When dilute sulfuric acid is added to solid X, a colourless solution is formed and a gas is produced.

What is X?

- copper(II) oxide
- sodium oxide
- copper(II) carbonate
- sodium carbonate

Q93.

[0620/22/O/N/2018/Q19]

A few drops of methyl orange are added to a reaction mixture.

During the reaction, a gas is produced and the methyl orange turns from red to orange.

What are the reactants?

- aqueous sodium hydroxide and ammonium chloride
- aqueous sodium hydroxide and calcium carbonate
- dilute hydrochloric acid and magnesium
- dilute hydrochloric acid and aqueous sodium hydroxide

Q94.

The results of some experiments with sulfur dioxide are shown.

experiment	description	result
1	mix with dilute hydrochloric acid	does not react
2	mix with concentrated sodium hydroxide	a salt forms
3	add Universal Indicator	Universal Indicator turns purple
4	add acidified aqueous potassium manganate(VII)	purple solution turns colourless

Which results are correct?

- A 1, 2 and 4 B 2, 3 and 4 C 1 and 2 only D 3 and 4 only

[0620/23/O/N/2018/Q17]

Q95.

A white precipitate is produced when small amounts of two colourless solutions are mixed together.

Which pairs of solutions produce a white precipitate?

- 1 sodium hydroxide and zinc nitrate
 2 sodium hydroxide and aluminium chloride
 3 barium chloride and sulfuric acid
 4 acidified barium nitrate and potassium sulfate

- A 1, 2, 3 and 4
 B 1, 2 and 4 only
 C 1 and 2 only
 D 2 only

[0620/23/O/N/2018/Q18]

Q96.

Solution Q is warmed with ammonium chloride.

In a separate experiment, solution Q is added to methyl orange.

Which observations show that solution Q is basic?

	warmed with ammonium chloride	added to methyl orange
A	gas is produced	turns red
B	gas is produced	turns yellow
C	no reaction	turns red
D	no reaction	turns yellow

[0620/21/M/J/2019/Q17]

Q97.

Nitrogen(I) oxide, N_2O , nitrogen(II) oxide, NO , and carbon monoxide, CO , are all non-metal oxides.

They do not react with acids or bases.

Which statement is correct?

- A They are acidic oxides.
- B They are amphoteric oxides.
- C They are basic oxides.
- D They are neutral oxides.

[0620/21/M/J/2019/Q19]

Q98.

Ethanoic acid is a weak acid.

Hydrochloric acid is a strong acid.

Which statements are correct?

- 1 Ethanoic acid molecules are partially dissociated into ions.
- 2 $1.0 \text{ mol}/\text{dm}^3$ ethanoic acid has a higher pH than $1.0 \text{ mol}/\text{dm}^3$ hydrochloric acid.
- 3 Ethanoic acid is always more dilute than hydrochloric acid.
- 4 Ethanoic acid is a proton acceptor.

A 1 and 2

B 1 and 3

C 2 and 4

D 3 and 4

Q99.

[0620/21/M/J/2019/Q24]

Three metal compounds, P, Q and R, are heated using a Bunsen burner.

The results are shown.

- P colourless gas produced, which relights a glowing splint
- Q colourless gas produced, which turns limewater milky
- R no reaction

Which row shows the identity of P, Q and R?

	P	Q	R
A	magnesium carbonate	potassium carbonate	potassium nitrate
B	magnesium carbonate	potassium nitrate	potassium carbonate
C	potassium nitrate	magnesium carbonate	potassium carbonate
D	potassium nitrate	potassium carbonate	magnesium carbonate

[0620/22/M/J/2019/Q33]

Q100.

Which row shows the conditions used in the Contact process?

	temperature /°C	pressure /atm	catalyst
A	25	2	iron
B	25	200	iron
C	450	2	vanadium(V) oxide
D	450	200	vanadium(V) oxide

[0620/22/M/J/2019/Q7]

Q101.

Calcium metal reacts with water to form a solution of calcium hydroxide and hydrogen gas.

Which equation is correct?

- A $\text{Ca(s)} + \text{H}_2\text{O(aq)} \rightarrow \text{CaOH(aq)} + \text{H(g)}$
- B $\text{Ca(s)} + 2\text{H}_2\text{O(aq)} \rightarrow \text{Ca(OH)}_2\text{(s)} + 2\text{H}_2\text{(g)}$
- C $\text{Ca(s)} + 2\text{H}_2\text{O(l)} \rightarrow \text{Ca(OH)}_2\text{(aq)} + \text{H}_2\text{(g)}$
- D $\text{Ca(s)} + \text{H}_2\text{O(l)} \rightarrow \text{CaOH(l)} + \text{H(g)}$

Saman Atif

[0620/22/M/J/2019/Q17]

Q102.

Which type of oxide are carbon monoxide and aluminium oxide?

	carbon monoxide	aluminium oxide
A	acidic	amphoteric
B	acidic	basic
C	neutral	amphoteric
D	neutral	basic

[0620/22/M/J/2019/Q19]

Q103.

Which row shows the difference between a weak acid and a strong acid?

	weak acid	strong acid
A	fully ionised	partially ionised
B	concentrated	dilute
C	dilute	concentrated
D	partially ionised	fully ionised

[0620/23/M/J/2019/Q17]

Q104.

Which statement about carbon monoxide and aluminium oxide is correct?

- A Carbon monoxide and aluminium oxide are both amphoteric.
- B Carbon monoxide and aluminium oxide are both neutral.
- C Carbon monoxide is amphoteric but aluminium oxide is neutral.
- D Carbon monoxide is neutral but aluminium oxide is amphoteric.

Q105

[0620/21/O/N/2019/Q19]

Which statement about amphoteric oxides is correct?

- A They are made by combining an acidic oxide with a basic oxide.
- B They react with water to give a solution of pH 7.
- C They react with both acids and bases.
- D They do not react with acids or bases.

Q106.

[0620/21/O/N/2019/Q20]

Carbonic acid is a weak acid formed when carbon dioxide dissolves in water.

What is the pH of the solution?

A 1

B 5

C 7

D 9

Q107.

[0620/22/O/N/2019/Q21]

A method used to make copper(II) sulfate crystals is shown.

- 1 Place dilute sulfuric acid in a beaker.
- 2 Warm the acid.
- 3 Add copper(II) oxide until it is in excess.
- 4 Filter the mixture.
- 5 Evaporate the filtrate until crystals start to form.
- 6 Leave the filtrate to cool.

What are the purposes of step 3 and step 4?

	step 3	step 4
A	to ensure all of the acid has reacted	to obtain solid copper(II) sulfate
B	to ensure all of the acid has reacted	to remove the excess of copper(II) oxide
C	to speed up the reaction	to obtain solid copper(II) sulfate
D	to speed up the reaction	to remove the excess of copper(II) oxide

[0620/21/O/N/2019/Q22]

Q108.

Lead(II) sulfate is an insoluble salt.

Which process is not used to prepare a pure sample of this salt?

- A crystallisation
- B drying
- C filtration
- D precipitation

[0620/22/O/N/2019/Q34]

Q109.

Ammonium sulfate is used as a fertiliser.

It is made from ammonia and sulfuric acid.

Which words complete gaps 1, 2 and 3?

The1..... is made by the2..... process in which3..... is used as a catalyst.

	1	2	3
A	ammonia	Contact	iron
B	ammonia	Haber	vanadium(V) oxide
C	sulfuric acid	Contact	vanadium(V) oxide
D	sulfuric acid	Haber	iron

[0620/22/O/N/2019/Q19]

Q110.

Which oxide is classified as an amphoteric oxide?

- A aluminium oxide
- B calcium oxide
- C copper(II) oxide
- D nitrogen oxide

[0620/22/O/N/2019/Q20]

Q111.

Which statement describes the properties of hydrochloric acid?

- A Carbon dioxide is produced when limestone reacts with hydrochloric acid.
- B Hydrogen is produced when sodium hydroxide reacts with hydrochloric acid.
- C Methyl orange turns yellow in strong hydrochloric acid.
- D Red litmus paper turns blue when dipped into hydrochloric acid.

[0620/22/O/N/2019/Q22]

Q112.

Lead(II) sulfate is an insoluble salt.

Which reaction produces a mixture from which lead(II) sulfate is obtained by filtration?

- A adding solid lead(II) carbonate to dilute sulfuric acid
- B adding solid lead(II) hydroxide to dilute sulfuric acid
- C adding metallic lead to dilute sulfuric acid
- D adding aqueous lead(II) nitrate to dilute sulfuric acid

Q113.

[0620/22/O/N/2019/Q35]

Which statement about limestone and lime is correct?

- A Limestone combines with water to produce slaked lime.
- B Lime is obtained from limestone by oxidation.
- C Lime is used in the desulfurisation of flue gases.
- D Lime is used in the treatment of alkaline soil.

Q114.

[0620/23/O/N/2019/Q19]

Which substance is a neutral oxide?

- A aluminium oxide
- B carbon monoxide
- C sulfur dioxide
- D zinc oxide

Q115.

[0620/23/O/N/2019/Q20]

Which statements about dilute sulfuric acid are correct?

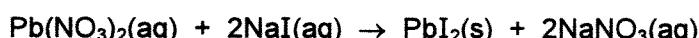
- 1 It turns red litmus paper blue.
- 2 It reacts with magnesium(II) oxide to form magnesium(II) sulfate and water.
- 3 It reacts with magnesium to form magnesium(II) sulfate and carbon dioxide.
- 4 Its pH is below pH 7.

- A 1 and 2 only B 1 and 3 only C 2 and 4 only D 3 and 4 only

Q116.

[0620/23/O/N/2019/Q22]

Lead(II) iodide is formed as a precipitate in the reaction shown.



Which method is used to separate the lead(II) iodide from the mixture?

- A crystallisation
- B distillation
- C evaporation
- D filtration

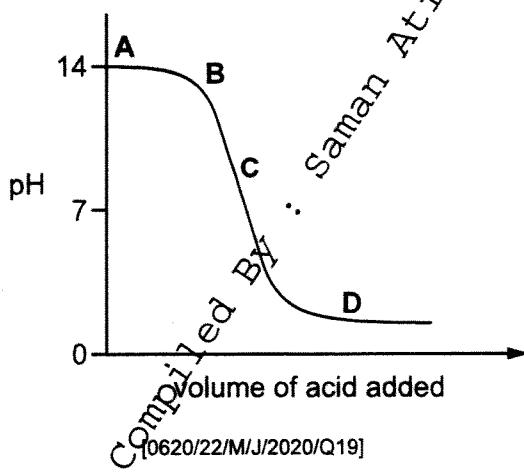
[0620/22/M/J/2020/Q18]

Q117.

The graph shows how the pH of a solution changes as an acid is added to an alkali.



Which letter represents the area of the graph where both acid and salt are present?



[0620/22/M/J/2020/Q19]

Q118.

Which statement describes a weak acid?

- A It is a proton acceptor and is fully ionised in aqueous solution.
- B It is a proton acceptor and is partially ionised in aqueous solution.
- C It is a proton donor and is fully ionised in aqueous solution.
- D It is a proton donor and is partially ionised in aqueous solution.

[0620/23/M/J/2020/Q34]

Q119.

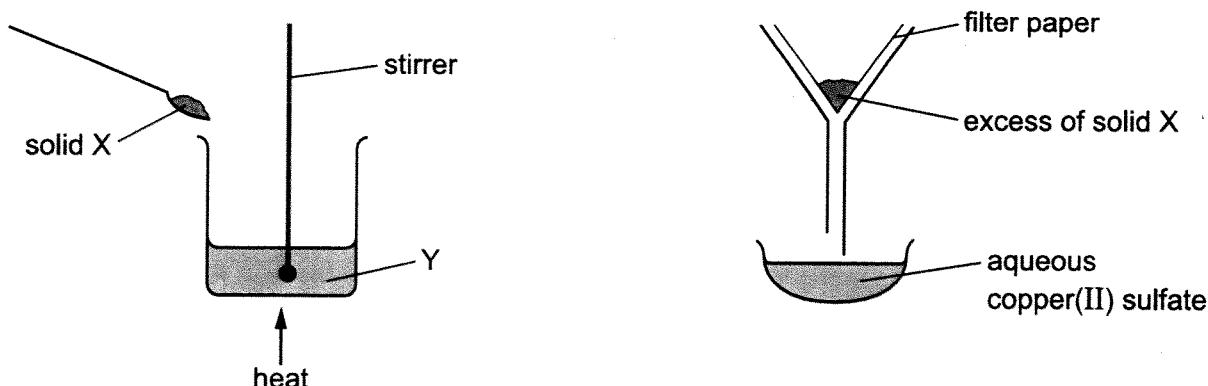
Which reaction in the Contact process is catalysed by vanadium(V) oxide?

- A $\text{S}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{SO}_2(\text{g})$
- B $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$
- C $\text{SO}_3(\text{g}) + \text{H}_2\text{SO}_4(\text{l}) \rightarrow \text{H}_2\text{S}_2\text{O}_7(\text{l})$
- D $\text{H}_2\text{S}_2\text{O}_7(\text{l}) + \text{H}_2\text{O}(\text{l}) \rightarrow 2\text{H}_2\text{SO}_4(\text{l})$

Q120.

[0620/22/M/J/2020/Q20]

The apparatus shown is used to prepare aqueous copper(II) sulfate.



What are X and Y?

	X	Y
A	copper	aqueous iron(II) sulfate
B	copper(II) chloride	dilute sulfuric acid
C	copper(II) oxide	dilute sulfuric acid
D	sulfur	aqueous copper(II) chloride

Q121.

[0620/21/M/J/2020/Q21]

Lead(II) sulfate is an insoluble salt.

BY

Which method is suitable for obtaining solid lead(II) sulfate?

- Method 1:*
- A Mix aqueous lead(II) nitrate and aqueous potassium sulfate, heat to evaporate all of the water, collect the solid and then wash and dry it.
 - B Mix aqueous lead(II) nitrate and aqueous potassium sulfate, filter, collect the filtrate, crystallise, then wash and dry the crystals.
 - C Mix aqueous lead(II) nitrate and dilute sulfuric acid, filter, then wash and dry the residue.
 - D Titrate aqueous lead(II) hydroxide with dilute sulfuric acid, crystallise, then wash and dry the crystals.

Q122.

[0620/21/M/J/2020/Q34]

The Contact process is used to manufacture concentrated sulfuric acid and consists of four steps.

Which step involves a catalyst?

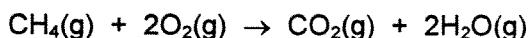
- A production of sulfur dioxide gas
- B production of sulfur trioxide gas
- C production of oleum
- D production of concentrated sulfuric acid

Q123.

[0620/22/M/J/2020/Q12]

Methane burns in excess oxygen.

The equation is shown.



Bond energies are shown.

bond	bond energy /kJ mol ⁻¹
C=O	805
C—H	410
O=O	496
O—H	460

What is the energy change for the reaction?

- A $(4 \times 410 + 2 \times 496) - (2 \times 805 + 4 \times 460)$
- B $(2 \times 805 + 2 \times 460) - (410 + 2 \times 496)$
- C $(410 + 2 \times 496) - (805 + 2 \times 460)$
- D $(410 + 496) - (805 + 460)$

Q124.

[0620/22/M/J/2020/Q21]

Which process is not used in the preparation of an insoluble salt?

- A filtration
- B washing
- C crystallisation
- D drying

Q125.

[0620/23/M/J/2020/Q21]

Which two compounds would react together to form the insoluble salt lead(II) chloride?

	compound	solubility in water
1	lead(II) nitrate	yes
2	lead(II) sulfate	no
3	silver chloride	no
4	sodium chloride	yes

- A 1 and 3

- B 1 and 4

- C 2 and 3

- D 2 and 4

Q126.

[0620/23/M/J/2020/Q26]

A salt is heated strongly. The only products are a white solid and a colourless gas.

What is the salt?

- A copper(II) carbonate
- B potassium carbonate
- C calcium nitrate
- D sodium nitrate

[0620/21/O/N/2020/Q22]

Q127.

What is a characteristic of acids?

- A Acids turn methyl orange indicator yellow.
- B Acids have a high pH value.
- C Acids react with ammonium salts to give ammonia gas.
- D Acids react with carbonates to produce salts.

Q128.

[0620/22/O/N/2020/Q23]

Zinc oxide is an amphoteric oxide.

Which row describes the reactions of zinc oxide?

	reaction with alkalis	reaction with acids
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

Compiled BY .. Saman Atif

Q129.

[0620/22/O/N/2020/Q22]

The equations for three reactions are shown.

- 1 $\text{Pb}(\text{NO}_3)_2(\text{aq}) + 2\text{KI}(\text{aq}) \rightarrow \text{PbI}_2(\text{s}) + 2\text{KNO}_3(\text{aq})$
- 2 $2\text{AgNO}_3(\text{aq}) + \text{CuI}_2(\text{aq}) \rightarrow \text{Cu}(\text{NO}_3)_2(\text{aq}) + 2\text{AgI}(\text{s})$
- 3 $\text{CuO}(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{CuSO}_4(\text{aq}) + \text{H}_2\text{O}(\text{l})$

Which reactions are suitable for making a salt by precipitation?

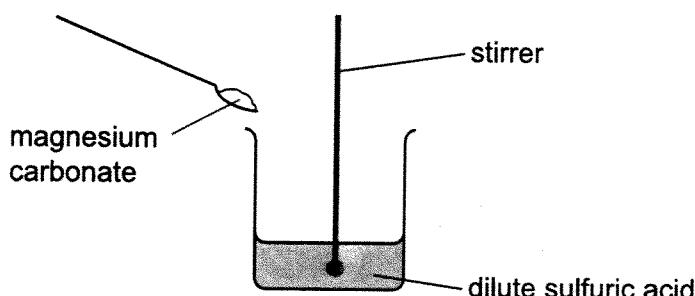
- A 1 and 2 only
- B 1 and 3 only
- C 2 and 3 only
- D 1, 2 and 3

Q130.

[0620/22/O/N/2020/Q24]

A student carries out an experiment to prepare pure magnesium sulfate crystals.

The diagram shows the first stage of the preparation.



He adds magnesium carbonate until no more reacts.

Which process should he use for the next stage?

- A** crystallisation
- B** evaporation
- C** filtration
- D** neutralisation

Q131.

[0620/22/O/N/2020/Q32]

The results of tests on solid S and its aqueous solution are shown.

tests on solid S	tests on aqueous solution of S	
effect of heat	effect of aqueous sodium hydroxide	effect of aqueous ammonia
brown gas given off, together with a gas which relights a glowing splint	white ppt., soluble in excess, giving a colourless solution	white ppt., soluble in excess, giving a colourless solution

What is S?

- A** aluminium nitrate
- B** aluminium sulfate
- C** zinc sulfate
- D** zinc nitrate

Q132.

[0620/23/O/N/2020/Q7]

Magnesium reacts with sulfuric acid.

What are the formulae of the products formed in this reaction?

- A** MgSO_4 and H_2
- B** MgSO_4 and H_2O
- C** $\text{Mg}(\text{SO}_4)_2$ and H_2
- D** $\text{Mg}(\text{SO}_4)_2$ and H_2O

[0620/23/O/N/2020/Q22]

Q133.

An aqueous cation reacts with aqueous sodium hydroxide to form a white precipitate.

The precipitate is insoluble in excess sodium hydroxide.

What is the aqueous cation?

- A aluminium ion
- B calcium ion
- C chromium ion
- D zinc ion

[0620/23/O/N/2020/Q27]

Q134.

A flammable gas needs to be removed from a tank at an industrial plant.

For safety reasons, an inert gas is used.

Which gas is suitable?

- A argon
- B hydrogen
- C methane
- D oxygen

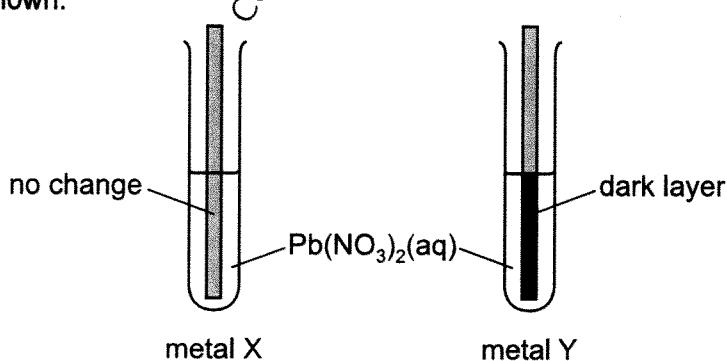
Q135.

[0620/23/O/N/2020/Q28]

An experiment is performed to determine the order of reactivity of metals X and Y compared to lead.

Strips of each metal were added to separate test-tubes containing aqueous lead(II) nitrate, $\text{Pb}(\text{NO}_3)_2$.

The results are shown.



What is the order of reactivity, least reactive first?

- A $\text{Pb} \rightarrow \text{X} \rightarrow \text{Y}$
- B $\text{X} \rightarrow \text{Y} \rightarrow \text{Pb}$
- C $\text{X} \rightarrow \text{Pb} \rightarrow \text{Y}$
- D $\text{Y} \rightarrow \text{Pb} \rightarrow \text{X}$

[0620/12/M/J/13/Q23]

Q1. Platinum is a transition metal.

Which statement about platinum is correct?

- A** It does not catalyse reactions.
 - B** It forms coloured compounds.
 - C** It has a low density.
 - D** It has a low melting point.

[0620/12/M/J/13/Q24]

Q2. Which element will be less reactive than the other members of its group in the Periodic Table?

- A** astatine
 - B** caesium
 - C** fluorine
 - D** rubidium

[0620/12/M/J/13/Q25]

Q3. Bromine is in Group VII on the Periodic Table.

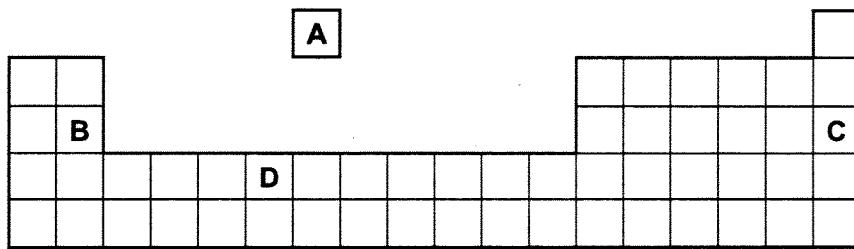
Which describes the appearance of bromine at room temperature?

- A** grey solid
 - B** purple fumes
 - C** red-brown liquid
 - D** yellow gas

[0620/11/M/J/13/Q5]

Q4. The positions of four elements are shown on the outline of the Periodic Table.

Which element forms a coloured oxide?



[0620/11/M/J/13/Q22]

Q5. Which property of elements increases across a period of the Periodic Table?

- A metallic character
- B number of electron shells
- C number of outer shell electrons
- D tendency to form positive ions

[0620/11/M/J/13/Q23]

Q6. Which element is a transition metal?

	colour of chloride	melting point of element / °C
A	white	113
B	white	1495
C	yellow	113
D	yellow	1495

[0620/11/M/J/13/Q24]

Q7. Fluorine is at the top of Group VII in the Periodic Table.

Which row shows the properties of fluorine?

	colour	state at room temperature	reaction with aqueous potassium iodide
A	brown	gas	no reaction
B	brown	liquid	iodine displaced
C	yellow	gas	iodine displaced
D	yellow	liquid	no reaction

[0620/11/M/J/13/Q25]

Q8. Group I metals are also known as the Alkali Metals.Which statement about the metals in Group I is **not** correct?

- A In their reactions they lose electrons.
- B Their atoms all have one electron in their outer shell.
- C They form +1 ions in their reactions with non-metals.
- D They form covalent compounds by sharing electrons.

[0620/13/O/N/13/Q21]

Q9. Calcium, on the left of Period 4 of the Periodic Table, is more metallic than bromine on the right of this period.

Why is this?

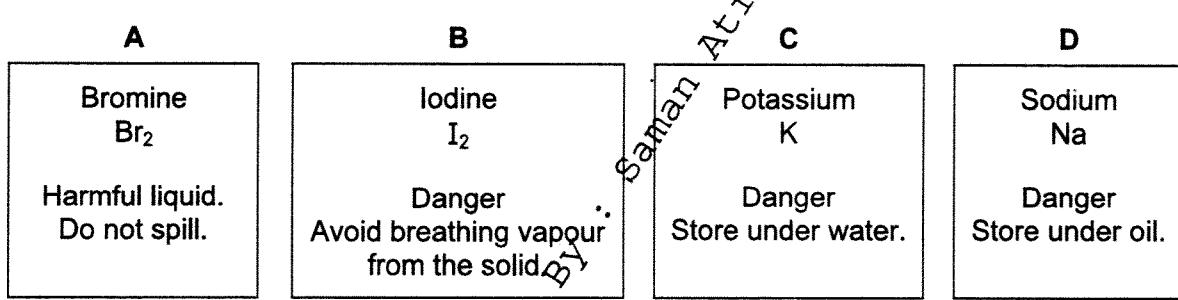
Calcium has

- A fewer electrons.
 - B fewer protons.
 - C fewer full shells of electrons.
 - D fewer outer shell electrons.

[0620/13/O/N/13/Q22]

Q10. The diagrams show the labels of four bottles.

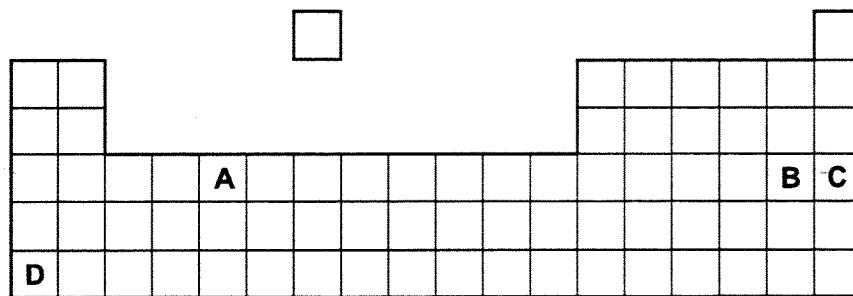
Which label is **not** correct?



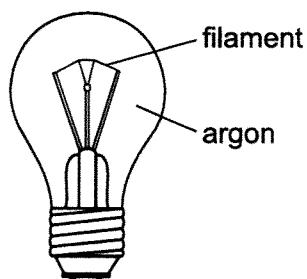
[0620/13/O/N/13/Q23]

Q11. An element has a melting point of 1084°C and a density of 8.93 g/cm^3 . Its oxide can be used as a catalyst.

In which position in the Periodic Table is the element found?



[0620/13/O/N/13/Q24]

Q12. The diagram shows a light bulb.

Why is argon used instead of air in the light bulb?

- A** Argon is a good conductor of electricity.
- B** Argon is more reactive than air.
- C** The filament glows more brightly.
- D** The filament does not react with the argon.

Q13. Element X is a non-metal.

[0620/12/M/J/14/Q21]

In which position of the Periodic Table could element X be found?

- A** at the bottom of Group I
- B** at the top of Group 0
- C** at the top of Group I
- D** in the transition elements

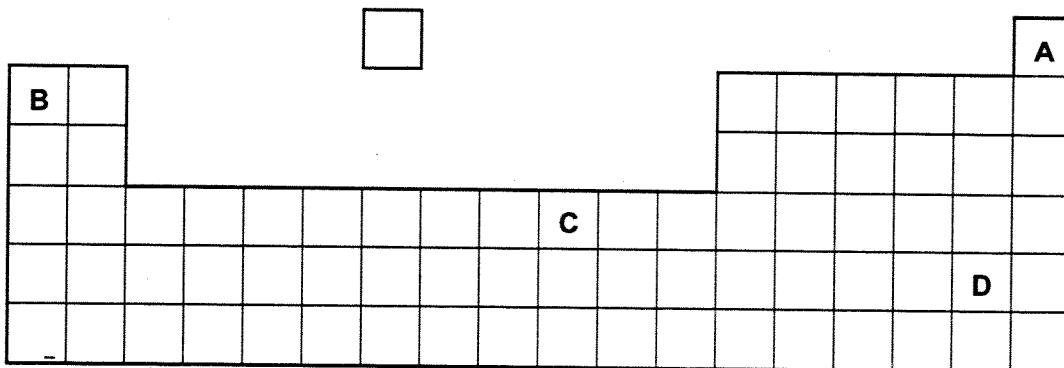
Q14. Why is argon gas used to fill electric lamps?

[0620/11/M/J/14/Q24]

- A** It conducts electricity.
- B** It glows when heated.
- C** It is less dense than air.
- D** It is not reactive.

Q15. An element melts at 1455 °C, has a density of 8.90 g/cm³ and forms a green chloride.

Where in the Periodic Table is this element found?



Q16. Which statement about the Periodic Table is correct?

- A** Elements in the same period have the same number of outer electrons.

B The elements on the left are usually gases.

C The most metallic elements are on the left.

D The relative atomic mass of the elements increases from right to left.

Q17. Which statement about the elements of Group I is correct?

- A Lithium is more dense than sodium.
 - B Potassium has a higher density than lithium.
 - C Potassium is less reactive than sodium.
 - D Sodium has a higher melting point than lithium.

Q18. Which information about an element can be used to predict its chemical properties?

- A** boiling point
 - B** density
 - C** melting point
 - D** position in the Periodic Table

[0620/11/O/N/14/Q24]

Q19. An element X has the two properties listed.

- 1 It acts as a catalyst.
- 2 It forms colourless ions.

Which of these properties suggest that X is a transition element?

	property 1	property 2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

[0620/11/O/N/14/Q25]

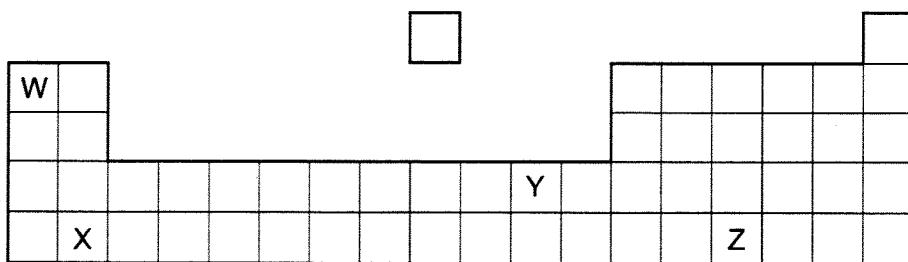
Q20. An inert gas X is used to fill weather balloons.

Which descriptions of X are correct?

	number of outer electrons in atoms of X	structure of gas X
A	2	single atoms
B	2	diatomic molecules
C	8	single atoms
D	8	diatomic molecules

[0620/11/O/N/14/Q20]

Q21. The positions of elements W, X, Y and Z in the Periodic Table are shown.



Which elements form basic oxides?

- A W, X and Y B W and X only C Y only D Z only

[0620/12/O/N/14/Q22]

Q22.

Elements in Group I of the Periodic Table react with water.

Which row describes the products made in the reaction and the trend in reactivity of the elements?

	products	trend in reactivity
A	metal hydroxide and hydrogen	less reactive down the group
B	metal hydroxide and hydrogen	more reactive down the group
C	metal oxide and hydrogen	less reactive down the group
D	metal oxide and hydrogen	more reactive down the group

Q23.

[0620/13/M/J/15/Q19]

The noble gases, which are in Group 0 of the Periodic Table, are all very 1..... .

..... 2....., one of these gases, is used to provide an inert atmosphere in lamps.

Another, 3....., is used for filling balloons because it's less dense than air.

Which words complete the sentences about noble gases?

	1	2	3
A	reactive	argon	helium
B	reactive	helium	argon
C	unreactive	argon	helium
D	unreactive	helium	argon

Q24.

[0620/11/M/J/15/Q20]

Which properties of the element titanium, Ti, can be predicted from its position in the Periodic Table?

	can be used as a catalyst	conducts electricity when solid	has low density	forms coloured compounds
A	✓	✓	✓	✗
B	✓	✓	✗	✓
C	✓	✗	✓	✓
D	✗	✓	✓	✓

[0620/13/M/J/15/Q21]

Q25. X is a Group I metal.

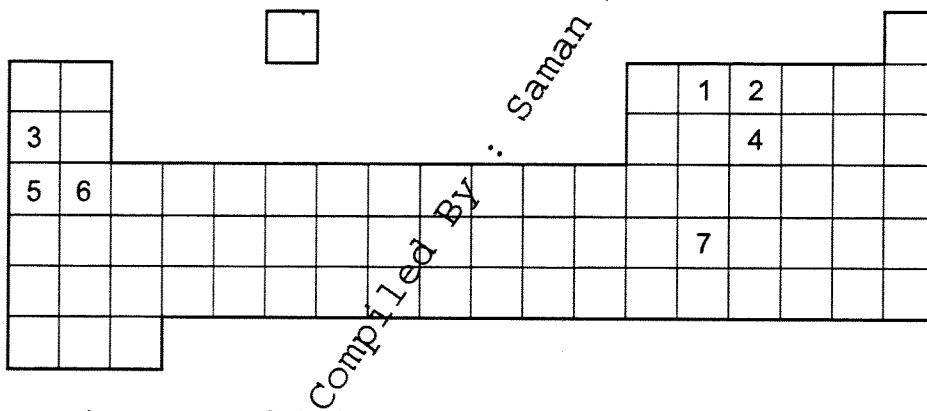
Y and Z are Group VII elements.

When X reacts with Y a salt is formed. A solution of this salt reacts with Z to form a different salt.

What are X, Y and Z?

	X	Y	Z
A	K	Cl_2	I_2
B	Li	Cl_2	Br_2
C	Mg	Br_2	Cl_2
D	Na	I_2	Cl_2

[0620/11/M/J/15/Q22]

Q26. In the outline of the Periodic Table below, some elements are shown as numbers.

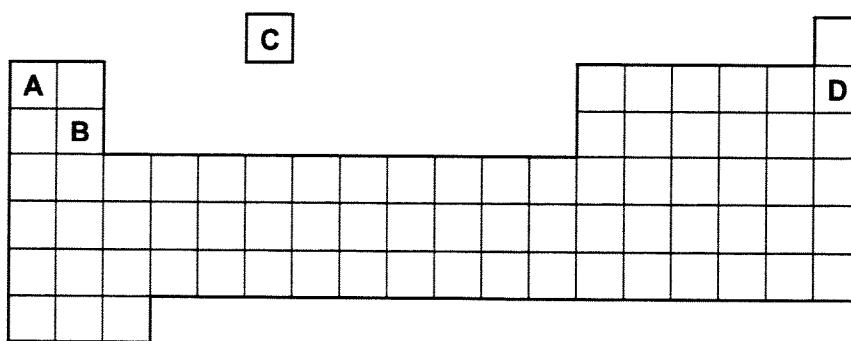
Which two numbers are metals in the same period?

- A** 1 and 2 **B** 1 and 7 **C** 3 and 5 **D** 5 and 6

[0620/12/M/J/15/Q19]

Q27. The positions of four elements in the Periodic Table are shown.

Which element does not form a compound with chlorine?



Q28. The table shows some properties of the Group I metals.

metal	melting point / °C	hardness	reaction with water
lithium	181	moderately soft	steady effervescence
sodium	98	soft	vigorous effervescence
potassium	63	very soft	very vigorous effervescence
rubidium	?	?	?

What are the properties of rubidium?

- A melts below 63 °C, very soft, reacts explosively with water
- B melts below 63 °C, very soft, reacts slowly with water
- C melts above 181 °C, very soft, reacts explosively with water
- D melts above 181 °C, very soft, reacts slowly with water

[0620/11/M/J/15/Q19]

Q29. Which element is in the same group of the Periodic Table as lithium?

	electrical conductivity	density in g/cm ³
A	high	0.97
B	high	8.93
C	low	0.07
D	low	3.12

[0620/11/M/J/15/Q21]

Q30. The following statements are about elements in the Periodic Table.

- 1 Their atoms have a full outer shell of electrons.
- 2 They form basic oxides.
- 3 They are found in Group 0.
- 4 They are present in small quantities in the air.

Which statements are correct for the noble gases?

- A 1, 2 and 3
- B 1, 2 and 4
- C 1, 3 and 4
- D 2, 3 and 4

[0620/13/O/N/15/Q19]

Q31. An element, X, is a dark grey crystalline solid at room temperature.

It has a melting point of 114 °C and a density of 4.9 g/cm³.

When heated gently it forms a purple vapour.

Where in the Periodic Table is X found?

[0620/13/O/N/15/Q20]

Q32. J and K are two elements from the same period in the Periodic Table.

The table gives some properties of J and K.

		J	K
appearance	Saman Atiq	shiny grey	dull yellow
electrical conductivity when solid	J	good	poor
malleability	BY	malleable	brittle

Which statement about J and K is correct?

- A J forms an acidic oxide.
- B J is found to the left of K in the Periodic Table.
- C K forms positive ions when it reacts.
- D K is more metallic than J.

[0620/11/O/N/15/Q21]

Q33. The table gives information about four elements.

Which element is a transition metal?

	electrical conductivity	density in g/cm ³	melting point in °C
A	good	0.97	98
B	good	7.86	1535
C	poor	2.33	1410
D	poor	3.12	-7

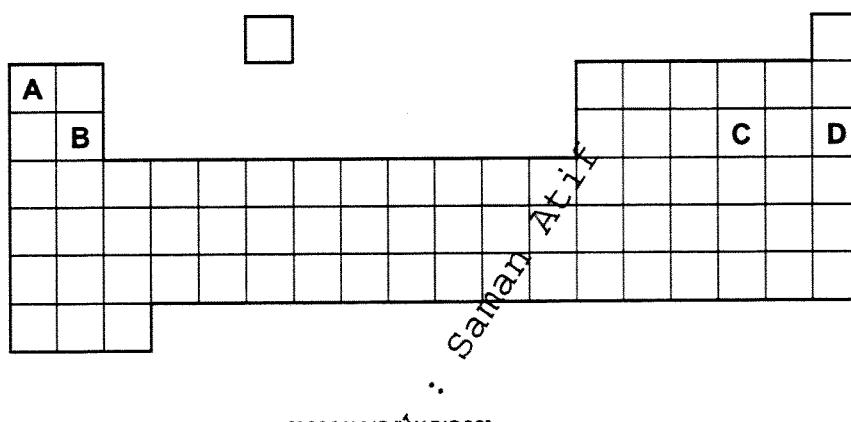
[0620/13/O/N/15/Q22]

Q34. Hydrogen and helium have both been used to fill balloons.

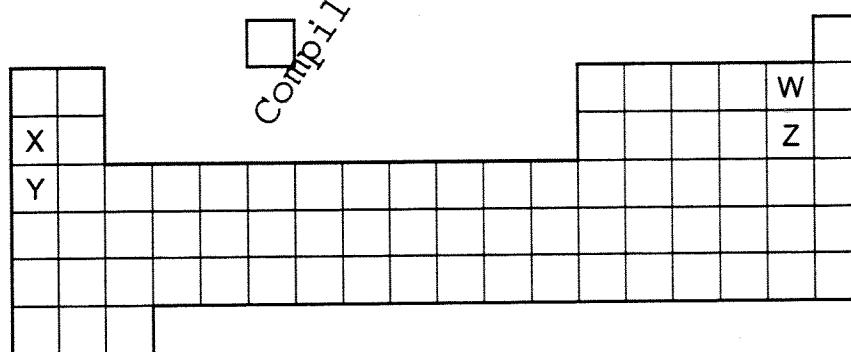
Which property of helium makes it the preferred choice to hydrogen?

- A easily compressed into a gas cylinder
- B forms monatomic molecules
- C lower density
- D unreactive

[0620/12/O/N/15/Q16]

Q35. Which element forms an acidic oxide?

[0620/12/O/N/15/Q22]

Q36. The diagram shows elements W, X, Y and Z in a section of the Periodic Table.

Which statement about the reactivity of the elements is correct?

- A X is more reactive than Y, and W is more reactive than Z.
- B X is more reactive than Y, and Z is more reactive than W.
- C Y is more reactive than X, and W is more reactive than Z.
- D Y is more reactive than X, and Z is more reactive than W.

[0620/11/O/N/15/Q19]

Q37. Which statements about Group I and Group VII elements are correct?

- 1 In Group I, lithium is more reactive than potassium.
- 2 In Group VII, chlorine is more reactive than fluorine.

	statement 1	statement 2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

[0620/11/O/N/15/Q20]

Q38. The Periodic Table lists all the known elements.

Elements are arranged in order of 1 number.

The melting points of Group I elements 2 down the group.

The melting points of Group VII elements 3 down the group.

Which words correctly complete the gaps 1, 2 and 3?

	1	2	3
A	nucleon	decrease	increase
B	nucleon	increase	decrease
C	proton	decrease	increase
D	proton	increase	decrease

[0620/11/O/N/15/Q22]

Q39. The Group 0 elements are unreactive.

The gas used to fill balloons is X..... .

This gas is unreactive because it has Y..... electrons in its outermost shell.

Which words correctly complete gaps X and Y?

	X	Y
A	argon	eight
B	argon	two
C	helium	eight
D	helium	two

[0620/21/M/J/16/Q21]

Q40. Where in the Periodic Table is the metallic character of the elements greatest?

	left or right side of a period	at the top or bottom of a group
A	left	bottom
B	left	top
C	right	bottom
D	right	top

[0620/23/M/J/16/Q22]

Q41. Which statement about the elements in Group I is correct?

- A Hydrogen is evolved when they react with water.
- B Ions of Group I elements have a -1 charge.
- C Sodium is more reactive than potassium.
- D Solid sodium is a poor electrical conductor.

[0620/23/M/J/16/Q23]

Q42. Osmium is a transition element.

Which row gives the expected properties of osmium?

	melting point	density	compounds formed
A	high	high	coloured
B	high	high	white
C	high	low	white
D	low	high	coloured

[0620/21/M/J/16/Q24]

Q43. Two statements about noble gases are given.

- 1 Noble gases are reactive, monatomic gases.
- 2 Noble gases all have full outer shells of electrons.

Which is correct?

- A Both statements are correct and statement 2 explains statement 1.
- B Both statements are correct but statement 2 does not explain statement 1.
- C Statement 1 is correct but statement 2 is incorrect.
- D Statement 2 is correct but statement 1 is incorrect.

[0620/22/M/J/16/Q22]

Q44. Rubidium is a Group I metal.Which statement about rubidium is **not** correct?

- A It has a higher melting point than lithium.
- B It has one electron in its outer shell.
- C It reacts vigorously with water.
- D It reacts with chlorine to form rubidium chloride, RbCl.

[0620/22/M/J/16/Q23]

Q45. The table gives information about four elements, P, Q, R and S.

	melting point in °C	electrical conductivity of element when solid	density in g/cm ³	colour of iodide of element
P	98	good	0.97	white
Q	-39	good	13.53	red
R	1410	poor	2.33	colourless
S	1535	good	7.87	green

Which elements could be transition elements?

- Compiled By Saman Atif*
- A P, Q and S
 - B Q and S only
 - C R and S only
 - D S only

[0620/22/M/J/16/Q24]

Q46. Part of the Periodic Table is shown.Which element is a gas that does **not** form a compound with potassium?

[0620/21/M/J/16/Q22]

Q47. Some properties of four elements, P, Q, R and S, are shown in the table.

Two of these elements are in Group I of the Periodic Table and two are in Group VII.

element	reaction with water	physical state at room temperature
P	reacts vigorously	solid
Q	does not react with water	solid
R	reacts explosively	solid
S	dissolves giving a coloured solution	liquid

Which statement is correct?

- A P is below R in Group I.
- B Q is above R in Group I.
- C Q is below S in Group VII.
- D R is below S in Group VII.

[0620/21/M/J/16/Q22]

Q48. Which of the following could be a transition element?

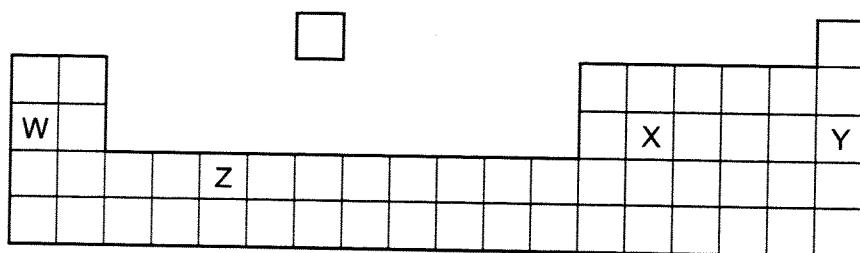
	melting point in °C	density in g/cm ³	colour	electrical conductor
A	114	4.9	purple	no
B	659	2.7	grey	yes
C	1677	4.5	grey	yes
D	3727	2.3	black	yes

[0620/21/O/N/16/Q22]

Q49. What is **not** a property of Group I metals?

- A They are soft and can be cut with a knife.
- B They react when exposed to oxygen in the air.
- C They produce an acidic solution when they react with water.
- D They react rapidly with water producing hydrogen gas.

[0620/23/O/N/16/Q24]

Q50. Part of the Periodic Table is shown.

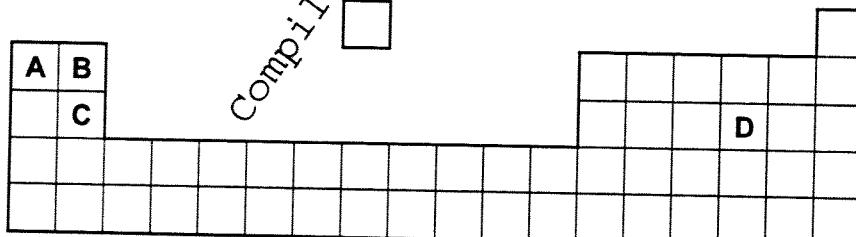
Which row correctly describes the properties of elements W, X, Y and Z?

	has variable oxidation states	reacts with cold water	very unreactive	has four outer shell electrons
A	W	Y	Z	X
B	X	W	Y	Z
C	Z	W	Z	X
D	Z	Y		W

[0620/22/O/N/16/Q24]

Q51. Part of the Periodic Table is shown.

Which element has two electrons in its outer shell and three electron shells?



[0620/21/O/N/16/Q24]

Q52. Which statement about transition elements and their compounds is correct?

- A All the transition elements have an oxidation state of +2 only.
- B Aqueous solutions of the salts of transition elements are generally coloured.
- C Transition elements change from metal to non-metal across the period.
- D Transition elements can act as catalysts but their compounds cannot.

[0620/21/M/J/17/Q22]

Q53. Which element is less reactive than the other members of its group in the Periodic Table?

- A astatine
- B caesium
- C fluorine
- D rubidium

[0620/21/M/J/17/Q23]

Q54. The elements in Group IV of the Periodic Table are shown.

carbon
silicon
germanium
tin
lead
flerovium

What does not occur in Group IV as it is descended?

- A The proton number of the elements increases.
- B The elements become more metallic.
- C The elements have more electrons in their outer shells.
- D The elements have more electron shells.

[0620/21/M/J/17/Q24]

Q55. Why are weather balloons sometimes filled with helium rather than hydrogen?

- A Helium is found in air.
- B Helium is less dense than hydrogen.
- C Helium is more dense than hydrogen.
- D Helium is unreactive.

[0620/22/M/J/17/Q22]

Q56. Which element is less reactive than the other members of its group in the Periodic Table?

- A astatine
- B caesium
- C fluorine
- D rubidium

[0620/22/M/J/17/Q23]

Q57. The elements oxygen and sulfur are in the same group of the Periodic Table.

Which statement about oxygen and sulfur is not correct?

- A They are non-metals.
- B They have giant covalent structures.
- C They have six electrons in their outer shells.
- D They react together to form an acidic oxide.

[0620/22/M/J/17/Q24]

Q58. Why are weather balloons sometimes filled with helium rather than hydrogen?

- A Helium is found in air.
- B Helium is less dense than hydrogen.
- C Helium is more dense than hydrogen.
- D Helium is unreactive.

[0620/22/M/J/17/Q25]

Q59. Which process is involved in the extraction of zinc from zinc blende?

- A Cryolite is added to lower the melting point of zinc blende.
- B Molten zinc blende is electrolysed.
- C Zinc blende is heated with carbon.
- D Zinc blende is roasted in air.

[0620/23/M/J/17/22]

Q60.

Which element is less reactive than the other members of its group in the Periodic Table?

- A astatine
- B caesium
- C fluorine
- D rubidium

[0620/23/M/J/17/23]

Q61.

Ununseptium (atomic number 117) is a man-made element that is below astatine in Group VII of the Periodic Table.

What is the expected state of ununseptium at room temperature?

- A a diatomic gas
- B a liquid
- C a monatomic gas
- D a solid

[0620/23/M/J/17/24]

Q62.

Why are weather balloons sometimes filled with helium rather than hydrogen?

- A Helium is found in air.
- B Helium is less dense than hydrogen.
- C Helium is more dense than hydrogen.
- D Helium is unreactive.

[0620/21/O/N/17/Q21]

Q63.

Which statements about the trends across a period of the Periodic Table are correct?

- 1 Aluminium is more metallic than sodium.
- 2 Beryllium is more metallic than carbon.
- 3 Boron is more metallic than lithium.
- 4 Magnesium is more metallic than silicon.

- A 1 and 2
- B 1 and 3
- C 2 and 4
- D 3 and 4

[0620/21/O/N/17/22]

Q64. Astatine is an element in Group VII of the Periodic Table.

Astatine is1..... reactive than iodine.

The melting point of astatine is2..... than the melting point of iodine.

Astatine is3..... in colour than bromine.

Which words complete gaps 1, 2 and 3?

	1	2	3
A	less	higher	darker
B	less	lower	lighter
C	more	higher	darker
D	more	lower	lighter

[0620/21/O/N/17/23]

Q65. Which row describes the properties of a typical transition element?

	melting point	forms coloured compounds	can act as a catalyst
A	high	no	no
B	high	yes	yes
C	low	no	yes
D	low	yes	no

[0620/21/O/N/17/24]

Compiled BY Atif

Q66. Why is argon gas used to fill electric lamps?

- A It conducts electricity.
- B It glows when heated.
- C It is less dense than air.
- D It is not reactive.

[0620/22/O/N/17/Q21]

Q67. Which statement about nitrogen and phosphorus is not correct?

- A Both are in the same group of the Periodic Table.
- B Both are in the same period of the Periodic Table.
- C Both are non-metals.
- D Both have the same number of electrons in their outer shell.

[0620/22/O/N/17/Q22]

Q68. Sodium and rubidium are elements in Group I of the Periodic Table.

Which statement is correct?

- A Sodium atoms have more electrons than rubidium atoms.
- B Sodium has a lower density than rubidium.
- C Sodium has a lower melting point than rubidium.
- D Sodium is more reactive than rubidium.

[0620/22/O/N/17/Q23]

Q69. Which properties do the elements chromium, iron and vanadium have in common?

- 1 They all conduct electricity.
- 2 They, or their compounds, can act as catalysts.
- 3 They all form coloured compounds.

- Sayeed Atif*
Copy by
- A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

[0620/23/O/N/17/Q21]

Q70. A period of the Periodic Table is shown.

group	I	II	III	IV	V	VI	VII	VIII
element	R	S	T	V	W	X	Y	Z

The letters are not their chemical symbols.

Which statement is correct?

- A Element R does not conduct electricity.
- B Elements R and Y react together to form an ionic compound.
- C Element Z exists as a diatomic molecule.
- D Element Z reacts with element T.

[0620/23/O/N/17/Q22]

Q71. Some properties of element X are shown.

melting point in °C	98
boiling point in °C	883
reaction with cold water	gives off H ₂ gas
reaction when heated with oxygen	burns to give a white solid

In which part of the Periodic Table is X found?

- A Group I
- B Group VII
- C Group VIII
- D transition elements

[0620/23/O/N/17/Q23]

Q72. The table gives some properties of an element.

melting point in °C	3422
appearance of the element	grey
appearance of the chloride of the element	dark blue
density in g/cm ³	19.2
electrical conductivity when solid	good

Which other property would you expect this element to have?

- A acts as a catalyst
- B brittle
- C forms an acidic oxide
- D highly reactive with water

[0620/23/O/N/17/Q24]

Q73. Why is argon gas used to fill electric lamps?

- A It conducts electricity.
- B It glows when heated.
- C It is less dense than air.
- D It is not reactive.

[0620/21/M/J/18/Q21]

Q74. Which element is in the same period of the Periodic Table as silicon?

- A germanium
- B scandium
- C sodium
- D strontium

[0620/21/M/J/18/Q22]

Q75. Which statement about the halogens is correct?

- A A sample of bromine reacts with potassium chloride solution.
- B A sample of bromine reacts with potassium iodide solution.
- C A sample of chlorine has a higher density than a sample of bromine.
- D A sample of chlorine is a darker colour than a sample of bromine.

[0620/21/M/J/18/Q23]

Q76. Which row shows the catalytic activity of transition elements and their compounds?

	catalytic activity of transition elements	catalytic activity of compounds of transition elements
A	good	good
B	good	poor
C	poor	good
D	poor	poor

[0620/22/M/J/18/Q21]

Q77. Which statement about the Periodic Table is correct?

- A Elements in the same group have the same number of electron shells.
- B It contains elements arranged in order of increasing proton number.
- C Metals are on the right and non-metals are on the left.
- D The most reactive elements are at the bottom of every group.

[0620/22/M/J/18/Q22]

Q78. Chlorine, bromine and iodine are elements in Group VII of the Periodic Table.

Which statement about these elements is not correct?

- A The colour gets darker down the group.
- B The density increases down the group.
- C They are all gases at room temperature and pressure.
- D They are all non-metals.

[0620/22/M/J/18/Q23]

Q79. Which row describes the properties of a transition element?

	property 1	property 2
A	forms colourless compounds	acts as a catalyst
B	forms colourless compounds	low electrical conductivity
C	high density	acts as a catalyst
D	high density	low electrical conductivity

[0620/23/M/J/18/Q21]

Q80. Which element is classified as a non-metal in the Periodic Table?

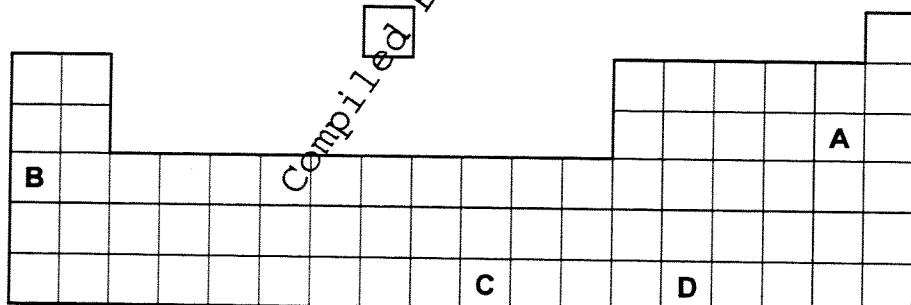
- A calcium
 - B chlorine
 - C chromium
 - D copper

[0620/23/M/J/18/Q22]

Q81. Part of the Periodic Table is shown.

Element Q has a low boiling point, low density and does not conduct electricity.

Which element is Q?



[0620/23/M/J/18/Q23]

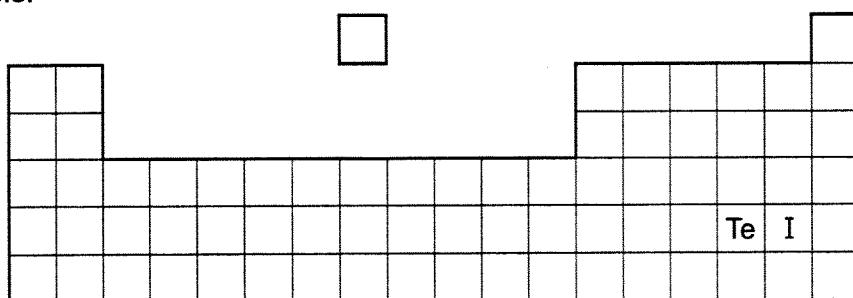
Q82. Which row describes a typical transition element?

	density in g/cm ³	melting point in °C	boiling point in °C	colour of oxide
A	0.97	98	883	white
B	2.64	769	1382	white
C	3.10	-7	59	yellow
D	8.96	1085	2562	red

[0620/21/O/N/2018/Q3]

Q83.

Iodine, I, has a lower relative atomic mass than tellurium, Te, but is placed after it in the Periodic Table.



Which statement explains why iodine is placed after tellurium in the Periodic Table?

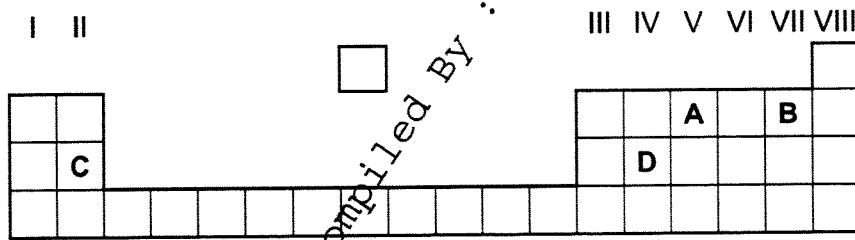
- A Iodine has fewer neutrons than tellurium.
- B Iodine has fewer protons than tellurium.
- C Iodine has more neutrons than tellurium.
- D Iodine has more protons than tellurium.

[0620/21/O/N/2018/Q17]

Q84.

Part of the Periodic Table is shown.

Which element forms an oxide that reacts with dilute acid to form a salt and water?



[0620/22/O/N/2018/Q21]

Q85.

Elements in Group I of the Periodic Table react with water.

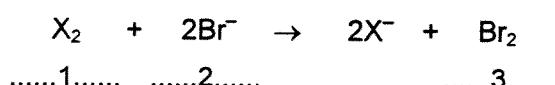
Which row describes the products made in the reaction and the trend in reactivity of the elements?

	products	trend in reactivity
A	metal hydroxide and hydrogen	less reactive down the group
B	metal hydroxide and hydrogen	more reactive down the group
C	metal oxide and hydrogen	less reactive down the group
D	metal oxide and hydrogen	more reactive down the group

Q86.

[0620/22/O/N/2018/Q22]

The equation shows the reaction between a halogen and aqueous bromide ions



Which words complete gaps 1, 2 and 3?

	1	2	3
A	chlorine	brown	colourless
B	chlorine	colourless	brown
C	iodine	brown	colourless
D	iodine	colourless	brown

[0620/22/O/N/2018/Q23]

Q87.

An inert gas R is used to fill weather balloons.

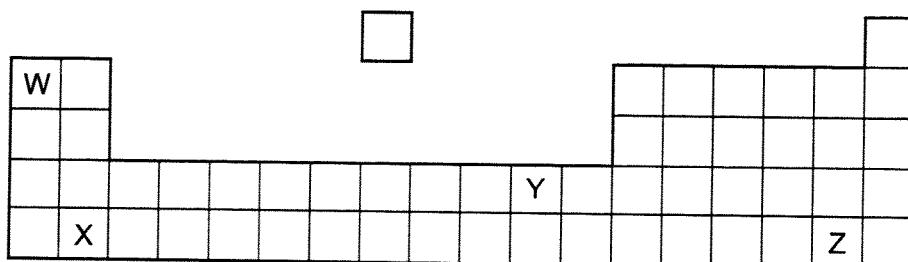
Which descriptions of R are correct?

	number of outer shell electrons in atoms of R	structure of gas R
A	2	diatomic molecules
B	2	single atoms
C	8	diatomic molecules
D	8	single atoms

Q88.

Q620/22/M/J/2019/Q18]

The positions of elements W, X, Y and Z in the Periodic Table are shown.



Which elements form basic oxides?

- A** W, X and Y **B** W and X only **C** Y only **D** Z only

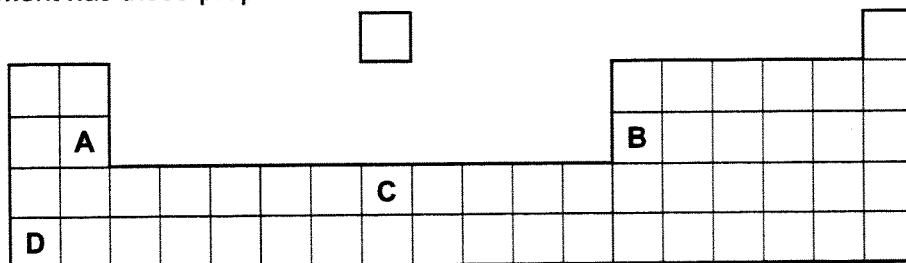
[0620/21/M/J/2019/Q20]

Q89.

The properties of an element are shown.

electrical conductivity	density	reaction with water
high	low	reacts violently with cold water

Which element has these properties?



[0620/21/M/J/2019/Q21]

Q90.

Which statement about elements in Group I and Group VII of the Periodic Table is correct?

- A Bromine reacts with potassium chloride to produce chlorine.
- B Iodine is a monatomic non-metal.
- C Lithium has a higher melting point than potassium.
- D Sodium is more reactive with water than potassium.

[0620/21/M/J/2019/Q22]

Q91.

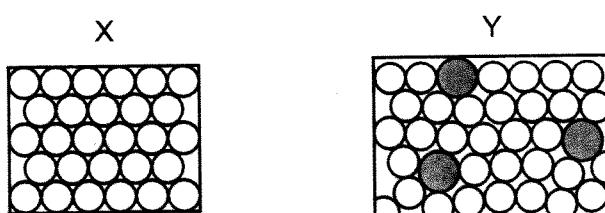
Which statement about elements in Group VIII of the Periodic Table is correct?

- A They all have a full outer shell of electrons.
- B They all react with Group I elements to form ionic compounds.
- C They are all diatomic molecules.
- D They are all liquids at room temperature.

Q92.

[0620/21/M/J/2019/Q23]

The diagrams show the structure of two substances used to make electrical conductors.



Which statement correctly describes X and Y?

- A X is a pure metal and Y is a compound.
- B X is a pure metal and Y is an alloy.
- C X is a solid and Y is a liquid.
- D X is harder and stronger than Y.

Q93

Part of the Periodic Table is shown

[0620/22/M/J/2019/Q201]

Which row describes the properties of X, Y and Z?

	good conductor of electricity	high melting point
A	X	Z
B	Y	Z and X
C	Y and Z	Z
D	Z and X	X

Q94.

[0620/22/M/J/2019/0]

The melting points and boiling points of the elements of Group I of the Periodic Table are shown.

element	melting point /°C	boiling point /°C
lithium	181	1330
sodium	98	883
potassium	63	759
rubidium	39	688
caesium	28	671

Which pair of elements are liquid at 800 °C?

- A caesium and rubidium
 - B potassium and sodium
 - C lithium and sodium
 - D potassium and caesium

[0620/23/M/J/2019/Q20]

Q95.

Part of the Periodic Table is shown.

Which row describes W, X, Y and Z?

	metal	non-metal
A	X	W, Y and Z
B	X and Y	W and Z
C	W and Z	X and Y
D	W, Y and Z	X

[0620/21/O/N/2019/Q23]

Q96.

Part of the Periodic Table is shown.

Which element is used to provide an inert atmosphere?

[0620/22/O/N/2019/Q24]

Q97.

Which pair of elements reacts together most violently?

- A chlorine and lithium
 - B chlorine and potassium
 - C iodine and lithium
 - D iodine and potassium

Q98.

[0620/21/O/N/2019/Q25]

- Which pair of compounds shows that transition elements have variable oxidation states?
- A Cr₂O₃ and CrBr₃
 - B CuSO₄ and CuCl₂
 - C Fe₂O₃ and FeCl₂
 - D NiO and NiCl₂

Q99.

[0620/22/O/N/2019/Q26]

Some properties of substance X are listed.

- It conducts electricity when molten.
- It has a high melting point.
- It burns in oxygen and the oxide dissolves in water to give a solution with pH 11.

What is X?

- A a covalent compound
- B a macromolecule
- C a metal
- D an ionic compound

Q100.

[0620/22/O/N/2019/Q23]

Helium is a noble gas.

Which statement about helium is correct?

- A It has eight electrons in its outer shell
- B It is a diatomic gas.
- C It is reactive.
- D It is used for filling balloons.

Q101.

[0620/22/O/N/2019/Q25]

Iron(II) ions can be oxidised to iron(III) ions by hydrogen peroxide.

Which statement explains why iron is a transition element?

- A Iron is a transition element because it can be oxidised.
- B Iron is a transition element because it has variable oxidation states.
- C Iron is a transition element because it takes part in redox reactions.
- D Iron is a transition element because it reacts with chlorine.

[0620/23/O/N/2019/Q23]

Q102.

Which statement describes a gas which is in Group VIII of the Periodic Table?

- A A colourless gas that helps substances burn.
- B A pollutant gas present in car exhausts.
- C A gas that is less dense than air and makes a 'pop' sound with a lighted splint.
- D A gas that is used in lamps.

[0620/23/O/N/2019/Q25]

Q103.

Iron reacts with dilute hydrochloric acid to form iron(II) chloride, FeCl_2 . Iron reacts with chlorine to form iron(III) chloride, FeCl_3 .

Which property of transition elements is shown by this information?

- A Transition elements have high melting points.
- B Transition elements can act as catalysts.
- C Transition elements have variable oxidation states.
- D Transition elements have coloured compounds.

Atif
Sajid
B
C
D

[0620/23/O/N/2019/Q27]

Q104.

Which statement about metals and their uses is correct?

- A Aluminium is used in the manufacture of aircraft because it has a high density.
- B Copper is used to make cooking utensils because it is a poor conductor of heat.
- C Mild steel is used to make car bodies because it is brittle and breaks easily.
- D Stainless steel is used to make cutlery because it is resistant to corrosion.

[0620/21/M/J/2020/Q22]

Q105.

A Group I metal (lithium, sodium or potassium) is reacted with a Group VII element (chlorine, bromine or iodine).

Which compound is formed when the Group I metal of highest density reacts with the Group VII element of lowest density?

- A lithium chloride
- B potassium chloride
- C potassium iodide
- D lithium iodide

Q106.

[0620/22/M/J/2020/Q23]

The properties of the element titanium, Ti, can be predicted from its position in the Periodic Table.

Which row identifies the properties of titanium?

	can be used as a catalyst	conducts electricity when solid	has low density	forms coloured compounds
A	✓	✓	✓	✗
B	✓	✓	✗	✓
C	✓	✗	✓	✓
D	✗	✓	✓	✓

Q107.

[0620/21/M/J/2020/Q24]

A balloon is filled with helium. Helium is a noble gas and makes the balloon rise up in the air.

The density of air is 1.23 g/dm³.

Which gas is helium?

	density in g/dm ³	reaction with oxygen
A	0.0899	burns rapidly
B	0.179	does not react with oxygen
C	1.78	does not react with oxygen
D	3.75	does not react with oxygen

Q108.

[0620/22/M/J/2020/Q22]

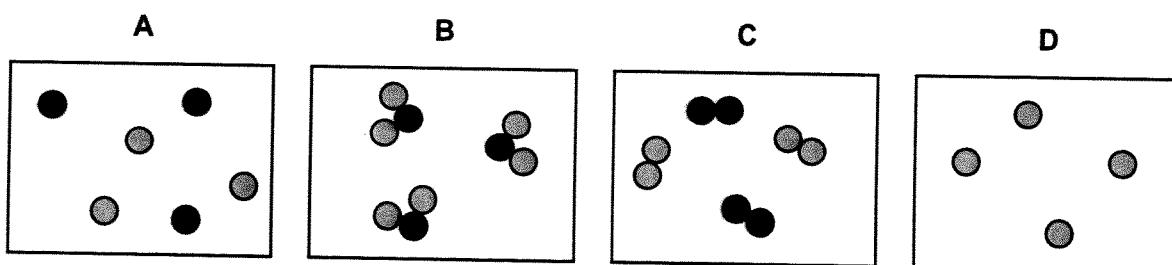
Which statement about Group I and Group VII elements is correct?

- A Group VII elements are monoatomic non-metals.
- B Lithium is more reactive with water than caesium.
- C The melting points of Group I metals increase down the group.
- D Potassium bromide reacts with chlorine to produce an orange solution.

Q109.

[0620/22/M/J/2020/Q24]

Which diagram shows a mixture of noble gases?



[0620/23/M/J/2020/Q22]

Q110.

The elements in Group I include lithium, sodium and potassium.

Which statements about these elements are correct?

- 1 Sodium is denser than lithium.
- 2 Lithium has a lower melting point than potassium.
- 3 Potassium is a relatively soft metal.
- 4 Sodium is less reactive than lithium but more reactive than potassium.

A 1 and 2 B 1 and 3 C 2 and 4 D 3 and 4

[0620/23/M/J/2020/Q24]

Q111.

Which statement about the noble gases is correct?

- A Argon is used in light bulbs and balloons.
- B Helium reacts with oxygen in the air.
- C They all have full outer electron shells.
- D They are all diatomic molecules.

[0620/21/O/N/2020/Q9]

Q112.

Rubidium is in Group I of the Periodic Table and bromine is in Group VII.

Rubidium reacts with bromine to form an ionic compound.

Which row shows the electron change taking place for rubidium and the correct formula of the rubidium ion?

	electron change	formula of ion formed
A	electron gained	<i>Compound</i> Rb^+
B	electron gained	Rb^-
C	electron lost	Rb^+
D	electron lost	Rb^-

[0620/21/O/N/2020/Q25]

Q113.

Elements P and Q have the same number of electron shells.

Q has more electrons in its outer shell than P.

Which statements are correct?

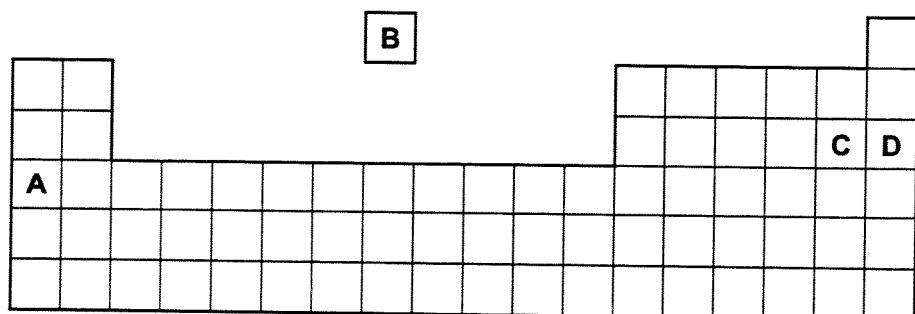
- 1 P and Q are in the same group of the Periodic Table.
- 2 P and Q are in the same period of the Periodic Table.
- 3 P has a greater tendency to form positive ions than Q.
- 4 The oxides of Q are more basic than those of P.

A 1 and 3 B 1 and 4 C 2 and 3 D 2 and 4

Q114.

[0620/21/O/N/2020/Q26]

The positions of four elements in the Periodic Table are shown.
 Which element is a gas that displaces iodine from sodium iodide?

**Q115.**

[0620/22/O/N/2020/Q27]

A flammable gas needs to be removed from a tank at an industrial plant.

For safety reasons, an inert gas is used.

Which gas is suitable?

- A** argon
- B** hydrogen
- C** methane
- D** oxygen

Q116.

[0620/22/O/N/2020/Q25]

Which row about elements in the Periodic Table is correct?

	statement 1	statement 2
A	two elements in the same group have similar chemical properties	metals are on the left of the table
B	two elements in the same group have similar chemical properties	metals are on the right of the table
C	two elements in the same period have similar chemical properties	metals are on the left of the table
D	two elements in the same period have similar chemical properties	metals are on the right of the table

[0620/22/O/N/2020/Q26]

Q117.

A new element oxfordium, Ox, was discovered with the following properties.

solubility	electrical conduction	formula of element	bonding in a molecule of Ox ₂
insoluble in water	doesn't conduct	Ox ₂	Ox≡Ox

In which group of the Periodic Table should the new element be placed?

- A Group III
- B Group V
- C Group VII
- D Group VIII

[0620/22/O/N/2020/Q28]

Q118.

Transition elements can have variable oxidation states.

Which pair of compounds shows a transition element in two different oxidation states?

- A Cr₂O₃ and Cr₂(SO₄)₃
- B Cu₂O and CuCO₃
- C ZnS and ZnSO₄
- D NiO and Ni(NO₃)₂

[0620/23/O/N/2020/Q20]

Q119.

Period 3 of the Periodic Table contains the elements sodium to argon.

Element Q is a non-metal from this period.

Which statement about Q is correct?

- A It conducts electricity.
- B It has a lower proton number than sodium.
- C It has electrons in only three shells.
- D It is malleable.

[0620/23/O/N/2020/Q21]

Q120.

Which metal has variable oxidation states?

- A aluminium
- B calcium
- C copper
- D sodiu

Q121.

[0620/23/O/N/2020/Q25]

- Which statement about the halogens and their compounds is correct?
- A The colour of the element gets lighter going down Group VII.
 - B The elements get less dense going down Group VII.
 - C When chlorine is added to sodium iodide solution, iodine is formed.
 - D When iodine is added to sodium bromide solution, bromine is formed.

Q122.

[0620/23/O/N/2020/Q26]

Elements in Group II of the Periodic Table show the same trends in their reaction with water and their density as Group I.

Which row shows how the properties of barium compare with calcium?

	reaction with water	density
A	faster	higher
B	faster	lower
C	slower	higher
D	slower	lower

Compiled BY : Saman Atif

[0620/12/M/J/13/Q30]

Q1. Q, R, S and T are four metals.

Q is found naturally as the metal.

R reacts with steam but not with cold water.

S reacts violently with cold water.

The oxide of T is reduced to T by heating with carbon.

What is the order of reactivity of the four metals, starting with the most reactive first?

- A Q → R → T → S
- B Q → T → R → S
- C S → R → Q → T
- D S → R → T → Q

[0620/11/M/J/13/Q26]

Q2. Which element is a metal?

	charge on element ion	electrical conductivity
A	negative	low
B	positive	high
C	negative	high
D	positive	low

[0620/11/M/J/13/Q27]

Q3. Which property makes aluminium ideal for making food containers?

- A conducts electricity
- B conducts heat
- C mechanical strength
- D resistance to corrosion

[0620/11/M/J/13/Q28]

Q4. Which substance is **not** involved in the extraction of iron from hematite?

- A carbon
- B carbon monoxide
- C calcium carbonate
- D nitrogen

[0620/11/M/J/13/Q29]

Q5. Pure metals conduct electricity and can be hammered into different shapes.

Why are metals sometimes used as alloys?

- A Alloys are cheaper than the metals they are made from.
- B Alloys are easier to hammer into different shapes.
- C Alloys are harder and keep their shape better.
- D Alloys conduct electricity better.

[0620/11/M/J/13/Q30]

Q6. Below are some metals in decreasing order of reactivity.

- magnesium
- zinc
- iron
- copper

Titanium reacts with acid and cannot be extracted from its ore by heating with carbon.

Where should titanium be placed in this list?

- A below copper
- B between iron and copper
- C between magnesium and zinc
- D between zinc and iron

[0620/13/O/N/13/Q25]

Q7. Duralumin is an alloy. It contains aluminium, copper and magnesium.

It has many uses including the manufacture of cooking utensils and ships.

Which statement about duralumin and its properties is correct?

- A It is a good conductor of electricity.
- B It is brittle.
- C It is soluble in water.
- D The aluminium, copper and magnesium are chemically combined.

[0620/13/O/N/13/Q26]

Q8. The list gives the order of some metals (and hydrogen) in the reactivity series.

Metal X is also included:

Most reactive K

Mg

Zn

(H)

X

Least reactive Cu

Which row correctly shows the properties of metal X?

	reacts with dilute acids	oxide reduced by carbon
A	no	no
B	no	yes
C	yes	no
D	yes	yes

[0620/13/O/N/13/Q27]

Q9. A new bicycle is being developed.

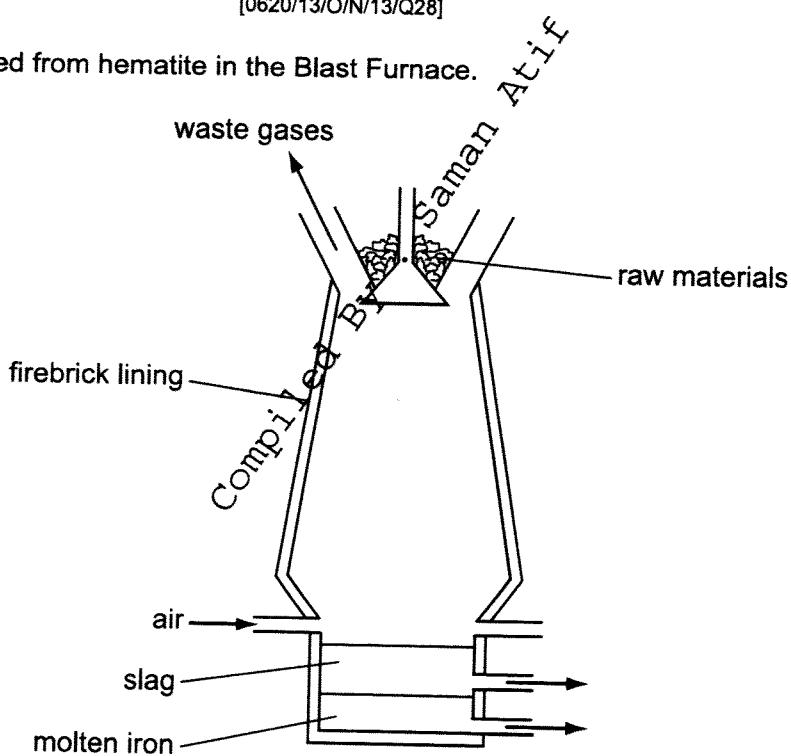
Two different materials are used in its construction, both of which must be corrosion resistant.



Which two metals could be used?

- A aluminium and mild steel
- B aluminium and stainless steel
- C mild steel and pure iron
- D pure iron and stainless steel

[0620/13/O/N/13/Q28]

Q10. Iron is extracted from hematite in the Blast Furnace.

The hematite contains silica as an impurity.

What reacts with this impurity to remove it?

- A calcium oxide
- B carbon
- C carbon dioxide
- D oxygen

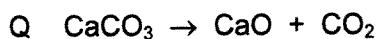
Q11. Some properties of four elements W, X, Y and Z are listed.

- 1 W melts at 1410 °C and forms an acidic oxide.
- 2 X has a high density and is easily drawn into wires.
- 3 Y acts as a catalyst and its oxide reacts with acids.
- 4 Z is a red-brown solid used to make alloys.

Which of the elements are metals?

- A 1 and 3 B 2, 3 and 4 C 2 and 3 only D 2 and 4 only

Q12. Equations P and Q represent two reactions which occur inside a blast furnace.



Which type of reactions are P and Q?

	P	
A	redox	redox
B	redox	thermal decomposition
C	thermal decomposition	redox
D	thermal decomposition	thermal decomposition

Q13. Which row describes the uses of mild steel and stainless steel?

	mild steel	stainless steel
A	car bodies, cutlery	chemical plant, machinery
B	car bodies, machinery	chemical plant, cutlery
C	chemical plant, cutlery	car bodies, machinery
D	chemical plant, machinery	car bodies, cutlery

[0620/12/O/N/13/Q29]

Q14. Reactions of three metals and their oxides are listed in the table.

metal	reacts with cold water	metal oxide reacts with carbon
W	no	no
X	no	yes
Y	yes	no

What is the order of reactivity of the metals?

	least reactive	→	most reactive
A	W	X	Y
B	X	W	Y
C	X	Y	W
D	Y	W	↙

[0620/12/O/N/13/Q30]

Q15. The diagrams show four uses of iron.

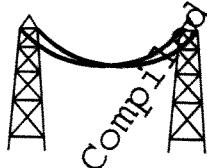
In which of these uses is the iron most likely to rust?

A



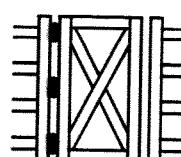
iron bucket
electroplated
with zinc

B



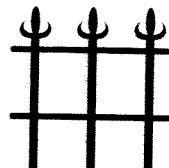
iron cored
aluminium
electricity cables

C



iron hinges
on a gate

D



painted
iron fence

[0620/12/O/N/13/Q32]

Q16. M is a shiny silver metal. It has a melting point of 1455 °C. Many of its compounds are green.

What is metal M?

- A aluminium
- B copper
- C mercury
- D nickel

Q17.

[0620/12/M/J/14/Q10]

Electrical cables are made from either1....., because it is a very good conductor of electricity, or from.....2....., because it has a low density.

Overhead cables have a3..... core in order to give the cable strength.

Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	aluminium	copper	magnesium
B	copper	aluminium	magnesium
C	copper	aluminium	steel
D	magnesium	copper	steel

[0620/12/M/J/14/Q23]

Q18.

A student carried out an experiment to find the order of reactivity of five metals.

They were tested with cold water, hot water and steam and the results recorded in a table.

metal	cold water	hot water	steam
V	no reaction	reacts slowly	vigorous reaction
W	no reaction	no reaction	slow reaction
X	reacts slowly	vigorous reaction	not attempted
Y	no reaction	no reaction	no reaction
Z	vigorous reaction	explosive reaction	not attempted

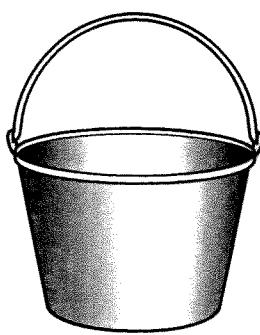
What is the order of reactivity of these metals?

	most reactive → least reactive				
A	V	W	Y	X	Z
B	W	X	Z	V	Y
C	Z	X	V	W	Y
D	Z	X	Y	W	V

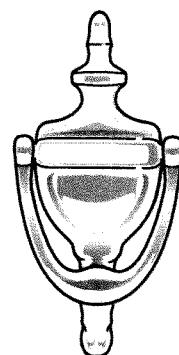
[0620/12/M/J/14/Q26]

Q19.

The diagrams show two items that may be found in the home. Each item contains zinc.



zinc plated bucket



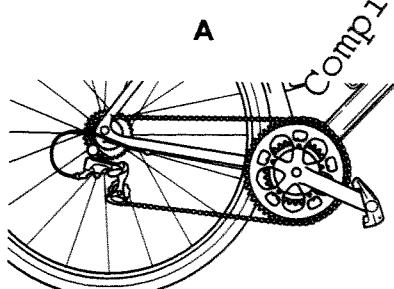
brass door-knocker

In which is zinc used as an alloy?

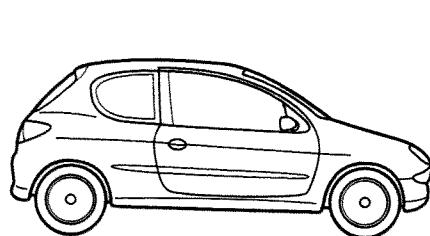
	bucket	door-knocker
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

Q20.

Which object is likely to be made from stainless steel?



bicycle chain

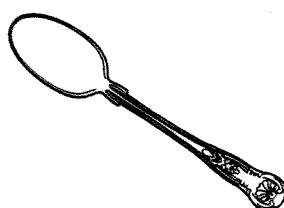


car body

C



can of beans



teaspoon

Q21. Four reactions that take place in the blast furnace to produce iron are shown.

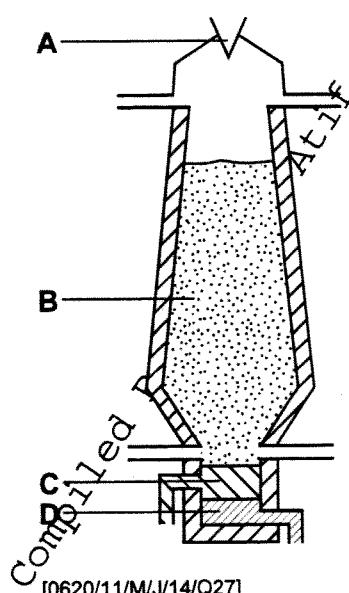
Which reaction is used to keep the furnace hot?

- A $C + O_2 \rightarrow CO_2$
- B $CO_2 + C \rightarrow 2CO$
- C $Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$
- D $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

[0620/12/M/J/14/Q29]

Q22. The diagram shows a blast furnace.

In which part is iron ore changed to iron?



[0620/11/M/J/14/Q27]

Q23.

In an experiment, three test-tubes labelled X, Y and Z were half-filled with dilute hydrochloric acid. A different metal was added to each test-tube. After a few minutes the following observations were made.

In tube X, bubbles slowly rose to the surface.

In tube Y, there was a rapid release of bubbles.

In tube Z, no bubbles were produced.

Which three metals match the observations?

	tube X	tube Y	tube Z
A	copper	zinc	iron
B	magnesium	iron	copper
C	zinc	magnesium	copper
D	zinc	magnesium	iron

[0620/11/M/J/14/Q28]

Q24. The table shows properties of four metals.

Which metal is the most suitable for aircraft construction?

	density	strength	resistance to corrosion
A	high	high	low
B	high	low	low
C	low	high	high
D	low	low	high

[0620/13/O/N/14/Q26]

Q25. The metal beryllium does not react with cold water.

It reacts with hydrochloric acid but cannot be extracted from its ore by using carbon.

Where should it be placed in the reactivity series?

magnesium
A
zinc
B
iron
C
copper
D

[0620/13/O/N/14/Q28]

Q26. A list of properties of aluminium is shown.

- 1 It conducts heat.
- 2 It has a low density.
- 3 It is resistant to corrosion.

Which properties make aluminium useful for making food storage containers?

- A 1, 2 and 3 B 1 and 3 only C 1 only D 3 only

[0620/13/O/N/14/Q29]

Q27. Which metal is commonly used to form alloys with a non-metallic element?

- A copper
B iron
C magnesium
D zinc

[0620/12/O/N/14/Q31]

Q28. Which object is least likely to contain aluminium?

- A a bicycle frame
- B a hammer
- C a saucepan
- D an aeroplane body

[0620/12/O/N/14/Q10]

Q29. Which metal could not be used for electroplating by using an aqueous solution?

- A chromium
- B copper
- C silver
- D sodium

[0620/12/O/N/14/Q24]

Q30. The table shows the reactions of four different metals with water.

metal	reaction
W	reacts vigorously with cold water
X	no reaction with water
Y	reacts very slowly with water, more vigorously with steam
Z	reacts violently with cold water

What is the correct order of reactivity, from most reactive to least reactive?

- A W → X → Y → Z
- B W → Z → Y → X
- C Z → W → X → Y
- D Z → W → Y → X

[0620/12/O/N/14/Q27]

Q31. The oxide of element X is reduced by heating with carbon.

Element X does not react with cold water, steam or dilute hydrochloric acid.

What is X?

- A copper
- B iron
- C magnesium
- D zinc

[0620/11/O/N/14/Q28]

Q32. Aluminium is the most common metal in the Earth's crust.Which is **not** a property of aluminium?

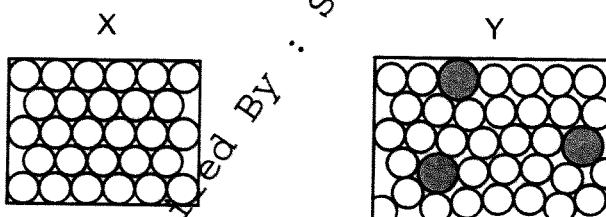
- A low density
- B resistance to corrosion
- C good conductor of electricity
- D poor conductor of heat

[0620/11/O/N/14/Q31]

Q33. Which reaction involves oxidation?

- A heating hydrated copper(II) sulfate in the air
- B polymerisation of ethene
- C rusting of iron
- D thermal decomposition of calcium carbonate

[0620/13/M/J/15/Q23]

Q34. The diagrams show the structure of two substances used to make electrical conductors.

Which statement correctly describes X and Y?

- A X is a pure metal and Y is a compound.
- B X is a pure metal and Y is an alloy.
- C X is a solid and Y is a liquid.
- D X is harder and stronger than Y.

[0620/13/M/J/15/Q24]

Q35. Which statement about the uses of aluminium, mild steel and stainless steel is correct?

- A Aluminium is used for food containers as it has a high density.
- B Mild steel is used for car bodies as it is resistant to corrosion.
- C Stainless steel is used for aircraft bodies as it is strong.
- D Stainless steel is used for cutlery as it is resistant to corrosion.

[0620/13/M/J/15/Q25]

Q36.

Which row describes the conditions used to make steel from the iron produced by a blast furnace?

	calcium oxide (lime)	oxygen	heat
A	✓	✓	✓
B	✓	✓	✗
C	✗	✓	✓
D	✗	✓	✗

[0620/13/M/J/15/Q26]

Q37.

The statements describe how different metals react with cold water.

- Calcium sinks, fizzing and releasing a steady stream of hydrogen.
- Copper does not react.
- Sodium floats, fizzing and rapidly releasing hydrogen.
- Zinc does not react but does react with steam, releasing hydrogen.

Using the information, where should hydrogen be placed in the reactivity series?

- Compiled By S. M. A. Irfan*
- A below copper
 - B between sodium and calcium
 - C between calcium and zinc
 - D between zinc and copper

Q38.

[0620/13/M/J/15/Q31]

Which method is **not** used for rust prevention?

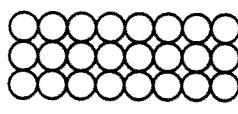
- A coating working parts of industrial machinery with oil
- B covering wire for gardening use with plastic
- C immersing gardening tools in water for storage
- D painting car bodies

Q39.

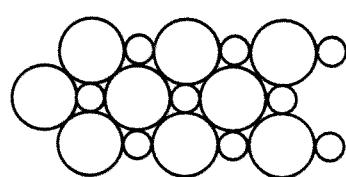
[0620/12/M/J/15/Q23]

Which diagram represents an alloy?

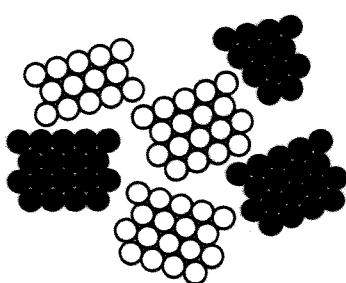
A



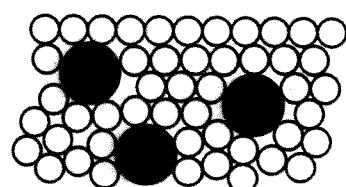
B



C



D



Q40.

[0620/12/M/J/15/Q24]

Which statement is **not** correct?

- A** Aluminium is used in food containers because of its resistance to corrosion.
- B** Aluminium is used in the manufacture of aircraft because of its strength and low density.
- C** Mild steel is used in car bodies because of its strength and low density.
- D** Stainless steel is used in chemical plant because of its strength and resistance to corrosion.

Q41.

[0620/12/M/J/15/Q31]

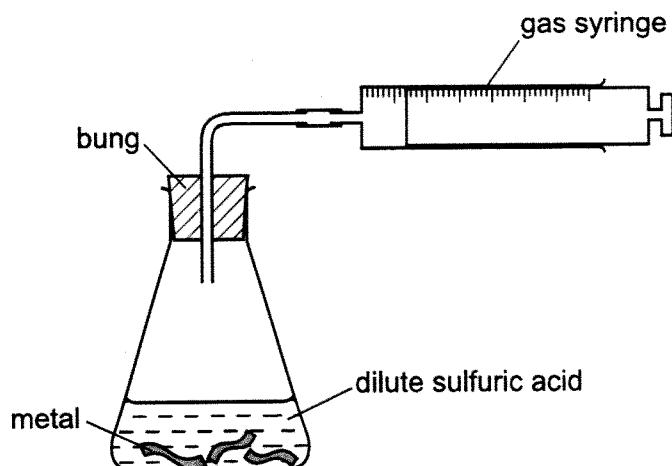
A steel bicycle which had been left outdoors for several months was starting to rust.

What would **not** reduce the rate of corrosion?

- A** Remove the rust and paint the bicycle.
- B** Remove the rust and store the bicycle in a dry shed.
- C** Remove the rust and wipe the bicycle with a clean damp cloth.
- D** Remove the rust and wipe the bicycle with an oily cloth.

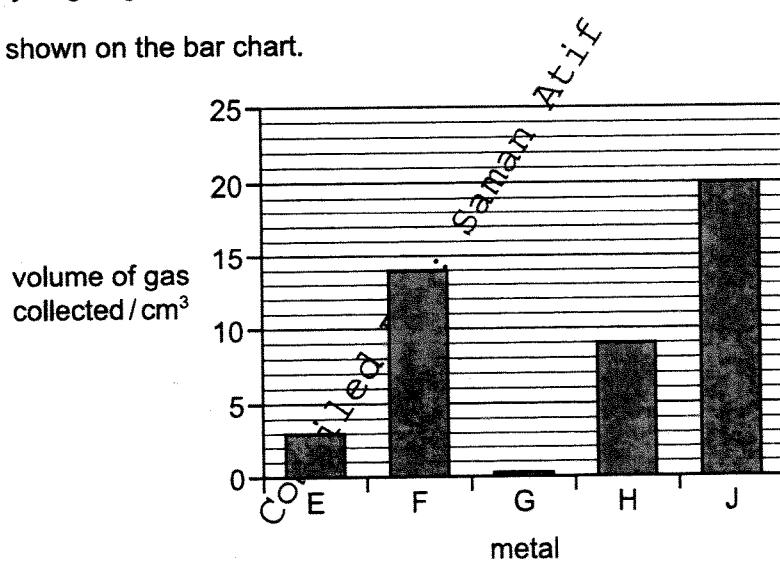
Q42.

Samples of five different metals, E, F, G, H and J were reacted with dilute sulfuric acid using the apparatus shown.



The volume of hydrogen gas collected after one minute was measured.

The results are shown on the bar chart.

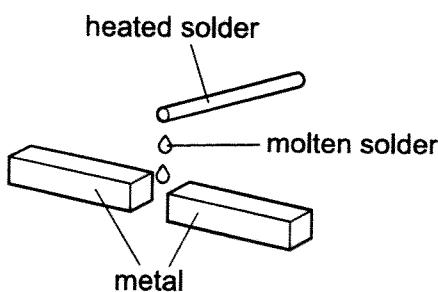


What is the order of reactivity of the metals (most reactive first)?

- A E, F, G, H, J
- B G, E, H, F, J
- C J, F, H, E, G
- D J, H, G, F, E

[0620/11/M/J/15/Q23]

Q43. Solder is an alloy of lead and tin. It is used for joining pieces of metal.



Which statement about solder is correct?

- A It can be represented by a chemical formula.
- B It contains a mixture of lead and tin.
- C It contains lead and tin chemically combined.
- D It has a higher melting point than lead or tin.

[0620/11/M/J/15/Q24]

Q44. What is a major use of aluminium?

- A making brass
- B making cutlery
- C making electrical wiring
- D making food containers

[0620/11/M/J/15/Q26]

Q45. W, X, Y and Z are four metals.

Some properties of these metals are listed below.

- 1 Only W and Z can be extracted by reduction of their oxides with carbon.
- 2 Only X will react with cold water.
- 3 Only Z can be found 'native' (not combined with any other element).

What is the correct order of these metals in the reactivity series (most reactive first)?

- A X, W, Y, Z
- B X, Y, W, Z
- C Z, W, Y, X
- D Z, Y, W, X

[0620/11/M/J/15/Q32]

Q46. Carbon dioxide and methane are 'greenhouse gases' which contribute to global warming.

Which process does **not** increase global warming?

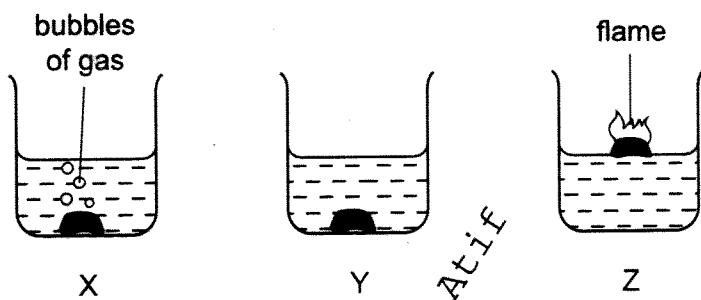
- A burning fossil fuels
- B decay of organic waste
- C farming cattle for beef
- D growing crops such as sugar cane

[0620/13/O/N/15/Q23]

Q47. Which statement is true for all metals?

- A Their atoms lose one or more electrons when they react.
- B They are brittle.
- C They do not conduct electricity when solid.
- D They melt at low temperatures when they are heated.

[0620/13/O/N/15/Q24]

Q48. The diagrams show what happens when three different metals are added to water.

What are X, Y and Z?

	X	Y	Z
A	calcium	copper	potassium
B	copper	calcium	potassium
C	potassium	calcium	copper
D	potassium	copper	calcium

[0620/13/O/N/15/Q25]

Q49. The table shows three uses of aluminium and a reason why aluminium is used for that purpose.

	use	reason
1	aircraft manufacture	high tensile strength
2	overhead electricity cables	low density
3	food containers	resistance to corrosion

Which reasons explain the use?

- A 1, 2 and 3
- B 1 and 2 only
- C 1 and 3 only
- D 2 and 3 only

Q50.

[0620/13/O/N/15/Q26]

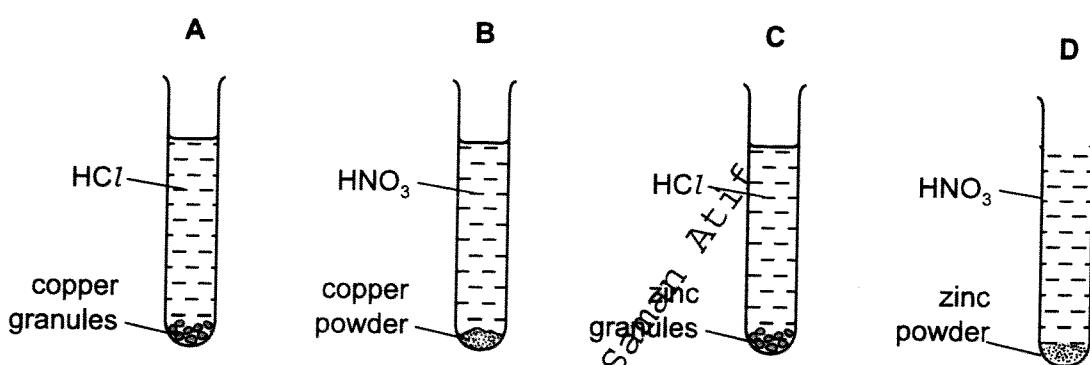
- Which conditions are necessary to make mild steel from iron?
- add calcium oxide and blow oxygen through it
 - heat with calcium oxide
 - heat with carbon and limestone
 - heat with nickel and chromium

Q51.

[0620/12/O/N/15/Q12]

The diagram shows four experiments in which equal volumes of aqueous acid (all in an excess) are added to equal masses of metal. Both acids have the same concentration.

In which experiment has the metal completely reacted in the shortest time?



Q52.

[0620/12/O/N/15/Q20]

The table shows the symbols of three metals with names that begin with the letter C.

Which row correctly shows the melting point of the metals?

	Co	Cr	Cs
A	high	high	high
B	high	high	low
C	low	low	high
D	low	low	low

Q53.

[0620/12/O/N/15/Q23]

Which two elements make up mild steel?

- aluminium and magnesium
- copper and zinc
- iron and carbon
- tin and lead

[0620/12/O/N/15/Q25]

Q54. Which substances do not react together?

- A calcium + water
 B copper + dilute hydrochloric acid
 C sodium + water
 D zinc + dilute hydrochloric acid

[0620/12/O/N/15/Q26]

Q55. Iron is extracted from hematite in a blast furnace.

Which reaction increases the temperature in the blast furnace to over 1500 °C?

- A calcium carbonate → calcium oxide + carbon dioxide
 B calcium oxide + silicon dioxide → calcium silicate
 C carbon + oxygen → carbon dioxide
 D carbon dioxide + carbon → carbon monoxide

[0620/11/O/N/15/Q25]

Q56. Which metal would be suitable for all of the following uses?

- making aircraft bodies
- making food containers
- making overhead power cables

- A aluminium
 B brass
 C mild steel
 D pure iron

[0620/11/O/N/15/Q26]

Q57. Iron is extracted from its ore (hematite) in the blast furnace.

Which gas is produced as a waste product?

- A carbon dioxide
 B hydrogen
 C nitrogen
 D oxygen

[0620/23/M/J/16/Q26]

Q58. Four metals P, Q, R and S are added to separate aqueous solutions of their ions.

The results are shown.

metal	P ²⁺	Q ²⁺	R ²⁺	S ²⁺	
P	X	X	✓	✓	key
Q	✓	X	✓	✓	✓ = reaction occurs
R	X	X	X	X	X = reaction does not occur
S	X	X	✓	X	

What is the order of reactivity of the metals, most reactive first?

- A Q → P → S → R
- B Q → S → P → R
- C R → P → S → Q
- D R → S → P → Q

[0620/23/M/J/16/Q27]

Q59. Copper is a transition element used to make saucepans.

Which property is **not** correct for copper?

- A good conductor of heat
- B insoluble in water
- C low melting point
- D malleable (can be hammered into shape)

[0620/23/M/J/16/Q28]

Q60. Aluminium is extracted by electrolysis of a mixture of aluminium oxide and cryolite.

Which statement is **not** correct?

- A The electrodes are made from graphite.
- B The formula for aluminium oxide is Al₂O₃.
- C The purpose of the cryolite is to lower the melting point of the mixture.
- D The reaction taking place at the anode is Al³⁺ + 3e⁻ → Al.

[0620/23/M/J/16/Q34]

Q61. Which process is used to make lime (calcium oxide) from limestone (calcium carbonate)?

- A chromatography
- B electrolysis
- C fractional distillation
- D thermal decomposition

Q62.

[0620/22/M/J/16/Q25]

Some magnesium compounds undergo thermal decomposition.

What are the products of thermal decomposition of magnesium nitrate, $Mg(NO_3)_2$, and magnesium hydroxide, $Mg(OH)_2$?

	$Mg(NO_3)_2$	$Mg(OH)_2$
A	MgO , NO_2 and O_2	MgO and H_2O
B	MgO , NO_2 and O_2	MgO and H_2
C	$Mg(NO_2)_2$ and O_2	MgO and H_2O
D	$Mg(NO_2)_2$ and O_2	MgO and H_2

Q63.

[0620/22/M/J/16/Q26]

Which property is **not** considered a typical metallic property?

- A good conductor of heat
- B low melting point
- C malleable (can be hammered into shape)
- D strong

Q64.

[0620/22/M/J/16/Q27]

Iron from a blast furnace is treated with oxygen and with calcium oxide to make steel.

Which substances in the iron are removed?

	oxygen removes	calcium oxide removes
A	carbon	acidic oxides
B	carbon	basic oxides
C	iron	acidic oxides
D	iron	basic oxides

Q65.

[0620/22/M/J/16/Q28]

Why is cryolite used during the extraction of aluminium by electrolysis?

- A It is a catalyst for the reaction.
- B It lowers the melting point of the electrolyte.
- C It protects the anodes.
- D It separates the aluminium from the electrolyte.

Q66.

[0620/21/M/J/16/Q25]

A student investigated the reactions of four metals, R, S, T and U, with solutions of their salts.

The results are given in the table.

metal	metal salt	result
R	S nitrate	reacts
R	T nitrate	reacts
S	U nitrate	no reaction
T	U nitrate	reacts
U	R nitrate	no reaction

What is the order of reactivity of the metals, most reactive first?

- A R → S → U → T
- B R → T → U → S
- C S → U → T → R
- D U → R → T → S

Q67.

[0620/21/M/J/16/Q26]

Three students, X, Y and Z, were told that solid P reacts with dilute acids and also conducts electricity.

The table shows the students' suggestions about the identity of P.

X	Y	Z
copper	iron	graphite

Which of the students are correct?

- A X, Y and Z
- B X only
- C Y only
- D Z only

Q68.

[0620/21/M/J/16/Q27]

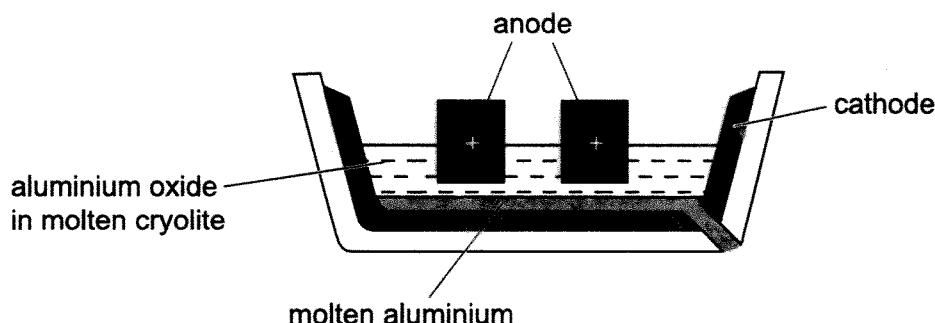
Which statement about the uses of metals is correct?

- A Aluminium is used in the manufacture of aircraft because of its strength and high density.
- B Copper is used in electrical wiring because of its strength and high density.
- C Mild steel is used in the manufacture of car bodies because of its strength and resistance to corrosion.
- D Stainless steel is used in the construction of chemical plant because of its strength and resistance to corrosion.

[0620/21/M/J/16/Q28]

Q69. Aluminium is manufactured by electrolysis of aluminium oxide.

The diagram shows the electrolysis cell.



Which statement about the process is **not** correct?

- A Aluminium ions gain electrons during the electrolysis and are reduced.
- B Cryolite is added to reduce the melting point of the aluminium oxide.
- C The anode and cathode are made of graphite.
- D The cathode has to be replaced regularly because it is burnt away.

[0620/23/O/N/16/Q25]

Q70. Basic oxides and oxygen are used to convert iron into steel.

Which statement is **not** correct?

- A Carbon is converted into carbon dioxide.
- B Silicon is converted into silicon(IV) oxide.
- C The basic oxides react with acidic impurities to form slag.
- D The oxygen reacts with the iron to produce hematite.

[0620/23/O/N/16/Q26]

Q71. The results of two experiments are given.

- 1 Cobalt displaces manganese from an aqueous solution of a manganese salt.
- 2 Manganese displaces silver from an aqueous solution of a silver salt.

Three more experiments are carried out.

- 3 Cobalt is added to an aqueous solution of a silver salt.
- 4 Manganese is added to an aqueous solution of a cobalt salt.
- 5 Silver is added to an aqueous solution of a cobalt salt.

In which experiments does a reaction take place?

- A 3 only
- B 3 and 4
- C 4 and 5
- D 5 only

[0620/23/O/N/16/Q27]

Q72. Cryolite, Na_3AlF_6 , is added to aluminium oxide in the electrolytic extraction of aluminium.

What is the reason for this?

- A to decrease the melting point of the electrolyte
- B to protect the anodes
- C to produce more aluminium
- D to stop the aluminium reacting with air

[0620/23/O/N/16/Q28]

Q73. Different forms of steel contain different proportions of carbon.

Steel P contains a high proportion of carbon.

Steel Q contains a low proportion of carbon.

Which statement is correct?

- A P is stronger and more brittle than Q.
- B P is stronger and less brittle than Q.
- C P is less strong and more brittle than Q.
- D P is less strong and less brittle than Q.

[0620/29/O/N/16/Q31]

Q74. A metal, X, is used to make oil pipelines.

X corrodes in air and water.

X can be protected from corrosion by attaching blocks of element Y.

Which statement is correct?

- A This process is known as galvanising.
- B Y forms positive ions more readily than X.
- C Y is an unreactive metal.
- D Y is an unreactive non-metal.

[0620/22/O/N/16/Q26]

Q75. Y displaces X from its aqueous sulfate.

X does not displace W from its aqueous sulfate.

X displaces Z from its aqueous sulfate.

What is the order of reactivity of elements W, X, Y and Z?

	most reactive			least reactive
A	W	X	Y	Z
B	W	Y	X	Z
C	Z	X	Y	W
D	Z	W	Y	X

[0620/22/O/N/16/Q27]

Q76. Which statement about the industrial extraction of aluminium from aluminium oxide is correct?

- A Aluminium is extracted by heating its oxide with carbon.
- B Aluminium is extracted using electrolysis and is collected at the anode.
- C Aluminium is extracted using platinum electrodes and direct current.
- D Molten cryolite is used as a solvent for aluminium oxide.

[0620/22/O/N/16/Q28]

Q77. The alloy brass is a mixture of copper and another metal.

Brass is used to make the pins of electrical plugs.

Copper is used to make electrical wiring.

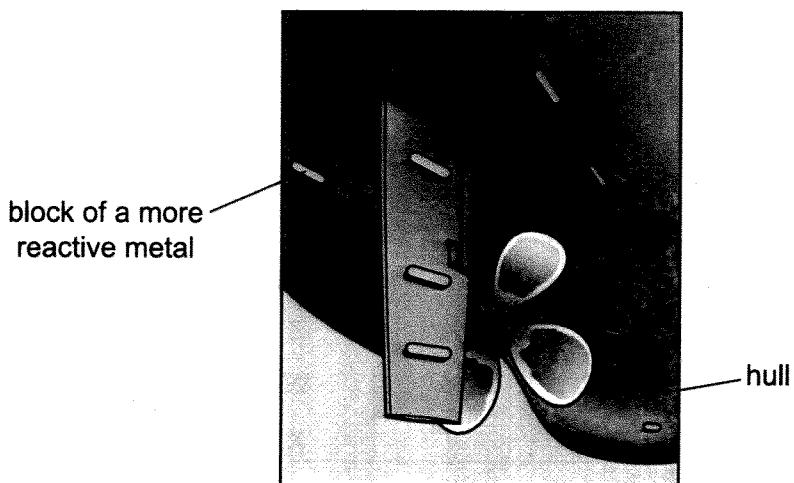
Which row about brass is correct?

	hardness	electrical conductivity	other metal
A	harder than copper	better than copper	tin
B	harder than copper	worse than copper	zinc
C	softer than copper	better than copper	tin
D	softer than copper	worse than copper	zinc

[0620/22/O/N/16/Q31]

Q78.

Boats made from steel can be protected from rusting by attaching blocks of a more reactive metal to the hull of the boat.



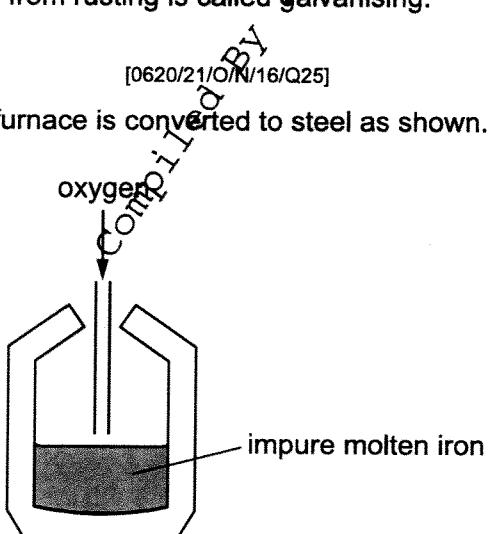
Which statement is correct?

- A** Copper is used for the blocks because it does not react with water.
- B** Magnesium is not used for the blocks because it reacts with steel.
- C** The metal used for the blocks loses electrons more easily than steel.
- D** This form of protection from rusting is called galvanising.

Q79.

[0620/21/O/N/16/Q25]

Impure iron from the blast furnace is converted to steel as shown.



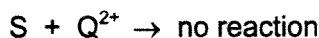
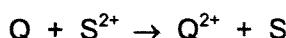
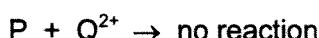
Which statement about the process is correct?

- A** Acidic oxides are added to remove alkaline impurities.
- B** Coke is added as a reducing agent.
- C** Oxygen is blown in to oxidise the impure iron.
- D** The steel produced contains less carbon than the impure iron.

Q80.

[0620/21/O/N/16/Q26]

The ionic equations represent the reactions between four metals, P, Q, R and S, and solutions of the salts of the same metals.



What is the correct order of reactivity of the metals?

	most				least
A	P	R	S	Q	
B	Q	R	S	P	
C	Q	S	R	P	
D	S	Q	P	R	

Saman Atif

Q81.

[0620/21/O/N/16/Q27]

Aluminium is extracted by electrolysis.



From which ore is aluminium extracted and at which electrode is aluminium deposited during electrolysis?

	ore	electrode
A	bauxite	negative
B	bauxite	positive
C	cryolite	negative
D	cryolite	positive

Q82.

[0620/21/O/N/16/Q28]

Zinc oxide can be reacted with carbon to produce zinc metal.

Which equation for this reaction is correct?

- A $2\text{ZnO} + \text{C} \rightarrow 2\text{Zn} + \text{CO}$
- B $2\text{ZnO} + 2\text{C} \rightarrow 2\text{Zn} + 2\text{CO}_2$
- C $\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$
- D $\text{ZnO} + 2\text{C} \rightarrow \text{Zn} + 2\text{CO}_2$

[0620/21/M/J/17/Q25]

Q83.

Metal X is added to a colourless aqueous solution of the sulfate of metal Y.

A coloured solution is formed and metal Y is deposited at the bottom of the beaker.

Which row describes elements X and Y and their relative reactivity?

	type of element	relative reactivity
A	X is a transition element	X is more reactive than Y
B	X is a transition element	Y is more reactive than X
C	Y is a transition element	X is more reactive than Y
D	Y is a transition element	Y is more reactive than X

Q84.

[0620/21/M/J/17/Q26]

Element E:

- forms an alloy
- has a basic oxide
- is below hydrogen in the reactivity series

What is E?

- A carbon
- B copper
- C sulfur
- D zinc

[0620/21/M/J/17/Q27]

Q85.

Zinc metal is extracted from its ore zinc blende in a similar method to that used to extract iron from hematite.

In which way is zinc extraction different from iron extraction?

- A Carbon and carbon monoxide are the main reducing agents.
- B Hot air at the base of the furnace reacts with coke to keep the furnace hot.
- C The metal is removed as a vapour at the top of the furnace.
- D The metal oxide is added into the top of the furnace.

Q86.

Stainless steel is an alloy of iron and other metals. It is strong and does not rust but it costs much more than normal steel.

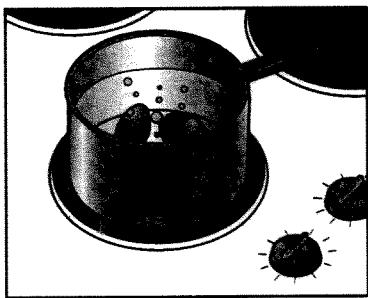
What is not made from stainless steel?

- A cutlery
- B pipes in a chemical factory
- C railway lines
- D saucepans

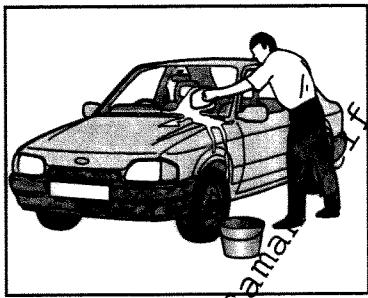
[0620/21/M/J/17/Q28]

Q87.

The diagram shows some uses of water in the home.



1



2



3

For which uses is it important for the water to have been treated?

- A 1 only
- B 2 only
- C 3 only
- D 1, 2 and 3

Compiled by Saman
[0620/21/M/J/17/Q34]

Q88.

Which statement is not correct?

- A Converting limestone into lime is a thermal decomposition reaction.
- B Flue gas desulfurisation is a neutralisation reaction.
- C In the extraction of iron, calcium carbonate is converted into calcium oxide.
- D Slaked lime is added to soil as a fertiliser.

[0620/22/M/J/17/Q25]

Q89. Which process is involved in the extraction of zinc from zinc blende?

- A Cryolite is added to lower the melting point of zinc blende.
- B Molten zinc blende is electrolysed.
- C Zinc blende is heated with carbon.
- D Zinc blende is roasted in air.

[0620/22/M/J/17/Q26]

Q90. Element E:

- forms an alloy
- has a basic oxide
- is below hydrogen in the reactivity series.

What is E?

- A carbon
- B copper
- C sulfur
- D zinc

[0620/22/M/J/17/Q27]

Q91. A list of metals is shown.

- Compiled By : Saman Atif
- aluminium
 - copper
 - iron
 - magnesium
 - silver
 - zinc

Which metal will displace all of the other metals from aqueous solutions of their salts?

- A aluminium
- B iron
- C magnesium
- D zinc

[0620/22/M/J/17/Q28]

Q92.

Stainless steel is an alloy of iron and other metals. It is strong and does not rust but it costs much more than normal steel.

What is not made from stainless steel?

- A cutlery
- B pipes in a chemical factory
- C railway lines
- D saucepans

[0620/23/M/J/17/25]

Q93.

Which equation from the zinc extraction process shows the metal being produced by reduction?

- A $\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$
- B $2\text{ZnS} + 3\text{O}_2 \rightarrow 2\text{ZnO} + 2\text{SO}_2$
- C $\text{Zn(g)} \rightarrow \text{Zn(l)}$
- D $\text{Zn(l)} \rightarrow \text{Zn(s)}$

[0620/23/M/J/17/26]

Q94.

Element E:

- forms an alloy
- has a basic oxide
- is below hydrogen in the reactivity series.

What is E?

- A carbon
- B copper
- C sulfur
- D zinc

[0620/23/M/J/17/27]

Q95. The section of the reactivity series shown includes a newly discovered element, symbol X.

The only oxide of X has the formula XO.

Ca

Mg

Fe

X

H

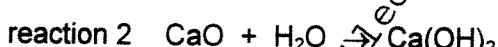
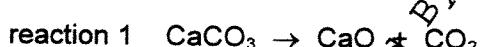
Cu

Which equation shows a reaction which occurs?

- A Cu(s) + X²⁺(aq) → Cu²⁺(aq) + X(s)
- B 2X(s) + Cu²⁺(aq) → 2X⁺(aq) + Cu(s)
- C X(s) + Fe₂O₃(s) → 2Fe(s) + 3XO(s)
- D X(s) + 2HCl(aq) → XCl₂(aq) + H₂(g)

[0620/23/M/J/17/284]

Q96. Two equations are shown.



Which terms describe reactions 1 and 2?

	reaction 1	reaction 2
A	reduction	hydration
B	reduction	hydrolysis
C	thermal decomposition	hydration
D	thermal decomposition	hydrolysis

Q97. What is a property of all metals?

- A conduct electricity
- B hard
- C low melting points
- D react with water

[0620/21/O/N/17/26]

Q98. Aluminium is extracted by the electrolysis of aluminium oxide.

Which statement is **not** correct?

- A Aluminium ions are oxidised at the cathode.
- B Carbon dioxide is made at the anode.
- C Cryolite is added to lower the melting point of the aluminium oxide.
- D The electrodes are made from graphite.

[0620/21/O/N/17/27]

Q99. Which row describes how the metals are used?

	mixed with zinc to form brass	used to galvanise iron
A	aluminium	tin
B	aluminium	zinc
C	copper	tin
D	copper	zinc

[0620/21/O/N/17/28]

Q100.

Information about the nitrates and carbonates of two metals, Q and R, is shown.

	appearance	solubility in water	effect of heat
nitrate of Q	white solid	soluble	colourless gas evolved which relights a glowing splint
carbonate of Q	white solid	soluble	no reaction
nitrate of R	white solid	soluble	brown gas evolved
carbonate of R	white solid	insoluble	colourless gas evolved which turns limewater milky

Which statement is correct?

- A Q is calcium and R is magnesium.
- B Q is magnesium and R is sodium.
- C Q is potassium and R is copper.
- D Q is sodium and R is calcium.

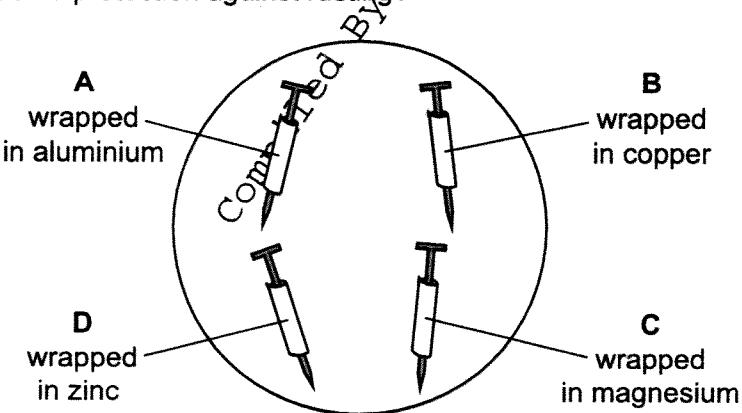
Q101.

[0620/21/O/N/17/30]

Four iron nails had different metals wrapped around them.

The nails were placed in an open dish filled with water and left for a week.

Which iron nail has no protection against rusting?



[0620/22/O/N/17/25]

Q102. What is a property of all metals?

- A conduct electricity
- B hard
- C low melting points
- D react with water

[0620/22/O/N/17/26]

Q103. Aluminium is extracted from bauxite by electrolysis.

Which row shows the anode material and the anode reaction?

	anode material	anode reaction
A	carbon	$Al^{3+} + 3e^- \rightarrow Al$
B	carbon	$2O^{2-} \rightarrow O_2 + 4e^-$
C	steel	$Al^{3+} + 3e^- \rightarrow Al$
D	steel	$2O^{2-} \rightarrow O_2 + 4e^-$

[0620/22/O/N/17/27]

Q104. Which statement about the metal zinc is not correct?

- A It forms an oxide more readily than iron.
- B It is manufactured by the electrolysis of zinc blende.
- C It is used to make brass.
- D It is used to prevent iron from rusting.

[0620/22/O/N/17/28]

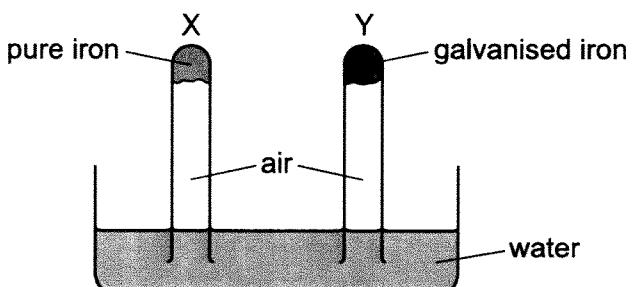
Q105. Calcium nitrate decomposes when it is heated.

What is the equation for the thermal decomposition of calcium nitrate?

- A $2Ca(NO_3)_2 \rightarrow 2CaO + O_2 + 4NO_2$
- B $Ca(NO_3)_2 \rightarrow Ca(NO_2)_2 + O_2$
- C $Ca(NO_3)_2 \rightarrow Ca + O_2 + 2NO_2$
- D $Ca(NO_3)_2 \rightarrow Ca + 3O_2 + N_2$

[0620/22/O/N/17/30]

Q106. An experiment to investigate the effect of galvanising iron is shown.



The experiment is left for seven days.

What happens to the water level in tubes X and Y?

	tube X	tube Y
A	falls	rises
B	no change	no change
C	rises	falls
D	rises	no change

[0620/23/O/N/17/25]

Q107. What is a property of all metals?

- A conduct electricity
- B hard
- C low melting points
- D react with water

[0620/23/O/N/17/26]

Q108. Aluminium is obtained by the electrolysis of a mixture of aluminium oxide and cryolite.

Why is cryolite used?

- A as a catalyst to speed up the process
- B as a coolant to prevent the process getting too hot
- C as a solvent for aluminium oxide
- D as the main source of aluminium ions

[0620/23/O/N/17/27]

Q109. Metal M is mixed with copper to produce brass.

What is M?

- A chromium
- B nickel
- C vanadium
- D zinc

[0620/23/O/N/17/30]

Q110. A piece of zinc is attached to the hull of a steel boat. Steel is an alloy of iron.

Which statement explains why the zinc prevents the iron from rusting?

- A Zinc is less reactive than iron, and iron is less likely to lose electrons than zinc.
- B Zinc is less reactive than iron, and iron is more likely to lose electrons than zinc.
- C Zinc is more reactive than iron, and iron is less likely to lose electrons than zinc.
- D Zinc is more reactive than iron, and iron is more likely to lose electrons than zinc.

[0620/21/M/J/18/Q24]
Sahar Copy**Q111.** The following statements are made about the metals copper, iron, magnesium and zinc.

- 1 Their oxides are acidic.
- 2 They all conduct electricity in the solid state.
- 3 They all have high melting points.
- 4 They all react with dilute acids to form hydrogen.

Which statements are correct?

- A 1 and 2
- B 1 and 4
- C 2 and 3
- D 3 and 4

[0620/21/M/J/18/Q25]
Sahar Copy**Q112.** Silver is a less reactive metal than cadmium.

Cadmium is a less reactive metal than barium.

Which statement is correct?

- A Barium does not react when heated with silver oxide.
- B Cadmium displaces barium from a solution of barium chloride.
- C Cadmium displaces silver from a solution of silver nitrate.
- D Cadmium reacts when heated with barium oxide.

[0620/21/M/J/18/Q26]

Q113. Aluminium metal is extracted from aluminium oxide using electrolysis.Which statement about the extraction process is **not** correct?

- A A large amount of electricity is required.
- B Molten cryolite is used to dissolve the aluminium oxide.
- C Oxygen gas is released which reacts to form carbon dioxide.
- D The negative electrodes burn away and have to be replaced.

[0620/21/M/J/18/Q27]

Q114. Which statement explains why aluminium is used in the manufacture of aircraft?

- A It conducts heat well.
- B It has a low density.
- C It is a good conductor of electricity.
- D It is easy to recycle.

[0620/22/M/J/18/Q24]

Q115. Stainless steel is an alloy of iron, carbon and other metals.

Which row is correct?

	stainless steel is harder than pure iron	stainless steel resists corrosion better than pure iron
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

[0620/22/M/J/18/Q25]

Q116. Metal X is more reactive than metal Y. Metal Y is more reactive than metal Z.

Which statement is correct?

- A When metal X is placed in a solution of Y sulfate, there is no reaction.
- B When metal X is placed in a solution of Z sulfate, a reaction occurs.
- C When metal Y is placed in a solution of Z sulfate, there is no reaction.
- D When metal Z is placed in a solution of X sulfate, a reaction occurs.

[0620/22/M/J/18/Q26]

Q117. Which statement about the industrial extraction of zinc is correct?

- A Cryolite is added to lower the melting point.
- B Molten zinc oxide is electrolysed.
- C Zinc oxide is heated with coke.
- D Zinc sulfide is heated with coke.

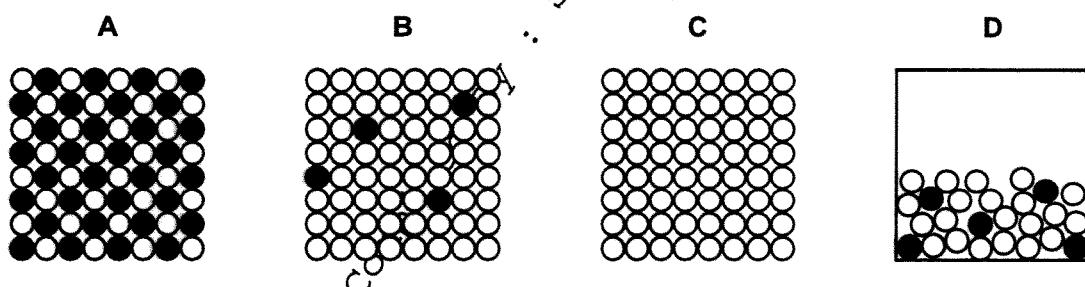
[0620/22/M/J/18/Q27]

Q118. Which row describes the use of an alloy and the property upon which the use depends?

	alloy	use	property
A	mild steel	cutlery	resistant to corrosion
B	mild steel	machinery	strong
C	stainless steel	cutlery	low density
D	stainless steel	machinery	good conductor of electricity

[0620/23/M/J/18/Q24]

Q119. Which diagram represents a solid alloy?



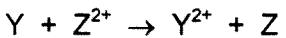
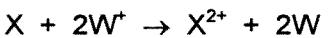
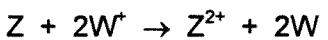
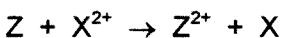
[0620/23/M/J/18/Q26]

Q120. Which equation represents the first stage in the extraction of zinc from zinc blende?

- A $2\text{ZnS} + 3\text{O}_2 \rightarrow 2\text{ZnO} + 2\text{SO}_2$
- B $\text{ZnS} + \text{H}_2\text{O} \rightarrow \text{ZnO} + \text{H}_2\text{S}$
- C $\text{ZnO} + \text{CO} \rightarrow \text{Zn} + \text{CO}_2$
- D $\text{ZnO} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2\text{O}$

[0620/23/M/J/18/Q25]

Q121. The ionic equations for four reactions are shown.



What is the order of reactivity of the four metals, W, X, Y and Z?

	most reactive → least reactive			
A	W	X	Z	Y
B	X	W	Y	Z
C	Y	Z	X	W
D	Z	W	X	Y

[0620/23/M/J/18/Q27]

Q122. Which statement explains why aluminium is used to manufacture aircraft?

- A It has a low density.
- B It is a good conductor of electricity.
- C It is a good conductor of heat.
- D It is ductile.

[0620/23/M/J/18/Q29]

Q123. A steel bicycle which had been left outdoors for several months was starting to rust.

What would **not** reduce the rate of corrosion?

- A Remove the rust and paint the bicycle.
- B Remove the rust and store the bicycle in a dry shed.
- C Remove the rust and wipe the bicycle with a clean, damp cloth.
- D Remove the rust and wipe the bicycle with an oily cloth.

[0620/21/O/N/2018/Q6]

Q124. Which statement describes the lattice structure of a metal?

- A The lattice consists of alternating positive ions and negative ions.
- B The lattice consists of neutral atoms arranged in layers.
- C The lattice consists of positive ions in a 'sea of electrons'.
- D The lattice consists of neutral atoms in a 'sea of electrons'.

[0620/21/O/N/2018/Q24]

Q125.

A student heated copper(II) carbonate and copper(II) nitrate in separate test-tubes.

Both compounds decomposed.

Which row shows the gases produced from each reaction?

	copper(II) carbonate	copper(II) nitrate
A	carbon dioxide	nitrogen dioxide only
B	carbon dioxide	oxygen only
C	carbon dioxide	oxygen and nitrogen dioxide
D	oxygen	oxygen and nitrogen dioxide

Q126.

[0620/21/O/N/2018/Q25]

Metal X reacts with steam but not with cold water.

What is X?

- A calcium
- B copper
- C sodium
- D zinc

Q127.

Which row shows uses of the metals listed? 

	aluminium	copper	mild steel
A	aircraft manufacture	food containers electrical wiring	cutlery
B	cutlery	aircraft manufacture	chemical plant
C	electrical wiring	cooking utensils	cooking utensils
D	food containers	cooking utensils	car bodies

Q128.

[0620/21/O/N/2018/Q27]

Aluminium objects do not need protection from corrosion.

Iron objects must be protected from corrosion.

Why does aluminium resist corrosion?

- A Aluminium does not form ions easily.
- B Aluminium does not react with water or air.
- C Aluminium has a protective oxide layer.
- D Aluminium is below iron in the reactivity series.

Q129.

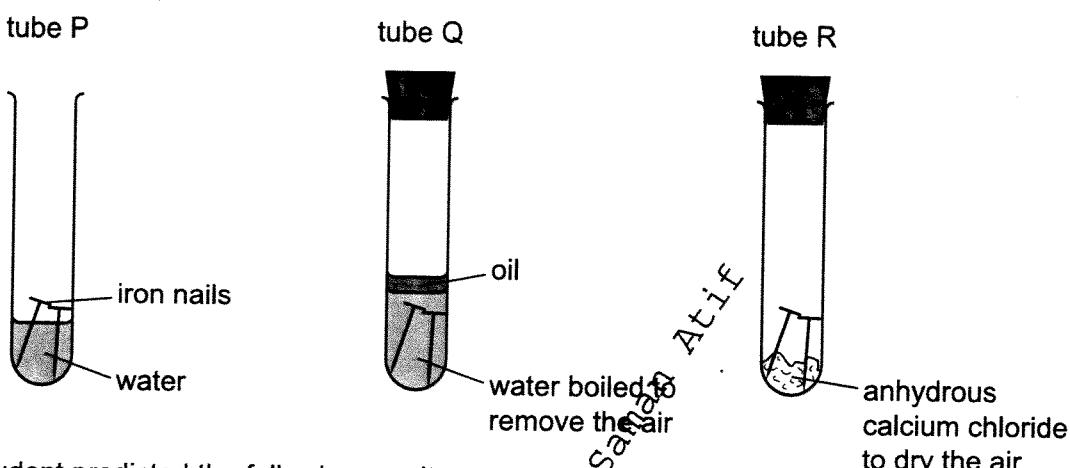
[0620/21/O/N/2018/Q28]

- Which statement describes the role of iron in the Haber process?
- It is used as a catalyst.
 - It is used as a reducing agent.
 - It is used to condense the ammonia gas into a liquid.
 - It is used to increase the yield of ammonia.

Q130.

[0620/22/O/N/2018/Q31]

The diagrams show experiments involving the rusting of iron.



A student predicted the following results.

- In tube P, the iron nails rust.
- In tube Q, the iron nails do not rust.
- In tube R, the iron nails do not rust.

Which predictions are correct?

- Complaints BY*
- 1, 2 and 3
 - 1 and 2 only
 - 1 and 3 only
 - 2 and 3 only

Q131.

[0620/22/O/N/2018/Q24]

Heating copper(II) carbonate produces copper(II) oxide and carbon dioxide.

Heating the copper(II) oxide formed with carbon produces copper.

Which processes are involved in this conversion of copper(II) carbonate to copper?

- sublimation followed by oxidation
- sublimation followed by reduction
- thermal decomposition followed by oxidation
- thermal decomposition followed by reduction

Q132.

[0620/22/O/N/2018/Q25]

Four metals, W, X, Y and Z, are separately reacted with water and dilute hydrochloric acid.

The results are shown.

	metal			
	W	X	Y	Z
reaction with water	fizzes	no reaction	fizzes vigorously	no reaction
reaction with dilute hydrochloric acid	fizzes	no reaction	fizzes violently	fizzes

What is the order of reactivity of the four metals starting with the least reactive?

	least reactive	→ most reactive		
A	X	W	Z	Y
B	X	Z	W	Y
C	Y	W	Z	X
D	Y	Z	W	X

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Q133.

[0620/22/O/N/2018/Q26]

Which statement about the uses of metals is ~~not~~ correct?

- A Aluminium is used in aircraft because of its strength and good electrical conductivity.
- B Copper is used in electrical wiring because of its good electrical conductivity.
- C Stainless steel resists corrosion and is used to make cutlery.
- D Transition elements are often used as catalysts.

Q134.

[0620/22/O/N/2018/Q27]

Bauxite contains aluminium oxide.

Aluminium is extracted from aluminium oxide by electrolysis.

Why is cryolite added to the electrolytic cell used to extract aluminium?

- A Cryolite prevents the carbon anodes being burned away.
- B Cryolite removes impurities from the bauxite.
- C Cryolite increases the rate at which aluminium ions are discharged.
- D Molten cryolite dissolves the aluminium oxide.

Q135.

[0620/23/O/N/2018/Q24]

Heating copper(II) carbonate produces copper(II) oxide and carbon dioxide.

Heating the copper(II) oxide formed with carbon produces copper.

Which colour changes are observed during these reactions?

- A green → black → brown
- B green → white → brown
- C blue → black → silver
- D blue → white → brown

[0620/23/O/N/2018/Q25]

Q136.

Calcium reacts with cold water to produce hydrogen.

Lead reacts slowly when heated in air to form an oxide but has almost no reaction with steam.

Silver does not react with either air or water.

Zinc reacts when heated with steam to produce hydrogen.

What is the order of reactivity starting with the least reactive?

	least reactive	→	most reactive	
A	calcium	lead	zinc	silver
B	calcium	zinc	lead	silver
C	silver	lead	zinc	calcium
D	silver	zinc	lead	calcium

Q137.

[0620/23/O/N/2018/Q26]

Which row describes the use of a metal and the property upon which the use depends?

	metal	use	property
A	aluminium	aircraft bodies	aluminium is a heat conductor
B	aluminium	cooking utensils	aluminium has a low density
C	copper	cooking utensils	copper has a high density
D	copper	electrical wiring	copper is a good conductor of electricity

[0620/23/O/N/2018/Q34]

Q138.

Which equation represents the formation of lime?

- A $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- B $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$
- C $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$
- D $\text{Ca}(\text{OH})_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$

[0620/22/M/J/2019/Q26]

Q139.

Four metals, zinc, M, copper and magnesium, are reacted with aqueous solutions of their nitrates.

The results are shown.

metal	magnesium nitrate	M nitrate	copper nitrate	zinc nitrate
magnesium		✓	✓	✓
zinc	x	✓	✓ ↓ Act if	
M	x		↓ Act if	x
copper	x	x		x

key

✓ = reacts

x = no reaction

What is the order of reactivity of these four metals starting with the most reactive?

- A copper → zinc → M → magnesium
- B copper → M → zinc → magnesium
- C magnesium → M → zinc → copper
- D magnesium → zinc → M → copper

[0620/21/M/J/2019/Q27]

Q140.

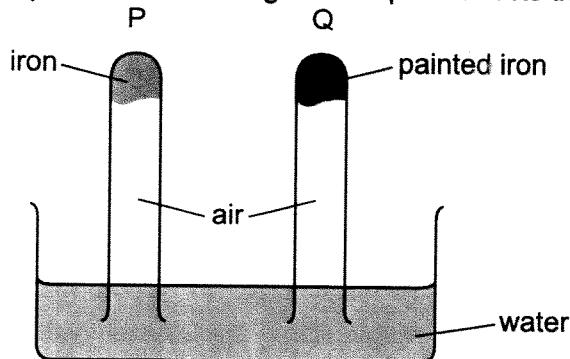
Why is aluminium used to make containers for storing food?

- A It conducts electricity.
- B It has a high melting point.
- C It is resistant to corrosion.
- D It is strong.

[0620/22/M/J/2019/31]

Q141.

The diagram shows an experiment to investigate how paint affects the rusting of iron.



What happens to the water level in tubes P and Q?

	tube P	tube Q
A	falls	rises
B	no change	rises
C	rises	falls
D	rises	no change

Q142.

[0620/22/M/J/2019/24]

A student heated the carbonates and nitrates of sodium and copper.

The results are shown.

	compound heated	gases released	solid formed
1	sodium carbonate	carbon monoxide	sodium oxide
2	copper(II) carbonate	carbon dioxide	copper
3	sodium nitrate	oxygen only	sodium nitrite
4	copper(II) nitrate	nitrogen dioxide and oxygen	copper(II) oxide

Which rows describe the correct results?

- A 1 and 3 B 2 and 3 C 3 and 4 D 4 only

Q143.

[0620/22/M/J/2019/27]

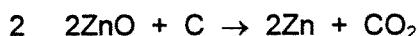
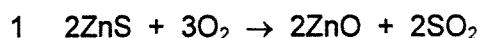
Which property of aluminium makes it useful in the manufacture of aircraft?

- A conducts electricity
B high boiling point
C low density
D silver colour

[0620/22/M/J/2019/25]

Q144.

Zinc is extracted from its ore, zinc blende, using two chemical reactions.



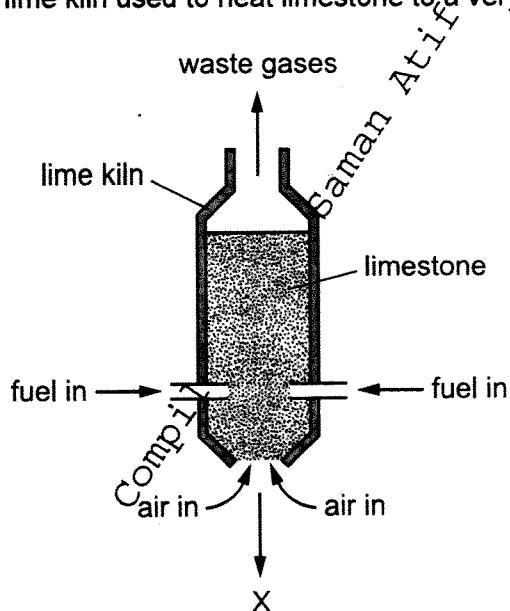
Which substance is reduced in reactions 1 and 2?

	reaction 1	reaction 2
A	O ₂	C
B	O ₂	ZnO
C	ZnS	C
D	ZnS	ZnO

[0620/22/M/J/2019/34]

Q145.

The diagram represents a lime kiln used to heat limestone to a very high temperature.



What leaves the kiln at X?

- A calcium carbonate
- B calcium hydroxide
- C calcium oxide
- D calcium sulfate

Q146.

[0620/23/M/J/2019/24]

Magnesium nitrate, magnesium hydroxide and magnesium carbonate all decompose when heated.

Which statement about these decomposition reactions is correct?

- A Magnesium carbonate decomposes to release carbon dioxide and oxygen.
- B Magnesium hydroxide decomposes to release hydrogen and oxygen.
- C Magnesium hydroxide decomposes to release water vapour.
- D Magnesium nitrate decomposes to release oxygen only.

Q147.

[0620/23/M/J/2019/27]

Aluminium is used to make containers for storing food.

Which property makes it suitable for this use?

- A conducts heat
- B low density
- C resists corrosion
- D shiny surface

Q148.

[0620/21/O/N/2019/27]

Which statement is correct?

- A Aluminium is used in the manufacture of aircraft because it has a high density.
- B Copper is used for cooking utensils because it is a good conductor of heat.
- C Mild steel is used for car bodies because it is resistant to corrosion.
- D Stainless steel is used for cutlery because it is a conductor of electricity.

Q149.

[0620/21/O/N/2019/28]

Iron rusts but aluminium does not easily corrode.

Which statement explains why aluminium does **not** easily corrode?

- A It is an alloy.
- B It is below iron in the reactivity series.
- C It is not a transition element.
- D Its surface is protected by an oxide layer.

Q150.

[0620/21/O/N/2019/29]

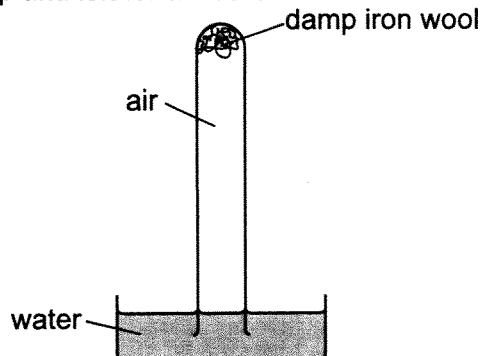
Which statement about the extraction of aluminium is correct?

- A Aluminium is formed at the cathode during the electrolysis of aluminium oxide.
- B Hematite is mainly aluminium oxide.
- C Molten cryolite is used to raise the melting point of the aluminium oxide.
- D Oxygen gains electrons at the anode during the electrolysis of aluminium oxide.

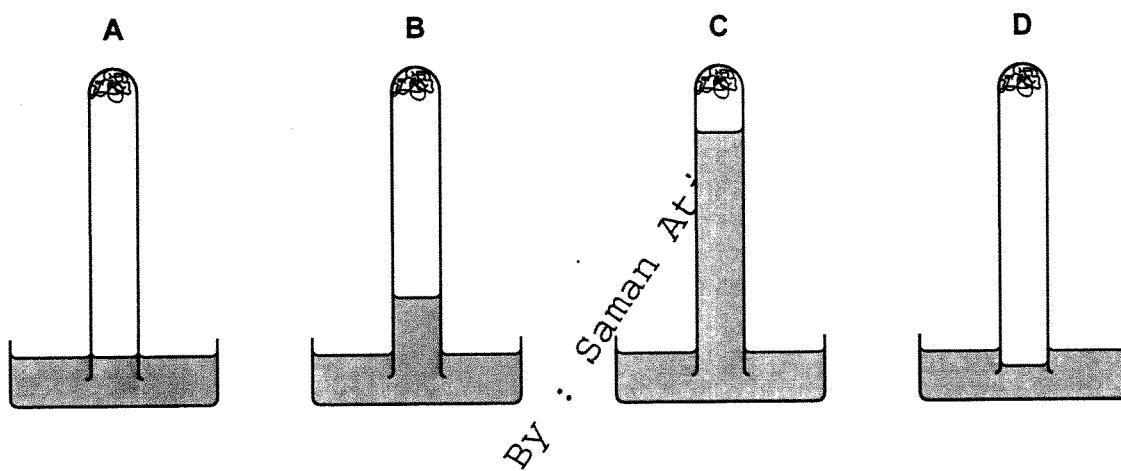
Q151.

[0620/22/O/N/2019/32]

The apparatus shown is set up and left for a week.



Which diagram shows the level of the water at the end of the week?



Q152.

[0620/22/O/N/2019/27]

Which row describes the uses of aluminium, copper and mild steel?

	aluminium	copper	mild steel
A	aircraft bodies	electrical wiring	car bodies
B	car bodies	cooking utensils	electrical wiring
C	electrical wiring	aircraft bodies	food containers
D	food containers	aircraft bodies	cooking utensils

Q153.

[0620/22/O/N/2019/29]

Which statement about the extraction of aluminium from aluminium oxide is correct?

- A Aluminium is formed at the positive electrode during electrolysis.
- B Pure aluminium oxide is dissolved in molten cryolite.
- C Pure aluminium oxide is electrolysed using aluminium as the positive electrode.
- D Pure aluminium oxide is heated with carbon to form carbon dioxide and aluminium.

Q154.

[0620/22/O/N/2019/28]

The properties of four metals are listed.

- Metal W does not react with dilute hydrochloric acid.
- Metal X reacts with dilute hydrochloric acid.
- Metal Y displaces metal X from an aqueous solution of its ions.
- Metal Z reacts with water and dilute hydrochloric acid.

What is the order of reactivity of the metals?

	most reactive			least reactive
A	W	X	Y	Z
B	W	Y	X	Z
C	Z	X	Y	W
D	Z	Y	X	W

Q155.

[0620/23/O/N/2019/28] Atif

Which word equation represents a reaction which occurs?

- A sodium oxide + carbon → sodium + carbon dioxide
- B sodium oxide + iron → sodium + iron(II) oxide
- C iron(II) oxide + copper → iron + copper(II) oxide
- D iron(III) oxide + carbon → iron + carbon dioxide

Q156.

[0620/23/O/N/2019/29] Combi

Why is cryolite used in the extraction of aluminium by electrolysis?

- A It changes bauxite to aluminium oxide.
- B It decreases the melting point of the aluminium.
- C It dissolves the aluminium oxide.
- D It protects the anodes from corrosion.

Q157.

[0620/23/O/N/2019/35]

Which type of reaction occurs when lime is manufactured from limestone?

- A combustion
- B neutralisation
- C redox
- D thermal decomposition

[0620/22/M/J/2020/25]

Q158.

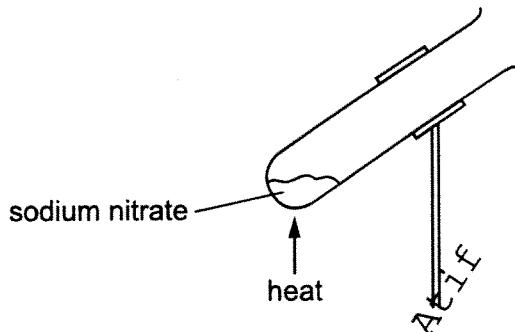
Which property is shown by all metals?

- A They are extracted from their ores by heating with carbon.
- B They conduct electricity.
- C They form acidic oxides.
- D They react with hydrochloric acid to form hydrogen.

[0620/21/M/J/2020/26]

Q159.

Sodium nitrate is a white crystalline solid that decomposes on heating.



Which row describes the decomposition products formed when sodium nitrate is heated strongly?

	solid products	gaseous products
A	sodium nitrite	NO ₂ and O ₂ only
B	sodium nitrite	O ₂ only
C	sodium oxide	NO ₂ and O ₂
D	sodium oxide	O ₂ only

[0620/22/M/J/2020/27]

Q160.

Molten iron from the blast furnace contains impurities.

The process of turning the impure iron into steel involves blowing oxygen into the molten iron and adding calcium oxide.

What are the reasons for blowing in oxygen and adding calcium oxide?

	blowing in oxygen	adding calcium oxide
A	carbon is removed by reacting with oxygen	reacts with acidic impurities making slag
B	carbon is removed by reacting with oxygen	reacts with slag and so removes it
C	iron reacts with the oxygen	reacts with acidic impurities making slag
D	iron reacts with the oxygen	reacts with slag and so removes it

Q161.

[0620/21/M/J/2020/32]

Coating iron helps to prevent rusting.

Which coating will continue to protect the iron even when the coating is damaged?

- A copper
- B paint
- C plastic
- D zinc

Q162.

[0620/22/M/J/2020/33]

A student suggests three uses of calcium carbonate (limestone).

- 1 manufacture of cement
- 2 manufacture of iron
- 3 treating alkaline soils

Which suggestions are correct?

- A 1 and 2 only B 1 and 3 only C 2 and 3 only D 1, 2 and 3

Q163.

[0620/22/M/J/2020/26]

Many metal carbonates decompose when they are heated.

Which row describes what happens when potassium carbonate, calcium carbonate and copper(II) carbonate are heated using a Bunsen burner?

	decomposes easily	decomposes with difficulty	does not decompose at Bunsen temperatures
A	calcium carbonate	copper(II) carbonate	potassium carbonate
B	copper(II) carbonate	calcium carbonate	potassium carbonate
C	copper(II) carbonate	potassium carbonate	calcium carbonate
D	potassium carbonate	calcium carbonate	copper(II) carbonate

Q164.

[0620/22/M/J/2020/28]

Four iron nails are added to four different metal sulfate solutions.

In which solution does a displacement reaction occur?

- A copper(II) sulfate
- B magnesium sulfate
- C sodium sulfate
- D zinc sulfate

Q165.

[0620/22/M/J/2020/32]

- Which process, used to prevent iron from rusting, involves sacrificial protection?
- alloying
 - electroplating
 - galvanising
 - painting

Q166.

[0620/23/M/J/2020/25]

Which property is shown by all metals?

- They are extracted from their ores by heating with carbon.
- They conduct electricity.
- They form acidic oxides.
- They react with hydrochloric acid to form hydrogen.

Q167.

[0620/23/M/J/2020/28]

P, Q, R and S are four metals.

P displaces Q from a solution of its sulfate.

Q reacts with hydrochloric acid and can be extracted from its ore using carbon.

R does not react with hydrochloric acid.

The carbonate of S does not decompose when heated strongly.

What is the order of reactivity of the metals, starting with the most reactive?

	most reactive			least reactive
A	R	P	Q	S
B	R	Q	P	S
C	S	P	Q	R
D	S	Q	P	R

Q168.

[0620/21/O/N/2020/29]

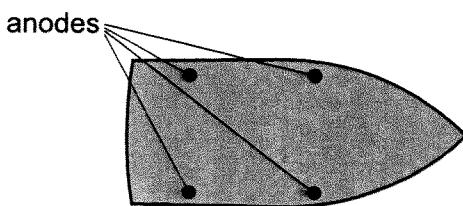
Which statements about the metal zinc are correct?

- It is extracted from the ore bauxite.
 - It is used to galvanise steel.
 - It is used to make the alloy brass.
 - It reacts with dilute hydrochloric acid to produce hydrogen gas.
- A 2 and 3 only B 1, 2 and 4 C 1, 3 and 4 D 2, 3 and 4

Q169.

[0620/23/M/J/2020/32]

The diagram shows the positions of sacrificial anodes on the steel hull of a yacht.



Which metal is used to make the anodes?

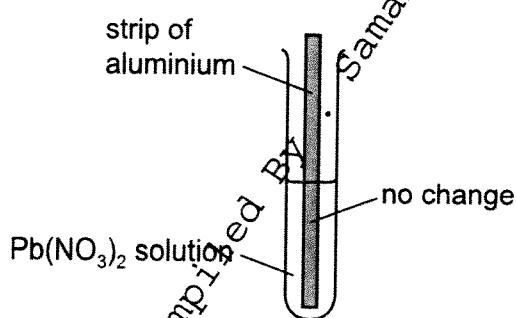
- A calcium
- B copper
- C sodium
- D zinc

Q170.

[0620/21/O/N/2020/28]

A strip of aluminium is placed into a test-tube containing aqueous lead(II) nitrate and left for several minutes.

Aluminium is higher than lead in the reactivity series.



Which statement explains why lead is **not** displaced by this strip of aluminium?

- A A thin insoluble layer of aluminium nitrate forms on the aluminium.
- B Nitrate ions are reduced in aqueous solution.
- C The ionic bonds between lead and nitrate ions are too strong.
- D There is an unreactive oxide layer on the aluminium.

Q171.

[0620/21/O/N/2020/30]

What is the symbol of the metal used in the manufacture of aircraft because of its strength and low density?

- A Al
- B Cu
- C Fe
- D Zn

Q172.

Iron can be protected from rusting by attaching a piece of a more reactive metal, e.g. magnesium, to the iron.

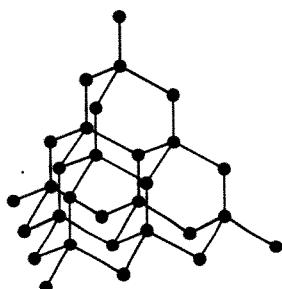
Which equation represents the reaction that takes place?

- A $\text{Fe(s)} \rightarrow \text{Fe}^{2+}(\text{aq}) + 2\text{e}^-$
- B $\text{Fe}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Fe(s)}$
- C $\text{Mg(s)} \rightarrow \text{Mg}^{2+}(\text{aq}) + 2\text{e}^-$
- D $\text{Mg}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Mg(s)}$

Q173.

Which diagram best represents the structure of a substance that is a good conductor of electricity at 25 °C?

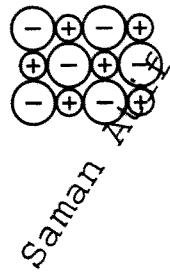
A



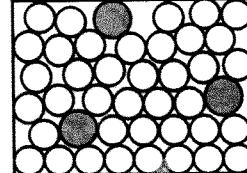
B



C

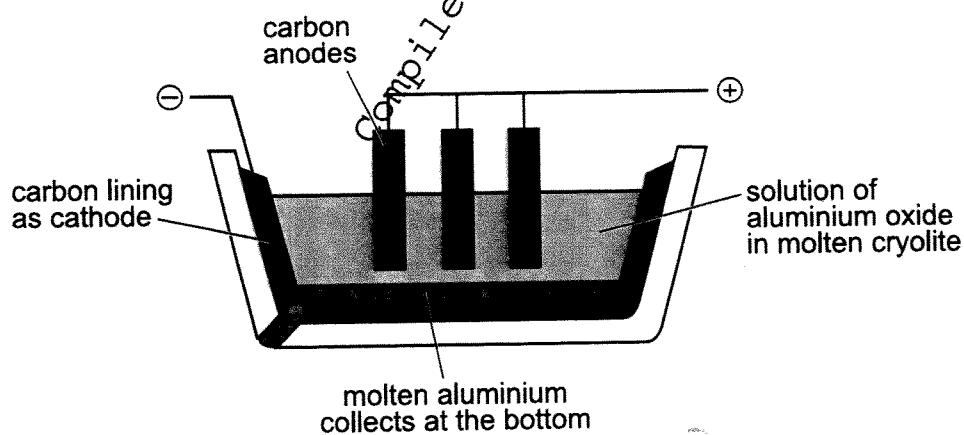


D



Q174.

The apparatus used for the extraction of aluminium oxide by electrolysis is shown.



Which equation represents a reaction taking place at the anode?

- A $\text{O} + 2\text{e}^- \rightarrow \text{O}^{2-}$
- B $2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$
- C $\text{Al}^{3-} \rightarrow \text{Al} + 3\text{e}^-$
- D $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$

[0620/22/O/N/2020/30]

Q175.

Why is aluminium metal unreactive with air?

- A It is covered with a layer of oxide.
- B It is low in the reactivity series.
- C It is produced by electrolysis of its oxide.
- D It melts at a high temperature.

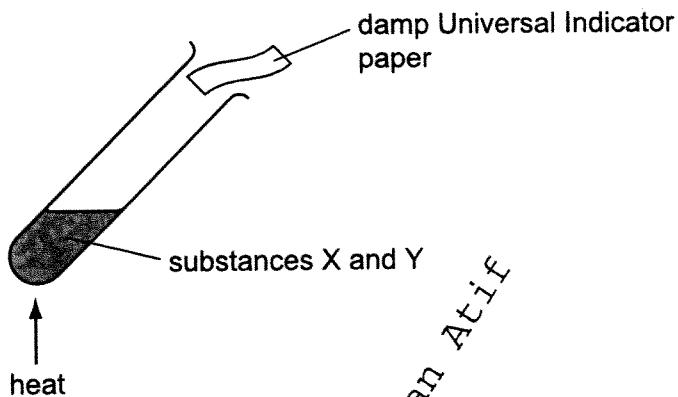
Compiled BY : Saman Atif

[0620/12/O/N/12/Q32]

Q1. Carbon dioxide is produced when dilute hydrochloric acid reacts with

- A calcium sulfate.
- B carbon.
- C copper(II) carbonate.
- D limewater.

[0620/12/O/N/12/Q33]

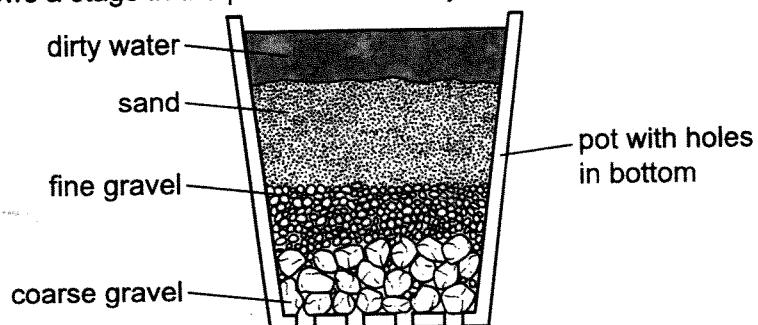
Q2. The diagram shows two substances, X and Y, being heated together.

The Universal Indicator paper turns blue during the experiment.

What are substances X and Y?

- A ammonium nitrate and hydrochloric acid
- B ammonium nitrate and sodium hydroxide
- C sodium carbonate and hydrochloric acid
- D sodium carbonate and sodium hydroxide

[0620/12/M/J/13/Q31]

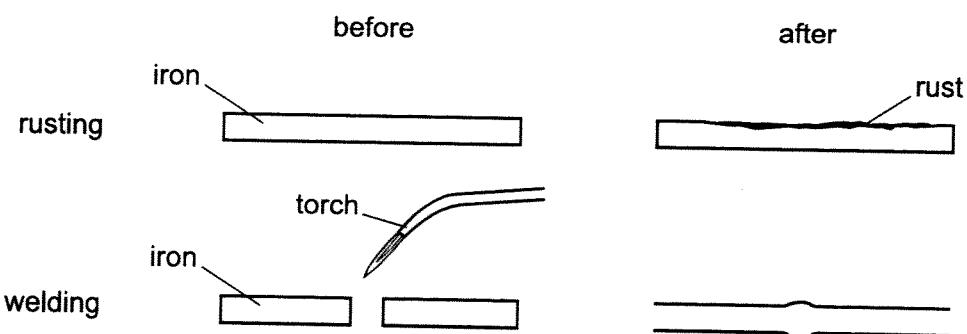
Q3. The diagram shows a stage in the purification of dirty water.

Which process does this apparatus show?

- A chlorination
- B condensation
- C distillation
- D filtration

[0620/12/M/J/13/Q32]

Q4. The diagrams show two processes.



For which processes is oxygen involved?

	rusting	welding
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

[0620/12/M/J/13/Q33]

Q5. Which substance would make the best general fertiliser?

	relative amount			solubility in water
	P	K	N	
A	5	0	5	soluble
B	5	5	20	insoluble
C	5	10	15	soluble
D	10	5	10	insoluble

[0620/12/M/J/13/Q34]

Q6. Which information about carbon dioxide and methane is correct?

		carbon dioxide	methane
A	formed when vegetation decomposes	✓	✗
B	greenhouse gas	✓	✓
C	present in unpolluted air	✗	✗
D	produced during respiration	✗	✓

key
✓ = true
✗ = false

[0620/12/M/J/13/Q35]

Q7. Which process does **not** produce carbon dioxide?

- A fermentation
- B respiration
- C the production of lime from limestone
- D the treatment of acidic soil with lime

[0620/11/M/J/13/Q31]

Q8. Water has been contaminated with sea-water.

Which substances can be removed by chlorination and filtration?

- A bacteria, sand and sodium chloride
- B bacteria and sand only
- C bacteria and sodium chloride only
- D sand and sodium chloride only

[0620/11/M/J/13/Q32]

Q9. Iron rusts when it reacts with1.....

Rusting can be prevented by covering the iron with2..... more reactive metal, such as

Which words correctly complete gaps 1 and 2?

	1	2
A	oxygen	copper
B	oxygen	magnesium
C	oxygen and water	copper
D	oxygen and water	magnesium

[0620/11/M/J/13/Q35]

Q10. The list shows four methods that were suggested for the formation of carbon dioxide.

- 1 action of an alkali on a carbonate
- 2 action of heat on a carbonate
- 3 complete combustion of methane
- 4 reaction of a carbonate with oxygen

Which methods would result in the production of carbon dioxide?

- A 1 and 2
- B 1 and 4
- C 2 and 3
- D 3 and 4

[0620/11/M/J/13/Q33]

Q11. Nitrogen, phosphorus and potassium are essential elements for plant growth.

Which mixture provides all three essential elements?

	mixture	formula
A	ammonium phosphate + potassium chloride	$(\text{NH}_4)_3\text{PO}_4$ + KCl
B	ammonium phosphate + ammonium nitrate	$(\text{NH}_4)_3\text{PO}_4$ + NH_4NO_3
C	ammonium phosphate + ammonium chloride	$(\text{NH}_4)_3\text{PO}_4$ + NH_4Cl
D	ammonium nitrate + potassium chloride	NH_4NO_3 + KCl

[0620/11/M/J/13/Q34]

Q12. Which information about carbon dioxide and methane is correct?

	BT	carbon dioxide	methane
A	formed when vegetation decomposes	✓	✗
B	greenhouse gas	✓	✓
C	present in unpolluted air	✗	✗
D	produced during respiration	✗	✓

key
 ✓ = true
 ✗ = false

[0620/13/O/N/13/Q29]

Q13. In which process is carbon dioxide **not** formed?

- A burning of natural gas
- B fermentation
- C heating lime
- D respiration

[0620/13/O/N/13/Q30]

Q14. Carbon dioxide is produced when

X reacts with ethanol.

Y reacts with sodium carbonate.

What are X and Y?

	X	Y
A	H ₂	HCl
B	H ₂	NaOH
C	O ₂	HCl
D	O ₂	NaOH

[0620/13/O/N/13/Q31]

Q15. A sample of fertiliser is tested by warming it with aqueous sodium hydroxide.

A colourless gas is produced which turns red litmus paper blue.

Which element, essential for plant growth, must be present?

- A nitrogen
 B phosphorus
 C potassium
 D sulfur

[0620/13/O/N/13/Q32]

Q16.

Iron rusts. This process involves the1..... of iron. Rusting can be prevented by covering the iron with grease or paint which stops2..... from reaching the surface of the iron.

Which words correctly complete gaps 1 and 2?

	1	2
A	oxidation	nitrogen
B	oxidation	oxygen
C	reduction	nitrogen
D	reduction	oxygen

[0620/13/O/N/13/Q33]

Q17. Oxides of nitrogen are given out from car exhausts.

Which row best shows why oxides of nitrogen are unwanted?

	acidic	toxic
A	no	no
B	no	yes
C	yes	no
D	yes	yes

[0620/13/O/N/13/Q34]

Q18. Water is treated at a water works to make it fit to drink.

What is present in the water when it leaves the waterworks?

- A bacteria only
- B bacteria and insoluble substances
- C chlorine only
- D chlorine and soluble substances

[0620/12/O/N/13/Q27]

Q19. Farmers add calcium oxide (lime) and ammonium salts to their fields.

The compounds are not added at the same time because they react with each other.

Which gas is produced in this reaction?

- A ammonia
- B carbon dioxide
- C hydrogen
- D nitrogen

[0620/12/O/N/13/Q33]

Q20. In many countries river water is used for the washing of clothes.

The same water is not considered to be safe for drinking.

Why is it **not** safe for drinking?

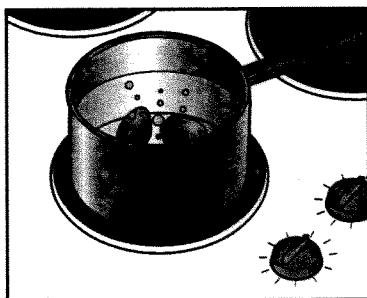
- A because river water contains dissolved salts
- B because river water may contain harmful bacteria
- C because river water may contain small particles of sand
- D because river water may contain soap from washing clothes

[0620/12/O/N/13/Q35]

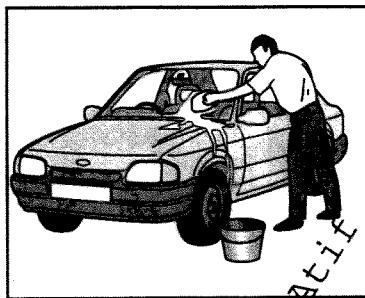
Q21. Which air pollutant is **not** made when coal burns in a power station?

- A carbon monoxide
- B lead compounds
- C nitrogen oxides
- D sulfur dioxide

[0620/12/M/J/14/Q30]

Q22. The diagram shows some uses of water in the home.

1



2



3

For which uses is it important for the water to have been treated?

- A 1 only
- B 2 only
- C 3 only
- D 1, 2 and 3

[0620/12/M/J/14/Q31]

Q23.

A piece of uncoated iron and three pieces of iron with various coatings were left exposed to the air.

Which piece of iron would rust? *Coatings*

- A the painted piece
- B the tin-coated piece
- C the uncoated piece
- D the zinc-coated piece

[0620/12/M/J/14/Q32]

Q24. Which compound would **not** be an effective fertiliser?

- A ammonium nitrate, NH_4NO_3
- B calcium oxide, CaO
- C calcium phosphate, $\text{Ca}_3(\text{PO}_4)_2$
- D potassium nitrate, KNO_3

[0620/12/M/J/14/Q33]

Q25. Sulfur dioxide, SO₂, nitrogen dioxide, NO₂, and carbon monoxide, CO, are air pollutants.

Which row correctly shows their major source?

	motor car engines	power stations
A	CO	NO ₂ , SO ₂
B	NO ₂ , CO	SO ₂
C	SO ₂ , NO ₂	CO
D	SO ₂	NO ₂ , CO

[0620/12/M/J/14/Q34]

Q26. Which process does **not** produce carbon dioxide?

- A combustion of methane
- B fermentation of sugar
- C polymerisation of ethene
- D respiration

[0620/12/M/J/14/Q35]

Q27. Which pollutant gas is produced by the decomposition of vegetation?

- A carbon monoxide
- B methane
- C nitrogen oxide
- D sulfur dioxide

[0620/11/M/J/14/Q31]

Q28. Four steel paper clips are treated as described before being placed in a beaker of water.

Which paper clip rusts most quickly?

- A coated with grease
- B dipped in paint and allowed to dry
- C electroplated with zinc
- D washed with soap and rinsed

[0620/11/M/J/14/Q32]

Q29. Which compound contains two of the three essential elements needed for a complete fertiliser?

- A ammonium chloride
- B ammonium nitrate
- C ammonium phosphate
- D ammonium sulfate

[0620/11/M/J/14/Q34]

Q30. Acid rain is formed when sulfur dioxide and oxides of nitrogen dissolve in rain water.

Which problem is **not** caused by acid rain?

- A breathing difficulties
- B dying trees
- C erosion of statues
- D lowered pH of lakes

[0620/11/M/J/14/Q35]

Q31. Which pollutant gas is produced by the decomposition of vegetation?

- A carbon monoxide
- B methane
- C nitrogen oxide
- D sulfur dioxide

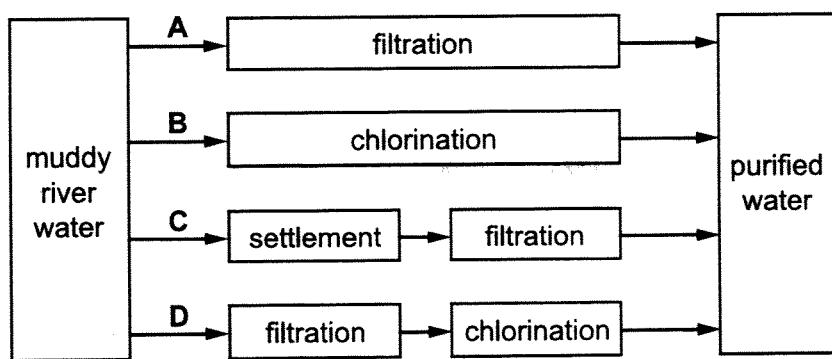
[0620/13/O/N/14/Q32]

Q32. Which pair of compounds would make a N, P, K fertiliser?

- A ammonium sulfate and potassium phosphate
- B calcium hydroxide and ammonium nitrate
- C calcium phosphate and potassium chloride
- D potassium nitrate and ammonium sulfate.

[0620/13/O/N/14/Q33]

Q33. Which method of purification would produce water **most** suitable for drinking?



[0620/13/O/N/14/Q34]

Q34. Which statement about methane is **not** correct?

- A It is a liquid produced by distilling petroleum.
- B It is produced as vegetation decomposes.
- C It is produced by animals, such as cows.
- D It is used as a fuel.

[0620/13/O/N/14/Q35]

Q35. A man blows up a balloon.

What is the approximate composition of his exhaled air in the balloon?

	% composition		
	carbon dioxide	oxygen	nitrogen
A	0.03	20	79
B	0.03	79	20
C	4	16	76
D	4	20	75

[0620/12/O/N/14/Q32]

Q36. Which method can be used to obtain ammonia from ammonium sulfate?

- A Heat it with an acid.
- B Heat it with an alkali.
- C Heat it with an oxidising agent.
- D Heat it with a reducing agent.

[0620/12/O/N/14/Q33]

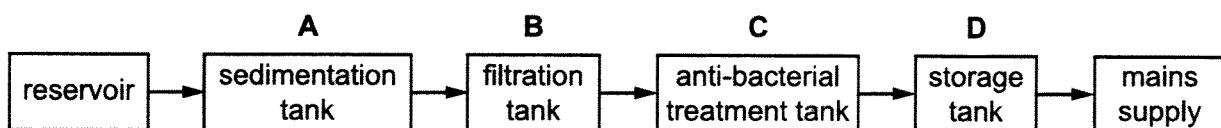
Q37. Which is an air pollutant that affects a part of the body other than the lungs and blood system?

- A lead compounds
- B nitrogen
- C oxides of nitrogen
- D sulfur dioxide

[0620/13/M/J/15/Q27]

Q38. The diagram shows stages in producing drinking water.

In which tank is chlorine added to the water?



[0620/13/M/J/15/Q28]

Q39. Oxygen is a reactive element.

Which row shows which of oxygen's reactions are useful?

	fuel combustion	rusting	steel manufacture
A	no	no	yes
B	no	yes	no
C	yes	no	yes
D	yes	yes	no

[0620/13/M/J/15/Q32]

Q40. Carbon dioxide and methane are 'greenhouse gases' which contribute to global warming.

Which process does **not** increase global warming?

- A burning fossil fuels
- B decay of organic waste
- C farming cattle for beef
- D growing crops such as sugar cane

[0620/13/M/J/15/Q33]

Q41. Four reactions produce carbon dioxide.

- 1 respiration
- 2 fermentation
- 3 combustion of methane
- 4 manufacture of lime

Which reactions do **not** use oxygen from the air?

- A 1 and 2
- B 1 and 3
- C 2 and 4
- D 3 and 4

[0620/12/M/J/15/Q28]

Q42. Which gas is **not** present in a sample of clean air?

- A** carbon dioxide
- B** chlorine
- C** oxygen
- D** water vapour

[0620/12/M/J/15/Q30]

Q43. Carbon monoxide is given out from the exhaust of vehicles that burn fossil fuels.

Which row shows why carbon monoxide is a pollutant?

	acidic	toxic
A	no	no
B	no	yes
C	yes	no
D	yes	yes

[0620/12/M/J/15/Q31]

Q44. A zinc compound forms carbon dioxide in two different reactions.

- 1 It is heated strongly.
- 2 It is added to hydrochloric acid.

Which type of reaction occurs in 1 and 2?

	1	2
A	combustion	neutralisation
B	combustion	oxidation
C	thermal decomposition	neutralisation
D	thermal decomposition	oxidation

Q45. Which gas is **not** found in clean air?

- A** carbon dioxide
- B** carbon monoxide
- C** nitrogen
- D** oxygen

Q46.

[0620/11/M/J/15/Q30]

The pollutants released into the air from car exhausts and some power stations include oxides of the type XO and YO_2 .

What are X and Y?

	X	Y
A	carbon only	nitrogen only
B	carbon only	nitrogen and sulfur only
C	carbon and nitrogen	carbon and nitrogen only
D	carbon and nitrogen	carbon, nitrogen and sulfur

[0620/11/M/J/15/Q33]

Q47. These statements are about a gas.

- 1 It is produced by thermal decomposition of a carbonate.
- 2 It is produced by the fermentation of glucose.
- 3 It makes up 1% of unpolluted air.
- 4 It is produced during the production of steel from iron.

Which statements are correct for carbon dioxide?

- A 1 and 2 only B 1, 2 and 3 C 1, 2 and 4 D 1, 3 and 4

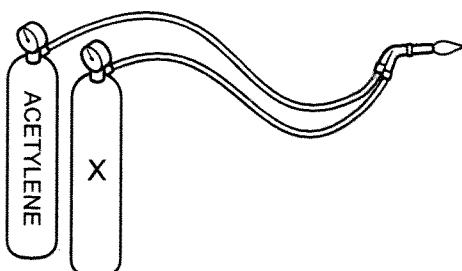
[0620/01/O/N/15/Q27]

Q48. Which statements about water are correct?

- 1 Household water may contain salts in solution.
 - 2 Water for household use is filtered to remove soluble impurities.
 - 3 Water is treated with chlorine to kill bacteria.
 - 4 Water is used in industry for cooling.
- A 1, 2, 3 and 4
 B 1, 2 and 3 only
 C 1, 3 and 4 only
 D 2, 3 and 4 only

Q49.

The diagram shows the flame produced from burning a hydrocarbon, acetylene, in a welding torch.



Which gas is X?

- A hydrogen
- B methane
- C nitrogen
- D oxygen

[0620/13/O/N/15/Q28]

Q50. Carbon monoxide is an air pollutant produced when petrol is burned in a car engine.

Why is carbon monoxide considered to be an air pollutant?

- A It causes climate change.
- B It causes the corrosion of buildings.
- C It is a significant greenhouse gas.
- D It is poisonous.

[0620/13/O/N/15/Q29]

Q51. Which compound is **not** a fertiliser?

- A ammonium sulfate, $(\text{NH}_4)_2\text{SO}_4$
- B calcium hydroxide, $\text{Ca}(\text{OH})_2$
- C potassium chloride, KCl
- D urea, $\text{CO}(\text{NH}_2)_2$

[0620/13/O/N/15/Q30]

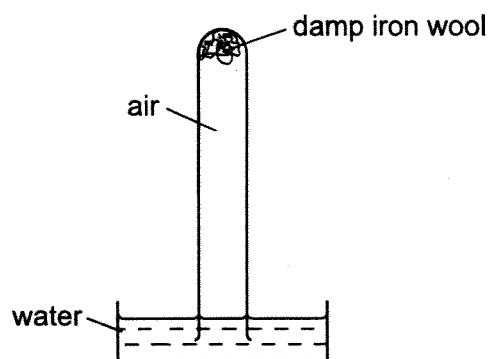
Q52. In which reaction is carbon dioxide **not** produced?

- A complete combustion of petrol
- B hydrochloric acid reacting with magnesium
- C respiration
- D thermal decomposition of limestone

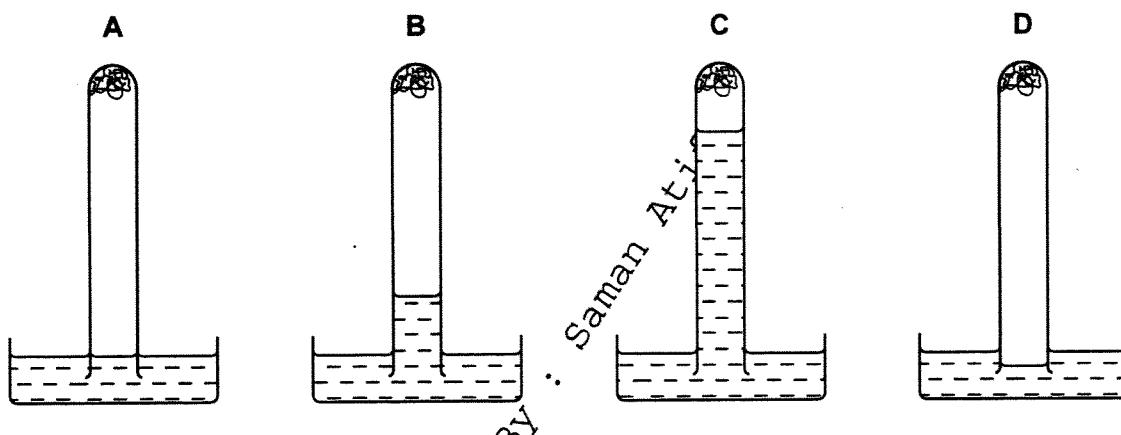
Q53.

[0620/13/O/N/15/Q32]

The apparatus shown is set up and left for a week.



Which diagram shows the level of the water at the end of the week?



[0620/13/O/N/15/Q33]

Q54.

Unwanted vegetation is sometimes placed in a bin where it decays to form compost. This compost can be used to fertilise soils.

Which gas is likely to be present in a higher percentage inside the bin than in the air outside the bin?

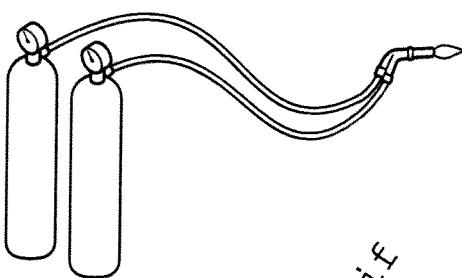
- A carbon monoxide
- B methane
- C oxygen
- D sulfur dioxide

[0620/12/O/N/15/Q28]

Q55. Which gas is a pollutant of the air?

- A argon
- B carbon dioxide
- C nitrogen
- D sulfur dioxide

[0620/12/O/N/15/Q30]

Q56. Metals are welded by using the heat produced by burning a gas in oxygen.Which gas could **not** be used for this purpose?

- A ethene
- B hydrogen
- C helium
- D methane

[0620/12/O/N/15/Q31]

Q57. Which elements are present in NPK fertilisers?

- A nitrogen, phosphorus, potassium
- B nitrogen, potassium, calcium
- C sodium, phosphorus, potassium
- D sodium, potassium, calcium

[0620/12/O/N/15/Q33]

Q58. A farmer moves his cows into a concrete shelter for protection.

There is little access for fresh air once the door is closed.

Which gases would increase in amount in the shelter?

- A carbon dioxide and carbon monoxide
- B carbon dioxide and methane
- C carbon monoxide and oxygen
- D methane and oxygen

Q59.

[0620/11/O/N/15/Q14]

Some crystals of hydrated cobalt(II) chloride are heated in a test-tube until no further change is observed.

The test-tube is allowed to cool and a few drops of water are then added to the contents.

Which colours are observed?

	before heating	after heating	after adding water
A	blue	pink	blue
B	blue	white	blue
C	pink	blue	pink
D	white	blue	white

[0620/11/O/N/15/Q28]

Q60. Which is a use of oxygen?

- A as the gas in a lamp
- B to react with ethene to form ethanol
- C to react with methane in a Bunsen burner
- D to react with hematite to form iron

[0620/11/O/N/15/Q29]

Q61. Carbon monoxide is an air pollutant produced when petrol is burned in a car engine.

Why is carbon monoxide considered to be an air pollutant?

- A It causes climate change.
- B It causes the corrosion of buildings.
- C It is a significant greenhouse gas.
- D It is poisonous.

[0620/11/O/N/15/Q30]

Q62. Fertilisers are mixtures of different compounds used to increase the growth of crops.

Which pair of substances contains the three essential elements for plant growth?

- A ammonium nitrate and calcium phosphate
- B ammonium nitrate and potassium chloride
- C ammonium phosphate and potassium chloride
- D potassium nitrate and calcium carbonate

[0620/11/O/N/15/Q31]

Q63. Which process does **not** produce carbon dioxide?

- A complete combustion of a fossil fuel
- B fermentation
- C reaction of an alkali with a carbonate
- D respiration

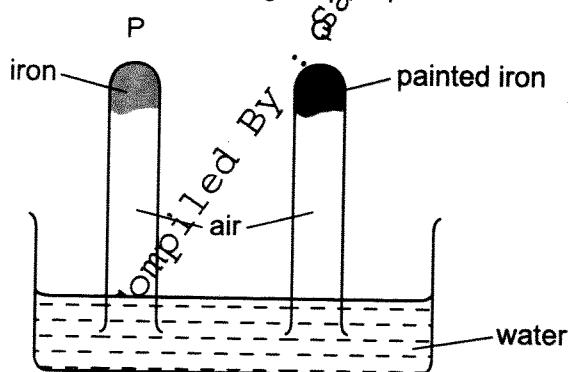
[0620/11/O/N/15/Q33]

Q64. Carbon dioxide and methane both contribute to climate change.

Which process produces both gases?

- A complete combustion of natural gas
- B farming cattle
- C heating calcium carbonate
- D respiration

[0620/21/M/J/16/Q29]

Q65. The diagram shows an experiment to investigate how paint affects the rusting of iron.

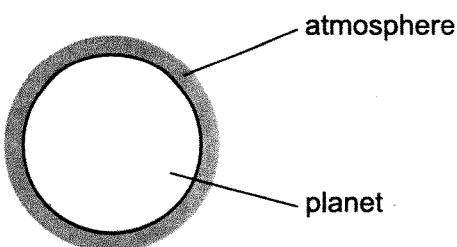
What happens to the water level in tubes P and Q?

	tube P	tube Q
A	falls	rises
B	no change	rises
C	rises	falls
D	rises	no change

[0620/21/M/J/16/Q30]

Q66.

A new planet has been discovered and its atmosphere has been analysed.



The table shows the composition of its atmosphere.

gas	percentage by volume
carbon dioxide	4
nitrogen	72
oxygen	24

Which gases are present in the atmosphere of the planet in a higher percentage than they are in the Earth's atmosphere?

- A carbon dioxide and oxygen
- B carbon dioxide only
- C nitrogen and oxygen
- D nitrogen only

Q67.

Catalytic converters are used to remove some gaseous pollutants from car exhaust fumes.

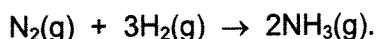
Which gas is removed from the fumes by oxidation?

- A carbon dioxide
- B carbon monoxide
- C nitrogen
- D nitrogen oxide

Q68.

[0620/23/M/J/16/Q32]

Ammonia is produced by the Haber process.



Which statement about the Haber process is **not** correct?

- A An iron catalyst is used to increase the rate of reaction.
- B The reaction is carried out at high temperature to increase the rate of reaction.
- C The reaction is carried out at low pressure to increase the yield of ammonia.
- D The reaction is reversible.

Q69.

[0620/22/M/J/16/Q31]

The gases coming from a car's engine contain oxides of nitrogen.

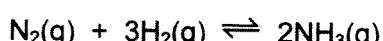
How are these oxides formed?

- A Nitrogen reacts with carbon dioxide.
- B Nitrogen reacts with carbon monoxide.
- C Nitrogen reacts with oxygen.
- D Nitrogen reacts with petrol.

Q70.

[0620/22/M/J/16/Q32]

Ammonia is manufactured by a reversible reaction.



The forward reaction is exothermic.

What is the effect of increasing the pressure on the percentage yield and rate of formation of ammonia?

	percentage yield	rate of formation
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

Q71.

[0620/21/M/J/16/Q31]

Many car exhaust systems contain a catalytic converter.

Which change does **not** occur in a catalytic converter?

- A carbon dioxide \rightarrow carbon
- B carbon monoxide \rightarrow carbon dioxide
- C nitrogen oxides \rightarrow nitrogen
- D unburnt hydrocarbons \rightarrow carbon dioxide and water

Q72.

[0620/21/M/J/16/Q34]

A farmer's soil is very low in both nitrogen (N) and phosphorus (P).

Which fertiliser would improve the quality of this soil most effectively?

	percentage		
	nitrogen (N)	phosphorus (P)	potassium (K)
A	11	11	27
B	12	37	10
C	28	10	10
D	31	29	9

Q73. Air is a mixture of gases.

Which gas is present in the largest amount?

- A argon
- B carbon dioxide
- C nitrogen
- D oxygen

[0620/23/O/N/16/Q30]

Q74. Which information about carbon dioxide and methane is correct?

		carbon dioxide	methane
A	formed when vegetation decomposes	✓	x
B	greenhouse gas	x	✓
C	present in unpolluted air	x	x
D	produced during respiration	x	✓

key
✓ = true
x = false

[0620/23/O/N/16/Q34]

Q75. Slaked lime is used to neutralise an acidic soil.

How does the pH of the soil change?

	from	to
A	6	7
B	7	8
C	8	7
D	8	6

Q76.

[0620/21/O/N/16/Q31]

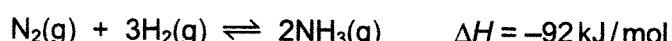
Underwater steel pipes can be protected from corrosion by attaching magnesium blocks to them. Which equation represents the reaction that prevents corrosion?

- A $\text{Fe} \rightarrow \text{Fe}^{2+} + 2\text{e}^-$
- B $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}^-$
- C $\text{Mg} \rightarrow \text{Mg}^{2+} + 2\text{e}^-$
- D $\text{Mg}^{2+} + 2\text{e}^- \rightarrow \text{Mg}$

Q77.

[0620/21/O/N/16/Q32]

Ammonia is manufactured by the Haber process. The reaction is exothermic.



Which statement about the Haber process is correct?

- A The reaction is irreversible and produces only one product.
- B The reaction is reversible and produces less ammonia at high pressure.
- C The reaction is reversible and produces less ammonia at high temperature.
- D The reaction is slow because a catalyst is not used in the Haber process.

[0620/21/M/J/17/Q30]

Q78.

Oxides of nitrogen are found in polluted air. BY
Samoa

Which statement about oxides of nitrogen is correct?

- A Oxides of nitrogen are formed by the reaction of nitrogen with oxygen during the fractional distillation of liquid air.
- B Oxides of nitrogen are formed in a car engine by the reaction of petrol with nitrogen from the air.
- C Oxides of nitrogen are removed from exhaust gases by reaction with carbon dioxide in a catalytic converter.
- D Oxides of nitrogen are removed from exhaust gases by reduction in a catalytic converter.

Q79.

[0620/21/M/J/17/Q31]

Photosynthesis and respiration are important natural processes.

Which statement is correct?

- A Carbon dioxide is formed by the reaction of glucose with water during photosynthesis.
- B Carbon dioxide is removed from the air by respiration.
- C Glucose reacts with water to form oxygen during respiration.
- D Photosynthesis produces glucose and oxygen.

Q80.

[0620/22/M/J/17/Q30]

The carbon cycle includes the processes combustion, photosynthesis and respiration.

Which row shows how each process changes the amount of carbon dioxide in the atmosphere?

	combustion	photosynthesis	respiration
A	decreases	decreases	increases
B	decreases	increases	decreases
C	increases	decreases	increases
D	increases	increases	decreases

[0620/22/M/J/17/Q32]

Q81.

Which chemical reaction decreases pollution in the air?

- A $S + O_2 \rightarrow SO_2$
- B $N_2 + O_2 \rightarrow 2NO$
- C $2CH_4 + 3O_2 \rightarrow 2CO + 4H_2O$
- D $2NO + 2CO \rightarrow 2CO_2 + N_2$

Q82.

[0620/23/M/J/17/Q30]

The carbon cycle describes how carbon dioxide gas is added to or removed from the atmosphere.

Which row describes the movement of carbon dioxide during each process?

	photosynthesis	combustion	respiration
A	added to the atmosphere	added to the atmosphere	removed from the atmosphere
B	added to the atmosphere	removed from the atmosphere	added to the atmosphere
C	removed from the atmosphere	added to the atmosphere	added to the atmosphere
D	removed from the atmosphere	added to the atmosphere	removed from the atmosphere

Q83.

[0620/23/M/J/17/Q32]

Petrol burns in a car engine to produce waste gases which leave through the car exhaust.

One of these waste gases is an oxide of nitrogen.

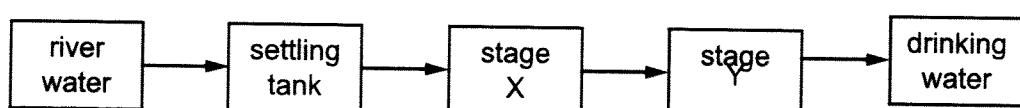
Which statement describes how this oxide of nitrogen is formed?

- A Carbon dioxide reacts with nitrogen in the catalytic converter.
- B Nitrogen reacts with oxygen in the car engine.
- C Nitrogen reacts with oxygen in the catalytic converter.
- D Petrol combines with nitrogen in the car engine.

Q84.

[0620/21/O/N/17/29]

The flow chart shows stages in the treatment of river water to produce drinking water.



What occurs at stages X and Y?

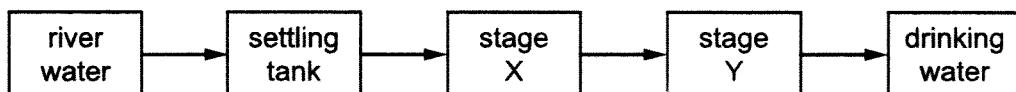
	X	Y
A	distillation	chlorination
B	distillation	filtration
C	filtration	chlorination
D	filtration	distillation

[0620/21/O/N/17/32]

Q85. Which process does not produce carbon dioxide?

- A combustion of alkanes
- B photosynthesis
- C respiration
- D thermal decomposition of limestone

[0620/22/O/N/17/29]

Q86. The flow chart shows stages in the treatment of river water to produce drinking water.

What occurs at stages X and Y?

	X	Y
A	distillation	chlorination
B	distillation	filtration
C	filtration	chlorination
D	filtration	distillation

Saman Atif

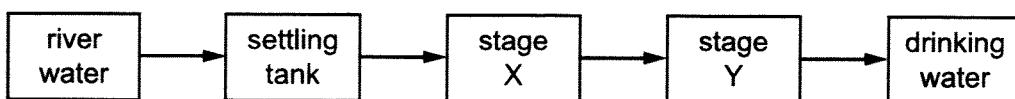
[0620/22/O/N/17/32]

Q87. Which process removes carbon dioxide from the atmosphere?

- A combustion of fossil fuels
- B decomposition of carbonates
- C photosynthesis
- D respiration

[0620/23/O/N/17/29]

Q88. The flow chart shows stages in the treatment of river water to produce drinking water.



What occurs at stages X and Y?

	X	Y
A	distillation	chlorination
B	distillation	filtration
C	filtration	chlorination
D	filtration	distillation

[0620/23/O/N/17/32]

Q89. Which process does not produce carbon dioxide?

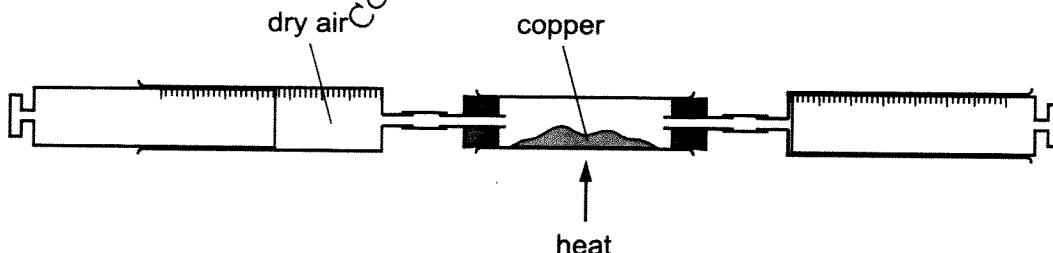
- A combustion of methane
- B photosynthesis
- C respiration
- D thermal decomposition of calcium carbonate

Saman Atif

BY

[0620/22/M/J/18/28]

Q90. Dry air is passed over hot copper until all the oxygen has reacted.



The volume of gas at the end of the reaction is 120 cm^3 .

What is the starting volume of dry air?

- A 132 cm^3
- B 152 cm^3
- C 180 cm^3
- D 570 cm^3

Q91.

[0620/22/M/J/18/29]

A steel bicycle which had been left outdoors for several months was starting to rust.
 What would **not** reduce the rate of corrosion?

- A** Remove the rust and paint the bicycle.
- B** Remove the rust and store the bicycle in a dry shed.
- C** Remove the rust and wipe the bicycle with a clean, damp cloth.
- D** Remove the rust and wipe the bicycle with an oily cloth.

Q92.

[0620/22/M/J/18/30]

Which statements about water are correct?

- 1 Household water contains dissolved salts.
 - 2 Water for household use is filtered to remove soluble impurities.
 - 3 Water is treated with chlorine to kill bacteria.
 - 4 Water is used in industry for cooling.
- A** 1, 2, 3 and 4
 - B** 1, 2 and 3 only
 - C** 1, 3 and 4 only
 - D** 2, 3 and 4 only

Q93.

[0620/22/M/J/18/31]

Ammonia is manufactured by reacting hydrogen with nitrogen in the Haber process.

Which row describes the sources of hydrogen and nitrogen and the conditions used in the manufacture of ammonia in the Haber process?

	source of hydrogen	source of nitrogen	temperature of reaction / °C	pressure of reaction / atm
A	air	natural gas	250	2
B	air	natural gas	250	200
C	natural gas	air	450	2
D	natural gas	air	450	200

Q94.

[0620/22/M/J/18/32]

Which statements about the carbon cycle are correct?

- 1 Carbon dioxide is added to the atmosphere by respiration.
 - 2 Carbon dioxide is added to the atmosphere by combustion of coal.
 - 3 Carbon dioxide is removed from the atmosphere by photosynthesis.
- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

[0620/21/M/J/18/34]

Q95. Which process is used to convert limestone (calcium carbonate) into lime?

- A electrolysis
- B fractional distillation
- C incomplete combustion
- D thermal decomposition

[0620/23/M/J/18/34]

Q96. Limestone is an important material with many uses.

Limestone is heated to produce1..... and carbon dioxide.

This reaction is called2..... .

Which words correctly complete gaps 1 and 2?

	1	2
A	lime	neutralisation
B	lime	thermal decomposition
C	slaked lime	neutralisation
D	slaked lime	thermal decomposition

[0620/21/O/N/2018/29]

Q97. Which statement about air pollutants is **not** correct?

- A Carbon monoxide is formed from the complete combustion of petroleum.
- B Lead compounds are formed from some types of petrol.
- C Oxides of nitrogen are formed from the combustion reactions inside car engines.
- D Sulfur dioxide is formed from the combustion of coal.

[0620/22/O/N/2018/30]

Q98. Argon is a noble gas used to fill light bulbs.

What is the approximate percentage of argon in air?

- A 1%
- B 20%
- C 79%
- D 99%

[0620/22/O/N/2018/29]

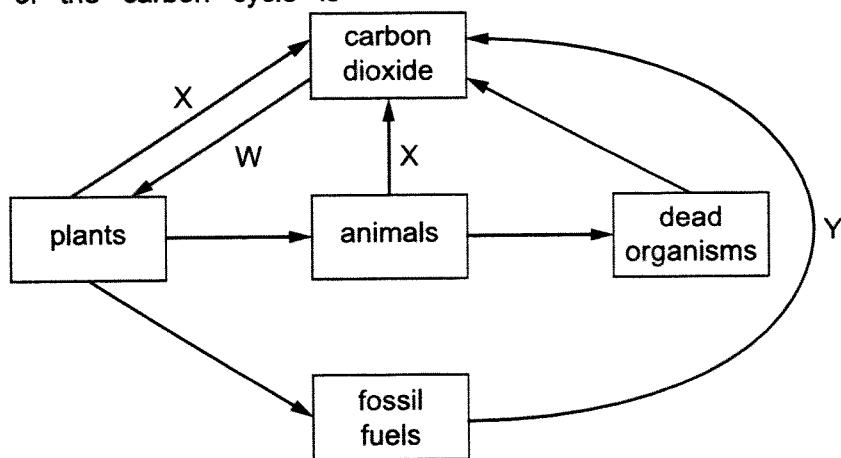
Q99. Which statements about sulfur dioxide pollution are correct?

- 1 It increases the pH of rivers.
 - 2 It damages limestone buildings.
 - 3 It causes respiratory problems.
- A 1 only
 - B 2 only
 - C 1 and 3
 - D 2 and 3

Q100

[0620/21/O/N/2018/32]

A diagram of the carbon cycle is shown.



Which processes are represented by the letters W, X and Y?

	W	X	Y
A	photosynthesis	combustion	respiration
B	photosynthesis	respiration	combustion
C	respiration	combustion	photosynthesis
D	respiration	photosynthesis	combustion

[0620/22/O/N/2018/32]

Q101.

In the carbon cycle, which two processes add carbon dioxide to the atmosphere?

- A combustion and carbonate formation
- B combustion and photosynthesis
- C combustion and respiration
- D respiration and photosynthesis

[0620/23/O/N/2018/32]

Q102.

Which statement about the carbon cycle is correct?

- A Animals and plants need carbon dioxide for respiration.
- B Combustion of plants and natural gas produces carbon dioxide.
- C Plants produce glucose from carbon dioxide and oxygen.
- D Oxygen is produced by both animals and plants.

Q103.

[0620/22/M/J/2019/29]

Water can be treated by filtration then chlorination.
Which uses do not need water of this quality?

- 1 water for cooling in industry
 - 2 water for washing clothes
 - 3 water for drinking
- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

Q104.

[0620/21/M/J/2019/29]

Oxides of nitrogen are formed in car engines and are a source of air pollution.

To decrease this pollution, catalytic converters are fitted to car exhausts.

What happens to the oxides of nitrogen in the catalytic converter?

- A** combustion
- B** cracking
- C** oxidation
- D** reduction

Q105.

[0620/22/M/J/2019/28]

The exhaust gases from cars contain oxides of nitrogen.

How are these oxides of nitrogen formed?

- A** Nitrogen and oxygen from the air react together at the high temperatures in the engine.
- B** Nitrogen and oxygen from the petrol react together in the car exhaust.
- C** Nitrogen from the petrol reacts with oxygen at the high temperatures in the engine.
- D** Nitrogen reacts with oxygen from the air in the catalytic converter.

Q106.

[0620/22/M/J/2019/30]

Some of the processes involved in the carbon cycle are shown.

- 1 glucose + oxygen → carbon dioxide + water
- 2 carbon dioxide + water → glucose + oxygen
- 3 methane + oxygen → carbon dioxide + water

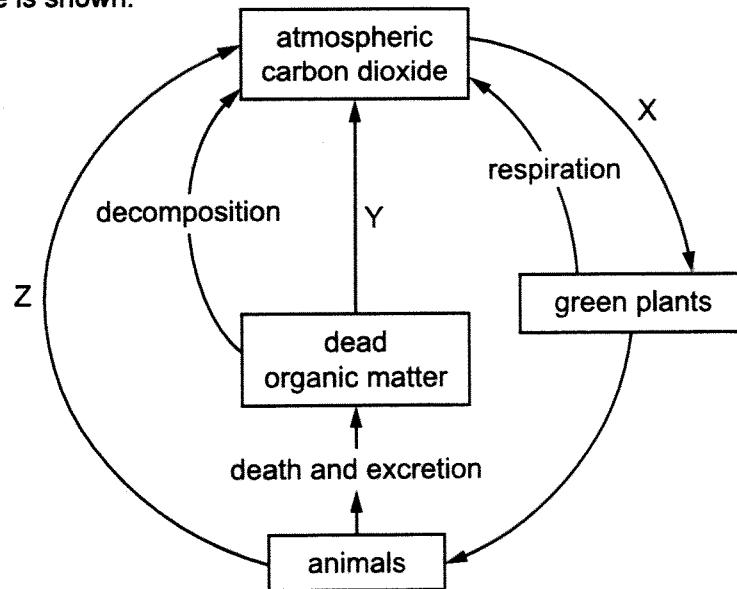
What are the names of these processes?

	1	2	3
A	combustion	respiration	photosynthesis
B	photosynthesis	combustion	respiration
C	respiration	combustion	photosynthesis
D	respiration	photosynthesis	combustion

[0620/21/M/J/2019/32]

Q107.

The carbon cycle is shown.



Which row describes processes X, Y and Z?

	X	Y	Z
A	respiration	combustion	photosynthesis
B	respiration	photosynthesis	combustion
C	photosynthesis	combustion	respiration
D	photosynthesis	respiration	combustion

[0620/23/M/J/2019/29]

Q108.

Catalytic converters in car exhausts change polluting gases into non-polluting gases.

Which statements about oxides of nitrogen and car engines are correct?

- 1 The nitrogen in oxides of nitrogen comes from compounds in petrol.
- 2 The oxygen in oxides of nitrogen comes from the air in the car engine.
- 3 Catalytic converters convert oxides of nitrogen into nitrogen and other gases.

A 1 and 2

B 2 and 3

C 2 only

D 3 only

Q109.

[0620/23/M/J/2019/31]

Which row about the carbon cycle is correct?

	process for removing carbon dioxide from the atmosphere	process for returning carbon dioxide to the atmosphere
A	photosynthesis	combustion of hydrocarbons
B	photosynthesis	cracking of hydrocarbons
C	respiration	combustion of hydrocarbons
D	respiration	cracking of hydrocarbons

Q110.

[0620/22/O/N/2019/30]

River water contains soluble impurities, insoluble impurities and bacteria.

River water is made safe to drink by filtration and chlorination.

Which statement is correct?

- A Filtration removes bacteria and insoluble impurities, and chlorination removes soluble impurities.
- B Filtration removes insoluble impurities, and chlorination kills the bacteria.
- C Filtration removes soluble and insoluble impurities, and chlorination kills the bacteria.
- D Filtration removes soluble impurities and bacteria, and chlorination removes insoluble impurities.

Q111.

[0620/22/O/N/2019/31]

Which physical property is used to separate the nitrogen and oxygen from air?

- A boiling point
- B density
- C electrical conductivity
- D molecular mass

Q112.

[0620/21/O/N/2019/33]

Which statement about the carbon cycle is correct?

- A Carbon is absorbed from the atmosphere by combustion and released into it by respiration.
- B Carbon is absorbed from the atmosphere by photosynthesis and released into it by combustion.
- C Carbon is absorbed from the atmosphere by both respiration and combustion.
- D Carbon is released into the atmosphere by both photosynthesis and respiration.

[0620/22/O/N/2019/31]

Q113.

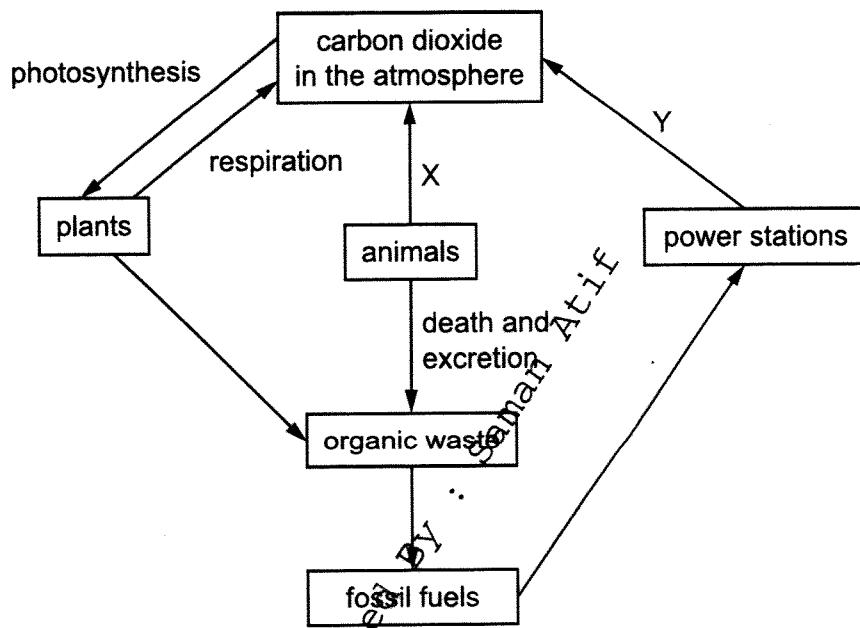
Which process is used to separate nitrogen and oxygen from air?

- A chromatography
- B evaporation
- C filtration
- D fractional distillation

[0620/22/O/N/2019/33]

Q114.

The diagram represents an outline of the carbon cycle.



Which processes are X and Y?

	X	Y
A	combustion	respiration
B	decomposition	respiration
C	photosynthesis	combustion
D	respiration	combustion

[0620/23/O/N/2019/31]

Q115.

How are oxygen and nitrogen separated from air?

- A chromatography
- B condensation and filtration
- C crystallisation
- D fractional distillation

Q116.

[0620/23/O/N/2019/33]

The following processes are part of the carbon cycle.

- 1 photosynthesis
- 2 combustion
- 3 respiration

Which processes decrease the amount of carbon dioxide in the atmosphere?

- A 1 only B 1 and 2 only C 1 and 3 only D 2 and 3 only

Q117.

[0620/21/M/J/2020/29]

Which statement shows that a liquid is pure water?

- A It boils at 100 °C.
B It has a pH value of 7.
C It turns blue cobalt(II) chloride pink.
D It turns white copper(II) sulfate blue.

Q118.

[0620/21/M/J/2020/30]

Which process removes carbon dioxide from the atmosphere?

- A combustion
B decomposition
C photosynthesis
D respiration

Q119.

[0620/22/M/J/2020/29]

Which statement about pure water is ~~not~~ correct?

- A It condenses at 100 °C.
B It freezes at 0 °C.
C It turns cobalt(II) chloride paper blue.
D It turns anhydrous copper(II) sulfate blue.

Q120.

[0620/23/M/J/2020/29]

Which substances can be used to detect the presence of water?

- 1 cobalt(II) chloride
- 2 copper(II) sulfate
- 3 litmus
- 4 methyl orange

- A 1 and 2 B 1 and 3 C 2 and 4 D 3 and 4

[0620/22/M/J/2020/30]

Q121.

Three processes in the carbon cycle are shown.

- 1 Methane reacts with oxygen producing carbon dioxide and water.
- 2 Carbon dioxide and water are absorbed and used by plants to make oxygen.
- 3 Oxygen is used by living things to release energy.

Which processes have taken place?

	1	2	3
A	combustion	photosynthesis	respiration
B	combustion	respiration	photosynthesis
C	photosynthesis	combustion	respiration
D	respiration	photosynthesis	combustion

[0620/23/M/J/2020/30]

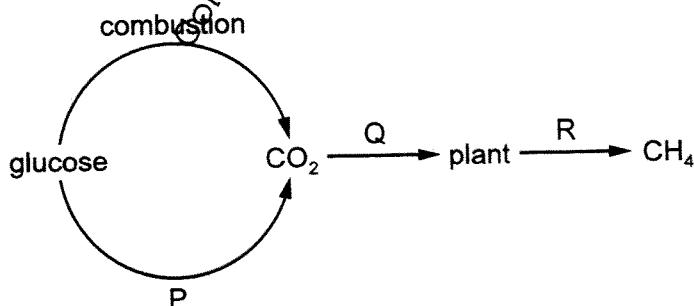
Q122.

Which processes increase the amount of carbon dioxide in the atmosphere?

- 1 burning ethanol
 - 2 farming cattle
 - 3 growing trees
- A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

Q123.

Part of the carbon cycle is shown.



What are processes P, Q and R?

	P	Q	R
A	decomposition	respiration	photosynthesis
B	respiration	photosynthesis	decomposition
C	respiration	decomposition	photosynthesis
D	photosynthesis	respiration	decomposition

Compiled BY : Saman Atif

[0620/12/O/N/12/Q40]

Q1. Which row is correct for ethanol?

	burns	made by fermentation
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

[0620/12/M/J/13/Q36]

Q2. Organic compounds may have names ending in -ane, -ene, -ol or -oic acid.

How many of these endings indicate the compounds contain double bonds in their molecules?

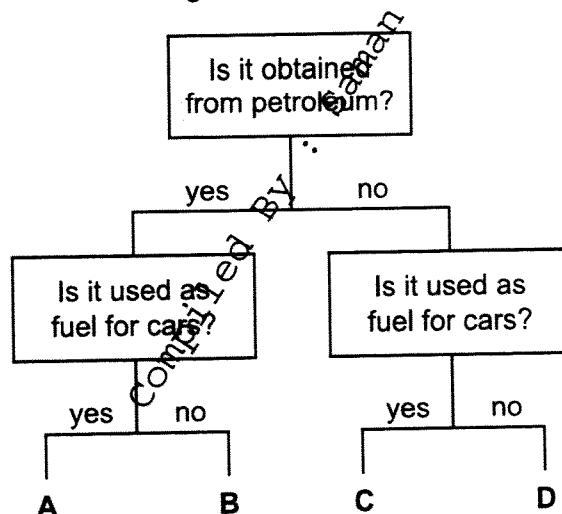
A 1

B 2

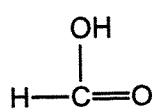
C 3

D 4

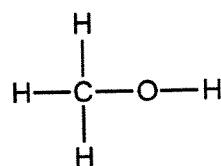
[0620/12/M/J/13/Q37]

Q3. In the flow chart, which fuel could be gasoline?

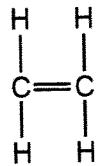
[0620/12/M/J/13/Q38]

Q4. The structures of four molecules are shown.

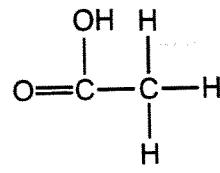
P



Q



R



S

Which two molecules belong to the same homologous series?

A P and Q

B P and S

C Q and R

D R and S

[0620/11/M/J/13/Q39]

Q5. Which columns describe the hydrocarbons ethane and ethene?

	1	2	3	4
state at room temperature	gas	gas	liquid	liquid
reaction with oxygen	burns	burns	burns	burns
reaction with aqueous bromine	no reaction	decolourises bromine	no reaction	decolourises bromine

- A 1 (ethane) and 2 (ethene)
- B 1 (ethane) and 4 (ethene)
- C 2 (ethene) and 3 (ethane)
- D 3 (ethane) and 4 (ethene)

[0620/12/M/J/13/Q40]

Q6. Which process is **not** used during the production of ethanol?

- A addition of steam to ethene
- B fermentation
- C fractional distillation
- D reacting ethane with oxygen

[0620/11/M/J/13/Q36]

Q7. Organic compounds may have names ending in -ane, -ene, -ol or -oic acid.

How many of these endings indicate the compounds contain double bonds in their molecules?

A 1

B 2

C 3

D 4

[0620/11/M/J/13/Q37]

Q8. The table shows the boiling points of four members of the homologous series of alcohols.

compound		boiling point / °C
name	formula	
methanol	CH ₃ OH	65
ethanol	C ₂ H ₅ OH	78
propanol	C ₃ H ₇ OH	X
butanol	C ₄ H ₉ OH	117

What is the value of X?

A 55 °C

B 82 °C

C 98 °C

D 115 °C

[0620/11/M/J/13/Q38]

Q9. The table shows some fractions that are obtained from petroleum by fractional distillation, together with some of their uses.

fraction	use
refinery gas	cooking
gasoline	fuel for cars
1	making chemicals
2	jet fuel
3	fuel for ships
bitumen	making roads

Which row correctly identifies fractions 1, 2 and 3?

	1	2	3
A	diesel oil	fuel oil	lubricating fraction
B	fuel oil	diesel oil	kerosene
C	kerosene	naphtha	diesel oil
D	naphtha	kerosene	fuel oil

[0620/11/M/J/13/Q40]

Q10. Which of the statements about ethanol are correct?

- 1 Ethanol can be formed by an addition reaction.
- 2 Ethanol can be formed by fermentation.
- 3 When ethanol burns in air, it forms carbon dioxide and water.

A 1, 2 and 3 B 1 and 2 C 1 and 3 D 2 and 3

[0620/13/O/N/13/Q36]

Q11. Molecule X is both an alkene and a carboxylic acid.

Which row describes X?

	saturated	-COOH present
A	no	no
B	no	yes
C	yes	no
D	yes	yes

[0620/13/O/N/13/Q37]

Q12. Which hydrocarbon reacts with steam to produce ethanol?**A** C₂H₄**B** C₂H₆**C** C₃H₆**D** C₃H₈

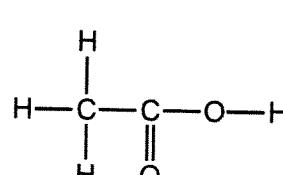
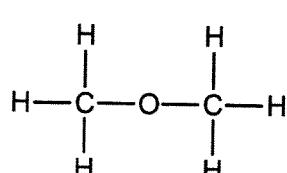
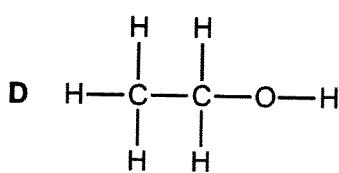
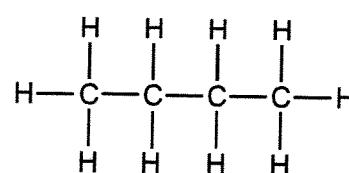
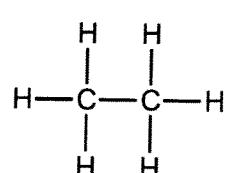
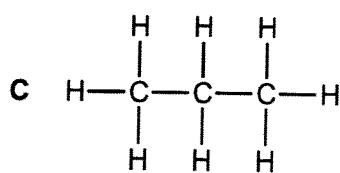
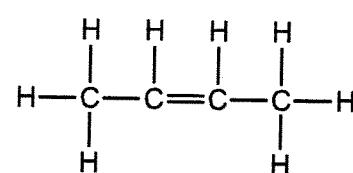
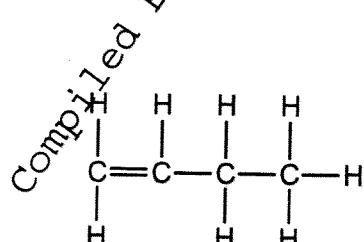
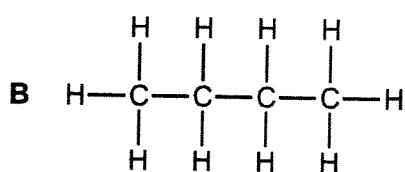
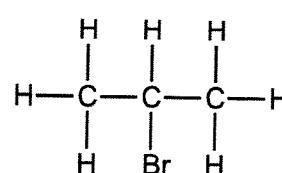
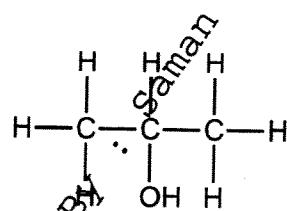
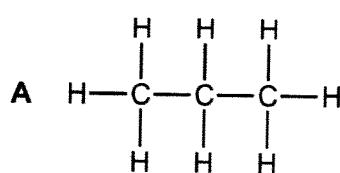
[0620/13/O/N/13/Q38]

Q13. Petroleum is a mixture of different hydrocarbons.

Which process is used to separate the petroleum into groups of similar hydrocarbons?

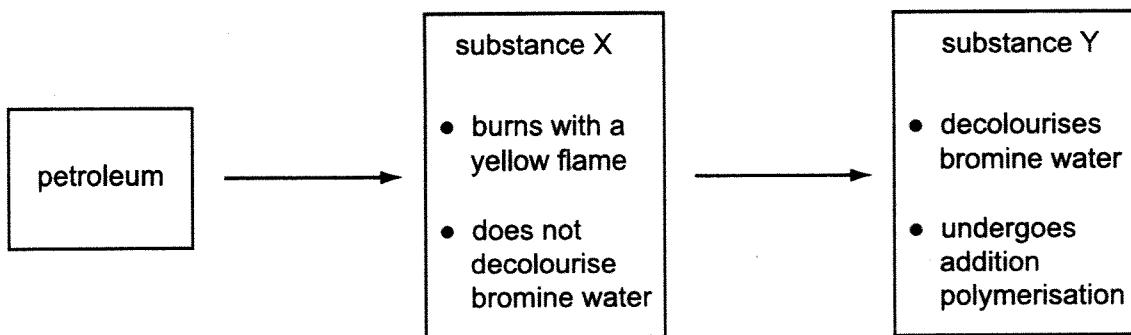
A combustion**B** cracking**C** fractional distillation**D** reduction

[0620/13/O/N/13/Q39]

Q14. Which row represents compounds in the same homologous series?

[0620/13/O/N/13/Q40]

Q15. The diagram shows a flow diagram.

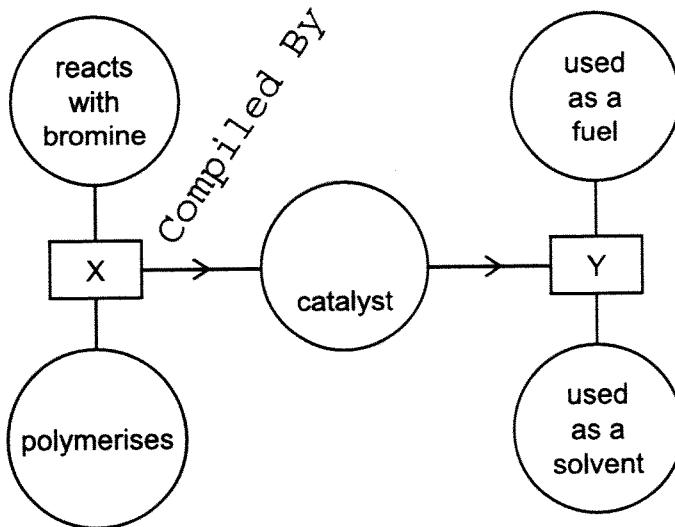


Which type of organic compounds are X and Y?

	substance X	substance Y
A	alcohol	alkane
B	alkane	alkene
C	alkene	alkane
D	alkane	alcohol

[0620/12/O/N/13/Q36]

Q16. The diagram shows some properties of two organic compounds X and Y.



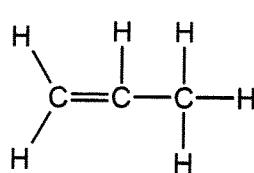
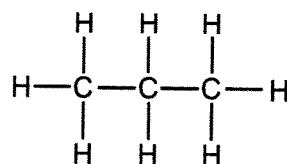
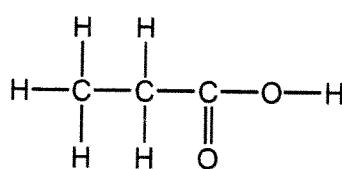
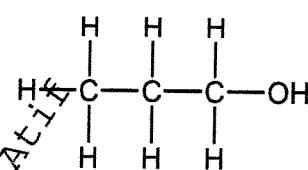
What are X and Y?

	X	Y
A	ethane	ethanoic acid
B	ethane	ethanol
C	ethene	ethanoic acid
D	ethene	ethanol

[0620/12/O/N/13/Q37]

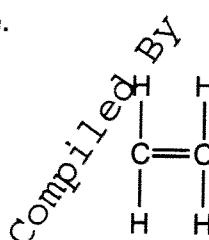
Q17. Three types of organic compound are alkanes, alkenes and alcohols.

Which structure does **not** belong to any of these three types of compound?

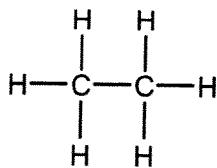
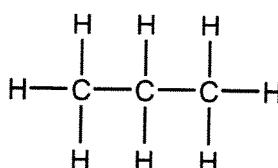
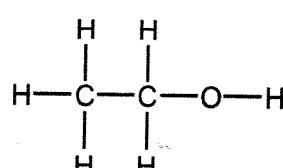
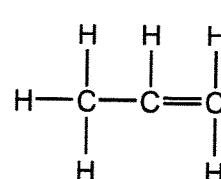
A**B****C****D**

[0620/12/O/N/13/Q38]

Q18. The diagram represents ethene.



Which compound has chemical properties similar to those of ethene?

A**B****C****D**

Q19.

Petroleum is a mixture of hydrocarbons which can be separated into fractions using fractional distillation.

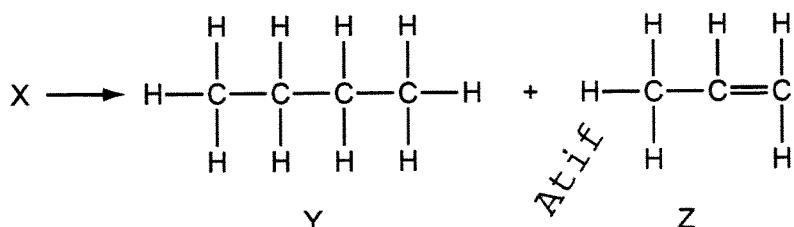
Which fraction is used as fuel in jet engines?

- A** bitumen
 - B** gasoline
 - C** kerosene
 - D** naphtha

[0620/12/O/N/13/Q40]

Q20.

A chemist carried out a cracking reaction on a hydrocarbon, X, and obtained two products, Y and Z.



The chemist then wrote the following statements in his notebook.

- 1 A molecule of X has 7 carbon atoms.
 - 2 Y is unsaturated.
 - 3 Z will decolourise bromine water.

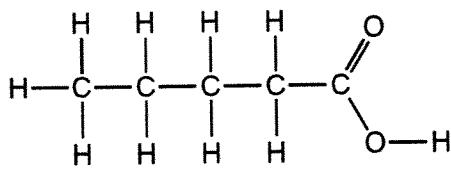
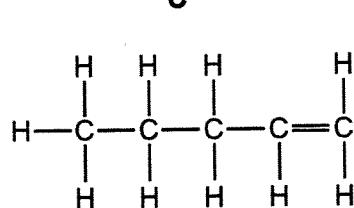
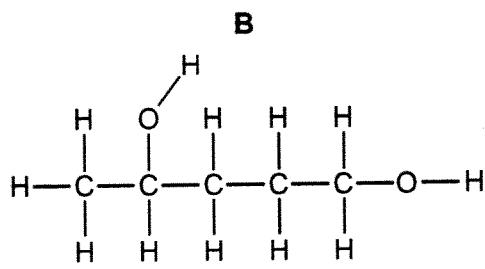
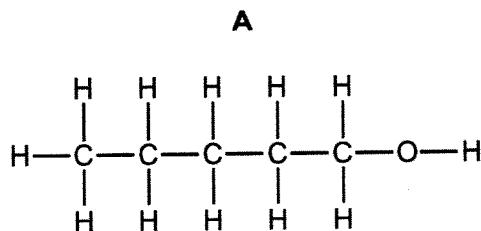
Which statements are correct?

- A** 3 only **B** 1 and 2 **C** 1 and 3 **D** 1, 2 and 3

Q21.

Which diagram shows the structure of pentanoic acid?

[0620/11/O/N/13/Q36]



[0620/11/O/N/13/Q37]

Q22. The table shows the composition of four different types of petroleum (crude oil).

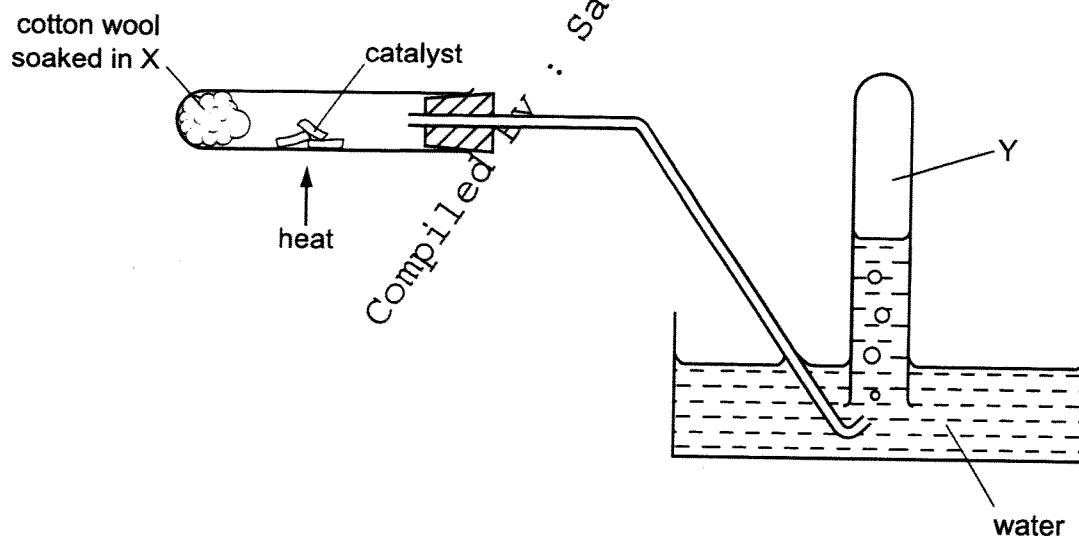
fraction	Arabian Heavy / %	Arabian Light / %	Iranian Heavy / %	North Sea / %
gasoline	18	21	21	23
kerosene	11.5	13	13	15
diesel oil	18	20	20	24
fuel oil	52.5	46	46	38

Which type of petroleum is best for the motor vehicle industry?

- A Arabian Heavy
- B Arabian Light
- C Iranian Heavy
- D North Sea

[0620/11/O/N/13/Q38]

Q23. The diagram shows the cracking of substance X.



Which type of organic compound is found in Y, which is not present in X?

- A acid
- B alcohol
- C alkane
- D alkene

Q24.

In which reaction could one of the products belong to the same homologous series as the organic reactant?

- A addition of steam to ethene
- B combustion of an alkane
- C cracking of an alkane
- D polymerisation of ethene

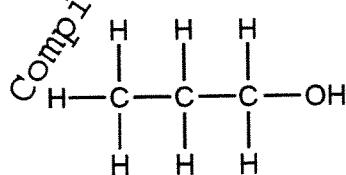
[0620/12/M/J/14/Q40]

Q25. Ethanol is produced from either ethene or sugar.

Which type of chemical reaction is used in each case?

	ethene → ethanol	sugar → ethanol
A	addition	fermentation
B	addition	fractional distillation
C	distillation	fermentation
D	distillation	fractional distillation

[0620/11/M/J/14/Q36]

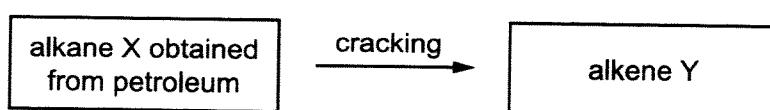
Q26. Which type of compound is shown?

- A alcohol
- B alkane
- C alkene
- D carboxylic acid

Q27.

[0620/11/M/J/14/Q38]

Alkenes are manufactured by cracking hydrocarbons obtained from petroleum.

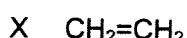


Which row describes the process of cracking?

	size of X molecules	size of Y molecules	catalyst required	temperature required
A	large	small	no	low
B	large	small	yes	high
C	small	large	no	low
D	small	large	yes	high

[0620/11/M/J/14/Q39]

Q28. X, Y and Z are three hydrocarbons.



What do compounds X, Y and Z have in common?

- 1 They are all alkenes.
- 2 They are all part of the same homologous series.
- 3 They all have the same boiling point.

A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

[0620/11/M/J/14/Q40]

Q29. Which statements about ethanol are correct?

- 1 It can be made by fermentation.
- 2 It is an unsaturated compound.
- 3 It burns in air and can be used as a fuel.

A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

[0620/13/O/N/14/Q37]

Q30. The list gives the names of four organic compounds.

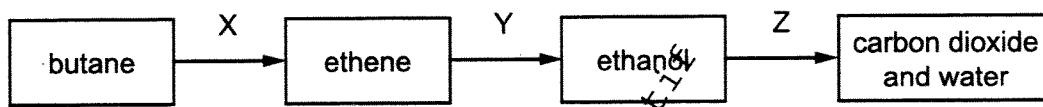
- ethane
- ethanoic acid
- ethanol
- ethene

Which bond do all four compounds contain?

A C-C**B** C=C**C** C-H**D** C-O

[0620/13/O/N/14/Q38]

Q31. The diagram shows a reaction sequence.



Which row names the processes X, Y and Z?

	X	Y	Z
A	cracking	fermentation	respiration
B	cracking	hydration	combustion
C	distillation	fermentation	respiration
D	distillation	hydration	combustion

[0620/13/O/N/14/Q39]

Q32. The main constituent of natural gas is hydrocarbon X.

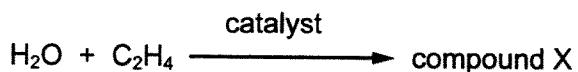
To which homologous series does X belong and how many atoms are in one molecule of X?

	homologous series	number of atoms in one molecule
A	alkane	1
B	alkane	5
C	alkene	1
D	alkene	5

Q33.

[0620/13/O/N/14/Q40]

The equation shows an industrial process.



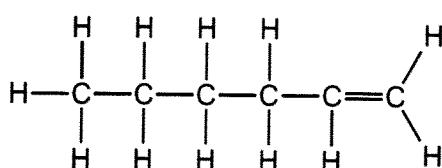
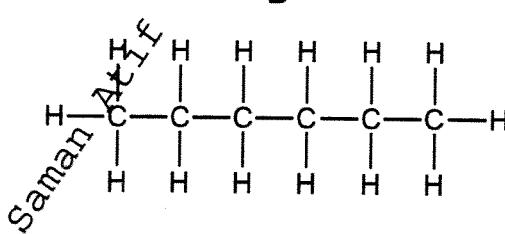
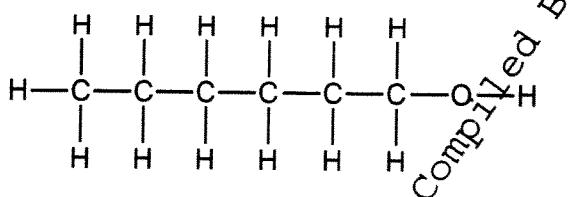
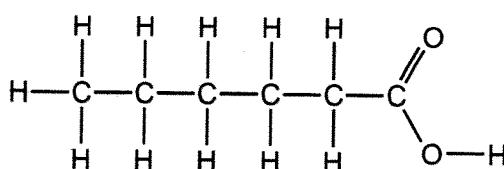
What is the name of compound X?

- A ethane
- B ethanoic acid
- C ethanol
- D methanol

Q34.

[0620/12/O/N/14/Q36]

Which molecular structure shows hexene?

A**B****C****D**

Q35.

[0620/12/O/N/14/Q37]

Increasing the number of atoms in one molecule of a hydrocarbon increases the amount of energy released when it burns.

What is the correct order?

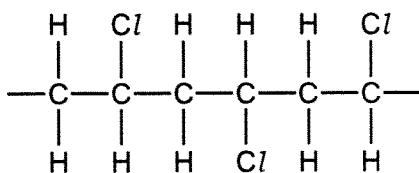
	less energy released	more energy released	
A	ethene	ethane	methane
B	ethene	methane	ethane
C	methane	ethane	ethene
D	methane	ethene	ethane

[0620/12/O/N/14/Q38]

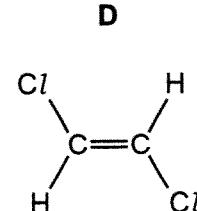
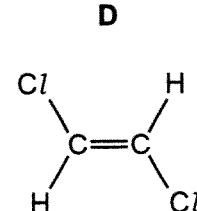
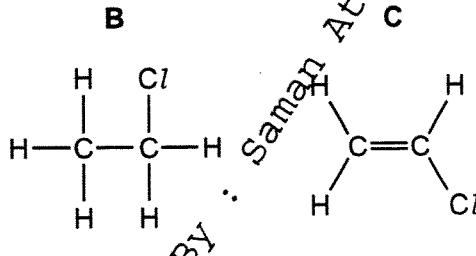
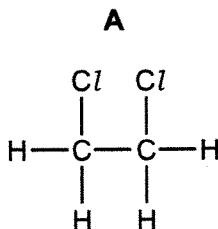
Q36. Which statement about alkenes is **not** correct?

- A** The functional group is C=C.
- B** The structural difference between one member and the next is $-\text{CH}_3$.
- C** They form a homologous series.
- D** They turn aqueous bromine from brown to colourless.

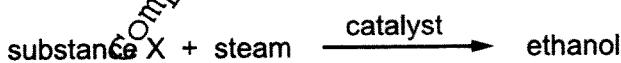
[0620/12/O/N/14/Q39]

Q37. The diagram shows three repeat units in the structure of an addition polymer.

Which alkene monomer is used to make this polymer?



[0620/12/O/N/14/Q40]

Q38. Ethanol can be manufactured from substance X.

What is substance X?

- A** carbon dioxide
- B** ethene
- C** hydrogen
- D** oxygen

[0620/13/M/J/15/Q35]

Q39. Which statement about the names of organic compounds is correct?

- A** Compounds containing C=C double bonds are alkanes.
- B** The compound of formula $\text{CH}_3\text{CO}_2\text{H}$ is methanoic acid.
- C** The compound of formula C_2H_4 is ethane.
- D** The compound of formula $\text{C}_2\text{H}_5\text{OH}$ is an alcohol.

[0620/13/M/J/15/Q36]

Q40. Which statement about petroleum is **not** correct?

- A It can be separated into useful substances by fractional distillation.
- B It consists mainly of hydrocarbons.
- C It is found underground in many parts of the world.
- D Its main use is for making lubricants and polishes.

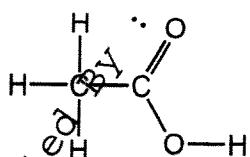
[0620/13/M/J/15/Q37]

Q41. Ethene, propene and butene are all members of the same homologous series.

Which statement explains why ethene, propene and butene have similar chemical properties?

- A They all have the same functional group.
- B They are all gases at room temperature.
- C They are all hydrocarbons.
- D They are all organic.

[0620/13/M/J/15/Q38]

Q42. Which statement describes the compound shown below?

- A It is a colourless flammable gas.
- B It is a liquid which decolourises bromine water.
- C It is a liquid with a characteristic smell.
- D It is formed when ethane reacts with steam.

[0620/13/M/J/15/Q39]

Q43. A hydrocarbon A is cracked to make B and hydrogen.

Compound C is formed by the addition polymerisation of B.

To which homologous series do A, B and C belong?

	alkene	alkane
A	A	B and C
B	B	A and C
C	C	A and B
D	-	A and C

[0620/13/M/J/15/Q40]

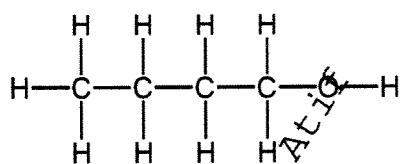
Q44. Ethanol is manufactured from petroleum by reacting ethene with steam.

Which statements about this process are correct?

- 1 Ethene is obtained from the cracking of alkanes.
 - 2 The process is carried out in the presence of yeast.
 - 3 The reaction is an addition reaction.
 - 4 The rate of reaction is increased by a catalyst.
- A 1 and 3 only B 1 and 4 only C 1, 2 and 3 D 1, 3 and 4

[0620/12/M/J/15/Q35]

Q45. An organic compound has the molecular structure shown.

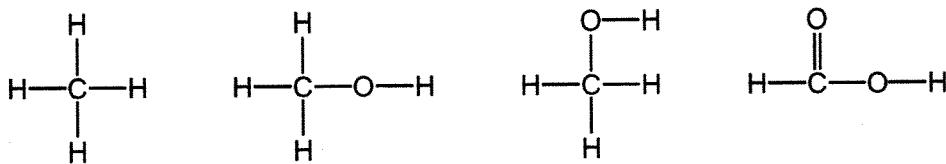


Which type of organic compound is this?

- A alcohol
B alkane
C alkene
D carboxylic acid

[0620/12/M/J/15/Q37]

Q46. The structures of four different organic compounds are shown.

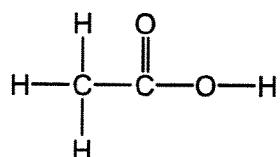


How many different homologous series are represented by these compounds?

- A 1 B 2 C 3 D 4

[0620/12/M/J/15/Q38]

Q47. The structure of a compound, Y, is shown.



Which row describes some of the physical properties of Y?

	colourless	characteristic smell	dissolves in water
A	no	no	no
B	no	no	yes
C	yes	yes	no
D	yes	yes	yes

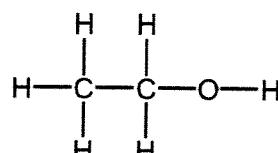
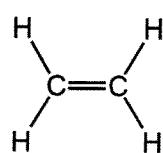
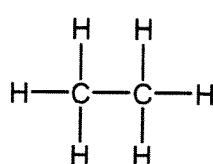
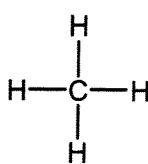
[0620/12/M/J/15/Q40]

Q48. Which row correctly describes the production of ethanol and its properties?

	can be made from glucose	can be made from ethene	is used as a fuel	is used as a solvent
A	✓	✓	✓	✓
B	✓	✗	✓	✓
C	✗	✓	✓	✗
D	✗	✓	✗	✓

[0620/11/M/J/15/Q35]

Q49. The structures of four organic compounds are shown.



Which statement is **not** correct?

- A Only one of the compounds is an alcohol.
- B Only one of the compounds is an alkane.
- C Only one of the compounds is unsaturated.
- D Only three of the compounds are hydrocarbons.

[0620/11/M/J/15/Q37]

Q50. Which statement about alkane molecules is correct?

- A They burn in oxygen.
- B They contain carbon, hydrogen and oxygen atoms.
- C They contain double bonds.
- D They contain ionic bonds.

[0620/11/M/J/15/Q38]

Q51. Which statements are correct for ethanoic acid?

- 1 It contains a carbon-oxygen double bond.
 - 2 It contains two carbon atoms.
 - 3 It decolourises bromine water.
 - 4 It contains an -OH group.
- A 1 and 2 only
 - B 1 and 3
 - C 1, 2 and 4
 - D 2, 3 and 4

[0620/11/M/J/15/Q40]

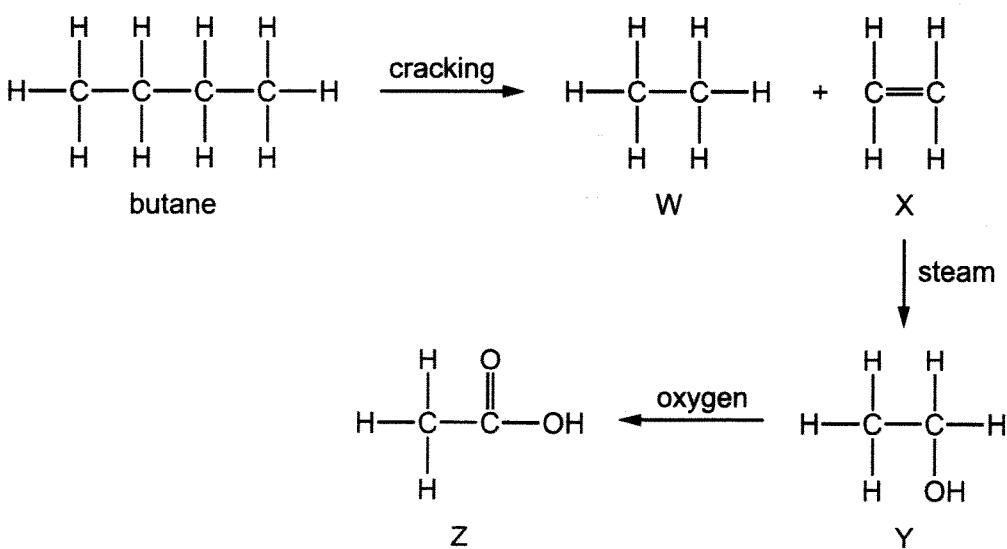
Q52. By which of the following methods is ethanol formed?

- 1 fractional distillation of petroleum
 - 2 fermentation
 - 3 catalytic addition of steam to ethene
- A 1 and 2 only
 - B 1 and 3 only
 - C 2 and 3 only
 - D 1, 2 and 3

Q53.

[0620/13/O/N/15/Q35]

What are the names of the compounds shown in the reaction scheme below?



	W	X	Y	Z
A	ethane	ethene	ethanol	ethanoic acid
B	ethane	ethene	ethanoic acid	ethanol
C	ethene	ethane	ethanol	ethanoic acid
D	ethene	ethane	ethanoic acid	ethanol

Q54.

Which row describes the formation of a polymer?

	monomer	polymer
A	ethane	poly(ethane)
B	ethane	poly(ethene)
C	ethene	poly(ethane)
D	ethene	poly(ethene)

Q55.

[0620/13/O/N/15/Q37]

Which row shows the correct use of a fraction obtained by the fractional distillation of petroleum?

	fraction	use
A	bitumen	making waxes and polishes
B	fuel oil	aircraft fuel
C	kerosene	fuel for ships
D	naphtha	making chemicals

[0620/13/O/N/15/Q38]

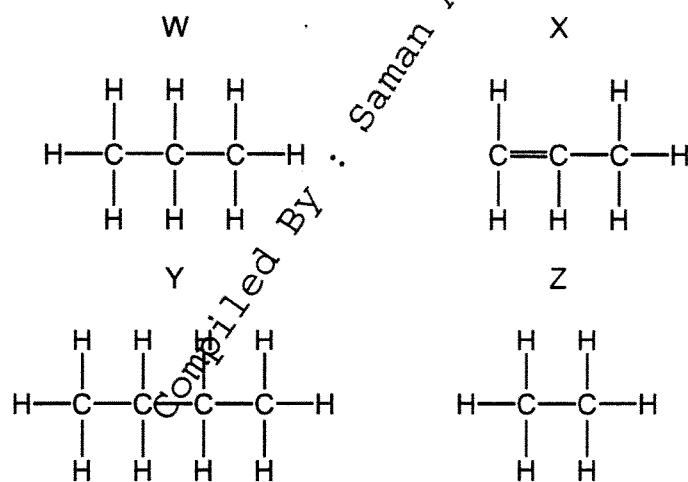
Q56. Ethanol can be formed by

- 1 fermentation
- 2 reaction between steam and ethene

Which of these processes uses a catalyst?

	1	2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

[0620/13/O/N/15/Q39]

Q57. The structures of four compounds are shown.

Which are members of the same homologous series?

- A W, X, Y and Z
- B W and X only
- C W, Y and Z only
- D X and Z only

Q58.

[0620/13/O/N/15/Q40]

During the process of cracking hydrocarbons, an 1 is converted into an 2

The presence of an 3 can be shown by a visible reaction with 4

Which words complete gaps 1, 2, 3 and 4?

	1	2	3	4
A	alkane	alkene	alkene	bromine
B	alkane	alkene	alkene	steam
C	alkene	alkane	alkane	bromine
D	alkene	alkane	alkane	steam

Q59.

[0620/12/O/N/15/Q37]

Hydrocarbons obtained by fractional distillation of petroleum can be cracked to make useful products.

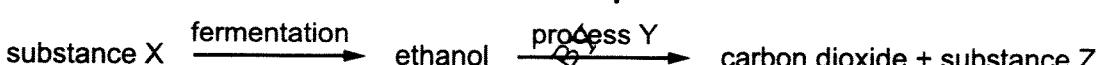
Which substance could **not** be obtained by cracking propane? *M, 44?*

A C₂H₄B C₃H₆C C₄H₈D H₂

Q60.

[0620/12/O/N/15/Q39]

The flow chart shows the preparation of ethanol and some important chemistry of ethanol.



What are X, Y and Z?

	X	Y	Z
A	ethane	combustion	yeast
B	glucose	combustion	steam
C	water	polymerisation	water
D	yeast	fermentation	glucose

Q61.

[0620/12/O/N/15/Q40]

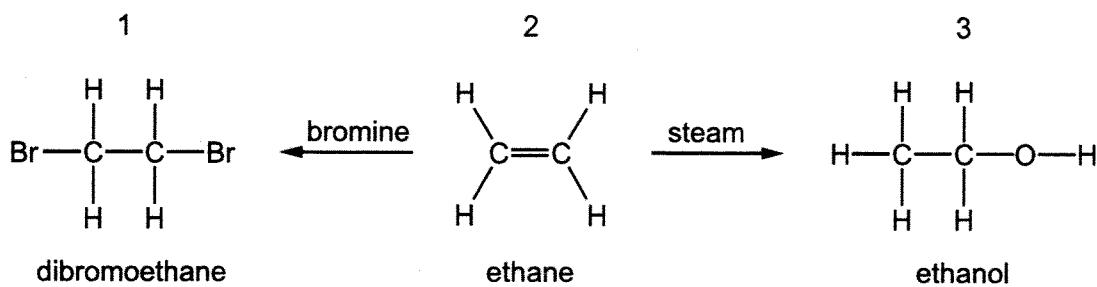
What are the properties of a dilute solution of ethanoic acid?

	smell	appearance
A	odourless	colourless
B	odourless	red
C	pungent smell	colourless
D	pungent smell	red

[0620/11/O/N/15/Q35]

Q62.

The diagram shows the structure of a simple hydrocarbon and the products of two of its reactions.



Which structures are named correctly?

	structure		
	1	2	3
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✓
D	✗	✓	✗

Q63.

[0620/11/O/N/15/Q37]

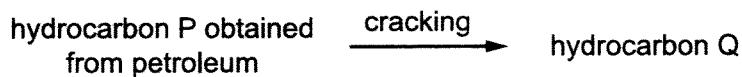
What is **not** the correct use for the fraction named?

	name of fraction	use
A	fuel oil	making waxes
B	gas oil	diesel engines
C	kerosene	jet fuel
D	naphtha fraction	making chemicals

Q64.

[0620/11/O/N/15/Q40]

Alkenes are manufactured by cracking hydrocarbons obtained from petroleum.

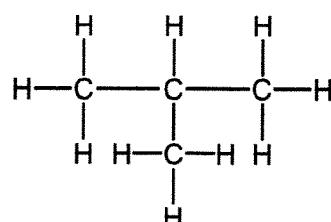
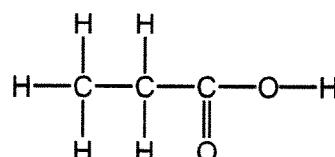
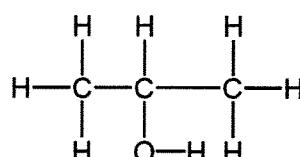
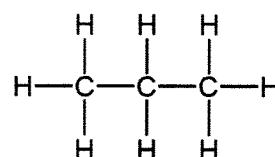


Which row describes the size of the molecules in hydrocarbons P and Q and the effect of Q on aqueous bromine?

	size of P molecules	size of Q molecules	effect of Q on aqueous bromine
A	large	small	decolourises
B	large	small	no effect
C	small	large	decolourises
D	small	large	no effect

[0620/11/O/N/15/Q39]

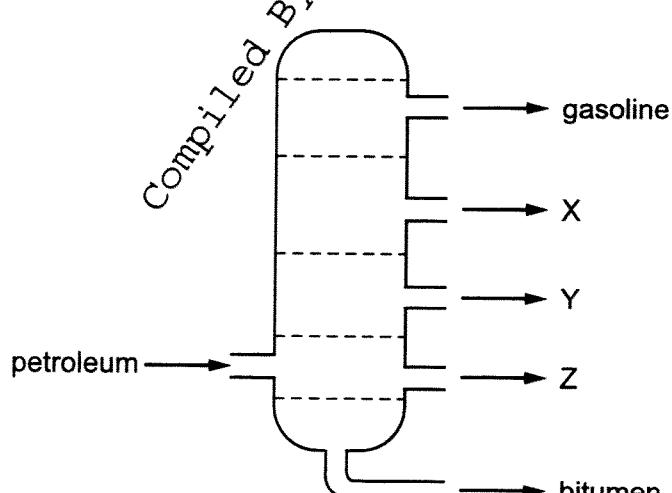
Q65. Which homologous series is **not** represented in the compounds shown below?



- A alcohols
 B alkanes
 C alkenes
 D carboxylic acids

[0620/23/M/J/16/Q25]

Q66. The diagram shows the separation of petroleum into fractions.



What could X, Y and Z represent?

	X	Y	Z
A	diesel oil	lubricating fraction	paraffin
B	lubricating fraction	diesel oil	paraffin
C	paraffin	lubricating fraction	diesel oil
D	paraffin	diesel oil	lubricating fraction

[0620/23/M/J/16/Q36]

Q67.

Which compound does **not** belong to the same homologous series as the other three compounds?

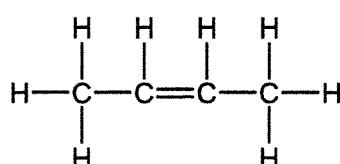
- A** CH₃OH **B** C₂H₅COOH **C** C₂H₅OH **D** C₇H₁₅OH

Q68.

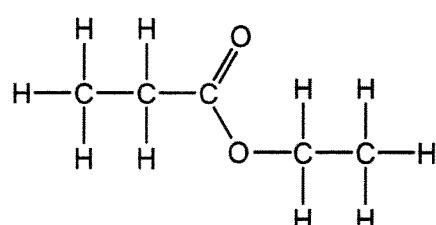
[0620/23/M/J/16/Q37]

The structure of an alkene and the structure of an ester are shown.

P



Q



What are the names of P and Q?

	P	Q
A	but-1-ene	ethyl propanoate
B	but-1-ene	propyl ethanoate
C	but-2-ene	ethyl propanoate
D	but-2-ene	propyl ethanoate

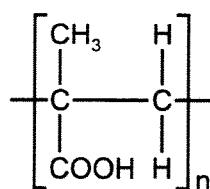
Q69.

[0620/23/M/J/16/Q38]

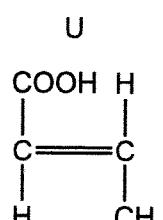
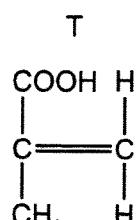
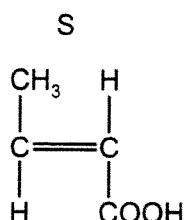
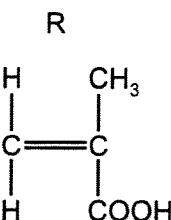
What is an advantage of producing ethanol by fermentation of sugar compared to the catalytic addition of steam to ethene?

- A** The alcohol produced is purer.
B The process is faster.
C The process uses high temperature.
D The process uses renewable raw materials.

[0620/23/M/J/16/Q39]

Q70. A polymer has the formula shown.

From which monomers can it be formed?

**A** R and S**B** R and T**C** S and U**D** T and U

[0620/23/M/J/16/Q40]

Q71. Which row shows a natural polymer with the same linkages as a synthetic polymer?

	natural polymer	synthetic polymer
A	complex carbohydrate	nylon
B	complex carbohydrate	Terylene
C	protein	nylon
D	protein	Terylene

[0620/22/M/J/16/Q36]

Q72. Which compound is not an alkene, $\text{C}_n\text{H}_{2n+2}$?**A** $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ **B** $(\text{CH}_3)_2\text{CHCH}_3$ **C** $\text{CH}_3\text{CHCHCH}_3$ **D** $(\text{CH}_3)_3\text{CH}$

[0620/22/M/J/16/Q37]

Q73. An ester is formed when a carboxylic acid reacts with an alcohol.

Which ester is formed when propanoic acid and ethanol react?

A $\text{CH}_3\text{CO}_2\text{CH}_2\text{CH}_3$ **B** $\text{CH}_3\text{CO}_2\text{CH}_2\text{CH}_2\text{CH}_3$ **C** $\text{CH}_3\text{CH}_2\text{CO}_2\text{CH}_3$ **D** $\text{CH}_3\text{CH}_2\text{CO}_2\text{CH}_2\text{CH}_3$

[0620/22/M/J/16/Q39]

Q74. In which row are the monomer and polymer chain correctly matched?

	monomer	part of the polymer chain
A	$\text{CH}_3\text{CH}=\text{CHCH}_3$	$-\text{CH}(\text{CH}_3)-\text{CH}(\text{CH}_3)-\text{CH}(\text{CH}_3)-\text{CH}(\text{CH}_3)-$
B	$\text{CH}_2=\text{CHCl}$	$-\text{CHCl}-\text{CHCl}-\text{CHCl}-\text{CHCl}-$
C	$\text{CH}_3\text{CH}=\text{CH}_2$	$-\text{CH}_3-\text{CH}-\text{CH}_2-\text{CH}_3-\text{CH}-\text{CH}_2-$
D	$\text{CH}_2=\text{CHCH}_2\text{CH}_3$	$-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}(\text{CH}_2\text{CH}_3)-$

[0620/22/M/J/16/Q40]

Q75. Which two polymers have the same linkages bonding the monomers together?

- A nylon and complex carbohydrate
- B nylon and protein
- C Terylene and complex carbohydrate
- D Terylene and protein

[0620/21/M/J/16/Q36]

Q76. Which of the compounds shown are in the same homologous series?

- 1 CH_3OH
- 2 $\text{CH}_3\text{CH}_2\text{OH}$
- 3 CH_3COOH
- 4 $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$

- A 1, 2 and 3
- B 1, 2 and 4
- C 1, 3 and 4
- D 2, 3 and 4

[0620/21/M/J/16/Q37]

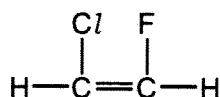
Q77. Which compounds contain the same number of carbon, hydrogen and oxygen atoms?

W	X	Y	Z
ethyl methanoate	methyl ethanoate	methyl methanoate	ethyl ethanoate

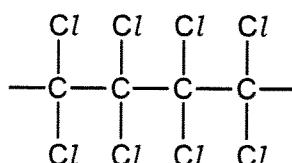
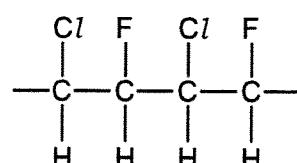
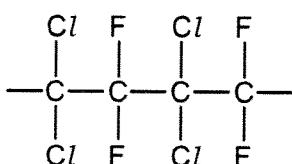
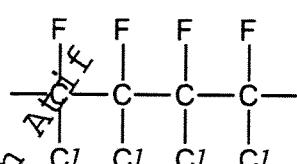
- A W and X
- B W and Y
- C X and Z
- D Y and Z

[0620/21/M/J/16/Q39]

Q78. The structure of a monomer is shown.

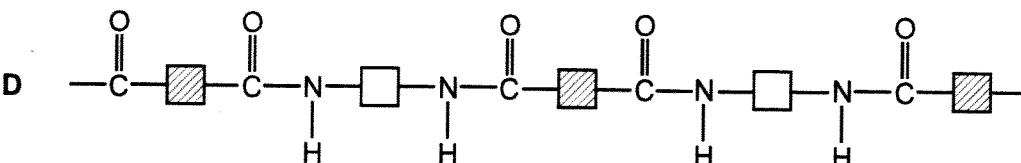
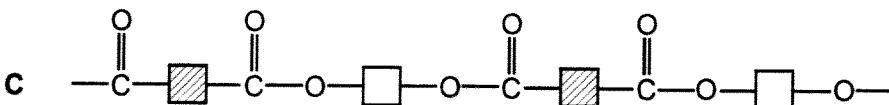
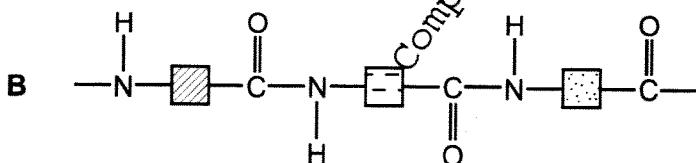
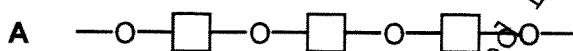


Which polymer can be made from this monomer?

A**B****C****D**

[0620/21/M/J/16/Q40]

Q79. Which formula represents a polyester?



[0620/23/O/N/16/Q35]

Q80.

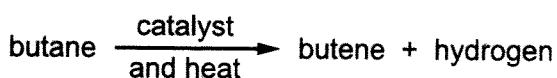
Which list shows the fractions obtained from distilling petroleum, in order of increasing boiling point?

- A bitumen → diesel oil → fuel oil → lubricating oil
- B diesel oil → gasoline → naphtha → kerosene
- C gasoline → naphtha → kerosene → diesel oil
- D kerosene → lubricating oil → naphtha → refinery gas

Q81.

[0620/23/O/N/16/Q36]

Butane reacts as shown.



What is this type of reaction?

- A combustion
- B cracking
- C polymerisation
- D reduction

Q82.

[0620/23/O/N/16/Q37]

Substance Z has the following characteristics. . .

- 1 It burns in an excess of oxygen to form carbon dioxide and water.
- 2 It is oxidised by air to form a liquid smelling of vinegar.
- 3 It reacts with carboxylic acids to form esters.

What is substance Z?

- A ethane
- B ethanoic acid
- C ethanol
- D ethyl ethanoate

[0620/23/O/N/16/Q38]

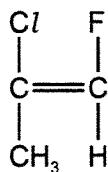
Q83.

Ethanol is manufactured by the catalytic addition of steam to ethene and by fermentation.

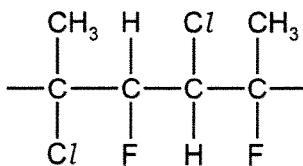
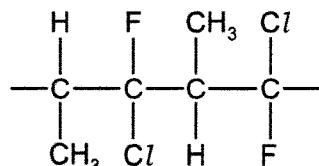
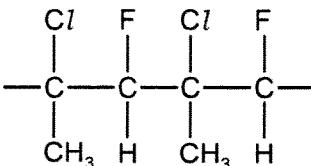
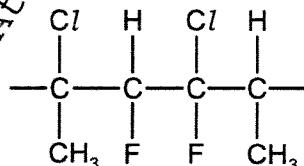
Which row shows an advantage and a disadvantage of using the catalytic addition of steam to ethene compared to fermentation?

	advantage	disadvantage
A	fast	the product is impure
B	fast	uses non-renewable materials
C	the product is pure	slow
D	uses renewable materials	slow

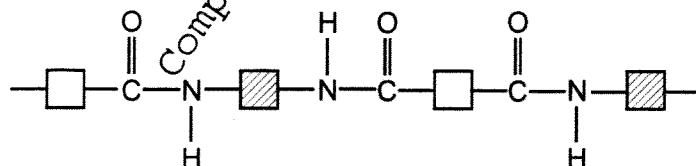
[0620/23/O/N/16/Q39]

Q84. The organic compound shown can be polymerised.

Which diagram represents a section of the polymer?

A**B****C****D**

[0620/23/O/N/16/Q40]

Q85. The partial structure of a polymer is shown.

Which type of polymer is represented?

- A** a carbohydrate
- B** a polyamide
- C** a polyester
- D** an addition polymer

[0620/22/O/N/16/Q35]

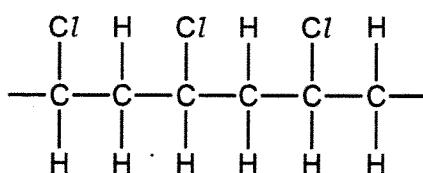
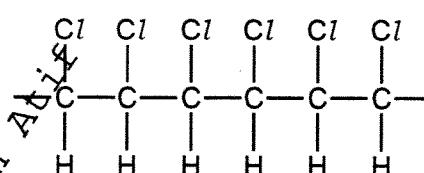
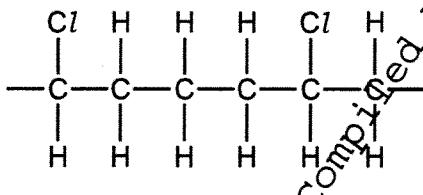
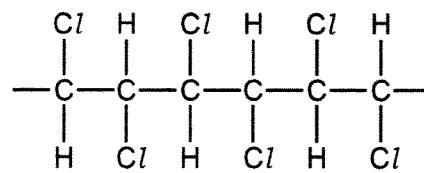
Q86. Petroleum is separated into fractions.Which statement is **not** correct?

- A** Each fraction contains a mixture of hydrocarbon molecules.
- B** Fuel oil burns easily and is used as fuel in cars.
- C** Refinery gas is the fraction containing the smallest molecules.
- D** The fractions are separated depending on their boiling point range.

[0620/22/O/N/16/Q39]

Q87. Chloroethene, $\text{CH}_2=\text{CHCl}$, can be polymerised.

Which diagram represents a section of the polymer?

A**B****C****D**

[0620/22/O/N/16/Q40]

Q88. Terylene is a synthetic polymer.Which statement about Terylene is **not** correct?

- A** It contains amide linkages.
- B** It contains carbon and oxygen atoms.
- C** It is made from small units called monomers.
- D** It is formed by condensation polymerisation.

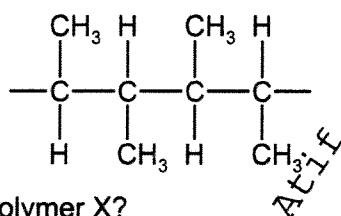
[0620/21/O/N/16/Q35]

Q89. Petroleum is an important fossil fuel.

Which row correctly describes petroleum?

	type of substance	composition
A	compound	mainly hydrocarbons
B	compound	only hydrogen and carbon
C	mixture	mainly hydrocarbons
D	mixture	only hydrogen and carbon

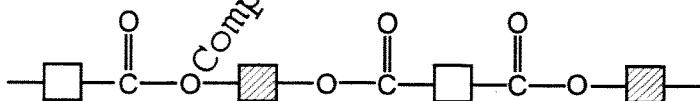
[0620/21/O/N/16/Q39]

Q90. The partial structure of addition polymer X is shown.

Which monomer is used to form polymer X?

- A $\text{CH}_2=\text{CH}_2$
 B $\text{CH}_3\text{CH}=\text{CH}_2$
 C $\text{CH}_3\text{CH}=\text{CHCH}_3$
 D $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$
- B7

[0620/21/O/N/16/Q40]

Q91. The diagram shows the partial structure of Terylene.

From which pair of compounds is it made?

- A $\text{HO}-\text{C}(=\text{O})-\square-\text{C}(=\text{O})-\text{OH}$ + $\text{HO}-\blacksquare-\text{OH}$
- B $\text{HO}-\square-\text{C}(=\text{O})-\text{OH}$ + $\text{HO}-\square-\text{C}(=\text{O})-\text{OH}$
- C $\text{HO}-\square-\text{OH}$ + $\text{HO}-\text{C}(=\text{O})-\blacksquare-\text{C}(=\text{O})-\text{OH}$
- D $\text{HO}-\text{C}(=\text{O})-\square-\text{C}(=\text{O})-\text{OH}$ + $\text{HO}-\text{C}(=\text{O})-\blacksquare-\text{C}(=\text{O})-\text{OH}$

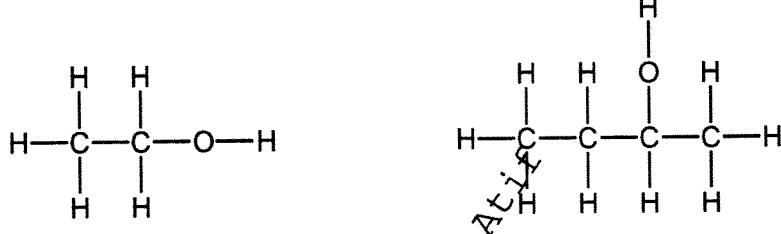
[0620/21/M/J/17/Q35]

Q92. Which fraction of petroleum is not matched to its correct use?

	fraction	use
A	bitumen	making roads
B	gasoline	fuel for cars
C	kerosene	fuel for ships
D	naphtha	chemical industry

[0620/21/M/J/17/Q36]

Q93. The diagram shows the structures of two organic molecules.

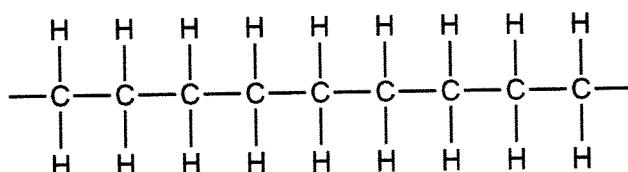


Which statement about these molecules is not correct?

- A They are both alcohols.
 B They both produce carbon dioxide and water when they burn in oxygen.
 C They contain different functional groups.
 D They have the same general formula.

[0620/21/M/J/17/Q37]

Q94. The diagram shows part of the molecule of a polymer.



Which diagram shows the monomer from which this polymer could be manufactured?

- A
 B
 C
 D

[0620/21/M/J/17/Q38]

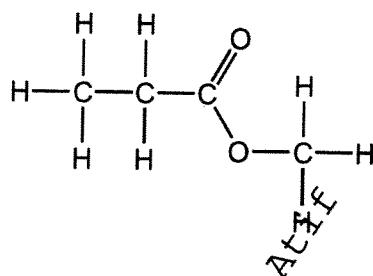
Q95. Ethanol is manufactured by fermentation or by the catalytic addition of steam to ethene.

Which statement is correct?

- A Fermentation uses a higher temperature than the catalytic addition of steam to ethene.
- B Fermentation uses a non-renewable resource.
- C The catalytic addition of steam to ethene produces purer ethanol than fermentation.
- D The catalytic addition of steam to ethene uses a biological catalyst.

[0620/21/M/J/17/Q39]

Q96. The structure of an ester is shown.



Which row is correct?

	name of ester	names of the carboxylic acid and the alcohol used to form the ester
A	methyl propanoate	methanoic acid and propanol
B	methyl propanoate	methanol and propanoic acid
C	propyl methanoate	methanoic acid and propanol
D	propyl methanoate	methanol and propanoic acid

[0620/21/M/J/17/Q40]

Q97. Keratin is a protein that is found in human hair.

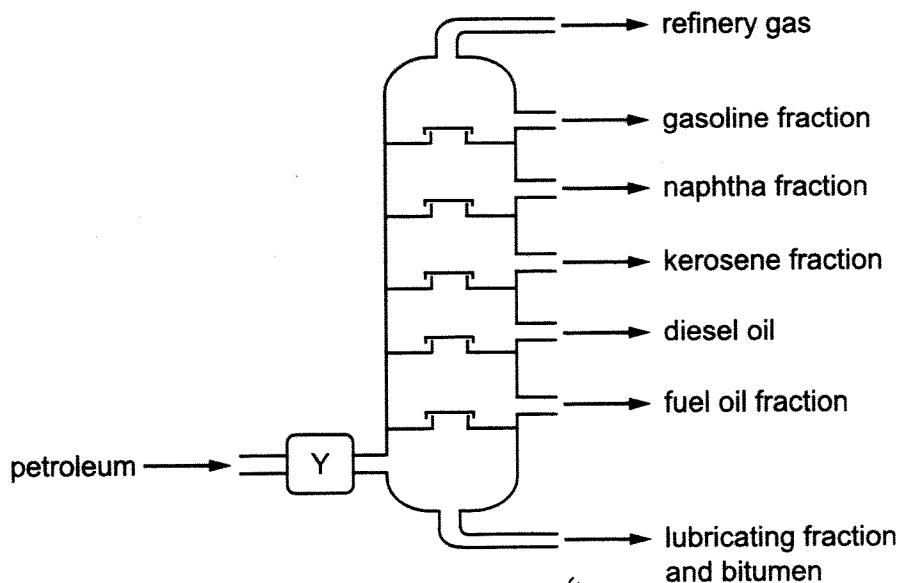
Keratin is chemically broken down to produce amino acids.

What is the name of this chemical process?

- A catalysis
- B hydration
- C hydrolysis
- D polymerisation

[0620/22/M/J/17/Q35]

Q98. The industrial fractional distillation of petroleum is shown.



Which process happens at Y?

- A burning
- B condensation
- C cracking
- D evaporation

[0620/22/M/J/17/Q36]

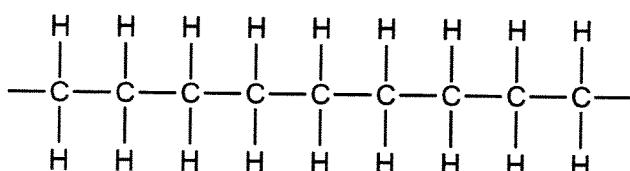
Q99. Which statement about homologous series is not correct?

- A Alkenes have the same general formula, C_nH_{2n+2} .
- B Each member of the homologous series of alkanes differs from the next by CH_2 .
- C The members of a homologous series all have similar chemical properties.
- D The members of a homologous series all have the same functional group.

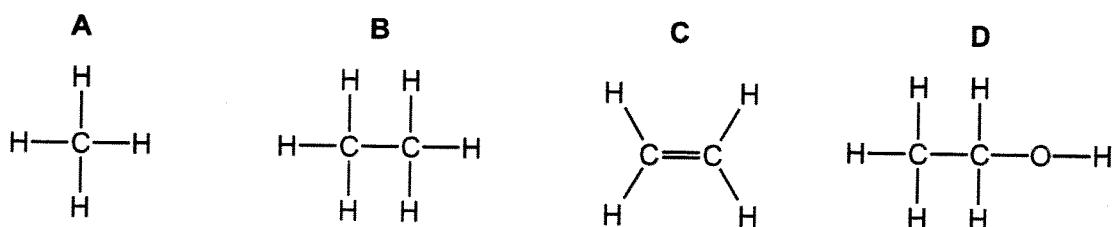
Q100.

[0620/22/M/J/17/Q37]

The diagram shows part of the molecule of a polymer.



Which diagram shows the monomer from which this polymer could be manufactured?



[0620/22/M/J/17/Q38]

Q101.

Ethanol is manufactured by fermentation or by the catalytic addition of steam to ethene.

What is an advantage of ethanol manufacture by fermentation instead of by the catalytic addition of steam to ethene?

- Same*
- Complexity*
- A Ethanol manufactured by fermentation is purified by distillation.
 - B Ethanol manufactured by fermentation produces purer ethanol.
 - C Ethanol manufactured by fermentation uses large areas of land.
 - D Ethanol manufactured by fermentation uses renewable resources.

[0620/22/M/J/17/Q39]

Q102.

The formula of an ester is $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOCH}_2\text{CH}_2\text{CH}_3$.

Which acid and alcohol react together to make the ester?

	acid	alcohol
A	butanoic acid	butanol
B	butanoic acid	propanol
C	propanoic acid	butanol
D	propanoic acid	propanol

Q103.

[0620/22/M/J/17/Q40]

Polyesters and polyamides are types of synthetic polymer.

Which statements are correct?

- 1 They are made by addition polymerisation.
- 2 They are made by condensation polymerisation.
- 3 The monomers from which they are made are unsaturated hydrocarbons.
- 4 The monomers from which they are made contain reactive functional groups at their ends.

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

Q104.

[0620/23/M/J/17/Q35]

Fuel oil, gasoline, kerosene and naphtha are four fractions obtained from the fractional distillation of petroleum.

What is the order of the boiling points of these fractions?

	highest boiling point → lowest boiling point
A	fuel oil → kerosene → gasoline → naphtha
B	fuel oil → kerosene → naphtha → gasoline
C	gasoline → naphtha → kerosene → fuel oil
D	naphtha → gasoline → kerosene → fuel oil

[0620/23/M/J/17/Q36]

Q105.

Butane and methylpropane are isomers with molecular formula C₄H₁₀.

Which statements are correct?

- 1 They have similar chemical properties.
- 2 They have the same general formula.
- 3 They have the same structural formula.

A 1, 2 and 3

B 1 and 2 only

C 1 and 3 only

D 2 and 3 only

Q106.

[0620/23/M/J/17/Q38]

Ethanol can be produced by fermentation or by the catalytic addition of steam to ethene.

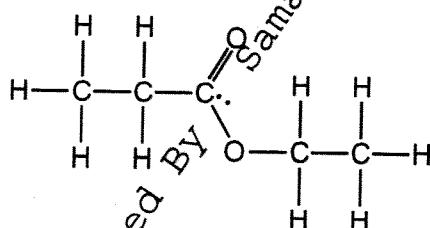
Which row shows an advantage and a disadvantage for each process?

	fermentation		catalytic addition of steam to ethene	
	advantage	disadvantage	advantage	disadvantage
A	batch process	slow reaction	continuous process	fast reaction
B	fast reaction	continuous process	pure ethanol formed	renewable raw material
C	renewable raw material	batch process	pure ethanol formed	slow reaction
D	renewable raw material	impure ethanol formed	fast reaction	finite raw material

Q107.

[0620/23/M/J/17/Q39]

The structure of an ester is shown.



Which alcohol and carboxylic acid produce this ester?

	alcohol	carboxylic acid
A	ethanol	ethanoic acid
B	ethanol	propanoic acid
C	propanol	ethanoic acid
D	propanol	propanoic acid

Q108.

[0620/23/M/J/17/Q40]

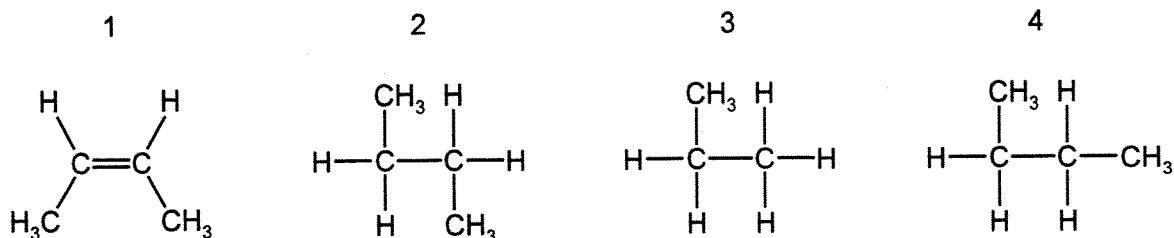
How can the amino acids in a protein be separated and identified?

- A Add a locating agent to the protein.
- B Hydrolyse the protein and then use chromatography.
- C Polymerise the protein and then add a locating agent.
- D Use chromatography on a solution of the protein.

Q109.

[0620/21/O/N/17/35]

The structures of some organic molecules are shown.



Which structures represent an alkane with four carbon atoms?

- A 1 only B 2 and 3 C 2 and 4 D 3 and 4

[0620/21/O/N/17/36]

Q110.

Some of the fractions obtained from the fractional distillation of petroleum are used as fuels for vehicles.

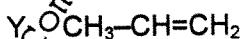
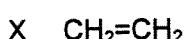
Which two fractions are used as fuels for vehicles?

- A bitumen fraction and gasoline fraction
 B bitumen fraction and naphtha fraction
 C gasoline fraction and kerosene fraction
 D kerosene fraction and lubricating fraction

Q111.

[0620/21/O/N/17/37]

X, Y and Z are three hydrocarbons.



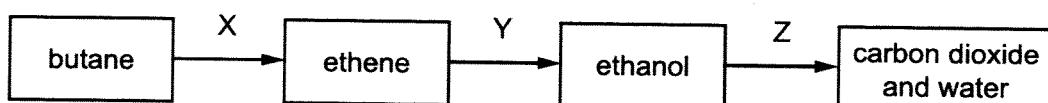
What do compounds X, Y and Z have in common?

- 1 They are all alkenes.
- 2 They are all part of the same homologous series.
- 3 They all have the same boiling point.

- A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

[0620/21/O/N/17Q38]

Q112. The diagram shows a reaction sequence.



Which row names the processes X, Y and Z?

	X	Y	Z
A	cracking	fermentation	respiration
B	cracking	hydration	combustion
C	distillation	fermentation	respiration
D	distillation	hydration	combustion

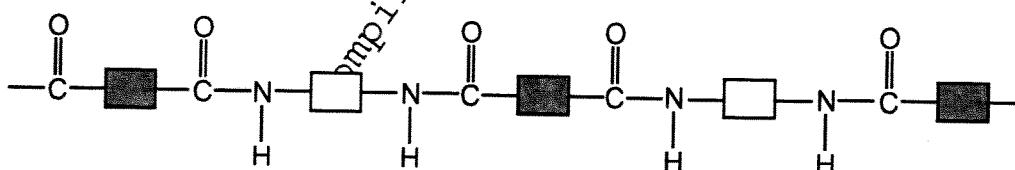
[0620/21/O/N/17/39]

Q113. Which pair of compounds can be used to prepare $\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_3$?

- A ethanoic acid and ethanol
- B ethanoic acid and propanol
- C propanoic acid and ethanol
- D propanoic acid and propanol

[0620/21/O/N/17/40]

Q114. The structure of a synthetic polymer is shown.



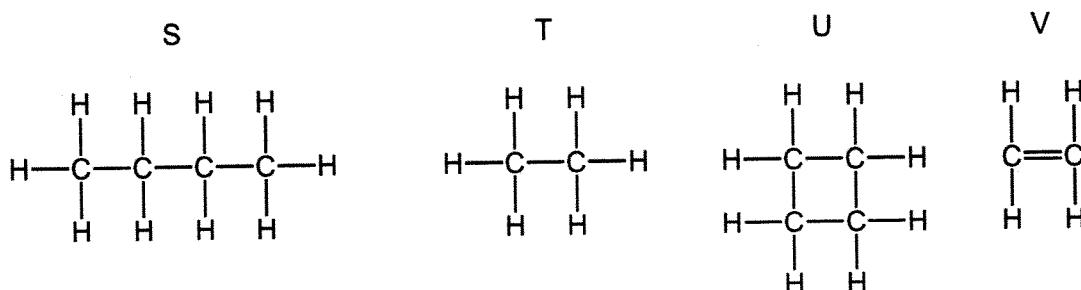
The structure shows that it is a1..... . It is formed by2..... polymerisation.

Which words complete gaps 1 and 2?

	1	2
A	polyamide	addition
B	polyamide	condensation
C	polyester	addition
D	polyester	condensation

[0620/22/O/N/17/35]

Q115. The structures of four organic compounds are shown.



Which compounds are unsaturated?

- A S only B T and U C U only D V only

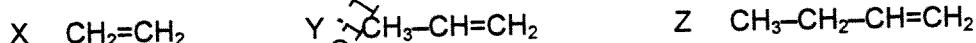
[0620/22/O/N/17/36]

Q116. Which statement is not correct?

- A Petroleum is a mixture of hydrocarbons.
 B The main constituent of natural gas is ethane.
 C The naphtha fraction of petroleum is used for making chemicals.
 D When natural gas burns in air, carbon dioxide and water are formed.

[0620/22/O/N/17/37]

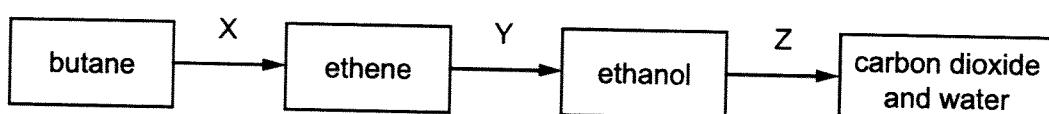
Q117. X, Y and Z are three hydrocarbons.



What do compounds X, Y and Z have in common?

- 1 They are all alkenes.
 2 They are all part of the same homologous series.
 3 They all have the same boiling point.
- A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

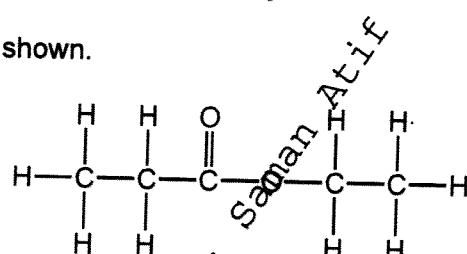
[0620/22/O/N/17/38]

Q118. The diagram shows a reaction sequence.

Which row names the processes X, Y and Z?

	X	Y	Z
A	cracking	fermentation	respiration
B	cracking	hydration	combustion
C	distillation	fermentation	respiration
D	distillation	hydration	combustion

[0620/22/O/N/17/39]

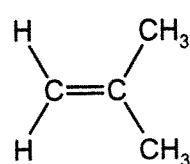
Q119. The structure of an ester is shown.

Which substances react to form this ester?

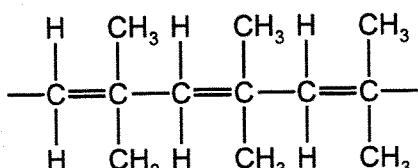
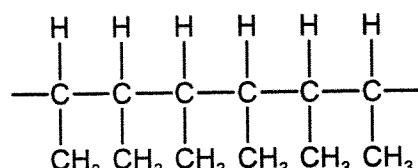
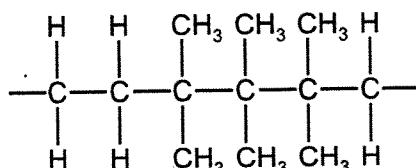
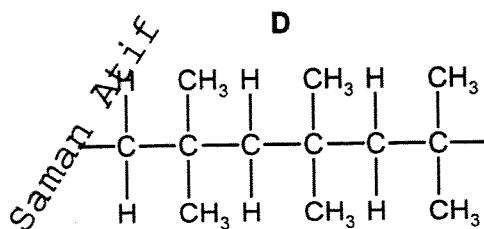
- A ethanol and ethanoic acid
 B ethanol and propanoic acid
 C propanol and ethanoic acid
 D propanol and propanoic acid
- Compiled by Saman Atiq

Q120.

A polymer can be made from methyl propene.



Which diagram shows the structure of the polymer?

A**B****C****D**

Q121.

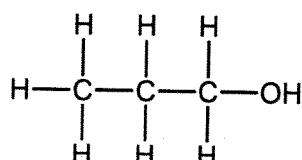
Some marble chips (calcium carbonate) are heated strongly and substances X and Y are formed.

Substance X is a white solid that reacts with water, giving out heat. Substance Y is a colourless gas.

What are substances X and Y?

	X	Y
A	calcium chloride	oxygen
B	calcium hydroxide	carbon dioxide
C	calcium oxide	carbon dioxide
D	calcium sulfate	oxygen

[0620/23/O/N/17/Q35]

Q122. The structure of compound R is shown.

What is R?

- A propane
- B propanoic acid
- C propanol
- D propene

[0620/23/O/N/17/Q36]

Q123. Fuel oil and naphtha are two fractions obtained from petroleum.

What are the major uses of these fractions?

	fuel oil	naphtha
A	jet fuel	making chemicals
B	jet fuel	making roads
C	ship fuel	making chemicals
D	ship fuel	making roads

[0620/23/O/N/17/Q37]

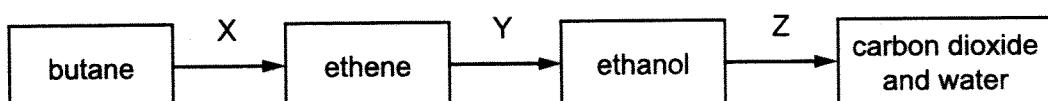
Q124. X, Y and Z are three hydrocarbons.

What do compounds X, Y and Z have in common?

- 1 They are all alkenes.
 - 2 They are all part of the same homologous series.
 - 3 They all have the same boiling point.
- A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

[0620/23/O/N/17/Q38]

Q125. The diagram shows a reaction sequence.

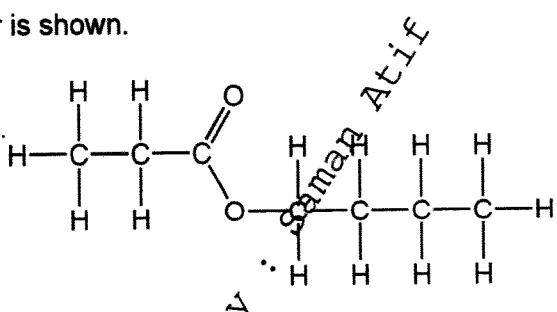


Which row names the processes X, Y and Z?

	X	Y	Z
A	cracking	fermentation	respiration
B	cracking	hydration	combustion
C	distillation	fermentation	respiration
D	distillation	hydration	combustion

[0620/23/O/N/17/Q39]

Q126. The structure of an ester is shown.

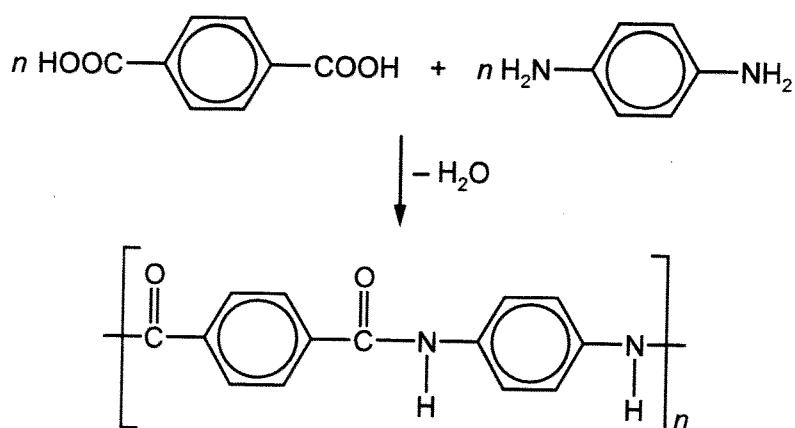


Which combination of carboxylic acid and alcohol produces this ester?

	carboxylic acid	alcohol
A	butanoic acid	ethanol
B	butanoic acid	propanol
C	ethanoic acid	butanol
D	propanoic acid	butanol

[0620/23/O/N/17/Q40]

Q127. The equation shows the formation of a polymer called Kevlar.



Which row describes Kevlar?

	how the polymer is formed	type of polymer
A	addition polymerisation	polyamide
B	addition polymerisation	polyester
C	condensation polymerisation	polyamide
D	condensation polymerisation	polyester

[0620/21/M/J/18/Q35]
 [0620/22/M/J/18/Q35]

Q128. What is not the correct use of the fraction named?

	name of fraction	use
A	fuel oil	making waxes
B	gas oil	fuel in diesel engines
C	kerosene	jet fuel
D	naphtha	making chemicals

[0620/21/M/J/18/Q36]

Q129. Which reaction is not a reaction which alkenes undergo?

- A bromination
- B hydration
- C hydrogenation
- D hydrolysis

[0620/21/M/J/18/Q37]

[0620/22/M/J/18/Q37]

Q130. Which substances can be obtained by cracking hydrocarbons?

- A ethanol and ethene
- B ethanol and hydrogen
- C ethene and hydrogen
- D ethene and poly(ethene)

[0620/21/M/J/18/Q38]

Q131. Ethanol is produced by fermentation or from ethene.

What is a disadvantage of producing ethanol by fermentation?

- A Distillation is needed to purify the ethanol produced.
- B Fermentation uses glucose from plants.
- C Fermentation is catalysed by enzymes in yeast.
- D Fermentation occurs at a low temperature and pressure.

[0620/21/M/J/18/Q39]

Q132. Which structural formula represents methyl propanoate?

- A $\text{CH}_3\text{CH}_2\text{COOCH}_3$
- B $\text{CH}_3\text{COOCH}_2\text{CH}_2\text{CH}_3$
- C $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOCH}_3$
- D $\text{HCOOCH}_2\text{CH}_2\text{CH}_3$

[0620/21/M/J/18/Q40]

Q133. Which row describes addition polymerisation and condensation polymerisation?

	addition polymerisation	condensation polymerisation
A	monomers have a C=C double bond and the polymer is the only product	monomers have a C=C double bond and the polymer is the only product
B	monomers have a C=C double bond and the polymer is the only product	the monomers react to form the polymer and a small molecule
C	the monomers react to form the polymer and a small molecule	monomers have a C=C double bond and the polymer is the only product
D	the monomers react to form the polymer and a small molecule	the monomers react to form the polymer and a small molecule

[0620/22/M/J/18/Q36]

Q134. Which statement about alkenes is not correct?

- A They decolourise aqueous bromine.
- B They only contain the elements carbon and hydrogen.
- C They react with hydrogen to form alkanes.
- D They react with steam to produce carboxylic acids.

[0620/22/M/J/18/Q38]

Q135. Two processes used for the large-scale production of ethanol are shown.

- process 1 A compound containing carbon, hydrogen and oxygen is used to produce ethanol.
- process 2 A compound containing carbon and hydrogen only is used to produce ethanol.

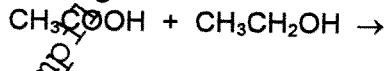
Which statement is correct?

- A Process 1 uses a renewable starting material.
- B Process 1 is done at a very high temperature.
- C Process 2 involves fermentation.
- D Process 2 is done at room temperature.

[0620/22/M/J/18/Q39]

Q136. What is the name of the organic product of the reaction shown?

- A ethyl ethanoate
- B ethyl methanoate
- C methyl ethanoate
- D methyl propanoate



[0620/22/M/J/18/Q40]

Q137. Which two compounds react together to form a condensation polymer?

- A $\text{HOCH}_2\text{CH}_2\text{OH}$ and CH_3COOH
- B $\text{HOCH}_2\text{CH}_2\text{OH}$ and CH_3NH_2
- C $\text{HOCH}_2\text{CH}_2\text{OH}$ and $\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2$
- D $\text{HOCH}_2\text{CH}_2\text{OH}$ and $\text{HOOCCH}_2\text{CH}_2\text{COOH}$

[0620/23/M/J/18/Q35]

Q138. What is not the correct use of the fraction named?

	name of fraction	use
A	fuel oil	making waxes
B	gas oil	fuel in diesel engines
C	kerosene	jet fuel
D	naphtha	making chemicals

[0620/23/M/J/18/Q36]

Q139. Methane, ethane and propane belong to a family of hydrocarbons called alkanes.

What is the general formula of an alkane?

- A C_nH_{2n} B C_nH_{2n+1} C C_nH_{2n-1} D C_nH_{2n+2}

[0620/23/M/J/18/Q37]

Q140. Which substances can be obtained by cracking hydrocarbons?

- A ethanol and ethene
 B ethanol and hydrogen
 C ethene and hydrogen
 D ethene and poly(ethene)

[0620/23/M/J/18/Q38]

Q141. Which row describes an advantage and a disadvantage of making ethanol by fermentation?

	advantage	disadvantage
A	uses a renewable resource	occurs at a slow rate
B	needs a high temperature	produces impure ethanol as a product
C	produces pure ethanol as a product	needs a high temperature
D	occurs at a slow rate	uses a non-renewable resource

[0620/23/M/J/18/Q39]

Q142. Which esters have the molecular formula $C_5H_{10}O_2$?

1 ethyl propanoate

2 propyl ethanoate

3 butyl methanoate

4 methyl butanoate

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 2 only

D 3 and 4 only

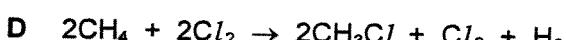
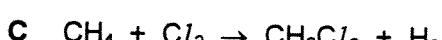
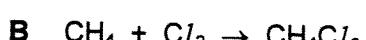
[0620/23/M/J/18/Q40]

Q143. A polymer linkage contains carbon, hydrogen, nitrogen and oxygen atoms.

Which row about the polymer is correct?

	type of polymer	formed by
A	polyamide	addition polymerisation
B	polyamide	condensation polymerisation
C	polyester	addition polymerisation
D	polyester	condensation polymerisation

[0620/22/O/N/18/Q35]

Q144. Which equation representing a reaction of methane is correct?

[0620/21/O/N/2018/Q38]

Q145.

When the alcohol $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ reacts with the carboxylic acid $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ an ester is formed.

What is the name and structural formula of this ester?

	name	structural formula
A	butyl propanoate	$\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
B	butyl propanoate	$\text{CH}_3\text{CH}_2\text{CH}_2\text{COOCH}_2\text{CH}_2\text{CH}_3$
C	propyl butanoate	$\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
D	propyl butanoate	$\text{CH}_3\text{CH}_2\text{CH}_2\text{COOCH}_2\text{CH}_2\text{CH}_3$

[0620/21/O/N/2018/Q39]

Q146.

A solution of ethanol and water is left to stand in an open beaker in a warm room for three weeks.

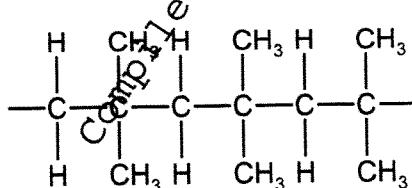
Which statement explains what happens to the ethanol in the solution?

- A The ethanol is dehydrated to ethene.
- B The ethanol is hydrolysed to ethene.
- C The ethanol is oxidised to ethanoic acid.
- D The ethanol is reduced to ethanoic acid.

[0620/22/O/N/2018/Q40]

Q147.

The structure of a polymer is shown.



Which monomer is used to make this polymer?

- | | | | |
|---|---|--|---|
| A | B | C | D |
| $\begin{array}{c} \text{CH}_3 \text{ CH}_3 \\ \quad \\ \text{C}=\text{C} \\ \quad \\ \text{H} \quad \text{H} \end{array}$ | $\begin{array}{c} \text{CH}_3 \text{ H} \\ \quad \\ \text{C}=\text{C} \\ \quad \\ \text{H} \quad \text{CH}_3 \end{array}$ | $\begin{array}{c} \text{H} \quad \text{CH}_3 \\ \quad \\ \text{C}=\text{C} \\ \quad \\ \text{CH}_3 \quad \text{H} \end{array}$ | $\begin{array}{c} \text{CH}_3 \text{ H} \\ \quad \\ \text{C}=\text{C} \\ \quad \\ \text{CH}_3 \quad \text{H} \end{array}$ |

Q148.

[0620/22/O/N/2018/Q38]

Ethanol is manufactured from ethene.

What is an advantage of this process?

- A It is a continuous process.
- B It has high labour costs.
- C It needs high temperature and pressure.
- D It uses non-renewable materials.

Q149.

[0620/22/O/N/2018/Q39]

Which reaction can be used to make ethanoic acid?

- A oxidation of ethanol
- B oxidation of ethene
- C reduction of ethanol
- D reduction of ethene

Q150.

[0620/23/O/N/2018/Q29]

Which equation represents the incomplete combustion of propane, C_3H_8 ?

- A $2C_3H_8 + 7O_2 \rightarrow 6CO + 8H_2O$
- B $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$
- C $2C_3H_8 + 11O_2 \rightarrow 6CO + 16H_2O$
- D $C_3H_8 + 7O_2 \rightarrow 3CO_2 + 8H_2O$

Q151.

[0620/23/O/N/2018/Q35]

Which equation representing a reaction of methane is correct?

- A $CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$
- B $CH_4 + Cl_2 \rightarrow CH_4Cl_2$
- C $CH_4 + Cl_2 \rightarrow CH_2Cl_2 + H_2$
- D $2CH_4 + 2Cl_2 \rightarrow 2CH_3Cl + Cl_2 + H_2$

[0620/23/O/N/2018/Q37]

Q152.

Ethanol can be formed by:

- 1 fermentation
- 2 reaction between steam and ethene.

Which of these processes use a catalyst?

	1	2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

[0620/23/O/N/2018/Q38]

Q153.

Sugar can be fermented to produce ethanol.

Some of the stages in the process to produce and purify ethanol are listed.

- 1 Leave in a warm place.
- 2 Add yeast.
- 3 Fractionally distil the solution.
- 4 Dissolve the sugar in water.
- 5 Filter to remove the yeast.
- 6 Crush some sugar cane.

What is the correct order of these stages?

- A $4 \rightarrow 6 \rightarrow 2 \rightarrow 1 \rightarrow 5 \rightarrow 3$
- B $6 \rightarrow 4 \rightarrow 1 \rightarrow 2 \rightarrow 5 \rightarrow 3$
- C $6 \rightarrow 4 \rightarrow 2 \rightarrow 1 \rightarrow 3 \rightarrow 5$
- D $6 \rightarrow 4 \rightarrow 2 \rightarrow 1 \rightarrow 5 \rightarrow 3$

[0620/23/O/N/2018/Q39]

Q154.

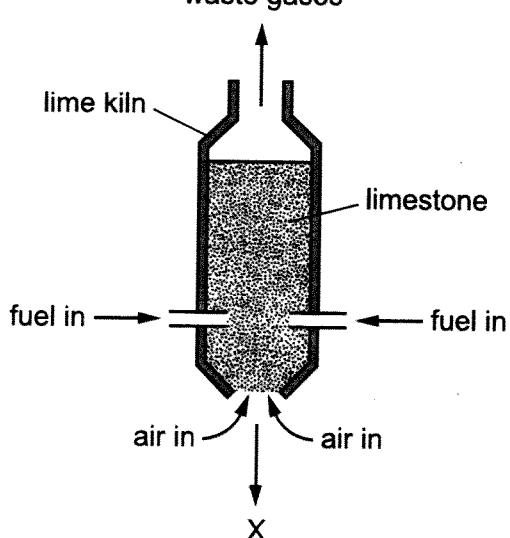
Which statement about ethanoic acid is correct?

- A It contains a $-C_2H_5$ group.
- B It is a strong acid.
- C It is formed by the reduction of ethanol.
- D It reacts with alcohols to form esters.

Q155.

[0620/21/M/J/2019/Q34]

The diagram represents a lime kiln used to heat limestone to a very high temperature.



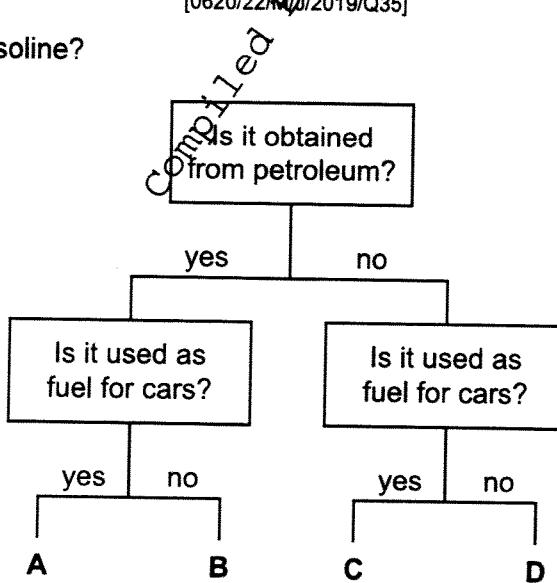
What leaves the kiln at X?

- A calcium carbonate
- B calcium hydroxide
- C calcium oxide
- D calcium sulfate

Q156.

[0620/22/M/J/2019/Q35]

Which fuel could be gasoline?



[0620/21/M/J/2019/Q36]

Q157.

- Why is ethanol a member of the homologous series of alcohols but propane is not?
- Ethanol has two carbon atoms per molecule but propane has three.
 - Ethanol can be made from ethene but propane is obtained from petroleum.
 - Ethanol is a liquid but propane is a gas.
 - Ethanol contains the same functional group as other alcohols but propane does not.

Q158.

[0620/21/M/J/2019/Q37]

Chlorine reacts with methane.

Which statements are correct?

- The reaction takes place in the dark.
 - The reaction of chlorine with methane forms chloromethane.
 - Chloromethane reacts with chlorine to produce dichloromethane.
 - The reaction of chlorine with methane is an addition reaction.
- Atif Khan*
- A 1 and 2 B 1 and 3 C 2 and 3 D 3 and 4

[0620/21/M/J/2019/Q38]

Q159.

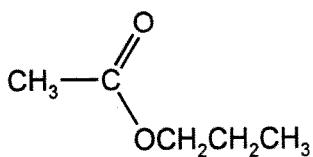
Which statements about aqueous ethanoic acid are correct?

- Ethanoic acid contains the functional group -COOH.
 - Ethanoic acid reacts with carbonates to produce hydrogen.
 - Ethanoic acid turns Universal Indicator paper blue.
 - Ethanoic acid has a pH lower than pH 7.
- Complaints*
- A 1 and 2 B 1 and 3 C 1 and 4 D 2 and 4

[0620/21/M/J/2019/Q39]

Q160.

The structure of an ester is shown.



What is the name of the ester?

- ethyl propanoate
- methyl propanoate
- propyl ethanoate
- propyl methanoate

Q161.

[0620/21/M/J/2019/Q40]

The structure of a polymer is shown.



Which type of polymer is shown and by which process is it formed?

	type of polymer	formed by
A	carbohydrate	addition polymerisation
B	carbohydrate	condensation polymerisation
C	polyester	addition polymerisation
D	polyester	condensation polymerisation

Q162.

[0620/22/M/J/2019/Q36]

Which statement about homologous series is not correct?

- A All homologous series are hydrocarbons.
 B Members of a homologous series have the same functional group.
 C Members of a homologous series have similar chemical properties.
 D The alkanes are an example of a homologous series.

Q163.

[0620/22/M/J/2019/Q37]

In bright sunlight, ethane and chlorine combine in substitution reactions.

Which compound is not formed in these reactions?

- A $\text{C}_2\text{H}_3\text{Cl}$ B $\text{C}_2\text{H}_5\text{Cl}$ C $\text{C}_2\text{H}_4\text{Cl}_2$ D HCl

Q164.

[0620/22/M/J/2019/Q38]

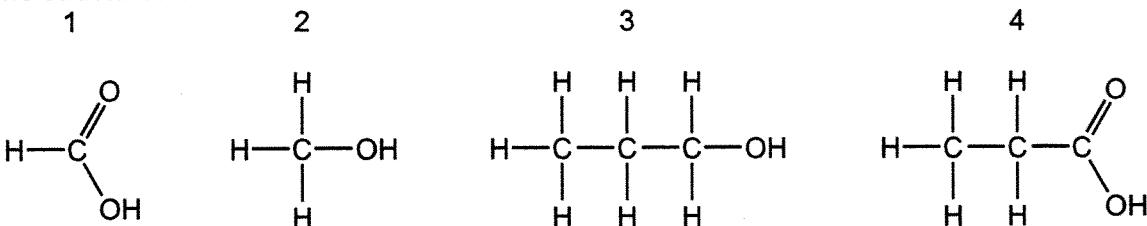
What are the properties of aqueous ethanoic acid?

	decolourises bromine water	reacts with calcium carbonate to make carbon dioxide	turns damp red litmus blue
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

Q165.

[0620/22/M/J/2019/Q39]

The structures of four molecules are shown.



Which molecules react together to form the ester propyl methanoate?

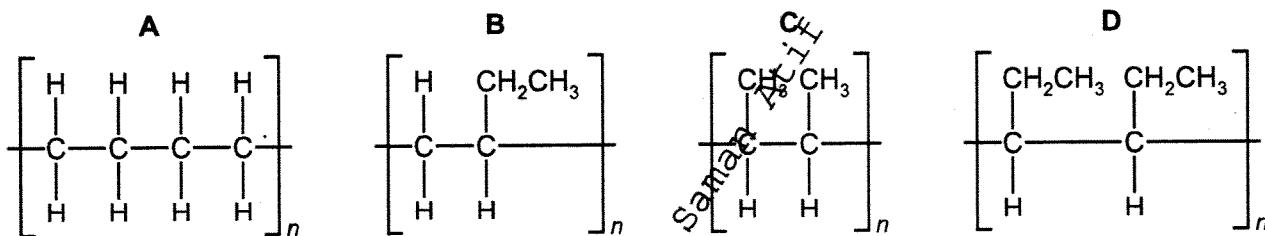
- A 1 and 2 B 1 and 3 C 2 and 4 D 3 and 4

[0620/22/M/J/2019/Q40]

Q166.

But-1-ene has the structure $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$.

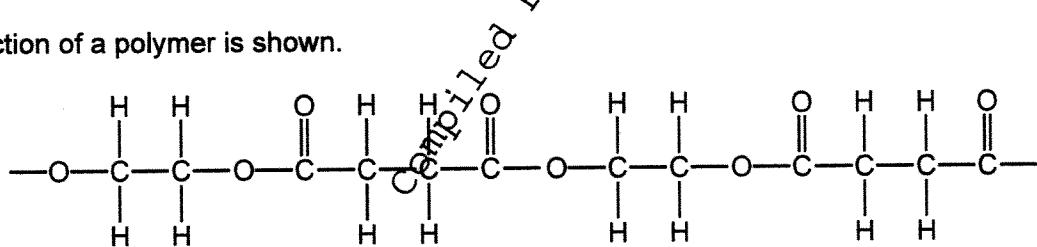
What is the structure of poly(but-1-ene)?



[0620/23/M/J/2019/Q40]

Q167.

A section of a polymer is shown.



How many different types of monomer units formed this section of polymer?

- A 1 B 2 C 3 D 4

Q168.

[0620/23/M/J/2019/Q36]

Which statements about homologous series are correct?

- 1 All members have similar chemical properties.
- 2 All members have the same molecular mass.
- 3 Ethane and ethene are members of the same homologous series.
- 4 Ethane and propane are members of the same homologous series.

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

Q169.

[0620/23/M/J/2019/Q37]

Which type of reaction takes place when methane reacts with chlorine in the presence of ultraviolet light?

- A addition
- B cracking
- C polymerisation
- D substitution

Q170.

[0620/23/M/J/2019/Q38]

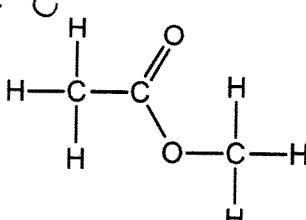
Which statement about aqueous ethanoic acid is correct?

- A It reacts with metal carbonates to form salts, hydrogen and water.
- B It reacts with metal oxides to form salts and oxygen.
- C It reacts with reactive metals to form salts and hydrogen.
- D It turns damp red litmus paper blue.

Q171.

The structure of ester W is shown.

[0620/23/M/J/2019/Q39]



Which row gives the names of ester W and the carboxylic acid and alcohol from which it is made?

	name of ester W	carboxylic acid	alcohol
A	ethyl methanoate	ethanoic acid	methanol
B	ethyl methanoate	methanoic acid	ethanol
C	methyl ethanoate	ethanoic acid	methanol
D	methyl ethanoate	methanoic acid	ethanol

Q172.

[0620/21/O/N/2019/Q35]

- Which process is used to obtain lime from limestone?
- cracking
 - fractional distillation
 - neutralisation
 - thermal decomposition

[0620/21/O/N/2019/Q36]

Q173.

Petroleum is separated by fractional distillation.

Which statement about the fractions produced is correct?

- Bottled gas for heating and cooking is obtained from the naphtha fraction.
- Diesel oil is used as a fuel for jet aircraft.
- Substances used to make polishes are obtained from the lubricating fraction.
- The kerosene fraction contains many useful waxes.

[0620/22/O/N/2019/Q37]

Q174.

Which products are obtained by the cracking of an alkane?

	alkene	hydrogen	water
A	✓	✓	✓
B	✓	✓	✗ BY
C	✓	✗	
D	✗	✓	

[0620/21/O/N/2019/Q38]

Q175.

Ethanol is manufactured by the catalytic addition of steam to ethene and by fermentation.

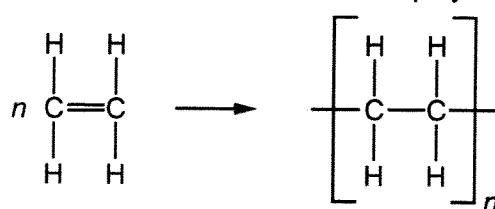
Which statement describes an advantage of fermentation compared to the catalytic addition of steam to ethene?

- Fermentation is a more rapid reaction.
- Fermentation produces a purer product.
- Fermentation uses a higher temperature.
- Fermentation uses renewable resources.

Q176.

[0620/22/O/N/2019/Q39]

The diagram shows the structure of a monomer and of the polymer made from it.



What are the monomer and polymer?

	monomer	polymer
A	ethane	poly(ethane)
B	ethane	poly(ethene)
C	ethene	poly(ethane)
D	ethene	poly(ethene)

Q177.

[0620/21/O/N/2019/Q40]

Which polymers possess the same linkage?

- A nylon and protein
- B protein and starch
- C starch and nylon
- D nylon and Terylene

Q178.

[0620/22/O/N/2019/Q36]

Some fractions obtained from petroleum are listed.

	fraction	use	position collected in the fractionating column
1	gasoline	waxes and polishes	below refinery gas
2	bitumen	making roads	above kerosene
3	kerosene	jet fuel	below gasoline
4	refinery gas	heating and cooking	above gasoline

Which rows are correct?

- A 1, 3 and 4
- B 2, 3 and 4
- C 3 and 4 only
- D 4 only

[0620/22/O/N/2019/Q38]

Q179.

Ethanol is produced by fermentation or by the reaction of ethene with steam.

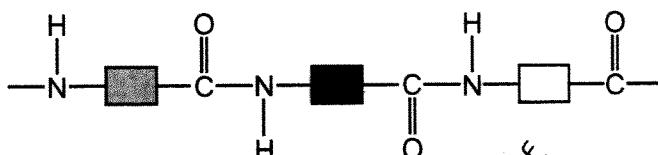
Which row is correct?

	by fermentation	from ethene
A	uses a temperature of 100 °C	uses a temperature of 350 °C
B	needs yeast as a catalyst	does not need a catalyst
C	very slow reaction	very fast reaction
D	high yield of ethanol	low yield of ethanol

[0620/22/O/N/2019/Q40]

Q180.

The structure of a naturally occurring polymer, X, is shown.



What is X?

- A an amino acid
- B a carbohydrate
- C a protein
- D a sugar

[0620/23/O/N/2019/Q36]

Q181.

Which statement is correct?

- A Bitumen is used as a fuel for ships.
- B Coal, natural gas and oxygen are all fuels.
- C Hydrogen is the main constituent of natural gas.
- D Petroleum is separated into useful substances by fractional distillation.

[0620/23/O/N/2019/Q38]

Q182.

Ethanol is made by fermentation of sugars and by the catalytic addition of steam to ethene.

What are two advantages of making ethanol by the catalytic addition of steam to ethene rather than by fermentation of sugars?

- A faster reaction and renewable raw materials
- B purer product and faster reaction
- C renewable raw materials and continuous process
- D uses more energy and forms a purer product

[0620/23/O/N/2019/Q40]

Q183.

Proteins and starch are both natural polymers.

Both proteins and starch are hydrolysed by dilute acids.

What are the products of hydrolysis of proteins and of starch?

	products of hydrolysis of proteins	products of hydrolysis of starch
A	amines and carboxylic acids	simple sugars
B	amines and carboxylic acids	alcohols and carboxylic acids
C	amino acids	simple sugars
D	amino acids	alcohols and carboxylic acids

Q184.

[0620/21/M/J/2020/Q35]

Which row about the production of ethanol by fermentation is correct?

	raw materials	energy requirement	rate of reaction
A	non-renewable	high	slow
B	renewable	low	slow
C	non-renewable	low	fast
D	renewable	high	fast

Q185.

[0620/21/M/J/2020/Q36]

Which statement about homologous series is correct?

- A Members of a homologous series have the same structural formula.
- B Members of a homologous series all have similar chemical properties.
- C Members of a homologous series all have similar physical properties.
- D Members of all homologous series are hydrocarbons.

Q186.

[0620/22/M/J/2020/Q37]

Increasing the number of atoms in one molecule of a hydrocarbon increases the amount of energy released when it burns.

What is the correct order?

	less energy released	more energy released
A	ethene	ethane
B	ethene	methane
C	methane	ethane
D	methane	ethene

Q187.

[0620/21/M/J/2020/Q38]

Some properties of an organic compound J are listed.

- It is a liquid at room temperature.
- It is soluble in water.
- A solution of J reacts with calcium carbonate to form carbon dioxide.
- A solution of J has a pH of 3.

In which homologous series does J belong?

- A alkane
 B alkene
 C alcohol
 D carboxylic acid

Q188.

[0620/21/M/J/2020/Q39]

Ethane, C_2H_6 , reacts with chlorine in a substitution reaction.

What are the products of this reaction?

- A chloroethane and hydrogen
 B chloroethane and hydrogen chloride
 C chloroethene and hydrogen
 D chloroethene and hydrogen chloride

Q189.

[0620/21/M/J/2020/Q40]

Which polymers or types of polymer are synthetic?

- 1 carbohydrates
 2 nylon
 3 proteins
 4 Terylene

- A 1 and 3 B 1 and 4 C 2 and 3 D 2 and 4

Q190.

[0620/22/M/J/2020/Q35]

Ethanol is made on an industrial scale by the fermentation of sugars or by the reaction of ethene with steam in the presence of a suitable catalyst.

What is a disadvantage of making ethanol from ethene rather than by fermentation?

- A A continuous production process is used.
 B A non-renewable raw material is used.
 C The product is very pure.
 D The rate of reaction is very high.

Q191.

[0620/22/M/J/2020/Q36]

Which statement about compounds in the same homologous series is correct?

- A They have the same chemical properties because they have the same number of carbon atoms.
- B They have the same physical properties because they have the same number of carbon atoms.
- C They have different chemical properties because they have different numbers of carbon atoms.
- D They have different physical properties because they have different numbers of carbon atoms.

Q192.

[0620/22/M/J/2020/Q38]

An organic compound, P, reacts with zinc to produce a gas, Q.

What are P and Q?

	P	Q
A	ethanoic acid	carbon dioxide
B	ethanoic acid	hydrogen
C	ethanol	carbon dioxide
D	ethanol	hydrogen

Saman Atif

Q193.

[0620/22/M/J/2020/Q39]

Alkanes undergo substitution reactions in the presence of UV light.

Which equation represents a substitution reaction of ethane?

- A $\text{C}_2\text{H}_6 + \text{Cl}_2 \rightarrow \text{C}_2\text{H}_4 + 2\text{HCl}$
- B $\text{C}_2\text{H}_6 + \text{Cl}_2 \rightarrow \text{C}_2\text{H}_5\text{Cl} + \text{HCl}$
- C $\text{C}_2\text{H}_6 + \text{Cl}_2 \rightarrow \text{C}_2\text{H}_4\text{Cl}_2 + \text{H}_2$
- D $\text{C}_2\text{H}_6 + \text{HCl} \rightarrow \text{C}_2\text{H}_5\text{Cl} + \text{H}_2$

Q194.

[0620/22/M/J/2020/Q40]

Which substances are natural polymers?

- 1 proteins
- 2 carbohydrates
- 3 nylon
- 4 poly(ethene)

A 1 and 2

B 1 and 3

C 2 and 3

D 3 and 4

[0620/23/M/J/2020/Q35]

Q195.

Ethanol is produced by:

- 1 the catalytic addition of steam to ethene
- 2 fermentation.

Which statement is correct?

- A Both processes require similar amounts of energy.
- B Both processes use a catalyst.
- C Process 1 uses a renewable resource.
- D Process 2 produces the purest ethanol.

[0620/23/M/J/2020/Q36]

Q196.

Which statement about a homologous series is correct?

- A All members have the same general formula.
- B All members have the same molecular formula.
- C All members have similar physical properties.
- D Members show a trend in their chemical properties.

[0620/23/M/J/2020/Q37]

Q197.

A small quantity of a solid chemical is added to a large excess of aqueous ethanoic acid.

No bubbles of gas are seen and the solid dissolves to give a colourless solution.

What was the solid chemical?

- A calcium hydroxide
- B copper(II) oxide
- C magnesium
- D sodium carbonate

[0620/23/M/J/2020/Q39]

Q198.

Alkanes undergo substitution reactions with chlorine in the presence of ultraviolet light.

Which equation shows a reaction of this type?

- A $\text{C}_3\text{H}_6 + \text{Cl}_2 \rightarrow \text{C}_3\text{H}_6\text{Cl}_2$
- B $\text{C}_3\text{H}_8 + \text{Cl}_2 \rightarrow \text{C}_3\text{H}_6\text{Cl}_2 + \text{H}_2$
- C $\text{C}_3\text{H}_8 + 2\text{Cl}_2 \rightarrow \text{C}_3\text{H}_6\text{Cl}_2 + 2\text{HCl}$
- D $\text{C}_3\text{H}_6 + \text{Cl}_2 \rightarrow \text{C}_3\text{H}_5\text{Cl} + \text{HCl}$

[0620/23/M/J/2020/Q40]

Q199.

Which statement about carbohydrates and proteins is correct?

- A Carbohydrates and proteins are constituents of food.
- B Carbohydrates and proteins are natural polymers used to make larger molecules called monomers.
- C Carbohydrates and proteins are synthetic polymers.
- D Carbohydrates and proteins cause pollution as they are non-biodegradable.

Q200.

[0620/21/O/N/2020/Q33]

Which row describes two uses of sulfur dioxide?

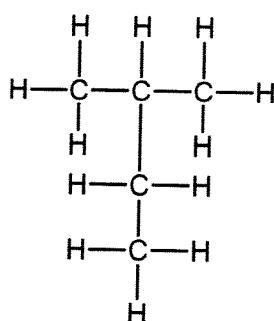
	use 1	use 2
A	bleaching paper pulp	neutralising acidic industrial waste
B	bleaching paper pulp	preserving food and drink
C	extracting iron from hematite	neutralising acidic industrial waste
D	extracting iron from hematite	preserving food and drink

Q201.

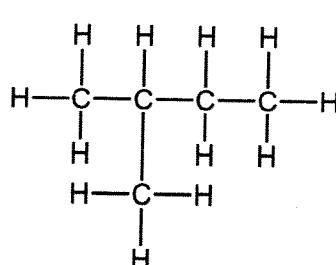
[0620/21/O/N/2020/Q35]

The structures of four organic molecules are shown.

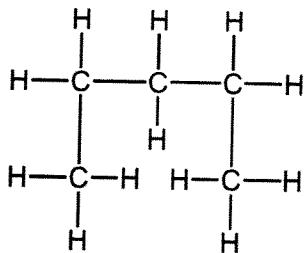
1



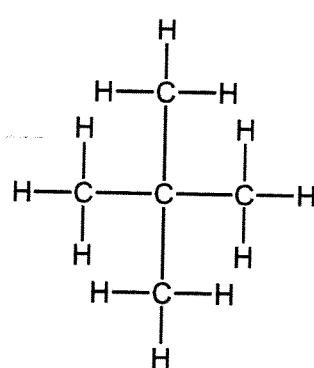
2



3



4



Which molecules are structural isomers of structure 1?

- A 2 and 4
- B 2 only
- C 3 and 4
- D 3 only

Q202.

Which chemical equation for the substitution of an alkane with chlorine is correct?

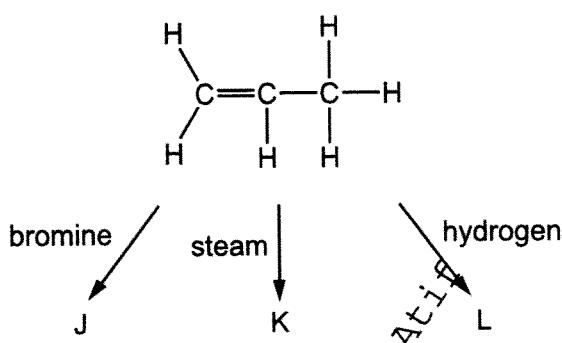
- A $\text{C}_3\text{H}_8 + \text{Cl}_2 \rightarrow \text{C}_3\text{H}_7\text{Cl} + \text{HCl}$
- B $\text{C}_3\text{H}_6 + \text{Cl}_2 \rightarrow \text{C}_3\text{H}_6\text{Cl}_2$
- C $\text{C}_3\text{H}_8 + \text{Cl}_2 \rightarrow \text{C}_3\text{H}_6\text{Cl}_2 + \text{H}_2$
- D $\text{C}_3\text{H}_6 + \text{Cl}_2 \rightarrow \text{C}_3\text{H}_5\text{Cl} + \text{HCl}$

[0620/21/O/N/2020/Q36]

Q203.

[0620/21/O/N/2020/Q37]

Propene is an alkene that reacts with bromine, steam and hydrogen as shown.



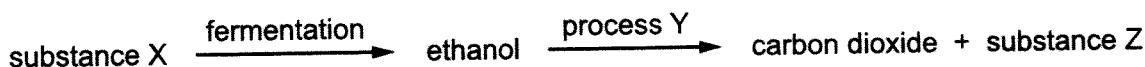
What are the products of these reactions?

	J	K	L
A	bromopropane	propanol	butane
B	dibromopropane	propanoic acid	propane
C	dibromopropane	propanol	propane
D	bromopropane	propanoic acid	butane

[0620/21/O/N/2020/Q38]

Q204.

The flow chart shows the preparation of ethanol and some important chemistry of ethanol.



What are X, Y and Z?

	X	Y	Z
A	yeast	combustion	oxygen
B	glucose	combustion	steam
C	glucose	polymerisation	water
D	yeast	fermentation	glucose

Q205.

[0620/21/O/N/2020/Q39]

Which statements about aqueous ethanoic acid are correct?

- 1 It is an alkane.
- 2 It reacts with sodium carbonate to form carbon dioxide.
- 3 It changes the colour of litmus solution from blue to red.
- 4 It is a hydrocarbon.

A 1 and 2

B 1 and 4

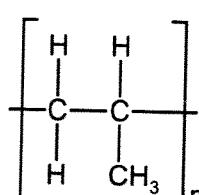
C 2 and 3

D 3 and 4

Q206.

[0620/21/O/N/2020/Q40]

The structure of a polymer is shown.



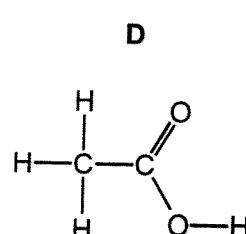
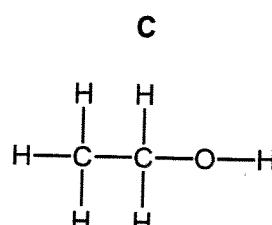
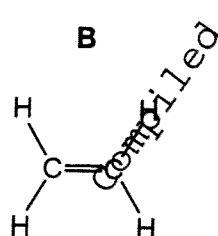
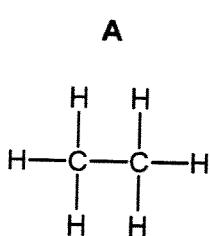
Which monomer forms this polymer?

- A ethane
B ethene
C propane
D propene

Q207.

[0620/22/O/N/2020/Q35]

Which structure represents a molecule of ethanol?



Q208.

[0620/22/O/N/2020/Q37]

Which molecule is not produced by an addition reaction of ethene?

- A CH₃CH₃ B CH₂BrCH₂Br C CH₃CH₂OH D CH₃CH₂CH₃

Q209.

[0620/22/O/N/2020/Q39]

Which statement about nylon and Terylene is correct?

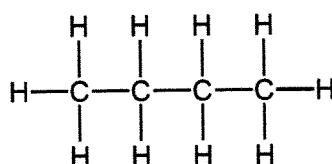
- A Nylon and Terylene are made from monomers with C=C bonds.
B Nylon and Terylene contain the same linkage.
C Nylon is a polyester.
D Terylene is made from two different monomers.

[0620/22/O/N/2020/Q36]

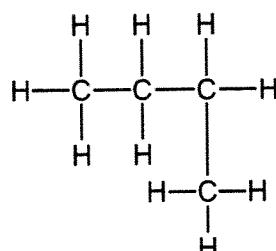
Q210.

Which structures are structural isomers of each other?

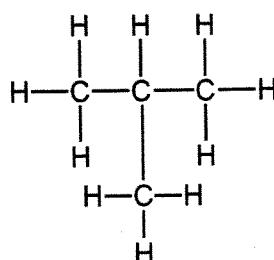
1



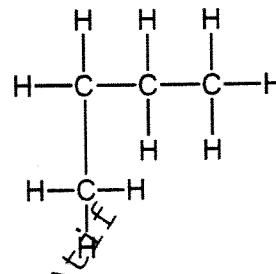
2



3



4



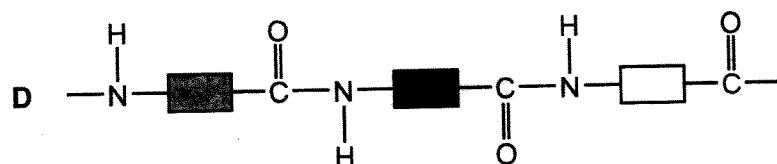
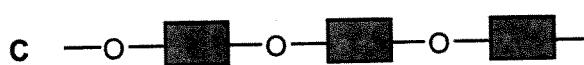
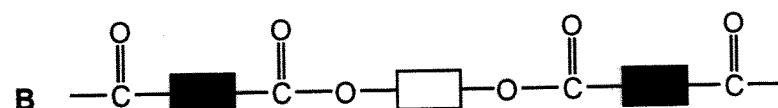
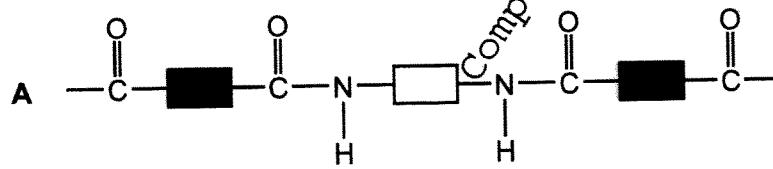
- A 1, 2, 3 and 4
 B 1, 2 and 4 only
 C 1 and 3 only
 D 2 and 4 only

Q211.

Which diagram represents the structure of a protein?

[0620/22/O/N/2020/Q40]

Saman A&F



Q212.

[0620/23/O/N/2020/Q36]

Which product is obtained when bromine reacts with propene, $\text{CH}_3\text{CH}=\text{CH}_2$?

- A $\text{CH}_3\text{CH}=\text{CHBr}$
- B $\text{CH}_3\text{CBr}=\text{CHBr}$
- C $\text{CH}_3\text{CH}_2\text{CHBr}_2$
- D $\text{CH}_3\text{CHBrCH}_2\text{Br}$

Q213.

[0620/23/O/N/2020/Q37]

Propanol is oxidised by acidified potassium manganate(VII) in a similar way to ethanol.

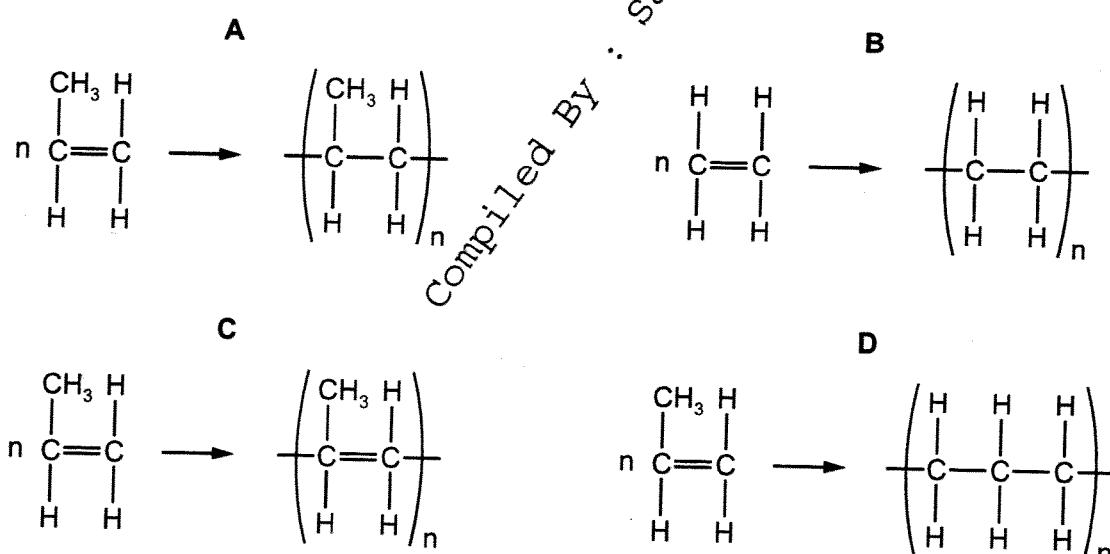
Which compound is produced by the oxidation of propanol with acidified potassium manganate(VII)?

- A $\text{CH}_3\text{CH}_2\text{OH}$
- B $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- C CH_3COOH
- D $\text{CH}_3\text{CH}_2\text{COOH}$

Q214.

[0620/23/O/N/2020/Q39]

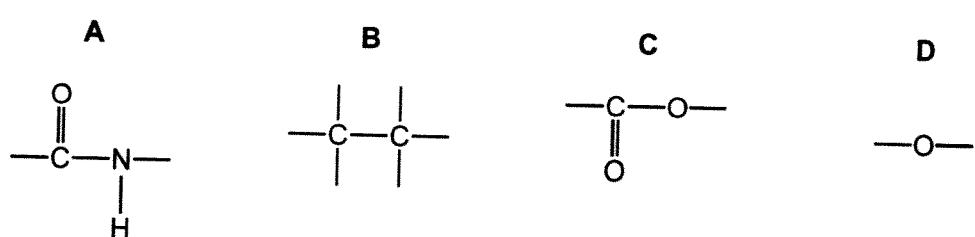
Which equation represents the formation of poly(propene) from propene?



Q215.

[0620/23/O/N/2020/Q40]

Which type of linkage joins the amino acids in a protein?



IGCSE O LEVEL CHEMISTRY TOPICAL PAPER 2

MARKING SCHEME

TOPIC #. 1 The Particulate Nature of Matter

Q. #	Ans.#								
1	D	26	B	51		76		101	
2	A	27	B	52		77		102	
3	B	28	B	53		78		103	
4	C	29	B	54		79		104	
5	B	30	D	55		80		105	
6	C	31	C	56		81		106	
7	A	32	C	57		82		107	
8	B	33	D	58		83		108	
9	D	34	D	59		84		109	
10	D	35	C	60		85		110	
11	A	36	C	61		86		111	
12	D	37	C	62		87		112	
13	C	38	A	63		88		113	
14	C	39	C	64		89		114	
15	C	40	B	65		90		115	
16	D	41	A	66		91		116	
17	B	42	A	67		92		117	
18	C	43	B	68		93		118	
19	D	44	D	69		94		119	
20	D	45	C	70		95		120	
21	D	46	B	71		96		121	
22	D	47	B	72		97		122	
23	C	48	D	73		98		123	
24	B	49	D	74		99		124	
25	A	50	D	75		100		125	

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TOPIC #. 2 Experimental Techniques

Q. #	Ans.#								
1	B	26	A	51	A	76		101	
2	B	27	D	52	B	77		102	
3	C	28	C	53	A	78		103	
4	A	29	D	54	C	79		104	
5	B	30	B	55	C	80		105	
6	C	31	D	56	C	81		106	
7	C	32	C	57	B	82		107	
8	C	33	C	58	A	83		108	
9	B	34	C	59	C	84		109	
10	B	35	D	60	C	85		110	
11	C	36	C	61	C	86		111	
12	A	37	A	62	C	87		112	
13	A	38	D	63	C	88		113	
14	C	39	B	64	D	89		114	
15	D	40	C	65	C	90		115	
16	A	41	B	66	B	91		116	
17	D	42	B	67	C	92		117	
18	B	43	B	68	B	93		118	
19	D	44	C	69	D	94		119	
20	C	45	C	70	A	95		120	
21	B	46	D	71	A	96		121	
22	C	47	A	72	D	97		122	
23	A	48	C	73	C	98		123	
24	C	49	D	74	D	99		124	
25	B	50	A	75		100		125	

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MARKING SCHEME

TOPIC #. 3 Atoms, Elements and Compounds

Q. #	Ans.#								
1	A	26	D	51	A	76	B	101	A
2	A	27	C	52	C	77	D	102	C
3	B	28	A	53	B	78	B	103	B
4	A	29	C	54	D	79	C	104	D
5	B	30	C	55	B	80	B	105	D
6	C	31	B	56	D	81	C	106	C
7	D	32	C	57	D	82	B	107	B
8	A	33	A	58	D	83	A	108	B
9	C	34	D	59	A	84	B	109	D
10	C	35	D	60	C	85	C	110	C
11	A	36	B	61	C	86	D	111	B
12	D	37	A	62	D	87	A	112	B
13	D	38	C	63	A	88	B	113	D
14	B	39	B	64	C	89	B	114	C
15	C	40	D	65	C	90	C	115	B
16	D	41	A	66	C	91	C	116	B
17	B	42	C	67	B	92	C	117	C
18	D	43	C	68	C	93	A	118	B
19	A	44	A	69	C	94	C	119	A
20	C	45	A	70	C	95	B	120	D
21	A	46	B	71	C	96	B	121	B
22	D	47	B	72	D	97	B	122	A
23	A	48	A	73	A	98	C	123	D
24	B	49	D	74	A	99	D	124	B
25	D	50	B	75	A	100	B	125	D

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TOPIC #. 3 Atoms, Elements and Compounds

Q. #	Ans.#								
126	D	151	A	176		201		226	
127	D	152	B	177		202		227	
128	B	153	D	178		203		228	
129	A	154	B	179		204		229	
130	A	155	B	180		205		230	
131	B	156	D	181		206		231	
132	D	157	A	182		207		232	
133	B	158	B	183		208		233	
134	D	159	C	184		209		234	
135	D	160	D	185		210		235	
136	A	161	C	186		211		236	
137	A	162	A	187		212		237	
138	A	163	B	188		213		238	
139	C	164	D	189		214		239	
140	A	165	D	190		215		240	
141	D	166	C	191		216		241	
142	B	167	C	192		217		242	
143	C	168	B	193		218		243	
144	C	169	C	194		219		244	
145	B	170		195		220		245	
146	B	171		196		221		246	
147	C	172		197		222		247	
148	B	173		198		223		248	
149	B	174		199		224		249	
150	A	175		200		225		250	

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TOPIC #. 4 Stoichiometry

Q. #	Ans.#								
1	D	26	D	51	C	76	C	101	
2	B	27	C	52	A	77	C	102	
3	D	28	B	53	A	78	C	103	
4	B	29	D	54	B	79	D	104	
5	B	30	D	55	A	80	B	105	
6	D	31	D	56	B	81	C	106	
7	C	32	C	57	A	82	C	107	
8	B	33	C	58	B	83	C	108	
9	B	34	C	59	B	84	C	109	
10	C	35	B	60	B	85	B	110	
11	D	36	A	61	B	86	C	111	
12	C	37	B	62	B	87	D	112	
13	B	38	D	63	C	88	D	113	
14	C	39	D	64	C	89		114	
15	B	40	C	65	D	90		115	
16	D	41	C	66	A	91		116	
17	B	42	B	67	B	92		117	
18	B	43	A	68	C	93		118	
19	C	44	A	69	C	94		119	
20	D	45	D	70	A	95		120	
21	C	46	B	71	D	96		121	
22	D	47	B	72	A	97		122	
23	B	48	A	73	C	98		123	
24	D	49	B	74	D	99		124	
25	D	50	A	75	A	100		125	

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TOPIC #. 5 Electricity and Chemistry

Q. #	Ans.#								
1	A	26	B	51	D	76	A	101	
2	D	27	A	52	B	77	A	102	
3	A	28	D	53	B	78		103	
4	A	29	C	54	B	79		104	
5	B	30	A	55	C	80		105	
6	B	31	B	56	B	81		106	
7	D	32	A	57	A	82		107	
8	C	33	A	58	D	83		108	
9	D	34	B	59	A	84		109	
10	B	35	B	60	C	85		110	
11	C	36	B	61	B	86		111	
12	B	37	A	62	A	87		112	
13	A	38	D	63	B	88		113	
14	D	39	A	64	D	89		114	
15	A	40	D	65	B	90		115	
16	D	41	C	66	A	91		116	
17	D	42	C	67	C	92		117	
18	C	43	C	68	B	93		118	
19	D	44	D	69	A	94		119	
20	C	45	B	70	A	95		120	
21	D	46	C	71	D	96		121	
22	B	47	C	72	D	97		122	
23	A	48	B	73	B	98		123	
24	D	49	C	74	C	99		124	
25	A	50	A	75	C	100		125	

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TOPIC #. 6 Chemical Energetics

Q. #	Ans.#								
1	C	26	A	51	B	76	D	101	
2	D	27	A	52	A	77	C	102	
3	D	28	B	53	A	78		103	
4	A	29	C	54	B	79		104	
5	D	30	B	55	B	80		105	
6	C	31	A	56	C	81		106	
7	A	32	D	57	B	82		107	
8	D	33	B	58	C	83		108	
9	D	34	A	59	B	84		109	
10	B	35	B	60	B	85		110	
11	D	36	C	61	D	86		111	
12	A	37	B	62	A	87		112	
13	D	38	B	63	D	88		113	
14	A	39	C	64	B	89		114	
15	B	40	B	65	C	90		115	
16	D	41	D	66	B	91		116	
17	C	42	C	67	A	92		117	
18	C	43	D	68	B	93		118	
19	C	44	B	69	B	94		119	
20	B	45	B	70	D	95		120	
21	C	46	B	71	A	96		121	
22	C	47	B	72	A	97		122	
23	D	48	C	73	D	98		123	
24	B	49	B	74	B	99		124	
25	C	50	A	75	A	100		125	

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TOPIC #. 7 Chemical Reactions

Q. #	Ans.#								
1	A	26	B	51	C	76	D	101	D
2	A	27	A	52	A	77	C	102	B
3	C	28	B	53	B	78	B	103	C
4	C	29	A	54	B	79	A	104	D
5	B	30	D	55	D	80	D	105	D
6	A	31	A	56	B	81	C	106	B
7	D	32	D	57	A	82	D	107	B
8	A	33	A	58	B	83	A	108	D
9	B	34	D	59	C	84	A	109	D
10	D	35	A	60	C	85	C	110	D
11	A	36	D	61	A	86	B	111	C
12	A	37	A	62	C	87	B	112	B
13	B	38	D	63	D	88	D	113	B
14	B	39	A	64	C	89	D	114	C
15	B	40	B	65	A	90	D	115	B
16	D	41	C	66	D	91	C	116	A
17	B	42	C	67	A	92	D	117	B
18	B	43	B	68	C	93	C	118	C
19	D	44	D	69	B	94	A	119	A
20	C	45	A	70	B	95	A	120	D
21	B	46	B	71	B	96	C	121	D
22	C	47	B	72	C	97	D	122	C
23	C	48	D	73	C	98	C	123	C
24	D	49	A	74	C	99	D	124	D
25	A	50	A	75	C	100	C	125	B

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TOPIC #. 7 Chemical Reactions

Q. #	Ans.#								
126	D	151	D	176		201		226	
127	C	152	A	177		202		227	
128	D	153	A	178		203		228	
129	C	154	B	179		204		229	
130	B	155	B	180		205		230	
131	B	156		181		206		231	
132	C	157		182		207		232	
133	D	158		183		208		233	
134	A	159		184		209		234	
135	C	160		185		210		235	
136	B	161		186		211		236	
137	B	162		187		212		237	
138	B	163		188		213		238	
139	B	164		189		214		239	
140	B	165		190		215		240	
141	A	166		191		216		241	
142	C	167		192		217		242	
143	C	168		193		218		243	
144	B	169		194		219		244	
145	B	170		195		220		245	
146	B	171		196		221		246	
147	C	172		197		222		247	
148	A	173		198		223		248	
149	D	174		199		224		249	
150	D	175		200		225		250	

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TOPIC #. 8 Acid, Bases and Salts

Q. #	Ans.#								
1	C	26	B	51	C	76	B	101	C
2	C	27	D	52	D	77	B	102	C
3	D	28	B	53	D	78	C	103	D
4	C	29	B	54	A	79	D	104	D
5	A	30	B	55	A	80	C	105	C
6	C	31	A	56	A	81	C	106	B
7	D	32	B	57	C	82	C	107	B
8	A	33	D	58	D	83	C	108	A
9	D	34	C	59	D	84	D	109	C
10	A	35	B	60	B	85	B	110	A
11	A	36	A	61	B	86	B	111	A
12	B	37	B	62	A	87	C	112	D
13	D	38	B	63	A	88	C	113	C
14	A	39	C	64	A	89	C	114	B
15	D	40	D	65	D	90	A	115	C
16	B	41	D	66	D	91	C	116	D
17	D	42	C	67	C	92	D	117	D
18	A	43	D	68	B	93	C	118	D
19	B	44	D	69	B	94	A	119	B
20	C	45	D	70	A	95	A	120	C
21	C	46	A	71	B	96	B	121	C
22	B	47	D	72	B	97	D	122	B
23	B	48	A	73	B	98	A	123	A
24	B	49	B	74	A	99	C	124	C
25	B	50	C	75	B	100	C	125	B

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TOPIC #. 8 Acid, Bases and Salts

Q. #	Ans.#								
126	D	151		176		201		226	
127	D	152		177		202		227	
128	A	153		178		203		228	
129	A	154		179		204		229	
130	C	155		180		205		230	
131	D	156		181		206		231	
132	A	157		182		207		232	
133	B	158		183		208		233	
134	A	159		184		209		234	
135	C	160		185		210		235	
136		161		186		211		236	
137		162		187		212		237	
138		163		188		213		238	
139		164		189		214		239	
140		165		190		215		240	
141		166		191		216		241	
142		167		192		217		242	
143		168		193		218		243	
144		169		194		219		244	
145		170		195		220		245	
146		171		196		221		246	
147		172		197		222		247	
148		173		198		223		248	
149		174		199		224		249	
150		175		200		225		250	

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TOPIC #. 9 The Periodic Table

Q. #	Ans.#								
1	B	26	D	51	C	76	A	101	B
2	A	27	D	52	B	77	B	102	D
3	C	28	A	53	A	78	C	103	C
4	D	29	A	54	C	79	C	104	D
5	C	30	C	55	D	80	B	105	B
6	D	31	D	56	A	81	A	106	B
7	C	32	B	57	B	82	D	107	B
8	D	33	B	58	D	83	D	108	D
9	D	34	D	59	D	84	C	109	A
10	C	35	C	60	A	85	B	110	B
11	A	36	C	61	D	86	B	111	C
12	D	37	D	62	D	87	B	112	C
13	B	38	C	63	C	88	A	113	C
14	D	39	D	64	A	89	D	114	C
15	C	40	A	65	B	90	C	115	A
16	C	41	A	66	D	91	A	116	A
17	B	42	A	67	B	92	B	117	B
18	D	43	C	68	B	93	C	118	B
19	B	44	A	69	A	94	C	119	C
20	A	45	D	70	B	95	B	120	C
21	A	46	B	71	A	96	C	121	C
22	B	47	C	72	A	97	B	122	A
23	C	48	C	73	D	98	C	123	
24	B	49	C	74	C	99	C	124	
25	D	50	C	75	B	100	D	125	

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TOPIC #. 10 Metals

Q. #	Ans.#								
1	D	26	D	51	D	76	D	101	B
2	B	27	B	52	B	77	B	102	A
3	D	28	B	53	C	78	C	103	B
4	D	29	D	54	B	79	D	104	B
5	C	30	D	55	C	80	C	105	A
6	C	31	A	56	A	81	A	106	D
7	A	32	D	57	A	82	C	107	A
8	B	33	C	58	A	83	A	108	C
9	B	34	B	59	C	84	B	109	D
10	A	35	D	60	D	85	C	110	C
11	B	36	A	61	D	86	C	111	C
12	B	37	D	62	A	87	A	112	C
13	B	38	C	63	B	88	D	113	D
14	B	39	D	64	A	89	D	114	B
15	C	40	C	65	B	90	B	115	A
16	D	41	C	66	B	91	C	116	B
17	C	42	C	67	C	92	C	117	C
18	C	43	B	68	D	93	A	118	B
19	C	44	D	69	D	94	B	119	B
20	D	45	B	70	D	95	D	120	A
21	A	46	D	71	A	96	C	121	C
22	B	47	A	72	A	97	A	122	A
23	C	48	A	73	A	98	A	123	C
24	C	49	A	74	B	99	D	124	C
25	A	50	A	75	B	100	D	125	C

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TOPIC #. 10 Metals

Q. #	Ans.#								
126	D	151	B	176		201		226	
127	D	152	A	177		202		227	
128	C	153	B	178		203		228	
129	A	154	D	179		204		229	
130	A	155	D	180		205		230	
131	D	156	B	181		206		231	
132	B	157	C	182		207		232	
133	A	158	B	183		208		233	
134	D	159	B	184		209		234	
135	A	160	B	185		210		235	
136	C	161	D	186		211		236	
137	D	162	A	187		212		237	
138	A	163	B	188		213		238	
139	D	164	A	189		214		239	
140	C	165	C	190		215		240	
141	D	166	B	191		216		241	
142	C	167	C	192		217		242	
143	C	168	D	193		218		243	
144	B	169	D	194		219		244	
145	C	170	D	195		220		245	
146	C	171	A	196		221		246	
147	C	172	C	197		222		247	
148	B	173	D	198		223		248	
149	D	174	B	199		224		249	
150	A	175	A	200		225		250	

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TOPIC #. 11 Air and Water

Q. #	Ans.#								
1	C	26	C	51	B	76	C	101	C
2	B	27	B	52	B	77	C	102	B
3	D	28	D	53	B	78	D	103	B
4	A	29	C	54	B	79	D	104	D
5	C	30	A	55	D	80	C	105	A
6	B	31	B	56	C	81	D	106	D
7	D	32	A	57	A	82	C	107	C
8	B	33	D	58	B	83	B	108	B
9	D	34	A	59	C	84	C	109	A
10	C	35	C	60	C	85	B	110	B
11	A	36	B	61	D	86	C	111	A
12	B	37	A	62	C	87	C	112	B
13	C	38	C	63	C	88	C	113	D
14	C	39	C	64	B	89	B	114	D
15	A	40	D	65	D	90	B	115	D
16	B	41	C	66	A	91	C	116	A
17	D	42	B	67	B	92	C	117	A
18	D	43	B	68	C	93	D	118	C
19	A	44	C	69	C	94	A	119	C
20	B	45	B	70	D	95	D	120	A
21	B	46	D	71	A	96	B	121	A
22	A	47	C	72	D	97	A	122	B
23	C	48	C	73	C	98	A	123	B
24	B	49	D	74	B	99	D	124	
25	B	50	D	75	A	100	B	125	

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TOPIC #. 12 Organic Chemistry

Q. #	Ans.#								
1	A	26	A	51	C	76	B	101	D
2	B	27	B	52	C	77	A	102	B
3	A	28	B	53	A	78	B	103	D
4	B	29	C	54	D	79	C	104	B
5	A	30	C	55	D	80	C	105	B
6	D	31	B	56	A	81	B	106	D
7	B	32	B	57	C	82	C	107	B
8	C	33	C	58	A	83	B	108	B
9	D	34	A	59	C	84	C	109	C
10	A	35	D	60	B	85	B	110	C
11	B	36	B	61	C	86	B	111	B
12	A	37	C	62	B	87	A	112	B
13	C	38	B	63	A	88	A	113	C
14	C	39	D	64	A	89	C	114	B
15	B	40	D	65	C	90	C	115	D
16	D	41	A	66	D	91	A	116	B
17	C	42	C	67	B	92	C	117	B
18	D	43	B	68	C	93	C	118	B
19	C	44	D	69	D	94	C	119	B
20	C	45	A	70	B	95	C	120	D
21	D	46	C	71	C	96	B	121	C
22	D	47	D	72	C	97	C	122	C
23	D	48	A	73	D	98	D	123	C
24	C	49	B	74	A	99	A	124	B
25	A	50	A	75	B	100	C	125	B

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Q. #	Ans.#								
126	D	151	A	176	D	201	C	226	
127	C	152	A	177	A	202	A	227	
128	A	153	D	178	C	203	C	228	
129	D	154	D	179	C	204	B	229	
130	C	155	C	180	C	205	C	230	
131	A	156	A	181	D	206	D	231	
132	A	157	D	182	B	207	C	232	
133	B	158	C	183	C	208	D	233	
134	D	159	C	184	B	209	D	234	
135	A	160	C	185	B	210	C	235	
136	A	161	B	186	D	211	D	236	
137	D	162	A	187	D	212	D	237	
138	A	163	A	188	B	213	D	238	
139	D	164	C	189	D	214	A	239	
140	C	165	B	190	B	215	A	240	
141	A	166	B	191	D	216		241	
142	A	167	B	192	B	217		242	
143	B	168	B	193	B	218		243	
144	A	169	D	194	A	219		244	
145	D	170	C	195	B	220		245	
146	C	171	C	196	A	221		246	
147	D	172	D	197	A	222		247	
148	A	173	C	198	C	223		248	
149	A	174	B	199	A	224		249	
150	A	175	D	200	B	225		250	

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