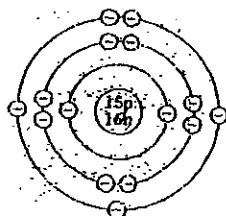


- 2 -

1. Sulphur and oxygen are in the same group of the periodic table because

- (A) they can react with each other
- (B) the atomic number of sulphur is 16 and the relative atomic mass of oxygen is 16
- (C) they have the same number of electrons in their outer shell
- (D) they can form covalent compounds

Item 2 refers to the following diagram which represents the structure of Atom X.



n – neutron
p – proton
⊖ – electron

2. If Atom X forms an ion, the charge on the ion would MOST likely be

- (A) 5^+
- (B) 5^-
- (C) 3^+
- (D) 3^-

Items 3–4 refer to the relative charges and approximate masses of four particles as listed below.

	Charge	Approximate mass
(A)	+1	1
(B)	0	1
(C)	-1	0
(D)	0	2

In answering items 3–4, each option may be used more than once, once, or not at all.

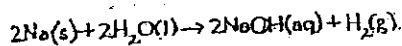
Which of the above properties refer to a

- 3. neutron?
- 4. proton?
- 5. Which of the following statements illustrates brownian motion?
 - (A) The random motion of pollen dust in water
 - (B) Perfume scent throughout the air in a room
 - (C) The swelling of red beans when soaked in water
 - (D) Loss of heat from a hot body to a cold body

6. Radioactive isotopes are NOT normally used in the

- (A) determination of the age of fossils
- (B) treatment of cancer
- (C) treatment of influenza
- (D) powering of certain types of submarines

7. Sodium reacts with water according to the equation

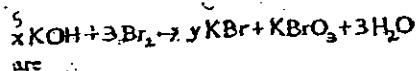


(Molar volume of a gas = 24 litres at r.t.p.)

The number of litres of hydrogen gas liberated when 0.1 mole of sodium reacts with excess water is

- (A) 1.2
(B) 2.4
(C) 12
(D) 24

8. The values of x and y respectively in the equation



are

- (A) $x = 5; y = 6$
(B) $x = 6; y = 5$
(C) $x = 5; y = 15$
(D) $x = 6; y = 6$

9. Which of the following statements about 1 mole of a gas would be correct?

- I. It contains 6×10^{23} individual species.
II. It is the relative atomic mass in grams.
III. It occupies 22.4 dm³ at standard temperature and pressure.
IV. It occupies the same volume as any other gas at r.t.p.

- (A) III only
(B) I and II only
(C) I, II and III only
(D) I, III and IV only

10. From the information given in the table below, which of the substances A, B, C or D, is MOST likely sodium chloride?

Substance	Boiling point / °C	Electrical conductivity	
		In the solid state	In aqueous state
A	1465	no	yes
B	444	no	no
C	2600	yes	no
D	-35	no	yes

11. The SMALLEST particle of a chemical compound that can take part in a reaction is the

- (A) atom
(B) mole
(C) formula
(D) molecule

12. The number of shared electron pairs in a methane molecule is

- (A) 4
(B) 6
(C) 8
(D) 10

13. How many covalent bonds are there in a nitrogen molecule?

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

14. A separating funnel can be used to separate a mixture of

- (A) water and sodium chloride
- (B) water and ethanol
- (C) water and kerosene
- (D) kerosene and sodium chloride

15. A substance X, with a boiling point of 60°C , is miscible with another liquid Y, of boiling point 80°C . A mixture of these two liquids can BEST be separated into its components by

- (A) use of a separating funnel
- (B) simple distillation
- (C) fractional distillation
- (D) sublimation

16. Which of the following atoms would NOT form a positive ion?

- (A) Magnesium
- (B) Aluminium
- (C) Sodium
- (D) Chlorine

17. When two substances, X and Y are stirred together in a beaker and the mixture filtered, X and Y are both present in the filtrate. Which of the following could describe the mixture formed by X and Y?

- I. Solution
- II. Colloid
- III. Suspension

- (A) I only
- (B) III only
- (C) I and II only
- (D) II and III only

18. Barium is below calcium in Group II of the periodic table. When these metals react with water, the main differences in observation would be the rate of reaction and

- (A) solubility of product
- (B) TYPE of gas evolved
- (C) reaction with litmus
- (D) TYPE of product

19. Which of the following is NOT true of the group of elements known as the halogens?

- (A) The boiling point of the elements increases as their atomic numbers increase.
- (B) The oxidizing power of the elements decreases as their atomic numbers increase.
- (C) They are all nonmetals.
- (D) They form negative ions by the loss of electrons from their atoms.

20. A solution has a pH of 1. This solution would be expected to

- (A) react with zinc metal to produce hydrogen
- (B) react with zinc metal to produce a solution of pH 10
- (C) neutralize a solution of pH 4
- (D) react with hydrochloric acid to produce a salt and water

21. Which of the following substances is the oxide of a metal?

- (A) Salt
- (B) Base
- (C) Alkali
- (D) Acid

Item 22 refers to 1 mole of EACH of the following acids.

- I. H_2SO_4
- II. CH_3COOH
- III. $(\text{COOH})_2$
- IV. HNO_3

22. Which TWO of the above acids require more than one mole of $\text{NaOH}(\text{aq})$ for complete neutralization?

- (A) I and II
- (B) I and III
- (C) II and III
- (D) II and IV

23. Which of the following is an acid salt?

- (A) Na_3PO_4
- (B) Na_2SO_4
- (C) NaHSO_4
- (D) Na_2CO_3

24. Which of the following ionic equations involves oxidation?

- (A) $\text{S}^{2-} - 2\text{e}^- \rightarrow \text{S}$
- (B) $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$
- (C) $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$
- (D) $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$

25. What is the oxidation number of carbon in EACH of the following compounds?

	CH_4	CO	CO_2
(A)	+4	+2	+4
(B)	-4	+2	+4
(C)	+4	-2	-4
(D)	-4	+4	+4

26. In which of the following reactions is sulphur dioxide acting as an oxidising agent?

- (A) $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$
- (B) $\text{SO}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + 3\text{S}(\text{s})$
- (C) $\text{SO}_2(\text{g}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_2\text{SO}_3(\text{aq})$
- (D) $\text{SO}_2(\text{g}) + 2\text{HNO}_3(\text{aq}) \rightarrow \text{H}_2\text{SO}_4(\text{aq}) + 2\text{NO}_2(\text{g})$

27. A substance that conducts an electric current but remains chemically unchanged is

- (A) aqueous copper (II) sulphate
- (B) copper
- (C) sulphur
- (D) sodium chloride

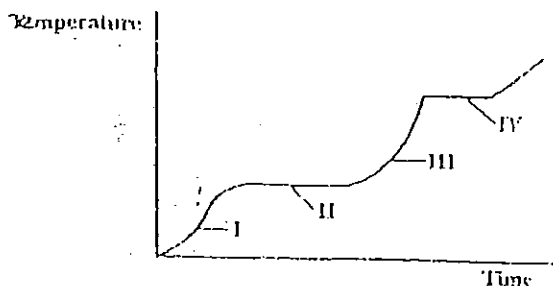
28. Which of the following statements about ionic compounds is true?

- (A) They contain molecules.
- (B) They are solids and vaporize easily.
- (C) They usually dissolve in organic solvents.
- (D) They conduct electricity when melted or dissolved in water.

29. Which of the following statements about electrolysis is NOT correct?

- (A) The electrons leave the solution by the positive electrode.
- (B) Decomposition of the electrolyte at the anode is due to an electric current.
- (C) The electrons enter the solution by the negative electrode.
- (D) Decomposition of the electrolyte at the electrode produces an electric current.

Item 30 refers to the following graph which shows the changes in temperature with time, for a substance heated until no further physical changes take place.



30. During which portion of the curve is the substance a liquid only?

- (A) I
- (B) II
- (C) III
- (D) IV

31. When heat is given off to the surroundings during a chemical reaction, it is because bond breaking

- (A) as well as bond formation releases energy
- (B) requires less energy than is released when new bonds are formed
- (C) requires more energy than that released when new bonds are formed
- (D) is an endothermic process whereas bond making is an exothermic one

32. Ions which are NOT changed in a reaction are called

- (A) metallic ions
- (B) nonmetallic ions
- (C) spectator ions
- (D) radicals

33. A piece of metal is reacted with an acid to produce hydrogen gas. Which of the following procedures should be employed in order to increase the rate of the reaction?

- I. Increasing the temperature at which the reaction is carried out
- II. Subdividing the lump of metal
- III. Reducing the concentration of the acid

- (A) I and II only
- (B) I and III only
- (C) II and III only
- (D) I, II and III

34. During the electrolysis of aqueous copper(II) sulphate solution using inert electrodes, the ions migrating to the cathode are

- (A) $\text{Cu}^{2+}(\text{aq})$ and $\text{SO}_4^{2-}(\text{aq})$
- (B) $\text{H}^+(\text{aq})$ and $\text{OH}^-(\text{aq})$
- (C) $\text{Cu}^{2+}(\text{aq})$ and $\text{H}^+(\text{aq})$
- (D) $\text{SO}_4^{2-}(\text{aq})$ and $\text{OH}^-(\text{aq})$

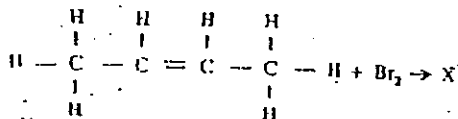
35. When a concentrated solution of sodium chloride is electrolysed using carbon electrodes

- (A) sodium is liberated at the cathode
- (B) the solution at the cathode is alkaline
- (C) oxygen is liberated at the anode
- (D) chlorine is liberated at the anode

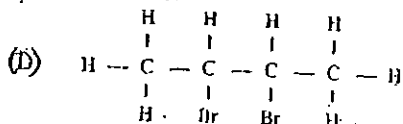
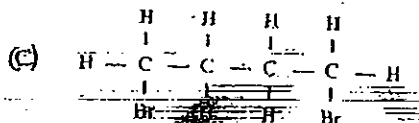
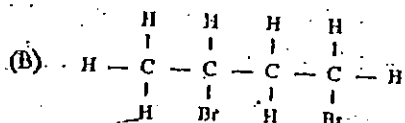
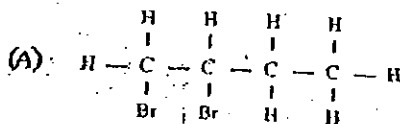
36. The compound ethene is described as being unsaturated. This means that the

(A) carbon atoms in ethene are linked by single bonds.
 (B) molecule contains at least one double bond.
 (C) carbon atoms in the molecule are very reactive.
 (D) molecule has insufficient hydrogen atoms.

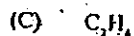
Item 37 refers to the following equation.



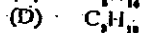
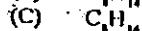
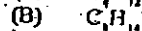
37. The correct structural formula for X is



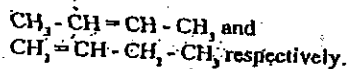
38. Which of the following compounds is NOT a member of the alkene series?



39. Octane, the major component of gasoline, is an alkane with 8 carbon atoms per molecule. Which of the following is the formula of octane?

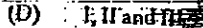
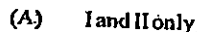


Item 40 refers to two compounds of formulae

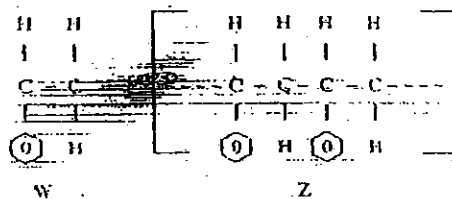


40. Which of the following are the same for these compounds?

I. Molecular formulae
 II. Empirical formulae
 III. Functional group



Item 41 refers to the following information:



W represents the structure of one molecule of the starting material used in an organic reaction. Z represents the structure of part of the product formed.

41. The reaction can be classified as

- (A) hydrogenation
- (B) addition polymerization
- (C) condensation polymerization
- (D) substitution

Items 42-43 refer to the following reactions of ethanol.

- (A) $\text{CH}_3\text{CH}_2\text{OH} \rightarrow \text{CH}_3\text{COOH}$
- (B) $\text{CH}_3\text{CH}_2\text{OH} \rightarrow \text{CH}_3\text{CHO}$
- (C) $\text{CH}_3\text{CH}_2\text{OH} \rightarrow \text{C}_2\text{H}_4$
- (D) $\text{CH}_3\text{CH}_2\text{OH} \rightarrow 2\text{CO}_2 + 3\text{H}_2\text{O}$

Match each item with one of the reactions above. Each reaction may be used more than once, once or not at all.

42. Complete oxidation with acidified potassium dichromate (VI) solution

43. The production of an alkene when heated with concentrated sulphuric acid

44. When ethanoic acid and ethanol react to form ethyl ethanoate, the catalyst used is

- (A) dilute hydrochloric acid
- (B) concentrated hydrochloric acid
- (C) dilute sulphuric acid
- (D) concentrated sulphuric acid

45. The residue in the fractional distillation of petroleum is

- (A) bitumen
- (B) paraffin oil
- (C) methane
- (D) propene

46. The fermentation of sugars, using glucose as the substrate, can be represented by the equation

- (A) $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$
- (B) $\text{C}_6\text{H}_{12}\text{O}_6 + \text{C}_6\text{H}_{12}\text{O}_6 \rightarrow \text{C}_{12}\text{H}_{22}\text{O}_{11} + \text{H}_2\text{O}$
- (C) $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2$
- (D) $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

47. Hydrocarbons occur naturally in

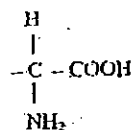
- (A) petroleum
- (B) methane
- (C) carbon
- (D) hydrogen

Items 48 - 49 refer to the following compounds.

- (A) Fats
- (B) Starch
- (C) Proteins
- (D) Polyamides

In answering items 48 - 49, each compound may be used more than once, once or not at all.

48. Which compound produces amino acids when hydrolysed?
49. Which compound is NOT considered to be a polymer?
50. Which of the following types of polymers may be derived from compounds containing the partial structure shown below?



- (A) Polyalkene
- (B) Polyester
- (C) Polyamide
- (D) Polysaccharide

51. Which of the following compounds are naturally occurring?

- I. Terylene
- II. Nylon
- III. Fat
- IV. Proteins

- (A) I and II only
- (B) I and III only
- (C) II and III only
- (D) III and IV only

52. The extraction of sucrose from sugarcane is through

- (A) addition polymerization
- (B) condensation polymerization
- (C) fermentation
- (D) vacuum distillation

53. Which of the following may be true of metals?

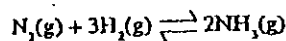
- I. They form solid chlorides.
- II. They generally form basic oxides.
- III. They conduct electricity only when molten.

- (A) III only
- (B) I and II only
- (C) II and III only
- (D) I, II and III

54. Which of the following elements reacts with water?

- (A) Carbon
- (B) Chlorine
- (C) Oxygen
- (D) Nitrogen

Item 55 refers to the Haber process for the production of ammonia, according to the equation



$$\Delta H = -92 \text{ kJ mol}^{-1}$$

55. The catalyst used in this process is

- (A) iron
- (B) nickel
- (C) platinum
- (D) vanadium(V) oxide

Item 56 refers to the following table.

Metal	Solution of P	Solution of Q	Solution of R
P	No reaction	No reaction	No reaction
Q	Displacement	No reaction	No reaction
R	Displacement	Displacement	No reaction

56. Which of the following gives the correct order of decreasing reactivity, (MOST reactive first), for metals P, Q and R?

- (A) R, Q, P
- (B) P, Q, R
- (C) Q, R, P
- (D) R, P, Q

57. Which of the following statements explains why, over time, aluminium articles DO NOT deteriorate in air as do iron articles?

- (A) Aluminium is higher up in the activity series than iron, therefore it is more resistant to corrosion than iron.
- (B) Both metals form oxide coats but aluminium oxide prevents further reaction while the iron oxide does not.
- (C) Both metals form hydroxide coats but the aluminium hydroxide prevents further reaction while the iron hydroxide does not.
- (D) Aluminium is lower than iron in the activity series; therefore it reacts less readily with air than iron.

58. Which of the following aqueous solutions will produce a blue precipitate with aqueous sodium hydroxide?

- (A) Calcium nitrate
- (B) Iron(II) nitrate
- (C) Copper(II) nitrate
- (D) Aluminium nitrate

59. Which of the following compounds may be used to counteract the effects of acid rain on the soil?

- (A) H_2S
- (B) CaO
- (C) CO
- (D) SO_2

60. A certain metal nitrate produces two gases when heated and a brown solid when it reacts with zinc. Which of the following could be the metal nitrate?

- (A) Sodium nitrate
- (B) Magnesium nitrate
- (C) Potassium nitrate
- (D) Copper(II) nitrate

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.