UNEB U.C.E CHEMISTRY (PAPER 2) 2017

SECTION A

1. Air is a mixture consisting mainly of two gases X and Y in the ratio 1:4 by volume respectively.
a) Name gas X and Y
b) i) State a suitable method by which the mixture of X and Y can be separated industrially.
ii) Give a reason for the choice of the method you have stated in (b) (i).
c) Name one process during which the concentration of X in the atmosphere can be increased.
d) State one industrial use of Y

2. a) State the difference between hard water and soft water.
b) Name one substance that causes
i) temporary hardness of water
ii) permanent hardness of water.
c) State one method that can be used to remove
i) temporary hardness of water
ii) permanent hardness of water

3. The number of electrons, protons and neutrons in the atoms of elements A,B,C,D and E are shown in the table below.

Atoms	Electrons	Protons	Neutrons
A	8	8	8
B	13	13	14
C	16	16	16
D	Y	11	11
E	8	Z	10

a) Determine the values of Y and Z
b) State the mass number of atom C.
c) Indicate which of the atoms
i) are isotopes
i) belong to the same group in the Periodic Table.
d) Write the electronic configuration of
i) atom C
ii) ion A^{2-}
iii) ion B^{3+}

4. An oxide W of formula mass 160 consists of 70.0% iron
i) Calculate the empirical formula of W.
(O = 16; Fe=56)
ii)Deduce the formula of W
Write the chemical name of W

5. In the preparation of ammonia in the laboratory , a mixture of ammonium chloride and calcium hydroxide is heated. The gas evolved is passed into a tower packed with calcium oxide before it is collected using upward delivery method.

a) i) Write an equation for the reaction that leads to the formation of ammonia.
   ii) State why ammonia is passed into the tower packed with calcium oxide.
   iii) Give a reason why ammonia is collected using upward delivery method.

b) i) Name one reagent that can be used to identify ammonia.
c) Name the catalyst that is used in the oxidation of ammonia during the manufacture of nitric acid.

6 a) Hydrogen chloride can be produced from potassium chloride.
   i) Name another reagent that is used with potassium chloride to produce hydrogen chloride.
   ii) Write an equation for the reaction leading to the formation of hydrogen chloride.
   b) Write an equation for the reaction between hydrogen chloride and
   i) silver nitratesolution
   ii) iron in the presence of water

7.Ethene is classified as an alkene and can be prepared in the laboratory by dehydration of ethanol.
  a) i) State what is meant by the term alkene
    ii) Write the structural formula of ethane
    iii)Name the reagent which is used as a dehydrating agent in the preparation of ethene
  b) Bromine was added to ethane. Write equation for the reaction that took place.
  c)Under high temperature and pressure, ethane molecules can react with one another to form a big molecule Z.
    i) Name Z
    ii)State one use of Z

8. In the extraction of sodium from sodium chloride, calcium chloride is added to sodium chloride and the mixture is melted. The molten mixture is then electrolysed using graphite electrodes.
    a)State the purpose of adding calcium chloride.
    b)Write the equation for the reaction that takes place at the
      i) anode
      ii) cathode
    c)Bromine vapour was passed over heated sodium. Write an equation for the reaction that took place.

9. a) Hydrogen peroxide decomposes quite easily at room temperature.
    i) Write the equation for the decomposition of hydrogen peroxide.
    ii) State two ways by which the decomposition can be made faster.
  b) Using the space below, on the same axes, sketch graphs of concentration of hydrogen peroxide versus time for the decomposition of the peroxide at
    i) room temperature
    ii) one of the conditions you have stated in (a) (ii)

10. a) State the conditions under which sulphuric acid can react with
    i) sucrose, C12 H2O11
    ii) zinc oxide
    b) Write equation for the reaction of sulphuric acid with
    i) sucrose
    ii) Zinc oxide
    c)State the property of sulphuric acid which is shown by its reaction with
    i) sucrose
    ii) zinc oxide

SECTION B

Answer two questions from this section

11 a) Describe how a pure sample of carbon dioxide can be prepared in the laboratory from calcium carbonate and write the equation for the reaction that takes place (Diagram not required)
  b) Explain with the aid of equations the changes that take place when excess carbon dioxide is bubbled into sodium hydroxide solution.
  c) Potassium hydrogencarbonate decomposes when heated according to the following equation
      $2KHCo_3 (S) ---->K_2CO_3(S) + H_20(I) + C0_2(g)$
    Calculate the mass of carbon dioxide evolved when 8 g of potassium hydrogen carbonate is heated strongly. (H= 1; C = 12; O =16; K=39)

12 a) One of the ores from which iron is extracted is spathic iron ore.
    i)Write the formula of the iron compound that is in the ore.
    ii)Describe how impure iron is extracted from spathic iron ore (Your answer should include equations)
  b) Write equation(s) where possible and state the conditions for the reaction of iron with
    i) water
    ii) chlorine
  c)State one use of iron

13 a) The elements copper, zinc and sulphur react with oxygen to form their oxides. Write the formula of the oxide of each of the elements and state the type of oxide whose formula you have written.
  b) Hydrogen gas was passed separately over the heated oxides of copper and zinc.
   i) State what was observed in each case and explain your observation
   ii) Write equation for any reaction that took place.
  c) Excess dilute sodium hydroxide solution was added to a mixture of the oxides of zinc and copper. State what was observed and give a reason for your observation
  d) A mixture of the oxides of zinc and copper was added to excess dilute sulphuric acid and warmed. State what was observed and write equation(s) for the reaction(s) that took place.

14 a) i) Write the equation for the complete combustion of ethanol.

ii) Outline an experiment that can be carried out in the laboratory to determine the enthalpy of combustion of ethanol. (A diagram is not required but your answer should include how the enthalpy of combustion of ethanol can be calculated from the experimental results)

b) When 0.15g of a compound W, molecular mass 60g was burnt, it caused the temperature of $150cm^3$ of water to rise by 8^0C. Calculate the enthalpy of combustion of W. (Density of water $= 1.0$ gcm^{-3}, specific hat capacity of water $= 4.2$ Jg^{-1} K^{-1})

c) The enthalpies of combustion #Hc of some hydrocarbons are shown in the table below.

Hydrogen	CH_4	C_3H_6	C_3H_8	C_4H_{10}	C_6H_{14}
#Hc	890	1560	2220	2880	4160

i) Plot a graph of enthalpy of combustion (vertical axis) against number of carbon atoms in the hydrocarbon (horizontal axis)

ii) State from the graph you have plotted in (c) (i), the enthalpy of combustion of C_5H_{12}

iii) Determine the slope of the graph that you have drawn.

iv) Using your slopw and the intercept, calculate the enthalpy of combustion of hydrocarbon C_7H_{16}

END