

STUDENT EDUCATION NUMBER



Sāmoa School Certificate

CHEMISTRY 2016

QUESTION and ANSWER BOOKLET

Time allowed: 3 hours and 10 minutes

INSTRUCTIONS:

1. You have 10 minutes to read before you start writing.
2. Write your Student Education Number (SEN) in the space provided on top right hand corner of this page.
3. **Answer ALL QUESTIONS.** Write your answers in the spaces provided in this booklet.
4. If you need more space, ask the supervisor for extra paper. Write your SEN on all extra sheets used and clearly number the questions. Attach the extra sheets at the appropriate places in this booklet.

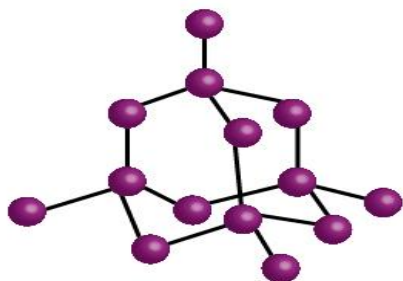
STRANDS	Page Number	Time (Minutes)	Weighting
1. Atomic Structure and Bonding	2	18	10
2. Quantitative Chemistry	4	22	12
3. Organic Chemistry	6	43	24
4. Oxidation and Reduction	10	18	10
5. Inorganic Chemistry	12	50	28
6. Principles of Physical Chemistry	17	29	16
TOTAL		180	100

CHECK! This booklet contains pages 2-19 in the right order.

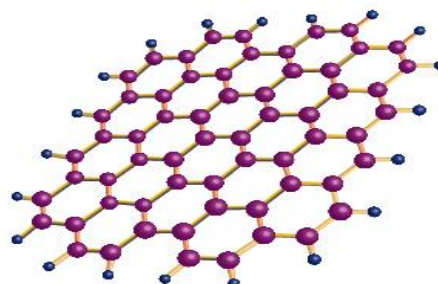
YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION

Carbon is known to exist as two different allotropes. The allotropes are known as diamond and graphite. Both diamond and graphite consist of carbon atoms bonded together in three-dimensional structures.

Diamond



Graphite



- 1.1 State the name given to the type of bond in which electrons are shared?

Skill Level 1

Diamond is one of the hardest substances known to man and is used on the edges of glass cutting tools.

- 1.2 In terms of their structures, give reasons why diamond is so much harder than graphite.

Skill Level 2

Use the Periodic Table to write down the electronic arrangement of

- 1.3 Chlorine

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Skill Level 1

If calcium is heated and put into a gas jar of chlorine a violent reaction takes place and solid calcium chloride is formed. The reaction proceeds due to the transfer of electrons.

1.4 Use the electron arrangements and the idea of electron transfer to explain how the reaction between atoms of calcium and chlorine takes place.
(You may include a diagram in your answer)

Skill Level 3

Various parts of the helicopter below are made out of metal, because metals are strong and malleable.



1.5 Describe with the aid of a diagram, the metallic bonding present in metals.

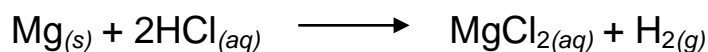
Skill Level 3

2.1 Define the term mole.

Skill Level 1

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2.2 Magnesium reacts with hydrochloric acid as shown. Use the equation below to answer questions (i) and (ii).



$$M(\text{Mg}) = 24 \text{ g/mol}$$

$$M(\text{Cl}) = 35.5 \text{ g/mol}$$

$$M(\text{H}) = 1 \text{ g/mol}$$

(i) How many moles of Mg react with 1 mole of HCl?

Skill Level 1

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(ii) How many moles of Mg must be reacted to produce 1 mole of H₂?

Skill Level 1

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2.3 An excess of sodium chloride solution is added to 200 mL of a solution of silver ions to precipitate all the dissolved silver ions. In total 3.97g silver chloride precipitate was formed. Calculate the amount of silver chloride in 3.97g.

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Skill Level 2

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2.4 Find the percentage of Oxygen in HNO_3 . Show all working out.

$$M(\text{H}) = 1\text{g/mol}$$

$$M(\text{N}) = 14\text{g/mol}$$

$$M(\text{O}) = 16\text{g/mol}$$

Skill Level 3

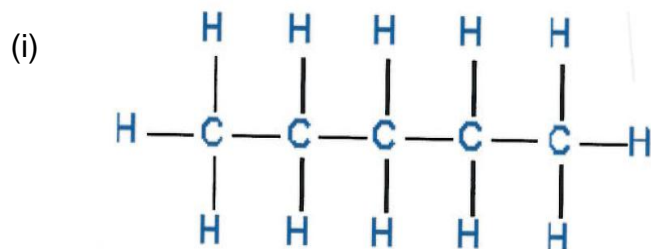
2.5 Five tonnes of nitrogen are converted to ammonia in an industrial process. If the conversion is 70% efficient, calculate the expected yield of ammonia.

$$M(\text{N}) = 14\text{g/mol}$$

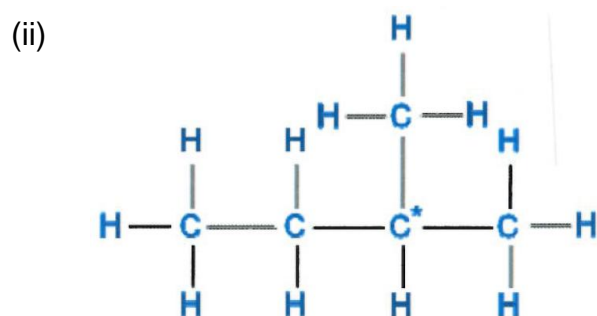
$M(\text{H}) = 1\text{g/mol}$ (Show all working out)

Skill Level 4

3.1. Give the IUPAC names for the following hydrocarbon



Skill Level 1



Skill Level 1

3.2. What is the relationship between the compounds in 3.1 (i) and (ii)?

Skill Level 1

3.3. Alkane molecules are non-polar.

(i) What is a non-polar molecule?

Skill Level 1

(ii) Choose the compounds from this list;

KI, I₂, HBr, Br₂, C₈H₁₈ that are likely to dissolve in hexane.

Skill Level 1

3.4. Draw structural formulae and give the abbreviated structural formulae for:

2,2,4-trimethylpentane

(i) Structural Formula:

Skill Level 1

(ii) Abbreviated structural formula:

Skill Level 1

3.5. Complete the following statement:

“Alkenes will dissolve grease because they are.....”

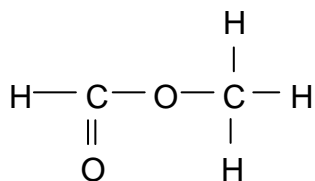
Skill Level 1

3.6. Name the compound below:



Skill Level 1

3.7. Name the ester by the structural formulae below:



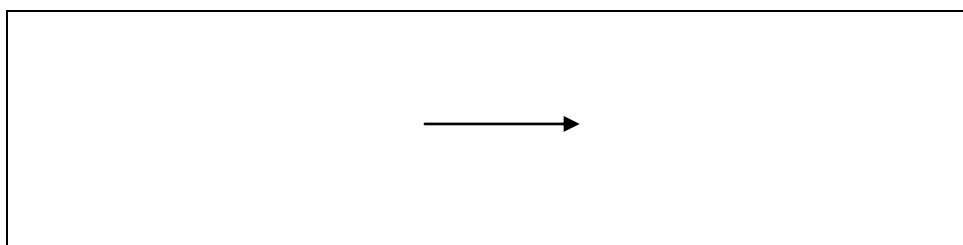
Skill Level 1

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3.8. Methanol is mixed with ethanoic acid in a test tube. A few drops of sulphuric acid are added and the mixture is warmed in a water bath.

Write an equation for the reaction that takes place.

Skill Level 2



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3.9. Using the Structural formulae to draw the products formed when HCl adds to methyl propene.



Skill Level 2

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3.10 Draw the three structural isomers of butane.



Skill Level 3

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3.11 Account for the difference in boiling points of Alcohols and Hydrocarbons.
Give specific examples to support your answer

Skill Level 3

3.12 Discuss the significance of the various processes of the esterification process in real life.

Skill Level 4

- 4.1 The oxidation number is _____ for an element, for example **He**, **O** and **S** in **He**, **O₂** and **S₈** respectively all have oxidation number zero.

Skill Level 1

- 4.2 In the reaction: $\text{Cl}_2(\text{aq}) + 2\text{Br}^-(\text{aq}) \rightarrow 2\text{Cl}^-(\text{aq}) + \text{Br}_2(\text{aq})$

The reductant is _____

Skill Level 1

- 4.3 Are metals oxidants or reductants? Give reasons for your answer.

Skill Level 2

- 4.4 Fill in the table below:

Half equation	Balanced Half-Equation	Oxidation or Reduction	Observation
$\text{Zn (s)} \rightarrow \text{Zn}^{2+}(\text{aq})$			

Skill Level 3

4.5 In a solution of chlorine in water, the following equilibrium is set up:



How does sodium hydroxide affect the above equilibrium?

Skill Level 1

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4.6 What is the oxidation number of Cl in HOCl?

Skill Level 1

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4.7 Acidified potassium permanganate solution is used in chemistry as

Skill Level 1

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5.1 Give ONE physical property of metals.

Skill Level 1

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5.2 Metals act as reducing agents. What charge resides on the resulting metal ion?

Skill Level 1

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5.3 Provide one chemical property of oxygen.

Skill Level 1

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5.4 Different forms of an element in the same state are called

Skill Level 1

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5.5. Which of the elements that occurs in air is always a reactant in combustion reactions?

Skill Level 1

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5.6 The force of attraction between water molecules is fairly strong. What is the name given to this attractive force?

Skill Level 1

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5.7 State the formula of the oxide of nitrogen that dissolves in water to give nitric acid.

Skill Level 1

5.8 Give the formula of the precipitate responsible for the cloudiness seen when carbon dioxide is bubbled into limewater.

Skill Level 1

5.9 What are the two ways can rusting of iron are prevented?

Skill Level 2

5.10 What is an alloy? Give an example.

Skill Level 2

5.11 Explain why the presence of ozone in the upper atmosphere is desirable.

Skill Level 2

5.12 Explain how the hardness of water affects its quality and use.

Skill Level 3

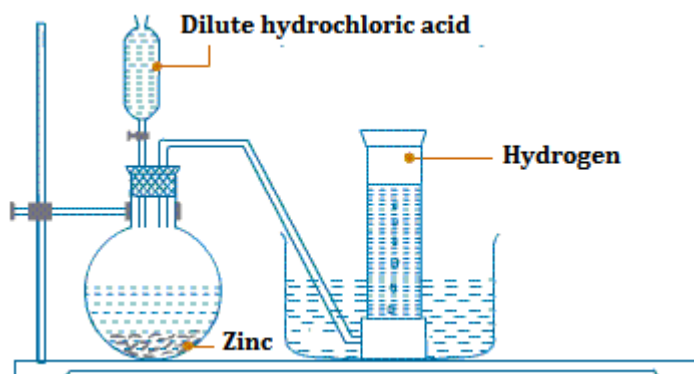
5.13 Explain the industrial preparation of sulphuric acid. Clearly indicate all the raw materials needed for the process and the steps involved in the production.

Skill Level 3

5.14 Discuss the properties of Sulphuric acid and its uses in everyday life situations.

Skill Level 4

Hydrogen can be prepared in the laboratory by the actions of acids on metals. Dilute hydrochloric acid containing 1 volume of acid to 4 volumes of water is added to granulated Zinc.



5.15 Discuss with the aid of balanced chemical equations the laboratory preparation of Hydrogen as shown in the above set-up.

Skill Level 4

STRAND 6

Principles of Physical Chemistry

Weighting 16

6.1 The reaction that releases heat to the surroundings and heats them up is called a/an

_____ reaction.

Skill Level 1

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6.2 For a chemical equilibrium, an expression which involves:

$\frac{\text{Concentration of products}}{\text{Concentration of reactants}}$ is called the _____ expression.

Skill Level 1

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6.3 Write down the two factors that increase the frequency of collision only.

Skill Level 2

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6.4 Describe exothermic and endothermic reactions.

Skill Level 2

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6.5 Explain how the surface area of reactants can affect the rate of a chemical reaction. You can use a simple illustration to your answer.

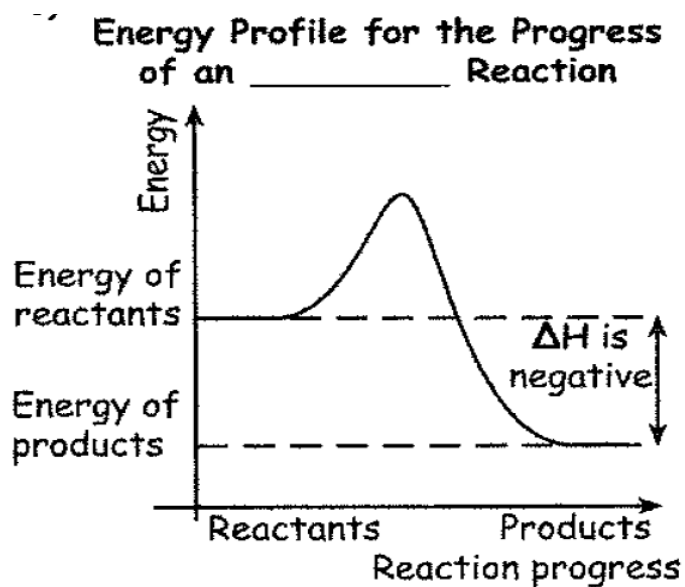
Skill Level 3

6.6 Reactions (a) to (c) below are described in different ways. Classify each as exothermic or endothermic and give reasons for your answer.

a) A puddle of water evaporates. _____

b) Water turns to ice. _____

c)

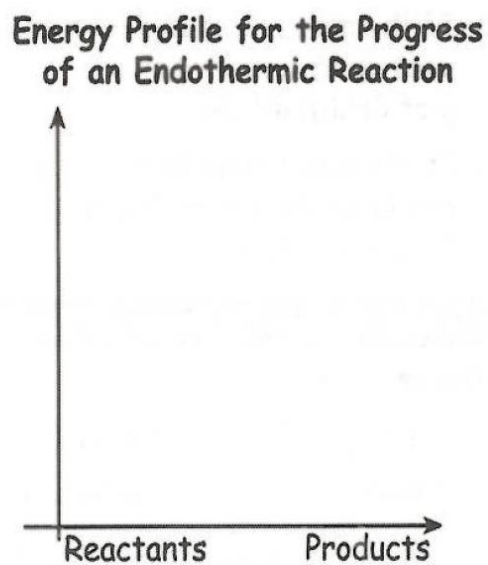
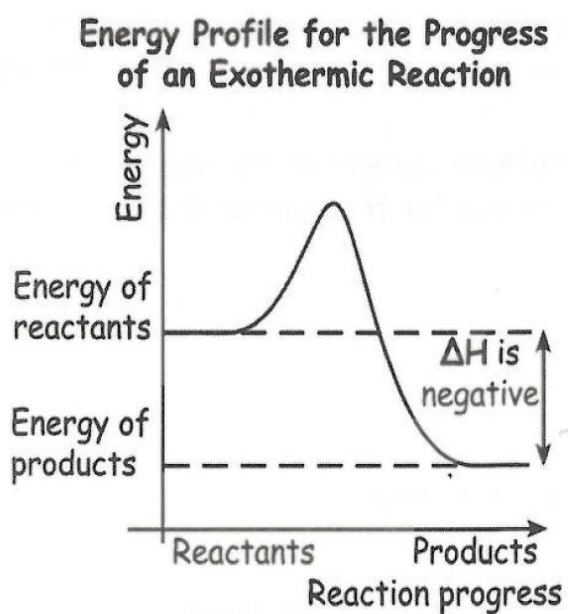


Skill Level 3

6.7 On the set of axes on the right, draw an energy profile diagram for the progress of an endothermic reaction.

Show and label clearly all of the following:

- 'Energy' axis and 'Reaction progress' axis
- 'Energy of reactants' and 'Energy of products'
- ' ΔH '



Skill Level 4
