1. a) Complete and balance the following equations.

(i) $Cu(s) + O_2(g) \longrightarrow$

(ii) $NaOH(aq) + CO_2(g) \longrightarrow$

(iii) $Fe(s) + O_2(g) + xH_2O(l) \longrightarrow$

(iv) $Na(s) + O_2(g) \longrightarrow$ (excess)

(v) $Ca(s) + O_2(g) \longrightarrow$

(vi) $Mg(s) + O_2(g) \longrightarrow$

(vii) $Al(s) + O_2(g) \longrightarrow$

(viii) $Al(s) + Cl_2(g) \longrightarrow$

(ix) $Mg_3N_2(s) + H_2O(l) \longrightarrow$

(x) $Mg(s) + N_2(g) \longrightarrow$

(xi) $Na_2O_2(s) + H_2O(l) \longrightarrow$

(xii) $KCLO_3(s) \xrightarrow{\text{heat}}$

(xiii) $P_4(s) + O_2(g) \longrightarrow$

(b) Balance the following equations f necessary.

(i) $XMnO_4(s) + HCl(aq) \longrightarrow XCl(g) + MnCl(aq) + H_2O(l)$

(ii) $CH_4(g) + O_2(g) \longrightarrow CO(g) + H_2(g)$

(iii) $X(NO_3)_2(s) \xrightarrow{\text{heat}} XO(s) + NO_2(g) + O_2(g)$

(iv) $Pb_3O_4(s) \longrightarrow PbO(s) + O_2(g)$

(v) $CuO(s) + NH_3(g) \longrightarrow Cu(s) + H_2O(l) + N_2(g)$

(vi) $C_4H_8(g) + O_2(g) \longrightarrow CO_2(g) + H_2O(g)$

(vii) $C_2H_2(g) + O_2(g) \longrightarrow CO_2(g) + H_2O(g)$

(viii) $C_2H_6O(l) + O_2(g) \longrightarrow CO_2(g) + H_2O(g)$

(ix) $Ca(OH)_2(s) + NH_4Cl(s) \longrightarrow CaCl_2(aq) + H_2O(l) + NH_3(g)$

(x) $NO_2 + H_2O(l) \longrightarrow HNO_3(aq)$.

2. a) Copy and complete the table.

ELEMENT	$^{60}_{31}X$	$^{64}_{32}Y$
Atomic mass		
Atomic number		
Number of protons		
Number of electrons		
Number of neutrons		

b) Write the formula of X with

(i) Sulphate

(ii) Phosphate

(iii) Nitrate

(iv) Peroxide

3. a) An element T belongs to period 2 of the periodic table and rhe formula of its ion is T^{2-}.

(i) State the electronic configuration of T.

(ii) Suggest the state in which the molecule of T exists.

b) Briefly describe how the molecule of T is prepared industrially. (Equation inclusive)

c) Explain five uses of molecule T in the society.

d) Describe how the molecule of T can be prepared in the laboratory by

(i) Use of a yellow solid

(ii) Heating

(iii) Not heating.

e) Explain the stages of any gas collection.

f) State two differences and similarities between rusting and combustion .

4. a) State what is observed and write equations for the reaction when the following substances are burnt in air

(i) Sodium

(ii) Phosphorus

(iii) Calcium

(iv) Sulphur

(v) Copper

(vi) Carbon.

5. a) Define the following terms

(i) Isotopes

(ii) Ground state

(iii) Atomic number

(iv) An oxide

b) Write the short notes about the following.(Definition, equation and three examples where necessary)

(i) Acidic oxides
(ii) Basic oxides
(iii) Amphoteric oxides
(iv) Neutral oxides
(v) Mixed oxides

(e) State three gases which exist as diatomic molecules.

(f) List any two examples of strong acids.

6. Carbon has two isotopes namely $^{14}_{6}C$ and $^{12}_{6}C$.

(a) State ant three elements which have isotopes and name two isotopes of each.

ELEMENTS	ISOTOPES
Carbon	$^{14}_{6}C$ - Carbon - 14 $^{12}_{6}C$ – Carbon – 12
	(i) (ii)

(b) Write the formula of the following compounds

(i) Water

(ii)Tri ion tetra oxide.

(iii) Lead (iv) oxide
(iv) Potassium permanganate
(v) Sodium peroxide
(vi) Calcium hydrogen phosphate
(vii) Manganese (iv) oxide
(viii) Calcium phosphate.

7. During the industrial manufacture of oxygen from air, water vapour and carbon dioxide gas are removed before the process of isolating oxygen from air.

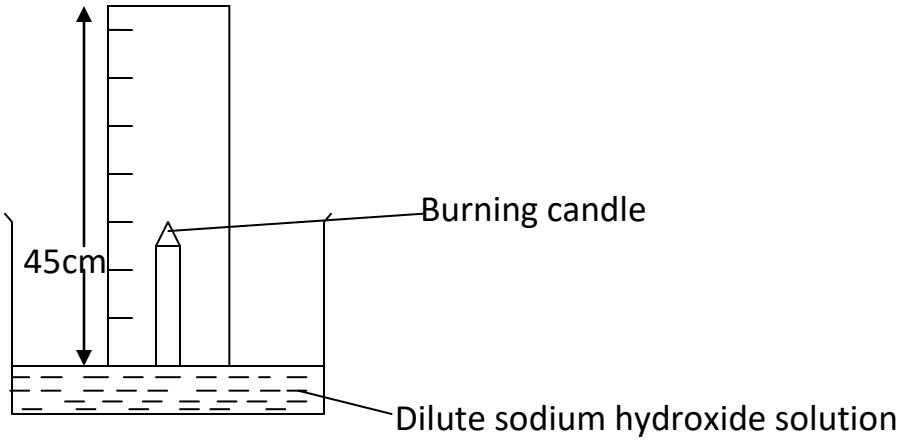
(i) What name is given to the industrial process?

(ii) Explain why water vapour and carbon dioxide are removed from air.

(iii) State the principle of isolation of oxygen from air.

(iv) Give any two practical applications of the process named in (i) above.

8. A Candle is burnt in air using the apparatus below.



a) State what would be observed if the experiment was run for some time until no further observable changes occurred.

b) State the role of dilute sodium hydroxide solution.

c) At the end of the experiment the apparatus was allowed to cool and the volume of air in the measuring cylinder as 35cm^3.

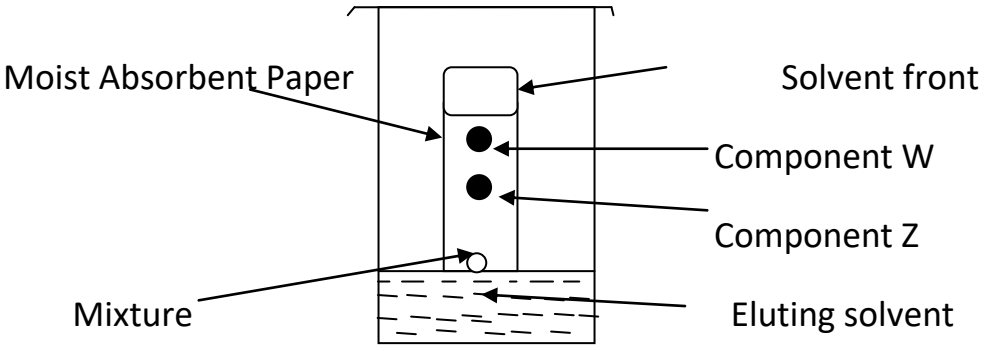
(i) Why was the final volume recorded after the apparatus has cooled?

(ii) Calculate the percentage change in the volume of air.

(iii) What conclusion can you draw from the above experiment about the composition of air?

(iv) When water was used instead of dilute sodium hydroxide the experiment ended after a shorter time. Explain.

9. A mixture of dyes can be separated as shown in figure 1 below.



(a) (i) Name the technique used to separate the components of the components of the mixture.

(iii) State the principle underlying the technique named in a(i) above.

(b) Which of the component W and Z bonds strongly with the;

(i) Eluting solvent

(II) Water in the absorbent paper

(c) Give a reason for your answer in b(i) above

(d) State one example of a mixture whose components can be separated using the technique.

10. When dilute hydrochloric acid is added in zinc granules, oxidation and reduction simultaneously occur leading to formation of hydrogen gas.

(a) State the type of reaction undergone by

(i) Zinc atoms

(ii) Hydrogen ions from the acid

(b) Write equation for the reaction undergone by

(i) Zinc atoms

(ii) Hydrogen ions

(c) Write the ionic equation for the overall reaction leading to the formation of hydrogen gas

11. Four atoms of elements are given as $^{35}_{17}M$, $^{29}_{19}N$, $^{19}_{9}X$ and $^{40}_{20}Y$ (the letters are not actual symbols of the elements)

(a) Write down the electronic structure of;

(i) M

(ii) N

(iii) Ion of Y

(b) State how the ion of X can be formed

(c) Which of the above atoms belong to same group in the periodic table.

12. With atleast three examples in each case, Define the following terms.

(i) Hygroscopic substances

(ii) Efflorescent substances

(iii) Deliquescent substances

(iv) Water

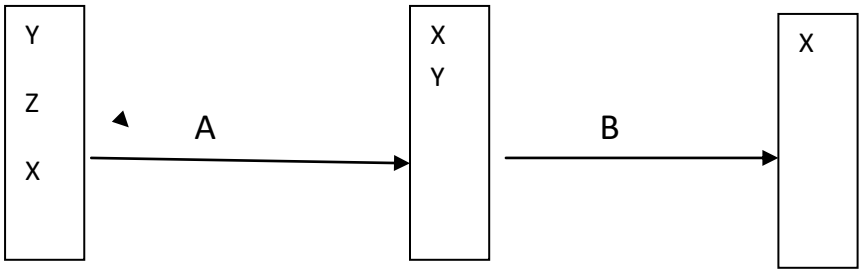
13.X,Yand Z represent the three major components of air and the order of their percentage composition by volume is Z< Y< X in the atmosphere.

a) Identify the components. (1.5marks)

(i) X……(ii) Y……

(iii) Z……

C) The flow chart below shows the preparation of component X from a sample of air.



Name ; (i) Suitable reagent for the process taking place at stage A.

……

(ii) Substance that can be used in the process taking place at B.(1mark)

……

(iii) Write the equation for the reaction taking place at B. (1.5marks)

……

……

D (i) What name is given to the above industrial process ? (1mark)

……

……

(ii) Explain why water vapour and carbondioxide are removed from air.

……

……

iii) State the principle of isolation of Z from air . (1mark)

……

……

(iv) Give two practical applications of the process named in d(iii) above.

(2marks)

……

……

(V) State one importance of component X to the society. (1mark)

……

14. The table below shows the melting and boiling points of some pure substances at atmospheric pressure. Study it and answer the questions that follow.

Substance	Melting point (^{o}c)	Boiling point (^{o}c)
A	0	100
B	-117	78
C	115	444
D	-219	-183

a) Which substance (s) at room temperature of 25^{o}c is;

(i) solid (s)…….

(ii) Liquid (s)…….

(iii) solid (s)…….

b) A sample of substance B was found to boil at a temperature of 85^{o}c at atmospheric pressure. What deductions do you make. (1 mark).

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