S.4 CHEMISTRY HOLIDAY WORK, JAN-2016

(READ, RESEARCH AND REMEMBER)

1. (a) (i) Draw a labeled diagram of the set-up of 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 observation 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 an equation to show how the white solid is formed.

2. (a) Explain what is meant by polymerisation
b) Name three natural polymers and three synthetic polymers and state one use of each of the polymers named.

3. (a) (i) State the difference between fats and oils.

(ii) Give one example of each.

(b) Briefly describe how soap can be prepared.

(c) State what would be observed if soap solution was shaken with a solution containing magnesium hydrogen carbonate.

(d) Explain your answers in (c).

(e) State what would be observed if a solution of soap less detergent was used instead of soap solution.

(f) Give one disadvantages of soap less detergents.

4. $20cm^3$ of sodium carbonate solution reacted completely with $25cm^3$ of a 0.8M hydrochloric acid according to the following equation:
$Na_2CO_3(aq) + 2HCI(aq) \longrightarrow 2NaCI(aq) + CO_2(g) + H_2O(I)$

Calculate the concentration of the sodium carbonate solution in grams per litre.

5. $18.75cm^3$ of 0.2 M sodium hydroxide solution neutralised $25cm^3$ of a 0.05 M solution of an acid.
Calculate
(a) the number of moles of sodium hydroxide that reacted.

(b) the number of moles of acid that reacted.

(c) the molar ratios of alkali to acid for the reaction

6. A sample of 0.106g of pure sodium carbonate was dissolved in water to make $100cm^3$ of solution.

(a) Calculate the mass of sodium carbonate needed to dissolve in one litre, of water.

(b) Calculate the molarity of the solution.

7. (a) One of the ores from which iron can be extracted is siderite, $FeCO_3$. Name and write the formulae of two other ores from which iron can be extracted.
(b) Outline the process by which iron metal is obtained from one of the ores you have named in (a). Write equations for the reactions that take place.
(c) Iron rusts when exposed to moist air.
Give two methods by which iron can be prevented from rusting.

8. (a) Name the raw materials used in your locality to make an alcoholic drink.

(b) Briefly describe how ethanol can be obtained from the materials you have named in (a).

(c) State how ethanol prepared in (b) can be concentrated and suggest one way of determining whether the ethanol is pure or not.

(d) Ethene can be formed from ethanol. Write equation and state the conditions for the reaction leading to the formation of ethene.

(e) Name two uses of ethanol apart from the preparation of ethene.

9. Iron forms compounds in which it shows a valency of two and three.

(a) State the general colour of iron compounds in which iron is:

(i) divalent

(ii) trivalent.

(b) Write the formula and the name of the sulphates of iron in which iron is:

(i) divalent

(ii) trivalent.

(c) (i) Name a reagent that can be used to distinguish between the sulphates in (b) (i) and (ii).

(i) State what would be observed if each of the iron sulphate is reacted, with the reagent you have named in (c) (i).

(iii) Write equations for the reaction in (c) (ii).

(d) Starting from, iron wool, state how the anhydrous chloride of iron (II) can be prepared and write equation to illustrate your answer. (Diagrams not required).

10. (i) State three ways by which hydrogen is manufactured on a large scale? Give three industrial uses of the gas.

(ii) Oxygen and nitrogen are obtained from air by fractional distillation. Explain why this method can be used for this purpose yet it cannot be used to obtain hydrogen and oxygen from water?

11. (a) Explain what is meant by "hard water".

(b) Give the names and formulae of compounds which cause temporary hardness and those which cause permanent hardness.

(c) Explain, using ionic equations, why boiling removes temporary hardness only while the addition of washing soda removes both types of hardness.

(d)(i) You are given a clear liquid in a beaker. Explain how you would confirm that the liquid is pure water.

(ii) If the liquid in (i) above is soft water, how would you convert it into water possessing temporary hardness.

(iii) In what way is hard water a nuisance when used in certain industries as a source of steam power?

(iv) State one advantage of hard water.

(v) Explain why the ability of temporary hard water to conduct electricity falls when the water is boiled but it is not much affected when the temporary hardness is removed by addition of washing soda.

(vi) Name a method by which hard water can be softened easily and conveniently at home. State briefly how it works.

12(a). (i) Name the materials used to prepare soaps and soap less detergents.

(ii) Why are soaps now outnumbered by synthetic (soap less) detergents?

(b) .Explain briefly the following observations about a sample of hard water

(a) when boiled it formed some white precipitate (b) even after boiling the water formed scum with soap (c) Sodium Carbonate made the water completely soft.

13(a). Determine the solubility of a substance P in 100cm^3 of water at room temperature from the following data.

(i) Mass of evaporating basin = 25.0g

(ii) Mass of evaporating basin + Saturated solution of P = 55.0

(iii) Mass of evaporating basin + Solid P (after evaporating) = 30.0g

N/B: Assume density of water to be $1g/cm^3$

(b). The table below show the solubilities of two salts P and Q at different temperatures.

Temp ^0C	10	20	30	40	50
Solubility of P (In g/100f of water	4.6	7.0	9.8	13.0	16.9
Solubility of Q (In g/100f of water	10.2	14.6	20.1	27.4	25.0

A solution contained 15g each of P and Q at 50^0C. Calculate the total mass of crystals that would be obtained on cooling this solution to 10^0C.

14 (a) What is meant by 'allotropy'?

(b) Name the allotropes of carbon.

(c) State what you understand by amorphous carbon and list down forms of the same.

(d) State the use of each of the form in (c) above.

(e). By considering the structures of the allotropes, explain why;

(i) Graphite conducts electricity but diamond does not.

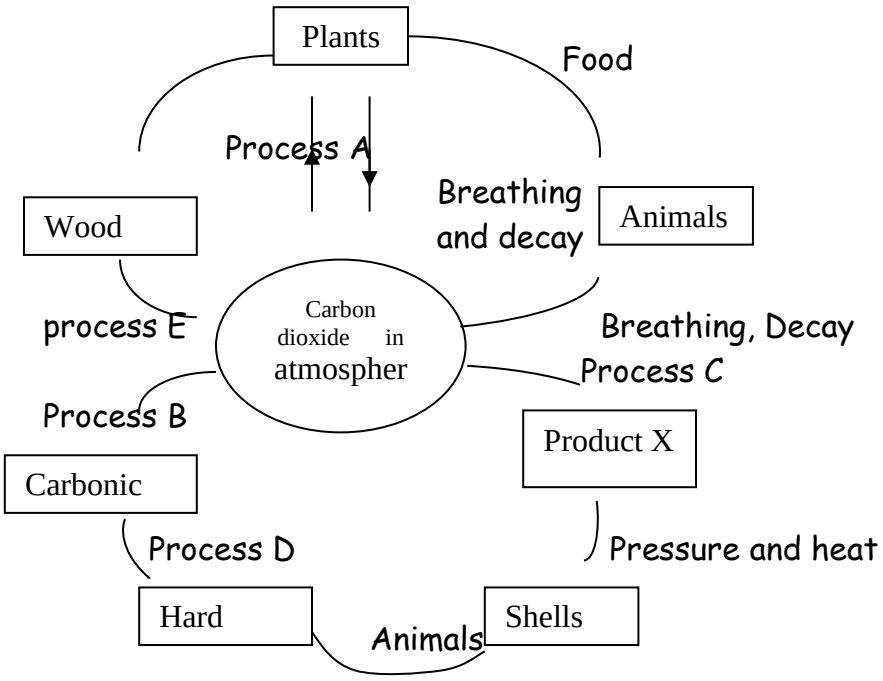
(ii) Graphite is soft but diamond is hard.
(iii) Graphite has a much lower density than diamond.
(iv) Both substances have high melting points.

(f) List four different types of fuels obtained from carbon and briefly explain how each is formed.

15(a) (i) State six used of carbon dioxide.
(ii) Give two ways in which carbon dioxide is added to the air.
(iii) Give two ways in which carbon dioxide is removed from the air.
(b) Explain the following observations.
(a) Why is dry ice a better refrigerant than ordinary ice?
(b) When a lighted splint is plunged into a gas jar containing carbon dioxide gas, it goes off.
(c) When a piece of burning magnesium is lowered into carbon dioxide in a gas jar, it continues burning with a spluttering flame and black specks are formed on the sides of the gas jar and white deposit is seen in the jar.
(d) State the uses of the following;
(i) Diamond
(ii) Graphite
(iii) Carbon monoxide

(e) State how is carbon dioxide obtained industrially.
(f) State the advantage that graphite has over other lubricants.
(g) Explain why it is dangerous to inhale carbon monoxide gas.
(h) Describe the chemical test for all carbonates.
(i) List the industrial uses of following carbonates.
1. Sodium carbonate
2. Calcium carbonate
3. Basic Lead (II) carbonate Pb $(OH)_2.2PbCO_3$)
4. Sodium hydrogen carbonate
5. Potassium carbonate

16. The following is an outline of the Carbon cycle. Study it and answer the questions that follow.



(a) State processes A, B, C , D and E

(b)(i) Name product X

(ii) Explain how product X produces carbon dioxide

(c) State two ways in which breathing is related to process C.

(d) State six elements in coal

(e) Use the correct terms to describe:

(i) Two processes that remove carbon dioxide from the air

(ii) Three processes that add carbon dioxide into the atmosphere.

END