Part A: Multiple Choice

1. Which of the following is the correct name for the compound CuOH?

(A) Copper (I) oxide

(B) Copper (II) hydroxide

(C) Monocopper hydroxide

(D) Copper (I) hydroxide

2. Identify the most common forms of energy that may be released during the decomposition or synthesis of substances.

(A) heat, sound and elastic energy

(B) light, heat and electrical energy

(C) electrical, nuclear and wave energy

(D) sound, light and electrical energy

3. Identify the group in which all of the substances have covalent bonds.

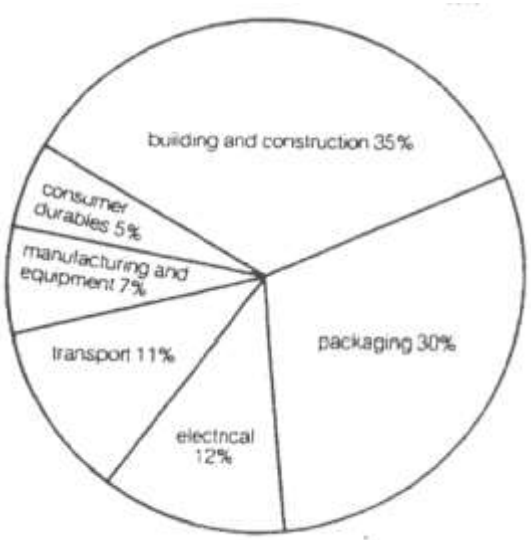
(A) diamond, graphite, carbon dioxide, potassium fluoride

(B) hydrogen iodide, water, calcium chloride, paraffin wax

(C) iodine, ice, zinc sulphide, ethanol

(D) ammonia, oxygen, water, methane

4. The diagram below shows the uses of one common element.



Which element best fits this pattern of use?

(A) aluminium

(B) copper

(C) lead

(D) sodium

5. Solder is a common alloy used in plumbing. Which metals are present in solder?

(A) brass and copper

(B) zinc and lead

(C) lead and tin

(D) tin and zinc

6. Which series of metals is in order from most reactive to least reactive?

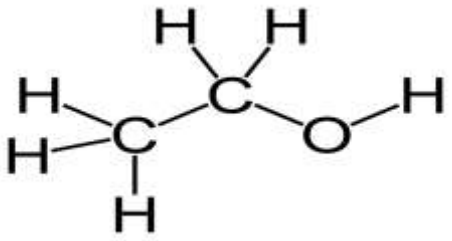
(A) zinc, magnesium, lead, sodium

(B) lead, zinc, magnesium, sodium

(C) sodium, zinc, magnesium, lead

(D) sodium, magnesium, zinc, lead

7. Name the compound shown below



(A) Ethanol

(B) Methane

(C) Ethane

(D) Propanol

8. Which list of substances all have a charge of 2 when they form ions or radicals?

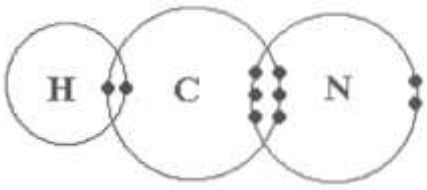
(A) magnesium, ammonium, sulfate, copper

(B) oxygen, magnesium, carbonate, sulfate

(C) hydroxide, sulphide, carbonate, magnesium

(D) potassium, bromine, carbonate, oxygen

9. The diagram shows the electron dot structure for hydrogen cyanide HCN.



The structural formula that represents HCN is

(A) H – C – N

(B) H = C = N

(C) H – C ≡ N

(D) H = C ≡ N

Questions 10 to 12 refer to the following diagram of a section of the Periodic Table with only some elements included. The elements are not represented by there usual symbols.

I	II		III	IV	V	VI	VII	VIII
E				**Z**	**R**		**Y**	
	F		**X**					**G**
P						**M**	**Q**	
					L			

10. Which sets of letters represent a covalent compound?

(A) EQ

(B) YP

(C) RY

(D) XQ

11. Which of the following formulas shows the simplest ratio for a compound of elements F and R?

(A) FR_5

(B) FR_3

(C) F_2R_3

(D) F_3R_2

12. Which trend is correct in regards to elements E and Z?

(A) E has a greater number of valence electrons than Z

(B) Z has a higher ionisation energy than E

(C) Z has a larger atomic radius than E

(D) Z has greater electrical conductivity than E

13. The following equation shows the combustion of carbon monoxide.

$$2CO_{(g)} + O_{2(g)} \rightarrow 2CO_{2(g)}$$

The number of moles of oxygen required for the combustion of 28g of carbon monoxide is

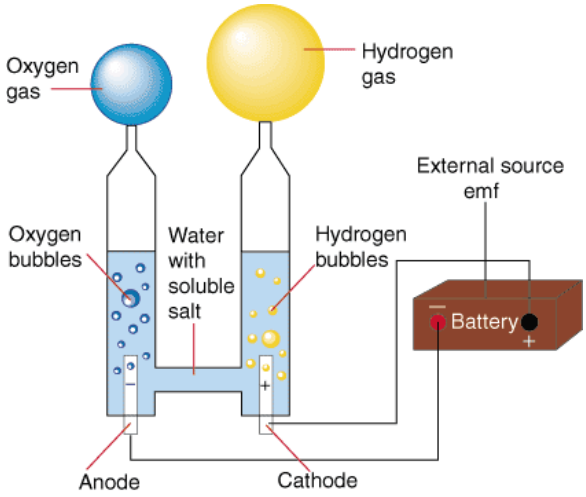
(A) 0.25 moles

(B) 0.50 moles

(C) 1.0 moles

(D) 2.0 moles

14. The following diagram represents the electrolysis of water.



The difference between the boiling and electrolysis of water is that

(A) Electrolysis is a physical change due to breaking of bonds within molecules.

(B) Boiling is a chemical change due to the breaking of bonds within molecules.

(C) Boiling is a physical change due to the breaking of bonds within molecules.

(D) Electrolysis is a chemical change due to breaking of bonds within molecules.

15. Which equation shows the balanced reaction between the metal sodium and water?

(A) $2Na_{(s)} + H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + H_{2(g)}$

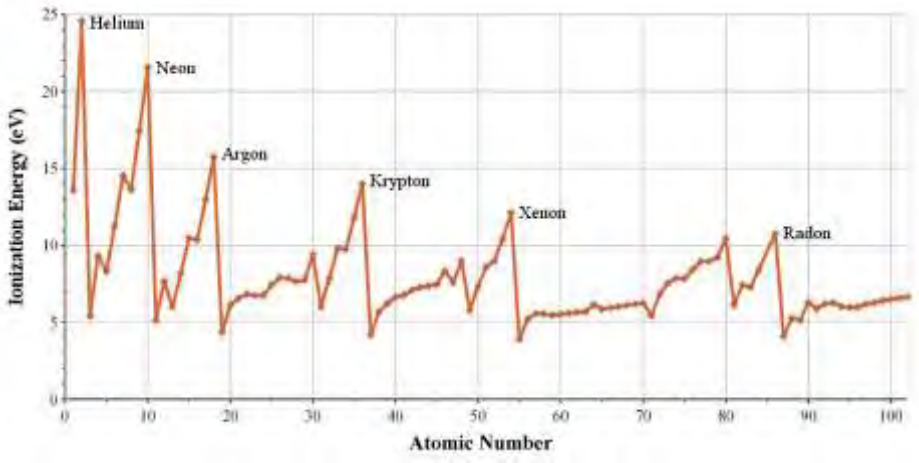
(B) $Na_{2(s)} + 2H_2O_{(l)} \rightarrow 2Na(OH)_{2(aq)} + H_{2(g)}$

(C) $2Na_{(s)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + H_{2(g)}$

(D) $Na_{(s)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + H_{2(g)}$

Question 16. (5 marks)

The amount of energy required to remove one electron from the outer shell of atoms is known as the ionisation energy. The higher the value, the more difficult it is to remove an electron from the valence shell. The graph below shows the ionisation energies for the elements.



(a) Identify the name given to the group of elements with the highest ionisation energies shown in the graph? **(1 mark)**

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(b) Explain why this group would have the highest ionisation energies. **(2 marks)**

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(c) Account for the decrease in ionisation energy of this group as you move across the graph from left to right. **(2 marks)**

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Question 17. (5 marks)

(a) Throughout history man has extracted and used different metals as uncombined metals or as alloys. Account for the reasons for the production and use of a named metal or alloy. **(2 marks)**

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(b) Describe the separation processes, chemical reactions and energy considerations involved in the extraction of copper from one of its ores. **(3 marks)**

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Question 18. (4 marks)

A student performed a first hand investigation to measure the mass of the elements in magnesium oxide. This involved heating magnesium metal in a crucible. The information she recorded is as follows

Mass of dry crucible and lid	32.14g
Mass of dry crucible, lid and magnesium	32.63g
Mass of dry crucible, lid and magnesium oxide	32.95g

(a) Determine, showing all working, the empirical formula of magnesium oxide.
(2 marks)

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(b) Calculate the volume of oxygen taken from the air during this experiment to form the magnesium oxide. Assume the air temperature and pressure was 25°C and 100kPa respectively. **(2 marks)**

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Question 19. (5 marks)

(a) Using Lewis electron dot formula, explain the differences between the polarity of ammonia (NH_3) and methane (CH_4). **(3 marks)**

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(b) Methane is combustible in air. Write a balanced equation for this combustion. **(1 mark)**

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(c) The gas ammonia can be produced by reacting nitrogen and hydrogen gases together under pressure. Identify ONE safety precaution that would be needed for this reaction. **(1 mark)**

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Question 20. (5 marks)

(a) Describe the contribution of Gay-Lussac to the understanding of gaseous reactions and apply this to an understanding of the mole concept. **(3 marks)**

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(b) Hydrochloric acid is made by dissolving the gas hydrogen chloride into water. Hydrogen chloride gas is made by reacting hydrogen and chlorine gas according to the following equation

$$H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$$

Calculate the volume of hydrogen chloride gas produced by the complete reaction of 8 grams of hydrogen gas at 25°C and 100kPa. **(2 marks)**

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Question 21. (5 marks)

You are provided with a mixture of sand, salt and water.

(a) Describe with the aid of a flow chart, how you would obtain samples of pure dry sand, pure dry salt and pure water from the mixture. **(3 marks)**

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(b) The total mass of the mixture provided was 250g. The mass of the salt obtained was 8.8g and 58mL of water is collected.
Calculate the percentage of sand in the original mixture. **(2 marks)**

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Question 22. (5 marks)

During your course you performed a first hand investigation on the decomposition of a carbonate using heat, and used appropriate tests to identify carbon dioxide and the oxide as the products of the reaction.

(a) Construct an equation to show the decomposition of copper II carbonate. **(1 mark)**

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(b) Outline the test for carbon dioxide and describe a positive result for the presence of carbon dioxide. **(2 marks)**

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(c) The oxide produced in the above reaction is reacted with sulfuric acid. This produces a blue solution. Using an equation, show the cause and effect of this observation. **(2 marks)**

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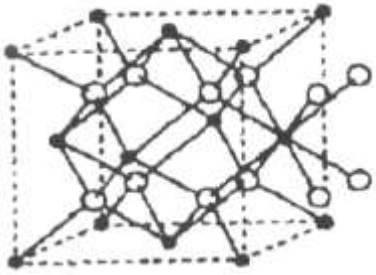
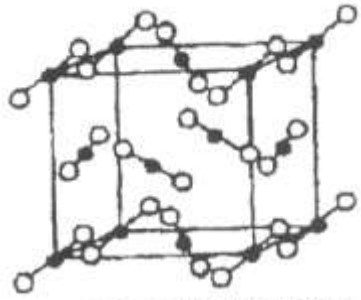
Question 23. (6 marks)

The diagrams below show the crystalline forms of calcium fluoride and carbon dioxide.



fluorite (CaF_2)

(● Ca, ○F)



carbon dioxide (CO_2)

(● C, ○O)

(a) Compare, in detail, the bonding of these two compounds in their solid state. **(3 marks)**

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(b) Contrast TWO physical properties of these compounds and relate to the types of bonding present in them. **(3 marks)**

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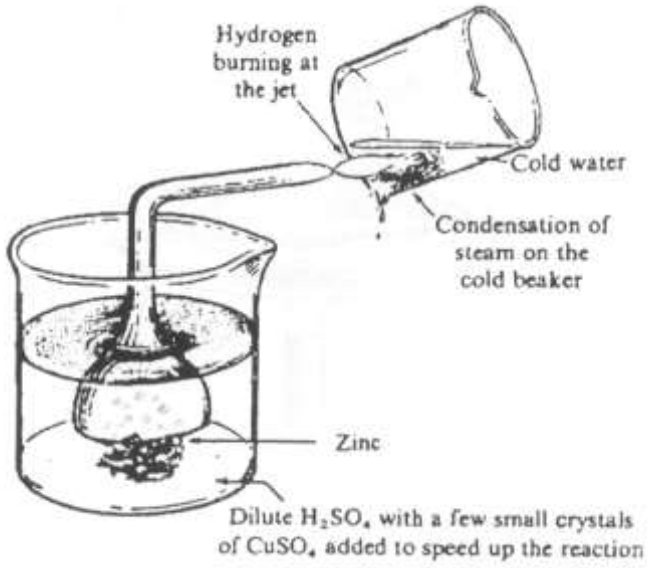
Question 24. (5 marks)

Hydrogen can be produced and burned in air using the apparatus shown in the diagram below.



(a) Construct TWO equations to show the production of hydrogen by this method and the combustion of hydrogen to form water.

(2 marks)

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(b) Calculate the mass of zinc needed to produce 1.0 gram of water by combustion of the hydrogen gas. **(3 marks)**

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