NANDI NORTH AND NANDI CENTRAL JOINT EXAMINATIONS 2016

233/1
CHEMISTRY
PAPER 1
THEORY
JULY / AUGUST 2016
TIME: 2 HOURS

1. Two elements A and B have electronic configurations 2.8.3 and 2.6 respectively.
    (a) To which group and period does element B belong? (1mk)
    (b) If the two react, what is the formula of the compound they form? (1mk)
2. (a) State Charles' Law. (1mk)
    (b) The volume of a sample of nitrogen gas at a temperature of 298k and 600 minHg pressures was $4.8 \times 10^{-2} m^3$.
    Calculate the temperature at which the volume of the gas would be $3.2 \times 10^2 m^3$ if pressure is constant. (2mks)
3. The formula given below represents a portion of polymer.
    (a) Give the name of the polymer. (1mk)
    (b) Draw the structure of the monomer used to manufacture the polymer. (1mk)
4. In a closed system, aqueous iron (II) chloride reacts with hydrogen sulphide gas as shown in the equation below.
    $2FeCL_{3(aq)} + H_2S_{(g)} \rightleftharpoons 2FeCl_{2(aq)} + 2HCl_{(aq)} + S_{(s)}$
    State and explain the observation that would be made if dilute hydrochloric acid is added to the system at equilibrium.
    (2mks)
5. Omolo a student in Form 1 set up an apparatus as shown for the preparation of dry chlorine gas.

    (a) (i) Name substance W. (1mk)
        (ii) State a suitable drying agent. (1mk)
    (b) Identify any **two** mistakes in the set-up. (2mks)
6. The table below shows the results obtained when soap solution was added to different samples of equal volumes of calcium hydroxide solution treated with different amounts of Carbon (IV) oxide.

Sample	Solution	Volume of soap added to sample to lather
C	$50cm^3$ of calcium hydroxide + excess x carbon (IV) oxide.	$10cm^3$
D	$50cm^3$ of calcium hydroxide + little carbon (IV) oxide.	$2cm^3$

7. Hydrogen sulphide gas was bubbled through a solution of zinc nitrate for sometime.
    (i) State the observations made. (1mk)
    (ii) Where should the experiment be carried out and why? (1mk)
8. The diagram below shows set-up used to burn hydrogen and collect the product.
    (a) State why it's necessary to dry the hydrogen gas before igniting it. (1mk)
    (b) (i) State the precaution that must be taken before igniting the hydrogen. (1mk)
        (ii) State **two** uses of hydrogen gas. (1mk)
9. The diagram below shows acidic and basic oxides fit into the general family of oxides.
    (i) State the name given to the type of oxides that would be placed in the shaded region. (1mk)
    (ii) Give the name of any oxide that could be placed in the shaded region. (1mk)
10. Eugene Kipngetich of Form II at Laboret School set up the following experiment with the help of the two laboratory assistants. Metal rods S, T, U and V were cleaned with sand paper and placed in a beaker containing water. A second set was put in a container of steam and a third set was placed in a beaker containing dilute acid. Bubbles of gas and reaction was observed around some of the rods as shown in the diagrams below.
    (a) It was very necessary to clean the rods with sand paper before dipping them. Explaining. (1mk)
    (b) Arrange the four metals in order of their reactivity starting with the most reactive. (1mk)
11. The following set up was used to investigate some properties of two gases G and H.
    When beaker B was filled with gas G the level of water in the glass tube rose to point II. When the experiment was repeated using gas H, the level of water dropped to point III. Explain these observations. (3mks)
12. Paper chromatography was carried out to investigate presence of amino acids in beans. Study the chromatograms below to answer the questions that follow.

    What conclusion can be drawn from these results? (1mk)
13. Describe how you would prepare a dry sample of lead II chloride starting with lead II carbonate. (3mks)
14. (a) A piece of burning magnesium was lowered into a gas jar containing nitrogen oxide. State and explain the observations made. (2mks)
    (b) Write an equation for the reaction in (a) above. (1mk)
15. The half equations involved in a cell are:-
    $2H_2O_{(l)} + 2e = H_{2(g)} + 2OH_{(aq)}$: $E^\theta = -0.83V$

$O_{2(g)} + 2H_2O_{(l)} + 4e = \quad 4OH^-_{(aq)} : \quad E^\ominus = -0.40V$
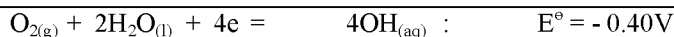
    (a) Write the overall equation for the electrochemical cell. (1mk)

    (b) Calculate the e.m.f. generated by a battery consisting of ten cells. (1mk)

    (c) State **one** environment advantage of using these cells in spacecrafts. (1mk)

16. The structures below are sections of models of the structures of elements P and Q.

    (i) In which group of the periodic table do the elements belong?

        I.   P (1mk)

        II.   Q

    (ii) Which of the two elements is a better conductor of electricity? Explain. (1mk)

17. Air was passed through reagents as shown below.

(i) State and explain the observations made when air is passed through chamber A for a long time. (2mks)

    (ii) Name **one** component in C. Explain. (1mk)

18. The following set-up shows the heating of a mixture of equal amounts of sodium chloride and ammonium chloride.

    (a) What is substance K? (1mk)

    (b) What is the process by which substance K is formed? (1mk)

19. In the industrial extraction of lead metal, the ore is first roasted in a furnace. The solid mixture obtained is then fed into another furnace together with coke limestone and scrape iron. State the functions of each of the following in this process:-

    (a) Coke (1mk)

    (b) Scrape iron (1mk)

    (c) Limestone (1mk)

20. The set-up below was made by a form four student. At the start of the experiment, the bulb did not light.

    (a) State and explain the observation made when $Cl_{2(g)}$ was bubbled in the water for about 10 minutes. (2mks)

    (b) Write the chemical equation for the reaction which took place at the cathode. (1mk)

21. Use the information below to answer the questions that follow:-

    Equation: Enthalpy of formation

    (i) $H_{2(g)} + \frac{1}{2}O_{2(g)} \quad\rightarrow\quad H_2O_{(l)} \quad\quad\quad\quad\quad \Delta H_1 = -286kJmol^{-1}$

    (ii) $C_{(s)} + O_{2(g)} \quad\quad\rightarrow\quad CO_{2(g)} \quad\quad\quad\quad\quad \Delta H_2 = -394kJmol^{-1}$

    (iii) $2C_{(s)} + 3H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow C_{(s)}H_2OH_{(l)} \quad\quad \Delta H_3 = -277kJmol^{-1}$

    Calculate the molar enthalpy of combustion of ethanol. Given that: (3mks)

    $C_{(s)}H_2OH_{(l)} + 3O_{2(g)} \quad\rightarrow\quad 2CO_{2(g)} + 3H_2O_{(l)}$

22. Dry sulphur (IV) oxide was passed through two pieces of coloured silk both in a gas jar as shown in the diagram

    (a) State the observation in the gas jars. (2mks)

    (b) What equations to explain your observations in flask II. (2mks)

23. Study the diagram below and answer the questions that follow.

    (i) Write the equation for the combustion of propane. (1mk)

    (ii) The PH of substance K was found to be less than 7. Explain this observation. (1mk)

24. The table below gives some physical properties of substances A, B and C. Study it and answr the questions that follow.

Substance	Colour	M.P (^{0}C)	Solubility in water	Electrical conductivity	
				Solid	Liqud
A	Black	114	Insoluble	Non conductor	Liquid
B	Black	1326	Soluble	Non conductor	Conducts
C	Black	3730	Insoluble	Conducts	Conducts

    Identify the substance that is:

    (i) Giant atomic structure (1mk)

    (ii) Ionic structure (1mk)

25. Calculate the amount of calcium carbonate that would remain if 15.0g of calcium carbonate were reacted with 0.2 moles of hydrochloric acid. (C = 12.0 = 1.60, Ca = 40.0) (3mks)

26. A certain mass of a metal E_1 reacted with excess dilute hydrochloric acid at 25^0C. The volume of hydrogen gas liberated was measured after every 30 seconds. The results were presented as shown in the graph below.

(a) Name one piece of apparatus that may have been used to measure the volume of the gas liberated. (1mk)

(b) (i) On the same axis, sketch the curve that would be obtained if the experiment was repeated at 37^0C. (1mk)

    (ii) Explain the shape of your curve in (b) (i) above. (1mk)

27. (a) Give **two** reasons why most laboratory apparatus are made of glass. (1mk)

(b) The diagrams below are some common laboratory apparatus. Name each apparatus and state its use.

28. The equation below shows a reversible reaction.

    $H_3O^+_{(aq)} + HSO^-_{4(aq)} \quad\quad H_2O(l) + H2SO4$

    (i) Identify the acid in the forward reaction and explain. (2mks)

29. (a) Give **two** advantages of hard water. (1mk)

    (b) Explain how water hardness is removed by ion exchange method. (2mks)

30. M grammes of radioactive isotope decayed to 5 grammes in 100 days. The half-life of the isotope is 25 days.

    (a) What is meant by half-life? (1mk)

    (b) Calculate the initial mass M of the radioactive isotope. (2mks)