Insert School Logo

CHEMISTRY

UNIT 1

2019

Name: _____

Teacher: _____

TIME ALLOWED FOR THIS PAPER
Reading time before commencing work: ten minutes
Working time for the paper: three hours

MATERIALS REQUIRED/RECOMMENDED FOR THIS PAPER

To be provided by the supervisor:
This Question/Answer Booklet
Multiple-choice Answer Sheet
Chemistry Data Book

To be provided by the candidate:
Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, eraser, correction tape/fluid, ruler, highlighters

Special items: up to three non-programmable calculators approved for use in the WACE examinations

IMPORTANT NOTE TO CANDIDATES
No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of exam
Section One: Multiple-choice	25	25	50	/50	/25
Section Two: Short answer	8	8	60	/70	/35
Section Three: Extended answer	5	5	70	/80	/40
					/100

Instructions to candidates

1. Answer the questions according to the following instructions.

   Section One: Answer all questions on the separate Multiple-choice Answer Sheet provided. For each question shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

   Sections Two and Three: Write your answers in this Question/Answer Booklet.

2. When calculating numerical answers, show your working or reasoning clearly. Express numerical answers to the appropriate number of significant figures and include appropriate units where applicable.

3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.

4. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
   - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
   - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

5. The Chemistry Data Book is **not** handed in with your Question/Answer Booklet.

Section One: Multiple-choice **25% (50 marks)**

This section has **25** questions. Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time: 50 minutes.

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1. For which subatomic particle below is the mass, charge and location stated correctly?

	Subatomic particle	Relative mass	Relative charge	Location
(a)	proton	1	+1	nucleus
(b)	neutron	$1/200^{th}$	0	nucleus
(c)	proton	$1/50^{th}$	-1	nucleus
(d)	neutron	1	0	electron cloud

2. Consider the flame test data in the table below.

Element	Flame colour
Li	red
Na	orange
Cs	blue-violet
Ca	orange-red
Cu	blue-green

Which 2 elements could be **most easily** distinguished by a flame test?

(a) Na and Ca.
(b) Cu and Cs.
(c) Ca and Li.
(d) Cu and Na.

3. An example of a pure substance is

(a) methylated spirits.
(b) sulfur dioxide.
(c) tap water.
(d) skim milk.

4. Complete the coefficients below to balance the equation correctly.

$$\_\_\_\ AlBr_3 + \_\_\_\ K_2SO_4 \rightarrow \_\_\_\ KBr + \_\_\_\ Al_2(SO_4)_3$$

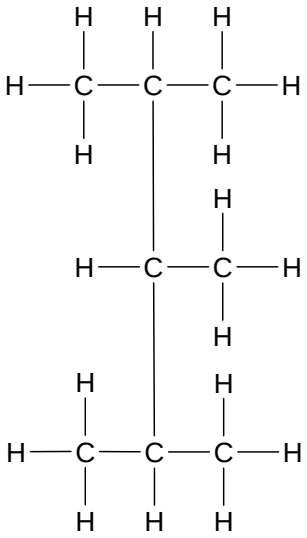
(a) 2, 1, 2, 1
(b) 2, 3, 3, 1
(c) 1, 3, 3, 2
(d) 2, 3, 6, 1

5. Niels Bohr contributed to our understanding of the atom, primarily by proposing

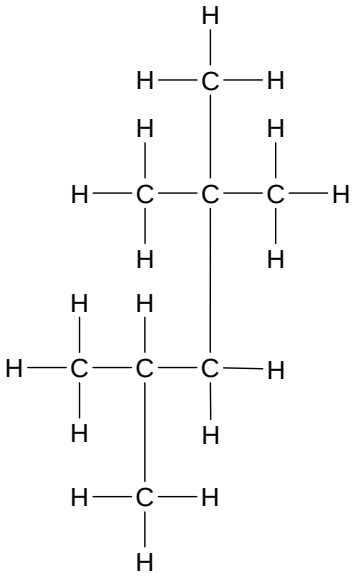
(a) the existence of neutrons within the atom.
(b) the existence of electrons within the atom.
(c) the presence, location and size of the nucleus.
(d) the motion of electrons within specific energy levels.

6. Which 2 molecules below would have the same IUPAC name?

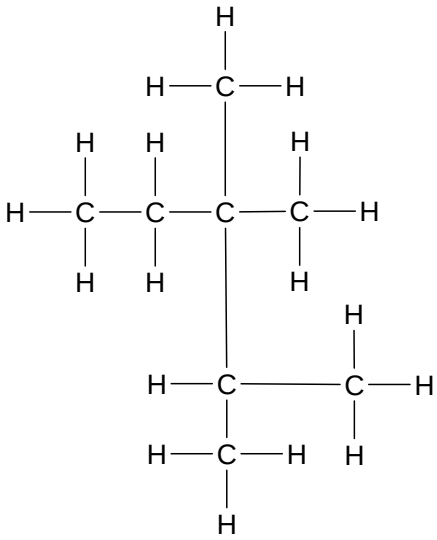
W



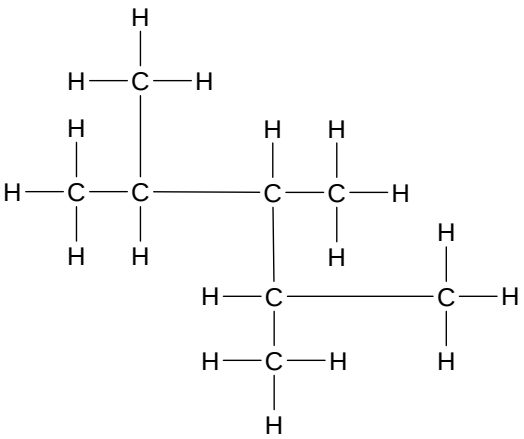
X



Y



Z



(a) W and X
(b) X and Y
(c) Y and Z
(d) W and Z

7. Which of the following symbols represents a non-metal element?

(a) Sc
(b) Se
(c) Sr
(d) Sn

8. "The non-directional bonding between the delocalised electrons and the positive metal ions means that the substance can be hammered and flattened into thin sheets without breaking."

This is a description of

(a) malleability.
(b) ductility.
(c) thermal conductivity.
(d) lustre.

9. Select the option where the formulas for the three named ions are given correctly.

	nitrite	**cyanide**	**phosphate**
(a)	NO_3^-	CN^-	P^{3-}
(b)	NO_2^-	Cy^-	PO_4^{3-}
(c)	N^{3-}	Cy^-	PO_3^{2-}
(d)	NO_2^-	CN^-	PO_4^{3-}

Questions 10 and 11 refer to the information in the table below.

Species	Number of protons	Number of neutrons	Number of electrons
I	9	10	10
II	10	10	10
III	11	12	10
IV	12	12	10
V	11	12	11
VI	10	12	10

10. Which species are charged?

(a) I and III
(b) II and IV
(c) I, III and IV
(d) II, V and VI

11. Which 2 species are isotopes of one another?

(a) I and II
(b) II and VI
(c) III and V
(d) IV and V

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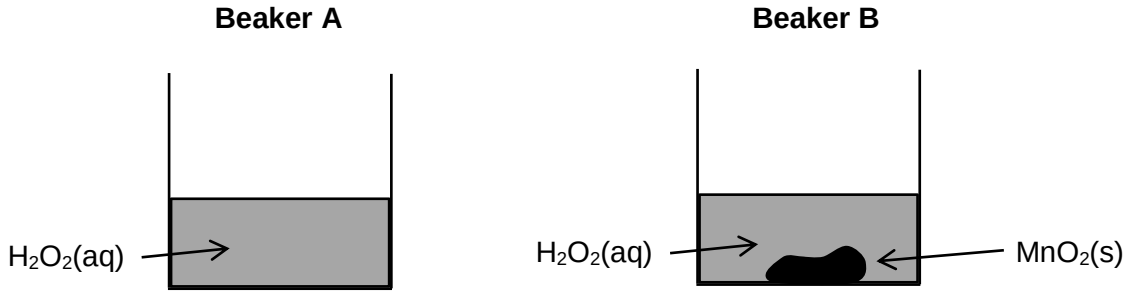
Questions 12, 13, 14 and 15 refer to the investigation described below.

Some chemistry students were investigating the decomposition of hydrogen peroxide solution, $H_2O_2(aq)$, which occurs according to the following equation.

$$2\ H_2O_2(aq) \rightarrow 2\ H_2O(l) + O_2(g)$$

The students poured some $H_2O_2(aq)$ into 2 separate beakers, and to one beaker they added some chips of manganese(IV) oxide, $MnO_2(s)$.



They immediately recorded the starting mass of each beaker on a digital scale, which gave a reading correct to 2 decimal places. The error of the scale was therefore ± 0.005 g.

The students then allowed the beakers to stand for 30 minutes, after which they returned and took readings of the final mass of each beaker. The results of their investigation are shown in the table below.

	Beaker A	**Beaker B**
Starting mass of beaker	57.34 g	61.88 g
Final mass of beaker	56.79 g	42.31 g

12. What mass of $O_2(g)$ can be inferred to have been produced in this investigation?

	Beaker A	**Beaker B**
(a)	0.55 ± 0.005 g	19.57 ± 0.01 g
(b)	0.55 ± 0.01 g	19.57 ± 0.01 g
(c)	0.55 ± 0.005 g	19.57 ± 0.005 g
(d)	0.55 ± 0.01 g	19.57 ± 0.005 g

13. Which of the following is **not** a variable that needs to be controlled?

(a) The initial volume of $H_2O_2(aq)$.
(b) The initial concentration of $H_2O_2(aq)$.
(c) The initial temperature of $H_2O_2(aq)$.
(d) The initial mass of $MnO_2(s)$.

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14. Which of the following hypotheses is supported by the data collected in this investigation?

(a) The $MnO_2(s)$ acts as a catalyst.
(b) The presence of $MnO_2(s)$ increases the rate of $O_2(g)$ production.
(c) $O_2(g)$ is produced by the decomposition of $H_2O_2(aq)$.
(d) $O_2(g)$ is produced faster at a higher temperature.

15. The students subsequently performed repeat trials of this investigation. This would **not**

(a) increase the validity.
(b) increase the reliability.
(c) minimise the effects of systematic error.
(d) minimise the effects of random error.

16. Consider the line spectrum below.

(a) This is an emission spectrum.
(b) This is an absorption spectrum.
(c) This is both an emission and absorption spectrum.
(d) This spectrum can be used to determine the number of neutrons in an atom.

17. Which of the following statements is **not** correct regarding the reaction between benzene and chlorine water?

(a) The reaction requires a suitable catalyst.
(b) The reaction produces chlorobenzene.
(c) The reaction produces hydrochloric acid.
(d) The reaction occurs as a result of an addition reaction.

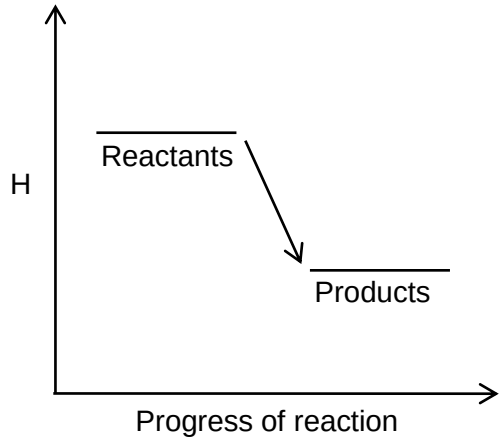
18. The ratio of the mass of a carbon-12 atom to a calcium-40 atom would be

(a) 1:4
(b) 2:7
(c) 3:10
(d) 4:13

19. Classify the type of bonding that occurs in the 3 compounds below.

	ZnI_2	**H_2O_2**	**SiH_4**
(a)	ionic	covalent	ionic
(b)	ionic	covalent	covalent
(c)	covalent	covalent	ionic
(d)	covalent	ionic	covalent

Questions 20, 21 and 22 refer to the enthalpy change diagram below.



20. This reaction is __X__. It would __Y__ the surroundings.

	X	**Y**
(a)	endothermic	take in heat from
(b)	endothermic	release heat to
(c)	exothermic	take in heat from
(d)	exothermic	release heat to

21. Which statement regarding the energy of the 'system + surroundings' in this reaction is **correct**?

(a) The total amount of energy is increased.
(b) The total amount of energy is decreased.
(c) The total amount of energy is the same.
(d) The law of conservation of energy does not apply in this situation.

22. If this diagram represented a phase change, it would most likely be

(a) melting.
(b) boiling.
(c) condensation.
(d) evaporation.

23. An example of an alkali metal, a halogen and a Noble gas is;

	Alkali metal	**Halogen**	**Noble Gas**
(a)	Li	I	Ar
(b)	Mg	Na	K
(c)	K	S	Ne
(d)	Na	F	Al

24. Which of the following are compounds?

(i) ammonia
(ii) water
(iii) oxygen gas
(iv) carbon monoxide
(v) silicon

(a) (ii) and (iv) only
(b) (iii) and (v) only
(c) (i), (ii) and (iv) only
(d) (i), (iii) and (iv) only

25. A molecule of alanine, $H_2NCH(CH_3)COOH$, contains

(a) 3 atoms of carbon.
(b) 4 atoms of hydrogen.
(c) 5 atoms of carbon.
(d) 6 atoms of hydrogen.

End of Section One

Section Two: Short answer **35% (70 marks)**

This section has **8** questions. Answer **all** questions. Write your answers in the spaces provided.

When calculating numerical answers, show your working or reasoning clearly. Express numerical answers to the appropriate number of significant figures and include appropriate units where applicable.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

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Suggested working time: 60 minutes.

Question 26 **(6 marks)**

Complete the following table by writing either the name or formula for each substance.

Name	Formula
aluminium sulfite	
	CCl_4
	$Fe(OH)_2$
phosphoric acid	
dinitrogen tetrahydride	
	$LiHCO_3$

Question 27 **(7 marks)**

Ethanol (C_2H_5OH) is a fuel that is produced by two main methods. The hydration of ethene produces ethanol, whilst the fermentation of glucose produces bioethanol. Ethanol and bioethanol are identical in structure, however bioethanol is classified as a biofuel.

(a) What is a 'biofuel'? Explain why biofuels produce a much lower level of overall carbon emissions compared to fossil fuels. (3 marks)

When liquid ethanol is combusted, it produces water vapour, carbon dioxide gas and solid soot (carbon, C).

(b) Write a balanced **thermochemical** equation for this combustion process. Include phase symbols. (4 marks)

Question 28 **(12 marks)**

The electron configuration of 'Element Y' is 2, 8, 5.

(a) What information does this electron configuration provide about the **period** in which Element Y is located? Justify your answer. (2 marks)

(b) What information does this electron configuration provide about the **group** in which Element Y is located? Justify your answer. (2 marks)

(c) Identify Element Y by name or symbol. (1 mark)

(d) Explain how and why this element may form an ion in a chemical reaction. Give the electron configuration of the corresponding ion. (3 marks)

(e) Complete the following table. (4 marks)

	Symbol of element in the form ${}^{A}_{Z}X$	Electron configuration
An element in the same period as Y but with a smaller atomic radius		
An element in the same group as Y that would have a higher first ionisation energy		

Question 29 **(9 marks)**

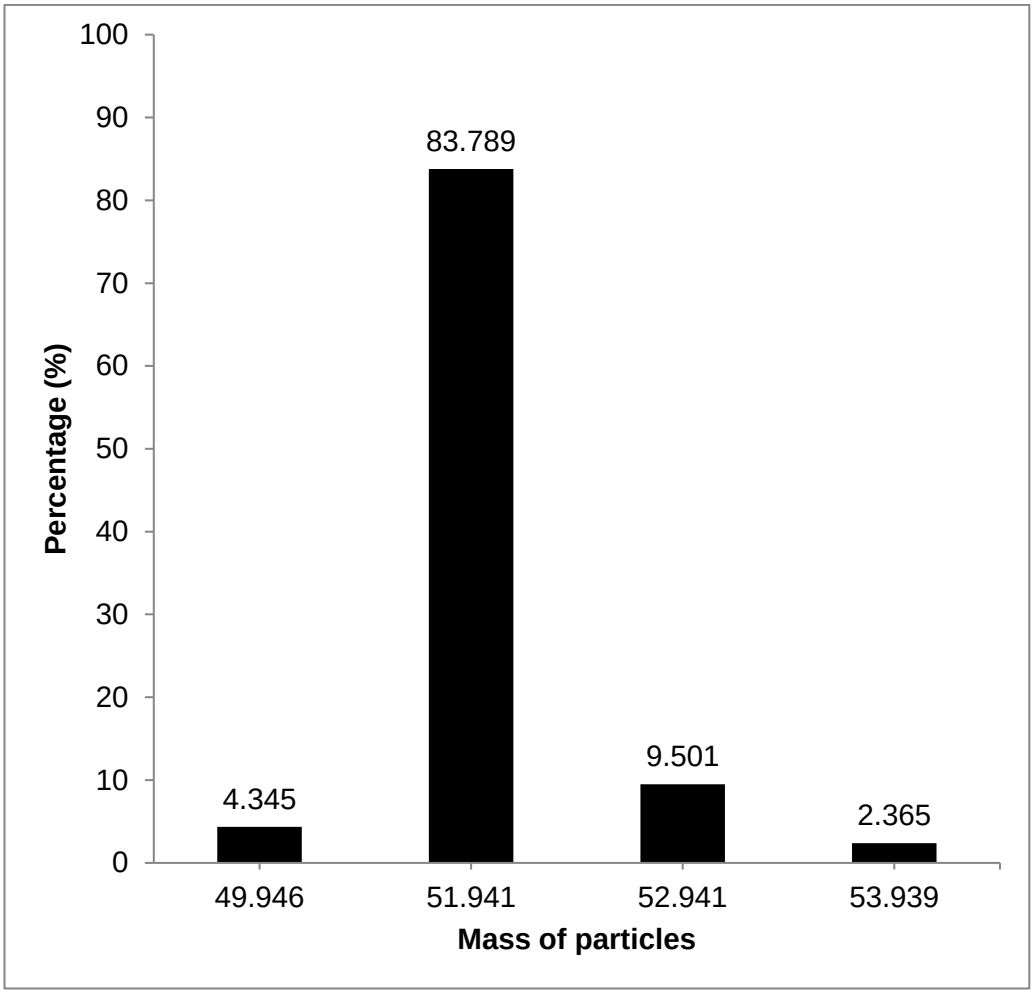
Mr Smith was tidying his house when he accidentally knocked one of his photo frames off the mantlepiece and it fell into the fire. He noticed the plastic frame made from **polystyrene**, $(CH(C_6H_5)CH_2)_n$, began to melt and deform immediately.

He threw water on the fire and once it had cooled down he examined what was left of the frame. The **brass** clips (a Cu/Zn alloy) had clearly begun to melt as he could see they had changed shape. However, he noticed that the piece of **glass** (SiO_2) that covered the photo was unchanged.

Explain his observations regarding the melting points of the three (3) substances discussed, in terms of the structure and bonding present in each.

Question 30 **(9 marks)**

A pure sample of an element is isolated and analysed by mass spectrometry to determine its relative atomic mass. The data from this analysis is shown below.



The process of mass spectrometry involves 4 steps;

1. _____
2. _____
3. deflection
4. detection

(a) Write the names of the first 2 steps involved in mass spectrometry in the spaces above. (2 marks)

In step 3, the various particles are deflected based on their mass. (You may assume that all particles in the mass spectrometer have the same charge.)

(b) How are the particles deflected? (1 mark)

(c) Explain how atoms of an element can have different masses, and elaborate on the composition of this element by using the graph on the previous page. (3 marks)

(d) Calculate the relative atomic mass of the element. Identify this element by name or symbol. (3 marks)

Question 31 **(10 marks)**

Lead metal can be extracted from several different compounds, the most common of which is galena, or lead(II) sulfide (PbS). The overall process for the extraction of lead from an ore containing galena can be represented by the equation below.

$$2\ PbS(s) + 3\ O_2(g) + C(s) \rightarrow 2\ Pb(s) + 2\ SO_2(g) + CO_2(g)$$

If 327 kg of galena (PbS) was available;

(a) Calculate the mass of $O_2(g)$ required to react with the PbS(s). (4 marks)

(b) Calculate the maximum mass of Pb(s) that could be extracted from the PbS(s). (2 marks)

(c) If the ore is 69.3% galena, calculate the starting mass of ore required. (2 marks)

Ore containing galena often also contains silver in small amounts. This too can be extracted and sold. If the mass of ore in part (c) was determined to contain 1.7% silver by mass;

(d) Calculate the maximum mass of silver that could also be extracted from this ore. (2 marks)

Question 32 **(7 marks)**

A student was practising the naming and drawing of various organic compounds.

(a) Complete the table below by drawing structural formulas of the organic substances indicated. Structures should include all bonds. (4 marks)

(i) 1,2-difluoropropene	(ii) 2,3-diethylbutane
(iii) 2-bromo-2,3-dimethylpentane	(iv) trichloroethene

One of the substances in part (a) has been incorrectly named, i.e. the name has not been stated according to IUPAC rules.

(b) Which name is incorrect? Explain why the name is incorrect and give the appropriate IUPAC name for the substance. (3 marks)

Question 33 **(10 marks)**

The 'enthalpy of dissolution' or 'heat of solution' refers to the value of ΔH associated with the process of dissolving a solute into water. Data regarding the enthalpy of dissolution for three different ionic substances is given below.

Ionic substance	Equation representing dissolution	Enthalpy of dissolution (ΔH)
ammonium nitrate	$NH_4NO_3(s) \rightarrow NH_4^+(aq) + NO_3^-(aq)$	+ 25.69 kJ mol^{-1}
potassium hydroxide	$KOH(s) \rightarrow K^+(aq) + OH^-(aq)$	- 57.61 kJ mol^{-1}
lithium bromide	$LiBr(s) \rightarrow Li^+(aq) + Br^-(aq)$	- 48.80 kJ mol^{-1}

Some chemistry students were given a 3.0 g sample of each ionic substance in the table above. Unfortunately the samples were unlabelled and all appeared as white powders.

(a) Describe an experimental procedure by which the students could quickly identify $NH_4NO_3(s)$ from the other two samples. You may assume you have access to standard laboratory equipment, however no other chemicals are available. (4 marks)

(b) What does the value of ΔH for the dissolution of NH_4NO_3 indicate about the energy associated with the bond breaking and making involved in this process? (2 marks)

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(c) Compare by calculation, the energy change associated with the dissolution of 3.0 g of KOH(s) and LiBr(s). Use your calculations to explain how these 2 powders could therefore be distinguished from one another. (4 marks)

End of Section Two

Section Three: Extended answer **40% (80 marks)**

This section contains **five (5)** questions. You must answer **all** questions. Write your answers in the spaces provided below.

Where questions require an explanation and/or description, marks are awarded for the relevant chemical content and also for coherence and clarity of expression. Lists or dot points are unlikely to gain full marks.

Final answers to calculations should be expressed to the appropriate number of significant figures.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Suggested working time: 70 minutes.

Question 34 **(16 marks)**

A chemistry student had two unlabelled beakers, each containing a different colourless liquid. One contained hexane, $CH_3CH_2CH_2CH_2CH_2CH_3(l)$, and the other hex-1-ene, $CH_2CHCH_2CH_2CH_2CH_3(l)$.

The student added a few drops of liquid bromine, $Br_2(l)$, to each beaker in order to distinguish the liquids.

(a) Why is it important that the liquid bromine be limiting (i.e. only a few drops are added) for this distinguishing test to be effective? (2 marks)

_____

_____

_____

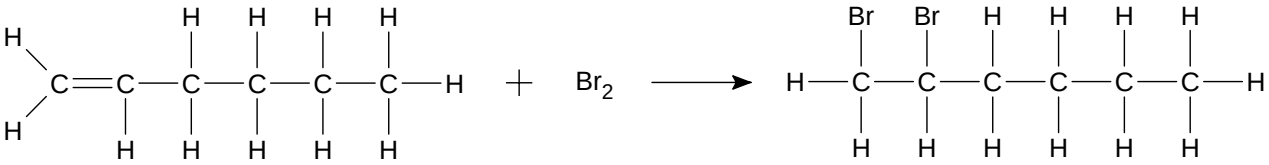
_____

Whilst no immediate or visible reaction was observed to occur with the hexane, in the presence of an appropriate catalyst, a slow reaction has the potential to take place.

(b) Write a balanced equation for this reaction, including phase symbols, and name the type of reaction that is occurring. (4 marks)

Equation:
Type of reaction:

The equation for the reaction with liquid hex-1-ene is shown below.



If 8 drops of bromine liquid are added to the beaker containing hex-1-ene and shaken;

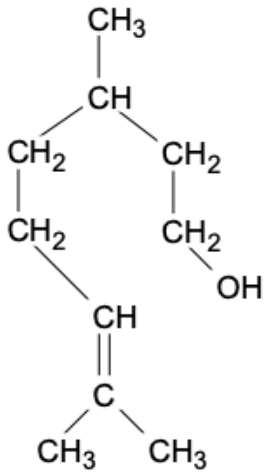
(c) Calculate the mass of 1,2-dibromohexane produced. Assume 1 drop = 0.05 g. (4 marks)

If hex-3-ene had been used in place of hex-1-ene in the reaction above;

(d) Draw and name the product of the reaction. (2 marks)

Structural diagram:	IUPAC name:

The organic substance ‘citronellol’ is found in citronella and essential oils isolated from lemongrass. It is used in soaps, candles, incense, cosmetics and insect repellents. A molecule of citronellol is shown below.



A pure sample of liquid citronellol was mixed with a few drops of iodine water, $I_2(aq)$.

(e) Write a balanced equation for the reaction that would take place and name the type of reaction occurring. (2 marks)

Equation:

Type of reaction:

(f) Calculate the percent by mass of carbon in citronellol. (2 marks)

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Question 35 **(16 marks)**

Atomic absorption spectroscopy (AAS) can be used to determine the concentration of calcium (Ca^{2+}) in a patient's blood serum. Measurement of Ca^{2+} concentration is important in the diagnosis of various medical conditions.

During the process of AAS, the hollow cathode lamp produces a unique calcium emission spectrum, which is then passed through the atomised blood serum sample.

(a) Explain how the calcium present in the cathode of the hollow cathode lamp produces this emission spectrum. (4 marks)

(b) How is a measure of concentration obtained from this emission spectrum? (3 marks)

The healthy or 'normal' range of Ca^{2+} concentration in blood serum is generally between 2.2 - 2.6 mmol / 100 mL (millimoles per 100 millilitres).

'Hypocalcaemia' i.e. low concentrations of serum calcium, can be associated with vitamin D deficiency or renal disease. 'Hypercalcaemia; i.e. high concentrations of serum calcium, can cause hair loss, insomnia, muscle fatigue and joint pain.

Patients with results lower than 2.2 mmol / 100 mL are classified as 'hypocalcaemic', whilst those with results above 2.6 mmol / 100 mL are classified as 'hypercalcaemic'.

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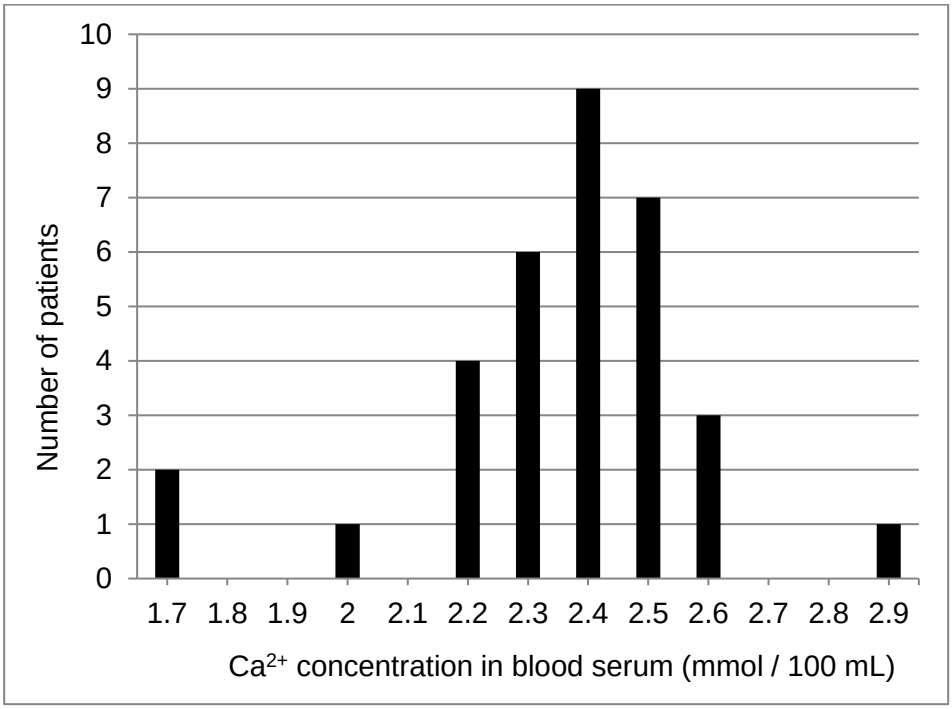
A group of patients were participating in a medical study and had their serum Ca^{2+} concentration determined using AAS. The results are shown in the frequency histogram below.

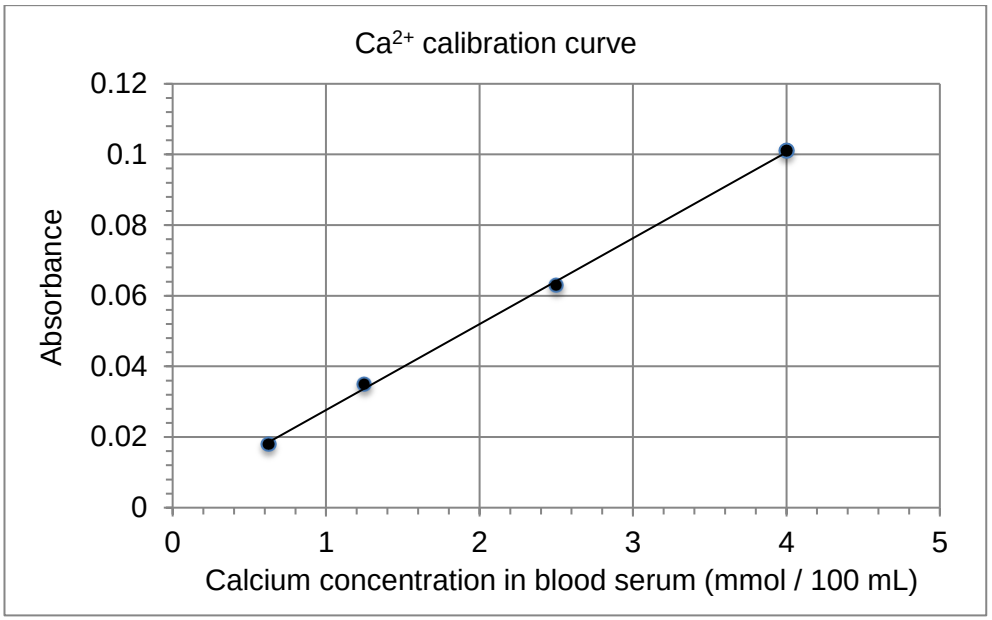


(c) How many patients participated in the study? Calculate the percentage of patients with the most common Ca^{2+} concentration of 2.4 mmol / 100 mL. (2 marks)

A patient with a Ca^{2+} concentration of 2.4 *m*mol / 100 mL contains 5.1 L of blood in their body.

(d) Calculate the total mass of Ca^{2+} in the patient's blood. (3 marks)

To determine the Ca^{2+} concentration using AAS, the patients' blood samples were compared to an existing calibration curve. This curve was obtained by performing AAS on a series of standards with known Ca^{2+} concentrations. Absorbance readings were taken at 422.7 nm.



A patient's blood sample recorded an absorbance reading of 0.074.

(e) Determine the concentration of Ca^{2+} in the patient's blood in mmol / 100 mL. Based on this result, would the patient be classified as having 'hypocalcaemia', 'hypercalcaemia' or 'normal' calcium levels? (2 marks)

If a patient's result is classified as hypocalcaemic or hypercalcaemic, a second blood sample is taken and the test is conducted again.

(f) Give two reasons why this would be done. (2 marks)

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Question 36 **(16 marks)**

Allotropes are defined as the different physical forms in which an element can exist. Allotropes will be composed of the same element but the atoms will be arranged in structurally distinct ways. The two major allotropes of carbon are diamond and graphite.

(a) Complete the following table comparing diamond and graphite. (8 marks)

	Diamond	**Graphite**
Brief description of carbon atom arrangement (2 marks each)		
Classification of bonding (covalent molecular OR covalent network)		
Conductivity in solid form (conductor OR non-conductor)		

Fullerenes are a group of substances also classified as allotropes of carbon. The structure and properties of fullerenes are varied, but one particularly unique fullerene is the 'buckyball'.

Buckyballs have the formula C_{60} and consist of carbon atoms arranged in the shape of a soccer ball. They are found in soot and appear as dark grey crystals in pure form. Buckyballs have high melting and boiling points and are semi-conductors.

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Buckyballs are also classified as nanomaterials.

(b) Define a ‘nanomaterial’ and name one other nanomaterial that is a fullerene. (2 marks)

(c) List one way in which the physical or chemical properties of buckyballs differ from the ‘bulk material’ in both the diamond and graphite forms. (2 marks)

One difference from bulk diamond material	
One difference from bulk graphite material	

A chemist isolated a pure sample of buckyballs weighing 3.8 mg.

(d) Calculate
(i) the number of buckyballs, and
(ii) the number of carbon atoms
that would be present in this sample. (4 marks)

Question 37 **(16 marks)**

Portable Bunsen burners use canisters of butane as their fuel source. Typically the canisters contain 220 g of butane and state that they provide 2.5 hours of burn time.

The chemical reaction that takes place when a portable Bunsen burner is being used is shown below.

$$2\ C_4H_{10}(g) + 13\ O_2(g) \rightarrow 8\ CO_2(g) + 10\ H_2O(g) + 5755\ kJ$$

Assuming you begin with a full canister containing 220 g of butane, and oxygen is consumed from the air at a rate of 4.772 g min^{-1};

(a) Calculate the burn time of the canister (i.e. how long will the Bunsen burner be able to function before the fuel runs out?) and comment on whether the advertised burn time is accurate. (6 marks)

Air is comprised of 21.0% oxygen gas by mass.

(b) Calculate the mass of air that would have been required to provide enough oxygen for the entire canister of butane to be combusted. (2 marks)

(c) Calculate the total amount of energy released in the combustion of the entire canister of butane. (2 marks)

Non-portable Bunsen burners used in the laboratory are joined to a gas tap where methane is the fuel source. The enthalpy of combustion for this fuel is 882 kJ mol^{-1} of methane.

(d) Write a balanced **thermochemical** equation for the complete combustion of methane (assume excess oxygen gas is present). (2 marks)

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If you wanted to produce the same amount of energy as that produced by a canister of butane;

(e) Calculate the mass of methane required. (2 marks)

Both methane and butane are extracted from crude oil, which is a fossil fuel.

(f) Name the process used to separate the components of crude oil, and state which physical property allows the separation of the various components. (2 marks)

Question 38 **(16 marks)**

Sodium (Na), magnesium (Mg), sulfur (S_8) and chlorine (Cl_2) are all elements located in period 3 of the Periodic Table.

(a) State and explain the trend in electronegativity across period 3. (3 marks)

Sodium and magnesium are both good conductors of electricity while sulfur and chlorine are not.

(b) Explain this difference in terms of the structure and bonding of the species present in these elements. (3 marks)

Consider two of the ionic compounds that could form from these elements; sodium chloride (NaCl) and magnesium sulfide (MgS).

(c) Using the concepts of ionisation energy and electronegativity, explain how the chemical bonds within NaCl or MgS form. (4 marks)

Sodium chloride is soluble in water, where as magnesium sulfide is not. A student was given a mixture of these two white powders.

(d) Briefly list the steps the student could use to separate the 2 compounds, resulting in isolation of pure samples of each solid. Alternately you may choose to use a series of clearly labelled diagrams or a flow chart to outline an appropriate method. (6 marks)

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End of questions

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