

Senior three Holiday work

- Describe briefly how you would prepare a pure sample of
 - calcium carbonate.
 - zinc sulphate starting from zinc oxide
 - State what would be observed and write an ionic equation for the reaction that would occur when dilute hydrochloric acid was added to calcium carbonate.
 - Calcium carbonate was strongly heated.
 - Write equation for the reaction that would occur.
 - Few drops of water were added to the solid product in (c)(i). State what was observed and write equation for the reaction that took place.
 - Calcium carbonate reacts with dilute sulphuric acid according to the following equation.

$$CaCO_3(s) + H_2SO_4(aq) \rightarrow CaSO_4(s) + H_2O(l) + CO_2(g)$$

Explain why the reaction stops after a short period of time.
- Excess lead(II) oxide was added to warm dilute nitric acid and the mixture was stirred. The resultant mixture was filtered and a solution of sodium chloride was added to the filtrate.

 - Write an equation for the reaction between lead(II) oxide and nitric acid.
 - State what was observed when sodium chloride solution was added to the filtrate.
 - Write an equation for the reaction in (b).
 - Describe what happens when the mixture in (b) is heated.
- Carbon monoxide can be prepared in the laboratory according to the following

$$CO_2(g) + C(s) \rightarrow 2CO(g)$$

The gaseous products are then passed through a concentrated potassium hydroxide solution.

 - State
 - why the reaction must be performed in an open place. (01 mk)
 - the role of concentrated potassium hydroxide solution. (01 mk)
 - Write equation(s)
 - for the reaction(s) that took place when the gaseous mixture is passed through concentrated potassium hydroxide solution. (1½ mks)
 - to show how carbon monoxide reacts separately with strongly heated lead(II) oxide and iron(III) oxide. (03 mks)
 - Dry carbon monoxide was passed over strongly heated powdered copper(II) oxide.
 - State what was observed. (1½ mks)
 - Write equation for the reaction that took place. (1½ mks)
 - State the property shown by carbon monoxide in the reaction in that took place in (c)(ii). (0½ mk)
 - Name **one** non-metallic substance and **one** gaseous compound that would react with copper(II) oxide in a similar way to carbon monoxide. (01 mk)
 - State **one** large scale use of carbon monoxide as a result of the property stated in (c)(iii). (01 mk)

- Differentiate between **atomic number** and **mass number**.
 - The full symbols of atoms of some elements Q, R and X are A_ZQ , B_ZR and C_ZX .
 - Write the electronic configuration of atoms of Q, R and X.
 - State the group to which each element belongs in the Periodic Table.
 - State the valency of each element.
 - State the number of neutrons in the nucleus of atom X.
 - What general name is used to refer to/describe the group to which element X belongs.
 - Write the electron configuration of the most likely ion formed by R.
 - Write the formula of the ion and oxide formed by X.
 - State the type of bond that exists in the oxide of X.
 - Write the formula of the compound formed when the following atoms combine.
 - Q and X. (01 mk)
 - R and X. (01 mk)
 - With the aid of diagrams, describe how the compounds in (c) are formed.
 - State **one**
 - difference between the compounds in (c).
 - property of the compound formed between Q and X. (01 mk)

- State how the following mixtures of substances can be separated

Mixture	Method of separation
Copper(II) oxide and sodium carbonate	
ink	
Crude oil (petroleum)	
Water and ethanol	
Ammonium chloride and sodium chloride	
Potassium chloride and potassium nitrate	
Potassium chloride and sodium chloride	
Sodium chloride and calcium carbonate	

 - Giving examples, distinguish between
 - miscible liquids.
 - immiscible liquids.
 - Describe briefly how a mixture of the liquids named in (b)(ii) can be separated.

- (a) Define the term oxide.
 (b) Complete the table below.

Element	Formula of oxide	Type of oxide
Sodium		
Aluminium		
Carbon		
Calcium		
Sulphur		

- (c) Write equation to show the oxide of calcium can be prepared.
 (d) Few drops of water were added to the oxide of calcium.
 (i) State what was observed.
 (ii) Write equation for the reaction that took place.
 (e) State which of the oxides in (b) react with
 (i) acids only;
 (ii) alkalis only;
 (iii) both acids and alkalis.
 (iv) neither acids nor alkalis.
 (f) A piece of a burning magnesium was lowered into a jar of dry oxygen.
 (i) State what was observed.
 (ii) Write equation for the reaction that took place.
 (iii) To the product in (e) was added dilute nitric acid. State what was observed and write equation for the reaction that took place.
 (h) State what would be observed and write equation for the reaction that would occur when copper(II) hydroxide
 (i) is heated strongly;
 (ii) is added to warm dilute sulphuric acid.
 (i) A mixture of copper(II) oxide and magnesium was heated strongly.
 (i) State what was observed.
 (ii) Write equation for the reaction that took place.
 (iii) The experiment in (h) was repeated using magnesium oxide and lead. State what was observed and give a reason for your answer.
- 7. Copper(II) sulphate-5-water decomposes when heated.**
 (a) State what would be observed when copper(II) sulphate-5-water is strongly heated.
 (b) Write equation for the reaction that takes place.
 (c) State what would be observed and write equation for the reaction that would take place when to the residue in (a) was added dilute nitric acid and mixture was heated.
- 8.**
 (a) (i) Draw a labelled diagram of the set-up the apparatus that can be used to prepare a dry sample of carbon dioxide in the laboratory.
 (ii) Write an equation that leads to the formation of carbon dioxide.
 (b) Burning magnesium was lowered into a jar of carbon dioxide.
 (i) State what was observed.
 (ii) Explain the observations in (b)(i).
 (c) Water was added to the product in (b) and the resultant mixture tested with litmus. State what was observed.

- (d) When a solution of sodium hydroxide was exposed to air, a white solid was formed on the surface.
 (i) Name the white solid.
 (ii) Write equations to show how the white solid is formed.

Use the data in the table below to answer the questions that follow.

Substance	M.P.°C	B.P.°C	Solubility in water	Electrical conductance		Density at room temp.
				Solid form	Molten form	
A	714	1418	V	none	good	2.3 g/cm ³
B	-95	56	V	none	none	0.8 g/cm ³
C	1083	2580	I	good	good	8.9 g/cm ³
D	-101	-34	V	none	none	2.55 g/l
E	-23	77	I	none	none	1.6 g/cm ³
F	-219	-183	S	none	none	1.33 g/l

V = very soluble; S = slightly soluble; I = insoluble.

- (a) (i) Name two substances that are liquid at room temperature.
 (ii) Which of the two is more volatile?
 (b) Which substance(s) would dissolve in water and could be separated from the solution by
 (i) fractional distillation.
 (ii) by evaporation of the water?
 (c) Which of the substances A to F,
 (i) has the structure consisting of ions?
 (ii) is a metal?
 (iii) is a liquid which would form separate layer with water?
 (iv) would the water be above or below?
 (d) Which substance is a gas which
 (i) would **not** be collected efficiently over water.
 (ii) would be collected efficiently over water.