S.4 CHEMISTRY 2020

CHEMISTRY

Paper 1

1. Sulphur is used in
   A: manufacture of soap
   B: manufacture of effervescent drinks
   C: vulcanization of rubber
   D: manufacture of cellulose

2. Which one of the following properties is shown by chlorine?
   A: it forms diatomic molecules
   B: it forms ions by loss of an electron
   C: it is a colourless gas
   D: it is a reducing agent

3. The solid product formed when sodium hydrogen carbonate is heated, was added to water. The P^H of the solution is approximately
   A: 3 B: 6 C: 7 D: 10

4. When ammonia reacts with hot copper (II) oxide, it is oxidized to nitrogen and steam according to the equation

   $$\mathbf{2NH_3(g) + 3CuO(s) \longrightarrow 3Cu(s) + 3H_2O(l) + N_2(g)}$$

   What is the volume of the gaseous product formed if $80cm^3$ of ammonia reacted?
   (All volumes measured at room temperature and pressure)
   A: $20cm^3$ B: $40cm^3$ C: $80cm^3$ D: $120cm^3$

5. Which one of the following is not observed when drops of water are added to a lump of freshly prepared calcium oxide?
   A: Calcium oxide readily dissolves
   B: Heat is evolved
   C: Calcium oxide becomes powder
   D: A hissing sound is heard

6. In an experiment 12g of propanol, C_3H_8O was burnt and heat produced raised the temperature of 120g of water by 0.7^oC. The enthalpy of combustion of propanol per mole is
   A: $\frac{120}{4.2} \times 0.7 \times 5J$
   B: $4.2 \times 120 \times 0.7 \times 5J$
   C: $\frac{120}{4.2} \times 0.7 \times 0.2J$
   D: 42 x 120 x 0.7 x 12J
   (C=12,O=16,H=1, Heat capacity of water is $4.2jg^{-1}\ ^oc^{-1}$)

7. In a solid salt, the electrostatic attractions between the negative and the positive ions gives rise to
   A: good electrical conductivity
   B: high boiling point

C: high solubility in water D: low molar heat of vaporization

8. Which one of the following metal oxides does not loss mass when it is heated and hydrogen gas is passed over it?
   A: magnesium oxide B: iron (II) oxide
   C: zinc oxide D: copper (II) oxide.

9. What mass of sodium hydroxide is required to make 200cm^3 of 2M solution? (Na=23,O=16, H=1)
   A: 8.0g B: 16.0g C: 32.0g D: 80.0g

10. From the following data, determine which elements are isotopes?

Element	E	F	G	H
Atomic mass	32	31	12	13
Atomic number	16	15	6	6
Number of neutrons	16	16	6	7

   A: E and F B: F and G C: G and H D: E and H

11. To test for ammonium ion you would
   A: add sodium hydroxide, heat and observe the smell
   B: add barium chloride solution
   C: put a red litmus paper in the solution
   D: add sodium carbonate solution

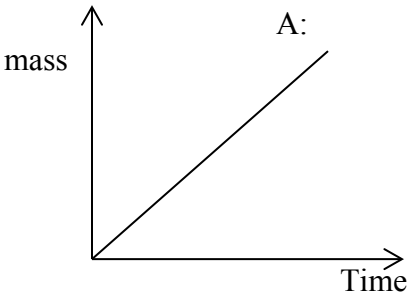
12. Which one of the following gases will occupy the same volume at s.t.p as 0.05 mole of hydrogen?
   (H = 1, O = 16, Cl = 35.5, N = 14; 1 mole of a gas occupies 22.4dm^3 at s.t.p)
   A: 14.60g HCl B: 3.20g O_2 C: 4.25g NH_3 D: 3.55g Cl_2

13. Ammonium salts are used as nitrogen fertilizers. The ammonium salt that would provide the biggest amount of nitrogen to plants is
   (Cl = 35.5 S = 32 P = 31 N = 14 O = 16 H = 1)
   A: $(NH_4)_3PO_4$ B: $(NH_4)_2SO_4$ C: NH_4Cl D: NH_4NO_3

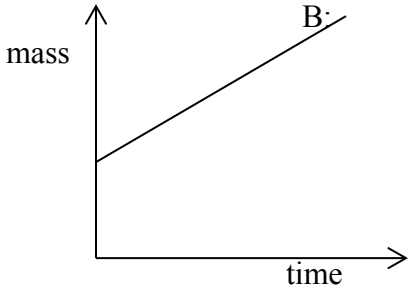
14. An indicator is used during neutralization reaction in order to
   A: detect the acid and the alkali
   B: show when exactly reacting quantities of acid and alkali are present
   C: speed up the rate of reaction between the acid and alkali
   D: show whether the reaction is reversible

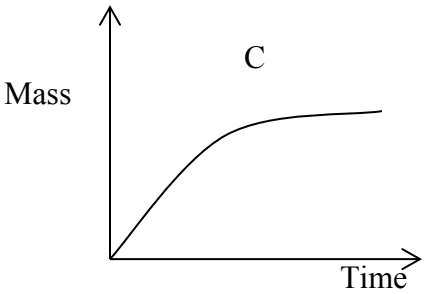
15. Which one of the following curves best shows the change in mass of a copper cathode during the electrolysis of copper (II) sulphate solution with copper electrodes and a constant current?

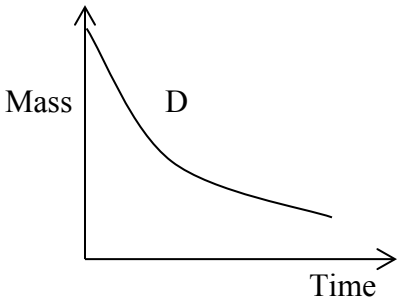
A:



B:







16. If a mixture of fine pollen grains in water is examined closely it will be seen that the pollen grains are always in motion. This motion is most likely to be due to
    A: the convection currents in the water
    B: the diffusion of pollen grains
    C: the attraction and repulsion between charged particles
    D: the collisions between pollen grains and water molecules

17. Which one of the following carbon compounds will most likely burn to give a thick soot? (H = 1 , C = 12, O = 16)
    A: CH_4 B: C_2H_2 C: C_2H_6 D: CH_3OH

18. Which one of the following statements about the reaction between soap and hard water is false?
    A: Lather cannot be produced
    B: Soap is a salt of an organic acid and it reacts with calcium compounds in the water
    C: An insoluble calcium salt is produced
    D: Soap reacts with both temporary and permanent hardness.

19. Omoding is given a mixture of iron and sulphur and told to extract the sulphur. In an attempt to do this he performs the four experiments below. Which one of the four will work best?
    A: treat the mixture with carbon disulphide and filter.
    B: treat the mixture with water and filter
    C: treat the mixture with warm dilute sulphuric acid and filter.
    D: treat the mixture with water and use a separating funnel .

20. Sodium peroxide reacts with water to produce oxygen according to the following equation;

$$\mathbf{2Na_2O_{2(s)} + 2H_2O_{(l)} \longrightarrow 4NaOH_{(aq)} + O_{2(g)}}$$

What volume of oxygen measured at room temperature would be produced together with 4.0g of sodium hydroxide? (1 mole of a gas occupies 24000 cm^3 at room temperature. (Na = 23, O = 16, H = 1)

A: $\left(\frac{4.0 \times 24000}{40}\right)cm^3$ B: $\left(\frac{2.0 \times 24000}{80}\right)cm^3$

C: $\left(\frac{8.0 \times 24000}{40}\right)cm^3$ D: $\left(\frac{2.0 \times 24000}{40}\right)cm^3$

21. The full symbols of elements W and X are $^{40}_{20}W$ and $^{19}_{9}X$ respectively. The formula of the compound formed between W and X is
A: W_2X B; WX_2 C:WX D:W_2X_3

22. Hydrochloric acid reacts with zin oxide according to the following equation;

$ZnO_{(s)} + 2HCl_{(aq)} \longrightarrow ZnCl_{2(aq)} + H_2O_{(l)}$

What is the volume of a 0.2M hydrochloric acid that would be required to completely neutralize 0.5g of zinc oxide?
A: $\frac{0.2 \times 1000}{2 \times 81 \times 0.5}cm^3$ B: $\left(\frac{0.5 \times 1000}{2 \times 80 \times 0.2}cm^3\right)$

C: $\left(\frac{0.5 \times 1000 \times 2}{80 \times 2}\right)cm^3$ D: $\left(\frac{0.5 \times 1000 \times 2}{0.2 \times 80}\right)cm^3$

23. Hydrogen peroxide decomposes to produce oxygen. Under which of the following condition(s) would the production of oxygen be fastest?
A: A 2M H_2O_2 at room temperature B: A 2M H_2O_2 + MnO_2 heated to 30°C
C: A 1M H_2O_2 heated to 35°C D: A 1M H_2O_2 + MnO_2 at room temperature

24. Concentrated sulphur acid turns blue copper (II) sulphate crystals to white powder because sulphuric acid is
A: a strong acid B: a dibasic acid
C: an oxidizing agent D: a dehydrating agent

25. An ion with a single positive charge becomes an atom by
A: gaining an electron B: gaining a neutron
C: gaining a proton D: losing an electron

26. 0.05 moles of a hydroxide, $M(OH)_3$, weighed 3.9g. Which one of the following is the relative atomic mass of M? (H = 1, O = 16)
A: 27 B: 30 C: 59 D: 61

27. Which one of the following forms of carbon is used to absorb brown colour from crude sugar?
    A: Wood charcoal B: Sugar charcoal
    C: Animal charcoal D:Lamp black

28. The percentage by mass of phosphorus in calcium dihydrogen phosphate, $Ca(H_2PO_4)_2$ is (Ca = 40, O = 16, P = 31)
    A: 13.2 B: 22.6 C: 26.5 D: 35.2

29. With which one of the following substances below does concentrated nitric acid not react as an oxidizing agent?
    A: ZnO B: SO_2 C: C D: Cu

30. Why does zinc displace copper from solutions of copper salts?
    A: Zinc is more electronegative than copper
    B: Zinc loses electrons more easily than copper
    C: Zinc is a stronger oxidizing agent than copper
    D: Zinc has fewer electrons than copper

31. The reaction $\mathbf{nCH_2 = CH_2} \longrightarrow \left(\mathbf{CH_2\ CH_2}\right)_{\mathbf{n}}$ is an example of
    A: Addition reaction B: Cracking
    C: Substitution reaction D:Polymerization reaction

32. The yield of ammonia in the reaction $\mathbf{N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) + Heat}$, may be increased by
    A: Increasing the pressure B: Raising the temperature
    C: Employing a suitable catalyst D: Adding an inert gas

33. The discharge of an ion at an electrode does not depend on
    A: the position of the ion in the reactivity series
    B: the magnitude of the charge on the ion
    C: the concentration of the ion
    D: the nature of the electrode

34. Lead (II) nitrate reacts with potassium iodide according to the following equation:

    $\mathbf{Pb(NO_3)_{2(aq)} + 2KI_{(aq)} \longrightarrow PbI_{2(s)} + 2KNO_{3(aq).}}$

    The mass of lead (II) iodide that will be formed when 33.2g of potassium iodide reacts with excess lead (II) nitrate is (K = 39, I = 127 , Pb = 207)
    A: 16.6g B: 66.4g C: 46.1g D: 92.2g

35. Hydrogen chloride solution in methylbenzene (toluene) is

A: Acidic B: Electrovalent C: Covalent D: Basic

36. Below are some of the properties of metals W,X,Y and Z
    (i) W and Z react with cold water and liberate hydrogen
    (ii) The oxide of Y is easily reduced by hydrogen
    (iii) Z most rapidly forms its oxide on exposure to air
    (iv) X reacts with steam but not with cold water

    Which one of the following is the correct order of the reactivity of the metals W, X, Y and Z?
    A: Y,W,Z,X B: W,Y,Z,X C: Z,W,X,Y D: X,Z,Y,W

37. When a solution containing silver ion that was acidified with dilute nitric acid was added to a solution T, a white precipitate was formed. The anion in T is
    A: SO_4^{2-} B: Cl^- C: SO_3^{2-} D: CO_3^{2-}

38. Propane burns in excess air according to the equation

    $$\mathbf{C_3H_{8(g)} + 5O_{2(g)} \longrightarrow 3CO_{2(g)} + 4H_2O_{(l)} \quad \Delta H = -2220 Kjmol^{-1}}$$

    The quantity of heat evolved when 9.6 dm^3 of propane is burnt at room temperature is;
    (1 mole of a gas occupies 24dm^3 at room temperature)

    A: $\left(\frac{2220 \times 9.6}{24}\right)Kj$ B: $\left(\frac{2220 \times 24}{9.6}\right)Kj$ C: $\left(\frac{9.6 \times 24}{2220}\right)Kj$ D: (2220 x 9.6 x 24)Kj

39. Which one of the following reactions shows the acidic property of nitric acid?
    A: $3Cu_{(s)} + 8HNO_{3(aq)} \longrightarrow 3Cu(NO_3)_{2(aq)} + 4H_2O_{(l)} + 2NO_{(g)}$
    B: $Mg_{(s)} + 2HNO_{3(aq)} \longrightarrow Mg(NO_3)_{2(aq)} + H_{2(g)}$
    C: $Cu_{(s)} + 4HNO_{3(aq)} \longrightarrow 2NO_{2(g)} + Cu(NO_3)_{2(aq)} + 2H_2O_{(l)}$
    D: $S_{(s)} + 6HNO_{3(aq)} \longrightarrow H_2SO_{4(aq)} + 6NO_{2(g)} + 2H_2O_{(l)}$

40. Magnesium carbonate reacts with dilute hydrochloric acid according to the following equation

    $$\mathbf{MgCO_{3(s)} + 2HCl_{(aq)} \longrightarrow MgCl_{2(aq)} + H_2O_{(l)} + CO_{2(g)}}$$

    Which one of the following is the mass of magnesium carbonate that would react completely with 100cm^3 of a 2M hydrochloric acid?
    A: $\left(\frac{2 \times 100}{1000} \times \frac{2}{84}\right)g$ B: $\left(\frac{1000}{2 \times 100} \times \frac{84}{2}\right)g$
    C: $\left(\frac{2 \times 1000}{100} \times \frac{2}{84}\right)g$ D: $\left(\frac{2 \times 100}{1000} \times \frac{2}{84}\right)g$

Each of the questions 41 to 45 consist of an assertion (statement) on the left hand side and a reason on the right hand side;
Select
A: if both the assertion and the reason are true statements and the reason is a correct explanation of the assertion
B: if both the assertion and the reason are true statements but the reason is not a correct explanation of the assertion
C: if the assertion is true but the reason is not a correct statement
D: if the assertion is not correct but the reason is a correct statement

INSTRUCTIONS SUMMARISED

Assertion	**Reason**
A: True	True and is a correct explanation
B: True	True but is not a correct explanation
C: True	incorrect
D: Incorrect	correct

41. Ethene undergoes addition reactions	because	Ethane is an unsaturated compound	
42. When manganese (IV) oxide is added to hydrogen peroxide solution, rapid effervescence occurs	because	Manganese (IV) oxide is a compound that contains oxygen	☐
43. Sodium hydrogen carbonate solution turns blue litmus red	because	Sodium hydrogen carbonate is an acid salt.	☐
44. Sulphur dioxide turns acidified potassium dichromate (VI) solution from orange to green	because	Sulphur dioxide reduces chromium (VI) to chromium (III) ion	☐
45. Copper metal is purified by electrolysis	because	Electrolysis is the only practical process for the extraction of active metals from their oxide	☐

In each of the questions 46 to 50 one or more of the answers given may be correct. Read each question carefully and then indicate the correct answer according to the following Choose;
A: if 1, 2 and 3 only are correct
B: if 1 and 3 only are correct
C: if 2 and 4 only are correct
D: if 4 only is correct

SUMMARY

A	B	C	D
1,2,3 Correct	**1,3 only correct**	**2,4 only Correct**	**4 only Correct**

46. The metals magnesium, zinc and iron
    1. Are used in alloys
    2. Reduce steam to hydrogen
    3. React with dilute hydrochloric acid
    4. Displace calcium from a solution of a calcium salt

47. Sulphur dioxide reacts with hydrogen sulphide according to the following equation:

    $$2H_2S_{(g)} + SO_{2(g)} \longrightarrow 2H_2O_{(l)}$$

    Which of the following statements is true?
    1. Sulphur dioxide is reduced
    2. hydrogen sulphide is a reducing agent
    3. hydrogen sulphide is oxidized to sulphur
    4. hydrogen sulphide is reduced

48. Which of the following are basic oxides?
    1. Na_2O
    2. CO_2
    3. CaO
    4. P_2O_5

49. Which of the following acid solutions when reacted separately with the same the highest volume of carbon dioxide within the shortest time?
    1. $100cm^3$ of a 2M HCl
    2. $100cm^3$ of a 1M H_2SO_4
    3. $200cm^3$ of a 1M HNO_3
    4. $400cm^3$ of a 0.5M H_2SO_4

50. Limestone is used in the blast furnace to extract iron from its ore because it
    1. Provides a source for production of carbon monoxide to reduce the oxide
    2. Helps to harden the cast iron
    3. Acts as a catalyst to speed up the reaction
    4. Provides a source which eliminates the silicate impurities.

CHEMISTRY

PAPER 2

SECTIOIN A: 50 MARKS)

1. (a) Write the name and formula of one salt that causes permanent hardness of water (1 mark)

……

……..

(b) State one physical and one chemical method of removing permanent hardness of water.

Physical method. (½ mark)

……..

Chemical method (1 mark)

……..

(c) Write equation for the reaction that takes place during removal of permanent hardness of water by chemical method. (1 ½ marks)

……..

……..

(d) State one advantage and one disadvantage of hard water.

Advantages (½ mark)

……..

Disadvantage (½ marks)

……..

2. (a) During the laboratory preparation of hydrogen at room temperature, zinc metal is reacted with sulphuric acid or hydrochloric acid but not nitric or ethanoic acid

(i) Write an ionic equation for the reaction leading to the formation of hydrogen (1 ½ marks)

……..

……..

(ii) State the condition for the reaction in (a) (i) (½ mark)

……..

(iii) State the method of collecting hydrogen (½ mark)

……..

(iv) Give a reason why laboratory preparation of hydrogen from zinc can not be done using;

- nitric acid (½ mark)

……..

- Ethanoic acid (½ mark)

……..

(b) Write equation for the reaction that would take place if dry hydrogen is passed overheated copper (II) oxide. (1 ½ marks)

……..

……..

3. (a) When hydrogen chloride was passed through a solution containing a cation X, a white shiny and crystalline precipitate was formed. The precipitate dissolved when the mixture was heated, but recrystallised on cooling the solution.

(i) State the identity of X. (1 mark)

……..

(ii) Write an ionic equation for the reaction that took place between hydrogen chloride and X. (1 ½ mark)

……..

……..

(b) Silver nitrate can react with sodium chloride to form silver chloride according to the following equation:

$Ag^{+}_{(aq)} + Cl^{-}_{(aq)} \longrightarrow AgCl_{(s)}$

Calculate the maximum mass of silver chloride that would be formed if excess sodium chloride solution was added to 20.0cm^3 of a 0.5M silver nitrate solution (Ag = 108, Cl = 35.5)
(2 ½ marks)

……..
……..
……..
……..

4. (a) Sulphuric acid can react with ethanol to produce ethene

(i) Write equation for the reaction leading to the formation of ethene (1 mark)

……..
……..

(ii) State the conditions for the reaction in a (i) (1 ½ marks)

……..
……..

(iii) Write equation for the reaction of ethene leading to formation of 1, 2 – dibromoethane. (1 mark)

……..
……..

(b) When butane is burnt in oxygen, the reaction is accompanied by heat change according to the following equation:

$2C_4H_{10(g)} + 13O_{2(g)} \longrightarrow 10H_2O_{(l)} + 8CO_{2(g)}$ $\Delta H = -288$ Kjmol^{-1}

(i) Suggest one use of butane. (½ mark)

……..

(ii) Calculate the heat energy change obtained when 5.6dm^3 of butane is burnt in oxygen at s.t.p (1 mole of a gas occupies 22.4dm^3 at s.t.p) (2 marks)

……
……
……
……

……

……

5. Warm dilute nitric acid was added to a mixture of lead (II) oxide and copper (II) oxide and the solution formed divided into two portions.

(a) To the first portion was added dilute sodium hydroxide drop wise until in excess and filtered.

Identify the cation in the

(i) Filtrate (1 mark)

……..

(ii) Residue (1 mark)

……..

(iii) Write equation for the reaction that led to the formation of the residue (1 ½ marks)

……..

……..

(b) To the second portion was added aqueous ammonia drop wise until in excess. State the colour of the;

(i) Residue (½ mark)

……..

(ii) Filtrate (½ mark)

……..

(c) Write the formula of the cation that was in the filtrate. (1 mark)

……..

6. During laboratory preparation of carbon dioxide, calcium carbonate reacts with dilute hydrochloric acid according to the following equation.

$CaCO_{3(s)} + 2HCl_{(aq)} \longrightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(l)}$

(a) Calculate the maximum volume of carbon dioxide in cm^3 that would be produced at room temperature if dilute hydrochloric acid reacted completely with 4.5g of calcium carbonate. (3 marks)

(C = 12, O = 16, Ca = 40, 1 mole of a gas occupies 24.0 cm^3 at room temperature)

……..

……..

……..

……..

……..

(b) A quantity of dilute sulphuric acid having the same hydrogen ion concentration as that of the hydrochloric acid in (a) was reacted with 4.5g of the calcium carbonate at room temperature.

(i) State how the maximum volume of carbon dioxide produced would compare with your answer in (a) (1 mark)

……..

……..

(ii) Give a reason for your answer in (b) (i) (1 mark)

……..

……..

7. The atomic numbers of elements Q, R and W are 15, 17 and 19 respectively.

(a) Write the electronic configuration of

(i) Q (½ mark)

……..

(ii) R (½ mark)

……..

(iii) W (½ mark)

……..

(b) R can combine with Q and W to form compounds Y and Z respectively. State the type of bond in

(i) Y (½ mark)

……..

(ii) Z (½ mark)

……..

(c) State one property in which

(i) Y resemble Z (1 mark)

……..

……..

(ii) Y differs from Z (1 mark)

……..

……..

8. (a) Name one allotrope of carbon that is used;

(i) in extraction of iron (½ mark)

……..

(ii) as an electrode (½ mark)

……..

(b) State one property of the allotrope of carbon that you have named in (a) which is the reason for its use;

(i) In extraction of iron (1 mark)

……..

(ii) As an electrode (1 mark)

……

……..

(c) Carbon – 12 and carbon – 14 are the two common atoms of carbon and carbon – 14 is used extensively in determining ages of old objects,

State

(i) One word, which means the relationship between atoms like carbon – 12 and carbon – 14 (1 mark)

……..

(ii) The property of carbon – 14 that is applied when it is used in determining the ages of old objects. (1 mark)

……..

9. Both carbon and sulphur can burn in air to form oxides

(a) Name the product of complete combustion of

(i) Sulphur (½ mark)

……..

(ii) Carbon

……..

(b) The products of combustion in (a) were carefully collected into separate boiling tubes and burning magnesium introduced in each. State what was observed in the boiling tube containing the product of combustion of

(i) Sulphur (1 mark)

……..

(ii) Carbon (1 mark)

……..

(c) Write equation to illustrate your observation in

(i) (b) (i) (1 ½ marks)

……..

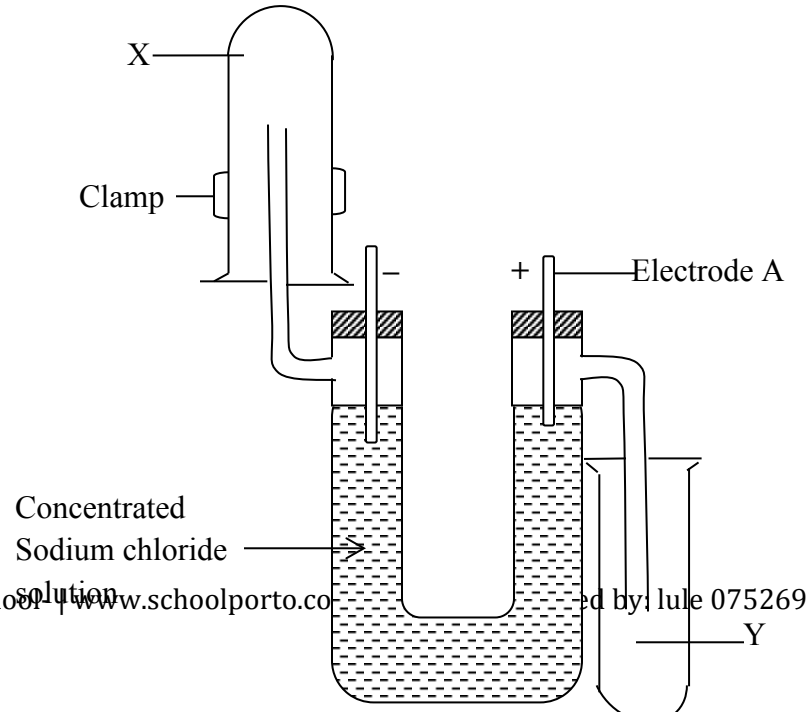
……..

(ii) (b) (ii) (1 ½ marks)

……..

……..

10.



The diagram above is U-tube voltameter for the electrolysis of concentrated sodium chloride solution

(a) Identity

(i) Gas X (½ mark)

…….

(ii) Gas Y (½ mark

……..

(iii) The material electrode A is made of (1 mark)

……

(b) Give a reason why electrode A should be made of the material you have identified in (a) (iii) (1 mark)

……

……

(c) State why each of the gases X and Y is collected as shown in the diagram (1 mark)

……

……

(d) Litmus paper was dropped into the solution near the cathode.

(i) State what was observed. (½ mark)

……

(ii) Give a reason for your observation in (d) (i) (½ mark)

……

SECTION B:

Answer any two questions only in this section. Extra questions answered will not be marked.

11. (a) Burning sulphur was lowered into a jar of oxygen.\

(i) State what was observed. (1 mark)

(ii) Write equation for the reaction that took place. (1 mark)

(b) The major product of combustion of sulphur is sulphur dioxide

(i) Name one reagent, which can be used to test for sulphur dioxide. (1 mark)

(ii) State what would be observed if the reagent which you have named in (b) (i) was tested with sulphur dioxide and give a reason for your observation (1 ½ marks)

(c) Under certain temperature and pressure conditions in the presence of a suitable catalyst, sulphur dioxide can be converted into sulphuric acid on a large scale through an industrial process known as the Contact process.

(i) Using equations to illustrate your answer, outline the reactions that lead to conversion of sulphur dioxide to sulphuric acid by the Contact process. (5 ½ marks)

(ii) Describe the temperature and pressure conditions used during the contact process; and briefly explain their effects on the reaction(s) where they are applied. (4 marks)

(iii) Name the suitable catalyst in modern day contact process and give a reason for its suitability.

12. (a) (i) Write equation for reaction that takes place when excess carbon dioxide is bubbled through concentrated sodium hydroxide solution (1 ½ marks)

(ii) Briefly describe how a pure dry sample of the product of the reaction in (a) (i) can be obtained in the laboratory. (2 ½ marks)

(b) State what would be observed and write equation for the reaction that would take place if

(i) to the solution of the dry sample in (a) (ii) was added aqueous lead (II) nitrate solution. (2 marks)

(ii) to some of the dry sample in (a) (ii) was added dilute sulphuric acid (2 marks)

(d) The Table below shows the variation in volume of carbon dioxide evolved when dilute hydrochloric acid solution was added to several weighed samples of a carbonate with formula, MCO_3 at s.t.p

Mass of MCO_3(g)	0.025	0.050	0.100	0.150	0.200	0.300	0.40
Volume of CO_2 at s.t.p (cm^3)	4.0	11.0	21.0	33.0	44.5	56.0	56.0

(i) Plot a graph of volume of carbon dioxide evolved (vertical axis) against mass of the carbonate, MCO_3 used (horizontal axis. (3 marks)

(ii) Determine the number of moles of the carbonate, MCO_3 that gave maximum volume of carbon dioxide evolved. (2 marks)

(iii) Calculate the atomic mass of M in the carbonate, MCO_3 (C=12,O=16) (2 marks)

13. Spathic iron is one of the major ores of iron

(a) Write the chemical name and formula of spathic iron (1 mark)

(b) During the extraction of iron, spathic iron is first roasted in air before being transferred into the Blast furnace. State the purpose of roasting the ore in air (1 mark)

(c) Name;

(i) the major impurity in iron ore (1 mark)

(ii) two substances, which are fed into the Blast furnace together with roasted iron ore (1 mark)

(iii) any other substance that is also fed into the furnace, and describe where from the substance is let into the furnace (1 mark)

(d) Using equations only, outline reactions which take place inside the Blast furnace up to

(i) Formation of iron (3 ½ marks)

(ii) Removal of the major impurity in the ore (2 marks)

(e) State the importance of slag during extraction of iron in the furnace. (1 mark)

(f) Describe how iron reacts with

(i) Water (2 marks)

(ii) Chlorine (2 marks)

14. (a) Draw a labeled diagram for the set up of apparatus that can be used to prepare a dry sample of ammonia in the laboratory (4 marks)

(b) Explain each of the following and write equation to illustrate your explanation

(i) Ammonia gives dense white fumes with hydrogen chloride (3 ½ marks)

(ii) Fused calcium chloride is not a suitable drying agent for ammonia (2 marks)

(c) Describe the reactions of ammonia with oxygen. (5 ½ marks)

CHEMISTRY

Paper .1

1. Which one of the following is not a property of nitrogen (IV) oxide gas?
   A. Denser than air
   B. Turns blue litmus red
   C. Insoluble in water
   D. Reddish brown in colour

2. Which one of the following substance can be purified by sublimation?
   A. Sodium chloride
   B. Potassium sulphate
   C. Iron (III) chloride
   D. Sulphur

3. Brass is an alloy of;
   A. Tin and copper
   B. Lead and tin
   C. Zinc and copper
   D. Aluminium and zinc

4. Silver chloride is prepared by reacting sodium chloride solution with;
   A. Silver oxide
   B. Silver nitrate solution
   C. Silver metal
   D. Silver sulphate

5. $25.0cm^3$ of 0.1M sodium carbonate reacted completely with $9.35cm^3$ of hydrochloric acid. The molarity of hydrochloric acid is;
   A. $\frac{2 \; x \; 25 \; x \; 0.1}{9.35}$

B. $\frac{9.35 \ x \ 0.1}{25 \ x \ 2}$

C. $\frac{2 \ x \ 9.35 \ x \ 0.1}{25}$

D. $\frac{9.35 \ x \ 0.1}{25 \ x \ 2}$

6. Which one of the following is not a raw material in the extraction of iron?
   A. Slag
   B. Calcium carbonate
   C. Carbon
   D. Hot air

7. A compound **X** contains 27.59% oxygen and 72.41% iron by mass. The formula of **X** is (Fe = 56, O = 16).
   A. Fe_3O_4
   B. Fe_2O_3
   C. FeO
   D. Fe_2O_4

8. Which one of the following can be conveniently used to determine the rate of the reaction:
   $Mg(s) + H_2SO_4(aq) \longrightarrow MgSO_4(aq) + H_2(g)$
   Measure the amount of;
   A. Magnesium sulphate formed in a given time
   B. Sulphuric acid used up per minute
   C. Magnesium ribbon used up per minute
   D. Hydrogen evolved in a given time

9. Which one of the following will not yield a metal oxide on strong heating?
   A. Lithium hydroxide
   B. Sodium peroxide
   C. Sodium carbonate
   D. Magnesium sulphate

10. An aqueous solution to which on adding lead (II) nitrate solution gives a white precipitate which dissolves on heating contains;
   A. SO_4^{2-}
   B. SO_3^{2-}
   C. CO_3^{2-}

D. Cl-

11. In the reaction; $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$. The yield of ammonia can be increased by;
A. Lowering pressure
B. Use of a catalyst
C. Increasing pressure
D. Decreasing the amount of hydrogen

12. Which of the following ions would form a yellow precipitate with potassium iodide solution?
A. Al^{3+}
B. Cu^{2+}
C. Pb^{2+}
D. Fe^{2+}

13. Calcium oxide is used to dry;
A. CO_2
B. HCl
C. SO_2
D. NH_3

14. Which of the following gases is very soluble in water?
A. Carbon dioxide gas
B. Oxygen gas
C. Hydrogen chloride gas
D. Hydrogen gas

15. Which one of the following electronic configuration represents that of halogen?
A. 2:8:1
B. 2:8:8
C. 2:8:7
D. 2:6

16. If two electrodes in the cell diagram below were joined by a connecting wire, which of the following changes would take place.

A. HCO_3 B. CO_3^{2-} C. SO_4^{2-} D. HSO_4^-.

19. Which one of the following is responsible for the bleach action of chlorine
A. H_2SO_3 B. HCl C. HClO D. H_2O.

Po

20. Iron(III) oxide can be reduced by hydrogen according

A. $Cu^{2+}(aq) + 2e^- \longrightarrow Cu(s)$ only
B. $Zn(s) \longrightarrow Zn^{2+}(aq) + 2e^-$
C. Both $Cu^{2+}(aq) + 2e^- \longrightarrow Cu(s)$ and $Zn^{2+}(aq)\ 2e^- \longrightarrow Zn(s)$
D. Both $Cu^{2+}(aq) + 2e^- \longrightarrow Cu(s)$ and $Zn(s) \longrightarrow Zn^{2+}(aq) + 2e^-$

17. Which one of the following would lose weight when exposed to the atmosphere?
A. Concentrated sulphuric acid
B. Anhydrous sodium carbonate
C. Solid sodium hydroxide
D. Hydrated sodium carbonate

18. Permanent hard water is due to the presence of;
A. Mg^{2+}
B. SO_4^{2-}
C. HCO_3
D. Ba^{2+}

19. Which one of the following is responsible for the bleaching action of chlorine?
A. H_2SO_3 B. HCl
C. HOCl D. H_2O

20. Iron (III) oxide can be reduced by hydrogen according to the following equation; ;
$Fe_2O_3(s) + 4H_2(g) \longrightarrow 3Fe(s) + 4H_2O(l)$
The mass of iron (III) oxide that would be formed when 10.5g of iron (III) oxide is reduced by hydrogen is (Fe = 56, O = 16)
A. 3 x 10.5 x 56
B. $\frac{10.5\ x\ 56}{3\ x\ 232}$
C. $\frac{3\ x\ 10.5\ x\ 232}{56}$
D. $\frac{232\ x\ 56}{3\ x\ 10.5}$

21. Which one of the following hydroxides is soluble in aqueous ammonia?
    A. $Al(OH)_3$
    B. $Fe(OH)_2$
    C. $Pb(OH)_2$
    D. $Cu(OH)_2$

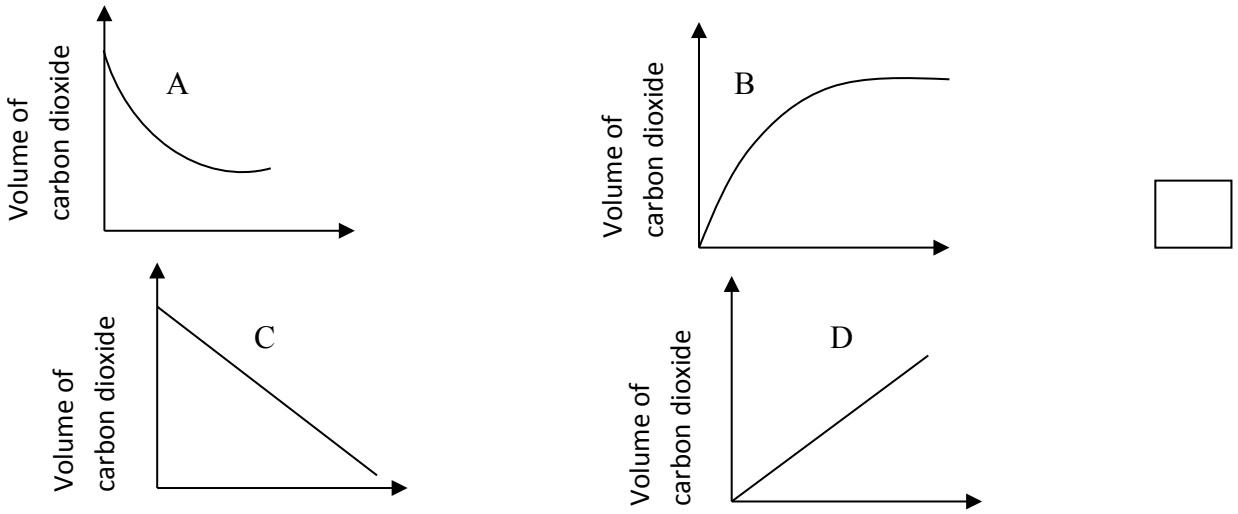
22. The strength of an acid or base is based on;
    A. Its molarity
    B. Its basicity
    C. Degree of ionization
    D. Its concentration

23. Nitrogen reacts with hydrogen according to the following equation;
    $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
    If $15cm^3$ of nitrogen and 50 cm^3 of hydrogen are reacted; the volume of the residual gas is;
    A. 5 cm^3
    B. 30 cm^3
    C. 65 cm^3
    D. 35 cm^3

24. Which one of the following is not an application of electrolysis?
    A. Purification of metals
    B. Manufacture of alloys
    C. Extraction of metals
    D. Electro plating

25. The heat generated when 4g of methanol (CH_3OH) is burnt is 90.6KJ. The heat produced when 1 mole of methanol is burnt is;
    A. $\frac{90.6 \ x \ 32}{4}$
    B. 90.6 x 8
    C. $\frac{90.6}{4}$
    D. $\frac{90.6 \ x \ 8}{4}$

26. Which of the graphs below shows the change in volume of carbon dioxide gas with time when dilute hydrochloric acid is reacted with a fixed mass of marble chips?



27. Sulphur dioxide reacts with oxygen according to the equation:

$2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)$

The volume of sulphur trioxide formed when $20cm^3$ of sulphur trioxide is reacted with $100cm^3$ of oxygen.

A. $120\ cm^3$
B. $30\ cm^3$
C. $20\ cm^3$
D. $10\ cm^3$

28. The electronic structure of an atom of element T is 2:8:5. Which one of the following is the formula of an oxide of T?

A. TO
B. TO_3
C. TO_5
D. T_2O_3.

29. Which one of the following gases is produced when ethanol is reacted with hot concentrated sulphuric acid?

A. C_2H_2

B. C_2H_4
C. C_3H_8
D. C_4H_{10}

30. Which one of the following equations represent the reaction that takes place at the cathode during the electrolysis of copper (II) sulphate solution.
A. $Cu^{2+}(aq) + 2e^- \longrightarrow Cu(s)$
B. $2H^+(aq) + 2e^- \longrightarrow H_2(g)$
C. $4OH^-(aq) \longrightarrow 2H_2O(l) + O_2(g) + 4e^-$
D. $Cu(s) \longrightarrow Cu^{2+}(aq) + 2e^-$

31. Aluminum reacts with hydrochloric acid according to the equation;
$2Al(s) + 6HCl(aq) \longrightarrow 2AlCl_3(aq) + 3H_2(g)$
Which one of the following is the volume of hydrogen formed at s.t.p when 10.0g of aluminium is reacted with excess hydrochloric acid?
(1 mole of a gas occupies 22400 cm at s.t.p).
A. $\left(\frac{3\ x\ 10\ x\ 22400}{2\ x\ 27}\right) cm^3$
B. $\left(\frac{10\ x\ 22400}{3\ x\ 2\ x\ 27}\right) cm^3$
C. $\left(\frac{27\ x\ 3\ x\ 22400}{2\ x\ 10}\right) cm^3$
D. $\left(\frac{10\ x\ 2\ x\ 22400}{3\ x\ 27}\right) cm^3$

32. $25.0cm^3$ of a 0.2M sodium hydroxide solution reacted with $16.6cm^3$ of a 0.1M solution of an acid. The ratio in which the acid reacted with sodium hydroxide is;
A. 1:2
B. 1:3
C. 2:1
D. 3:1

33. Metal P displaces metal R from its oxide and metal R displaced metal W from its oxide. Which one of the following is the order of affinity of the metals for oxygen?
A. W > R > P
B. R > P > W
C. P > W > R
D. P > R > W

34. A mixture of two soluble salts can best be separated by;

A. Filtration
B. Decanting
C. Fractional crystallization
D. Fractional distillation

35. Which one of the following substances undergoes a physical change?
A. Sulphur
B. Iron (III) chloride
C. Calcium carbonate
D. Iron (II) chloride

36. Which one of the following will react with oxygen to form an acidic oxide?
A. Phosphorus
B. Sodium
C. Magnesium
D. Zinc

37. The number of moles of sulphate ions present in $25.0cm^3$ of 0.2M aluminium sulphate are?
A. $\frac{0.2 \ x \ 1000}{25.0}$
B. $\frac{0.2 \ x \ 25.0}{1000}$
C. $\frac{25.0 \ x \ 1000}{0.2}$
D. $\frac{3 \ x \ 0.2 \ x \ 25.0}{1000}$

38. Which one of the following nitrates when heated strongly does not produce a metal oxide?
A. $Cu(NO_3)_2$
B. $NaNO_3$
C. $Mg(NO_3)_2$
D. $Pb(NO_3)_2$

39. Which one of the following will be the colour of the residue when a mixture of copper (II) oxide and magnesium powder are heated?
A. White powder and red solid
B. White powder and green solid
C. White powder and brown solid
D. White powder and black solid

40. An element U burns in oxygen to form a solid. The solid dissolves in water producing an alkaline solution and a gas which relights a glowing splint U is likely to be;
    A. Sulphur
    B. Magnesium
    C. Calcium
    D. Sodium

Each of the questions 41 to 45 consists of an assertion (statements) on the left hand side and a reason on the right hand side. Select;

A. If both the assertion and reason are true and the reason is a correct explanation of the assertion
B. If both the assertion and reason are true statements but the reason is not a correct explanation of the assertion
C. If the assertion is true but the reason is not a correct statement.
D. If both assertion is not correct but the reason is a correct statement.

INSTRUCTIONS SUMMARISED

Assertion	***Reason***
A. True	*True (Reason is a correct explanation)*
B. True	*True (reason is not a correct explanation*
C. True	*Incorrect*
D. Incorrect	*Correct*

41. Hydrogen is collected by downward delivery. *Because* Hydrogen is used in filling balloons

42. Lead (II) sulphate is prepared by precipitation method. *Because* Lead (II) sulphate is insoluble in water

43. 25.0cm^3 of 0.1 M sodium hydroxide solution required 12.50cm^3 of a 0.1M sulphuric acid for complete neutralization *Because* Sulphuric acid is completely ionized in solution.

44. Isotopes of an element show similar chemical properties *Because* Isotopes of an element contain different numbers of neutrons

45. When a piece of phosphorus is lowered into a jar of chlorine white fumes are observed *Because* Hydrogen chloride is formed during the reaction

In each of the questions 46 to 50, one or more of the answers given may be correct. Read each question carefully and then indicate the correct answer according to the following:

A. If 1, 2 and 3 only are correct
B. If 1 and 3 only are correct
C. If 2 and 4 only are correct
D. If 4 only is correct

46. Which one of the following is / are thermosetting plastics?
    1. Polyethen
    2. Perspex
    3. Nylon
    4. Melamine

47. In which of the following solutions is aluminium oxide soluble?
    1. Sodium carbonate solution
    2. Dilute sulphuric acid
    3. Water
    4. Sodium hydroxide solution

48. Which one of the following are products of the reaction between concentrated nitric acid and sulphur?
    1. H_2O
    2. NO_2
    3. H_2SO_4
    4. SO_2

49. Which one of the following hydroxides will form a brown solid when heated strongly?
    1. $Zn(OH)_2$
    2. $Cu(OH)_2$
    3. $Mg(OH)_2$
    4. $Pb(OH)_2$

50. Which one of the following substances when in solution will turn blue litmus red?
    1. Nitrogen dioxide
    2. Potassium ethanoate
    3. Sulphur dioxide
    4. Potassium chloride

CHEMISTRY

Paper .2

SECTION A

1. Gas **W** constitutes the largest proportion of air in the atmosphere.
   (a) Identify **W**. *(01 mark)*

   ……

   ……

   (b) Name the method by which **W** can be produced on industrial scale. *(01 mark)*

   ……

   ……

   (c) Ammonium nitrate was heated in a glass tube. Write equation for the reaction that took place. *(1½ marks)*

   ……

   ……

   (d) Write the equation for the reaction between hot magnesium and gaseous product in (c). *(1½ marks)*

   ……

   ……

2. (a) The atomic number of element **Z** is 12. Write;
   (i) The electronic configuration of **Z** *(01 mark)*

   ……

   ……

   (ii) The formula of the common ion formed by **Z** *(01 mark)*

……

……

(iii) The formula of the oxide of **Z.** *(01 mark)*

……

……

……

(b) Write equation for the reaction of **Z** with chlorine. *(1½ marks)*

……

……

……

(c) State the period to which **Z** belongs in the periodic table. *(½ mark)*

……

3. A hydrocarbon **X**, molecular mass = 42, contains 85.7% of carbon.

(a) (i) Calculate the empirical formula of hydrocarbon **X.** (H = 1, C = 12) *(02½ marks)*

……

……

……

……

……

……

(ii) Determine the molecular formular of **X.** *(01 mark)*

……

……

……

(b) Write the structural formula of **X.** *(01 mark)*

……

……

(c) Bromine liquid in tetrachromethane was added to **X.**

(i) State what was observed. *(01 mark)*

……

……

……

(ii) Give a reason for your answer in (c) (i).

……

……

4. (a) State what is meant by the terms;

(i) Electrolysis *(01 mark)*

……

……

……

(ii) Electrodes *(01 mark)*

……

……

……

(b) (i) Draw a well labeled diagram of the set up of apparatus that can be used to electrolyze lead (II) bromide. *(02 marks)*

(ii) State what was observed at the anode. *(01 mark)*

……

……

……

(iii) Write the equation for the reaction that would take place at the cathode. *(1½ marks)*

……

……

……

5. Name one reagent which can be used to distinguish between the following pairs of ions and state what would be observed in each case if each member of the pair was treated separately with the reagent you have harmed.

(a) $Cl^-(aq)$ and $I^-(aq)$

(i) Reagent *(01 mark)*

……

……

(ii) Observations *(01 mark)*

……

……

(b) $Al^{3+}(aq)$ and $Zn^{2+}(aq)$

(i) Reagent *(01 mark)*

……

……

(ii) Observation *(01 mark)*

……

……

6. Sulphuric acid is used in the laboratory preparation of both ethene and sulphur dioxide gases.

(a) Name one substance that when treated with sulphuric acid can be used in the laboratory preparation of;

(i) Ethene gas *(½ mark)*

……

……

(ii) Sulphur dioxide gas *(½ mark)*

……

……

(b) State the property of sulphuric acid shown during the laboratory preparation of;

(i) Ethene gas *(½ mark)*

……

……

(ii) Sulphur dioxide gas *(½ mark)*

……

……

(c) Write equation to show the reaction in which sulphuric acid reacts together with the substance that you have named in (a) to produce;

(i) Ethene gas *(01 mark)*

……

……

(ii) Sulphur dioxide gas *(01 mark)*

……

……

(d) State one industrial use of sulphur dioxide. *(½ marks)*

……

……

7. Calcium hydrogen carbonate can be converted to calcium carbonate according to the following equation;

$Ca(HCO_3)(aq) \longrightarrow CaCO_3(s) + H_2O(l) + CO_2(g)$

(a) State;

(i) The condition for the reaction *(01 mark)*

……

……

(ii) One practical application of the reaction. *(01 mark)*

……

……

(b) Calculate the maximum mass of calcium carbonate that can be obtained from $200cm^3$ of 0.25M calcium hydrogen carbonate solution.
(Ca = 40, C = 12, O = 12) *(03 marks)*

……

……

……

……

……

……

8. A yellow solid **M** was dissolved in water to form a colourless solution **N** and bubbles of a colourless gas **H** that relights a glowing splint was evolved.

(a) Name; *(1½ marks)*

(i) Yellow solid **M**

……

(ii) Solution **N**

……

(iii) Gas **H**

……

(b) Write the equation for the reaction between the yellow solid and water.
(1½ marks)

……

……

(c) Gas H was passed over heated copper metal.

(i) State what was observed. *(01 mark)*

……

……

(ii) Write the equation for the reaction. *(1½ marks)*

……

……

9. (a) Magnesium reacts with dilute sulphuric acid to produce hydrogen gas but copper does not.

(i) Write the equation for the reaction between magnesium and dilute hydrochloric acid. *(1½ marks)*

……

……

……

(ii) Explain why copper does not react with dilute sulphuric acid to produce hydrogen gas. *(01 mark)*

……

……

(iii) Name other metal other than magnesium that reacts with dilute sulphuric acid to produce hydrogen gas. *(½ mark)*

……

……

(b) Dry hydrogen gas was passed over heated lead (II) oxide.

(i) State what was observed. *(01 mark)*

……

……

……

(ii) Write equation for the reaction. *(1½ marks)*

……

……

……

10. (a) When a white solid **R**, was heated with sodium hydroxide solution an alkaline gas **B** was evolved. A solution of **R** forms a yellow precipitate with lead (II) nitrate solution. Identify;

(i) Cation in **R**

……

(ii) Anion in **R**

……

(iii) Gas B.

……

(b) Write ionic equation for the reaction leading to the formation of;

(i) Gas B in (a) *(1½ marks)*

……

……

……

(ii) The yellow precipitate in (a) *(1½ marks)*

……

……

……

(c) Chlorine was bubbled through an aqueous solution of R. State what was observed. *(01 mark)*

……

……

SECTION B

11. (a) With the aid of a labeled diagram explain how a dry sample of carbon dioxide is prepared in the laboratory. *(06 marks)*

(b) Explain the following observations;

(i) When excess carbon dioxide is bubbled through calcium hydroxide solution, a white precipitate is formed which dissolves to form a colourless solution. *(03 marks)*

(ii) Burning magnesium reacts with carbon dioxide to form a white solid and black particles. *(2½ marks)*

(c) Copper (II) carbonate was heated in a dry test tube until there was no further change:

(i) State what was observed. *(1½ mark)*

(ii) Calculate the mass of copper (II) carbonate required to produce $120cm^3$ of carbon dioxide gas at s.t.p (Cu = 64, C = 12, O = 16). (molar gas volume at s.t.p is $22.4dm^3$)

12. (a) Explain how sulphur can be extracted by Frasch process. *(6½ marks)*

(b) Write equation to show how sulphur can react with;

(i) Oxygen *(1½ mark)*

(ii) Charcoal *(1½ mark)*

(iii) Sulphuric acid *(1½ mark)*

(c) Concentrated nitric acid was added to sulphur powder in a porcelain dish and the mixture warmed. State what was observed and write equation for the reaction that took place. *(2½ marks)*

(d) The mixture in (c) was stirred with some water, filtrate was added to acidified barium chloride solution. Write an ionic equation for the reaction of the filtrate with barium chloride. *(1½ marks)*

13. (a) Define the term enthalpy of combustion. *(01 mark)*

(b) Describe using a well labeled diagram how the enthalpy of combustion of methanol can be determined in the laboratory. *(05 marks)*

(c) Methanol burns in oxygen according to the equation;

$$CH_3OH(l) + \tfrac{3}{2}O_2(g) \longrightarrow CO_2(g) + 2H_2O(l) \quad \Delta H = -120\ KJMol^{-1}$$

When a certain mass of methanol was burnt, the heat evolved raised the temperature of 100g of water from 25.0°C to 45.3°C.
(specific heat capacity of H_2O = 4.2 J/g/°C to density of water = $1g/cm^3$)
Calculate the mass of methanol burnt. *(03 marks)*

(d) When $40cm^3$ of a 2M nitric acid was mixed with $40cm^3$ of a 2M sodium hydroxide solution at initial temperature of 25.0^oC, the temperature of the solution rose to T^oC.
Determine T (S.H.C of water = 4.2 $Jg^{-1}K^{-1}$, density of water = 1 gcm-3, and enthalpy of neutralization of nitric acid by sodium hydroxide = 56.5 $KJmol^{-1}$)

(e) Explain why enthalpy of neutralization of ethanoic acid is lower than that of hydrochloric acid. *(2½ marks)*

14. (a) Define the terms;
(i) Acid *(01 mark)*
(ii) Salt *(01 mark)*

(b) An aqueous solution of hydrogen chloride formed bubbles of colourless gas when added to zinc granules where as a solution of hydrogen chloride in methyl benzene does not. Explain. *(04 marks)*

(c) Describe how a pure dry sample of zinc sulphate – 7 – water can be prepared from zinc oxide in the laboratory. *(5½ marks)*

(d) State and explain what would be observed when dilute sodium hydroxide solution was added drop wise until in excess to aqueous solution of zinc sulphate. *(3½ marks)*

Chemistry P/2

SECTION A (50MARKS)

Attempt all questions in this section.

1. Air is a mixture consisting of mainly of two gases X and Y in the ratio 1:4 by volume respectively.

(a) Name gas
(i) X…….. (1mark)
(ii) Y…….. (1mark)

(b) (i) state the suitable method by which the mixture of X and Y can be separated industrially. (1mark)

……

(ii) Give reason for the choice of the method you have stated in (b) (i) (1mark)

……

……

(c) Name one process during which the concentration of X in the atmosphere can be increased. ($^1/_2$ mark)

……..

(d) State one industrial use of Y ($^1/_2$ mark)

…….

2. (a) State the difference between hard water and soft water. (1mark)

……..

(b) Name one substance that causes:

(i) temporary hardness of water (1mark)

……..

(ii) permanent hardness of water (1mark)

……..

(c) State one method that can be used to remove

(i) temporary hardness in water (1mark)

……

(ii) permanent hardness in water. (1mark)

……

3. The number of electrons, protons and neutrons in the atoms of elementsA,B,C,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

(i) Y ……. ($^1/_2$ mark)

(ii) Z……. ($^1/_2$ mark)

(b) State the mass number of atom C ($^1/_2$ mark)

…….

…….

(b) indicate which of the atoms

(i) are isotopes ($^1/_2$ mark)

……

(ii) belong to the same group of in the Periodic Table ($1^1/_2$ marks)

……
……

(c) write the electronic configuration of

(i) atom C……($^1/_2$ mark)

(ii) ion A^{2+}……($^1/_2$ mark)

(iii) ion B^{3+} ……($^1/_2$ mark)

4. An oxide W of formula 160 consists of 70% iron.

(a) Calculate the empirical formula of W. (O =16,Fe = 56) ($2^1/_2$ marks)

……
……
……
……
……
……

(ii) Deduce the formula of W ($1^1/_2$marks)

……
……
……
……

(a) Write the chemical name of W. (1mark)

……
……

5. In the preparation of ammonia in the laboratory,a mixture of ammonium chloride and calcium chloride id heated. The gas produced is passed through a tower containing calcium oxide before it is collected using up ward delivery method.

(a) (i) write the equation of the reaction that leads to the formation of ammonia ($1^1/_2$marks)

……

(ii) State why ammonia is passed into the tower packed with calcium oxide. ($^1/_2$mark)

……

(iii) Give a reason why ammonia is collected using upward delivery method. ($^1/_2$ mark)

……

(b) (i) Name one reagent that can be used to identify ammonia (1mark)

……..

(ii) State what would be observed if ammonia was treated with the reagent you have named in

(b) (i) above (1mark)

……
……

(b) Name the catalyst that is used in the oxidation of ammonia during the manufacture of nitric acid. (½ mark)

……

6. (a) hydrogen chloride can be prepared in from potassium chloride.

(i) Name another reagent that is used with potassium chloride to produce hydrogen chloride ($^1/_2$ mark)

……

(ii) Write an equation for the reaction leading to formation of hydrogen chloride ($1^1/_2$marks)

……
……

(b) Write an equation for the reaction between hydrogen chloride and

(i) Silver nitrate solution ($1^1/_2$marks)

……
……

(ii) iron in the presence of water ($1^1/_2$ marks)

……
……

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 (1mark)

……
……

(ii) write the structural formula of ethane (1mark)

……
……

(ii) name the reagent which is used as a dehydrating agent in the preparation of ethane (1mark)

……

(b)Bromine was added to ethene . Write equation for the reaction that took place (1mark).

……
……

(c) Under high temperature and pressure, ethene molecules can react with one another to form a big molecule Z.

(i) Name Z…….($^1/_2$mark)

(ii) state one use of Z…….($^1/_2$ mark)

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 electrolyzed using graphite electrodes.

(a) State the purpose of adding calcium chloride ($^1/_2$ mark)

……

……

(b) Write the equation for the reaction that takes place at the ;

(i) Anode ……..($1^1/_2$ marks)

(ii) Cathode……...($1^1/_2$marks)

(c) Bromine vapour was passed over heated sodium. Write an equation for the reaction that took place. ($1^1/_2$marks)

……

……

9. (a) hydrogen peroxide decomposes quite easily at room temperature.

(i) Write the equation for the reaction decomposition of hydrogen peroxide (1mark)

……

……

(ii) State two ways by which the decomposition can be made faster (2marks)

……

……

(b) Using the space below, on the same axes, sketch graphs of concentration of hydrogen peroxide verses time for the decomposition of the peroxide at

(i) room temperature (1mark)

(ii) one of the conditions you have stated in(a) (ii) (1mark)

10. (a) state the conditions under which sulphuric acid can react with

(i) Sucrose, $C_{12}H_{22}O_{11}$ ($^1/_2$mark)

……

(ii) Zinc oxide ($^1/_2$mark)

……

(b) Write equation for the reaction of sulphuric acid with

(i) Sucrose ($1^1/_2$ marks)

……

……

.

(ii) Zinc oxide ($1^1/_2$marks)

……
……

(c) State the property of sulphuric acid which is shown by its reaction with

(i) Sucrose ($^1/_2$mark)

……

(ii) Zinc oxide ($^1/_2$mark)

……

SECTIONB (30 MARKS)

Answer two questions from this section.

Addition question(s) Answered will not be marked.

11. (a) Describe how a pure sample of carbon dioxide can be prepared in the laboratory from calcium carbonate and write the equation for reaction that takes place.(Diagram not required) (7marks)

(b) Explain with th aid of equations the changes that take place when excess carbon dioxide is bubbled into sodium hydroxide solution. ($5^1/_2$marks)

(c) Potassium hydrogen carbonate decomposes when heated according to the following equation.

$2KHCO_3(s) \longrightarrow K_2CO_3(s) + H_2O\ (l) + CO_2\ (g)$

Calculate the mass of carbon dioxide evolved when 8g of Potassium hydrogen carbonate is heated strongly. (H=1, C=12, K =39) ($2^1/_2$marks)

12. (a) One of the ores from which iron is extracted is sparthic iron ore.

(i) write the formula of the iron compound that is in the ore. (1mark)

(ii) Describe how impure iron is extracted from sparthic iron ore (your answer should include equations) (7marks)

(b) Write equation(s) where possible and state the condition(s) for the reaction of iron with

(i) Water (4marks)

(ii) Chlorine ($2^1/_2$marks)

(c) State one use of iron ($^1/_2$mark)

13. (a) The element copper, zinc and sulphur react with oxygen to form their oxide. Write the formula of the oxide of each of the elements and state the type of the oxide whose formula you have written. (3marks)

(b) Hydrogen gas was passed separately over the heated oxide of copper and zinc

(i) State what was observed in each case and explain your observation (4marks)

(ii) Write equation for any reaction that took place ($1^1/_2$marks)

(c)Hydrogen gas was passed separately over the heated oxides of copper and zinc.

(i) State what was observed in each case and explain your observations (4marks)

(ii) Write equations for the reaction that took place ($1^1/_2$ marks)

(c) Excess dilute sodium hydroxide was added to a mixture of the oxide of zinc and copper. State what was observed and give areason for your observation. ($2^1/_2$marks)
(d) Amixture of the oxide of Zinc and copper was added to excess dilute sulphuric and warmed. State what was observed and write equations for the reaction(s) that took place. (4marks)

14. (a) (i) Write the equation for the complete combustion of ethanol (1mark)
(ii) Outline an experiment that can be carried out in the laboratory to determine the enthalpy of combustion of ethanol ($6^1/_2$ marks)
(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 = 1.0g cm^3, specific heat capacity of water = $4.2JgK^{-1}$) (2marks)
(c) The enthalpies of combustion $\triangle H_C$ of some hydrocarbons are shown in the table below.

Hydrogen	CH_4	C_2H_6	C_3H_8	C_4H_{10}	C_6H_{14}
$\triangle H_C$	890	1560	2220	2880	4160

(i) Plot a graph of enthalpy of combustion (vertical axis) against number of carbon atoms in the hydrocarbons (horizontal axis) (3marks)
(ii) State from the graph you have plotted in (c) (i), the enthalpy of combustion of C_5H_{12} (½ mark)
(iii) Determine the slope of the graph that you have drawn (1mark)
(iv) Using your slope and the intercept, calculate the enthalpy of combustion of the hydrocarbon, C_7H_{16} (1mark)

CHEMISTRY

PAPER 1

1. The formula of the sulphate of element M is M_2SO_4 . The value of n in the formula M^{n+} is likely to be
   A. 2 B. 3 C. 0 D. 1

2. Which on the following mixtures of gases is explosive?
   A. Methane and hydrogen
   B. Hydrogen and oxygen
   C. Oxygen and methane
   D. Nitrogen and hydrogen

3. Which one of the following substances is formed when ethene completely burns in oxygen?

A. Soot and water B. Carbon monoxide and water
C. Carbon dioxide and water D. Carbon dioxide and soot

4. Copper(II) chloride solution reacts with sodium carbonate solution according to the ionic equation: $Cu^{2+}(aq) + CO_3^{2-}(aq) \longrightarrow CuCO_3(s)$
The mass of Copper(II) precipitated when $20cm^3$ a solution containing 5.3g of sodium carbonate n $500cm^3$ if solution is reacted completely with the copper(II)chloride is given by the expression.
(Cu=64, Cl=35.5, O=16, Na=23, C=12)

A. $\left(\frac{5.3 \times 20 \times 124}{106 \times 1000}\right)$ g
B. $\left(\frac{5.3 \times 20 \times 500}{106 \times 1000}\right)$ g
C. $\left(\frac{20 \times 106 \times 124}{20 \times 106}\right)$ g
D. $\left(\frac{20 \times 124 \times 5.3}{500 \times 5.3}\right)$ g

5. The reactivity of the element M, Magnesium and N is M, Mg, N. Which one of the following statements is true?
   A. $N(s) + M^{n+}(aq) \not\rightarrow N^{2+}(aq) + M(s)$
   B. Magnesium and N react with cold water
   C. Magnesium and N react with steam
   D. Magnesium and M react with steam

6. The reaction between concentrated sulpuric acid and glucose is described as
   A. A dehydration reaction B. An oxidation reaction
   C. A displacement reaction D. A neutralization reaction

7. Which one of the following mixtures can be separated by applying heat to the mixture?
   A. Iodine and sand B. sugar and sand
   C. Sand and Iron fillings D. Sulphur and iron feelings

8. Which one of the following contains the same number of moles of ammonium ions as a solution containing 1.32g of ammonium sulphate in $100cm^3$ of solution. [N=14, H=1, S=32,O=16]
   A. 10 cm^3 of 0.1M ammonium nitrate
   B. 20 cm^3 of 0.1M ammonium nitrate
   C. A solution containing 0.8g ammonium chloride per 100 cm^3.
   D. A solution containing 0.107g ammonium chloride per 100 cm^3.

9. What will be the molar heat of combustion of graphite if 1.2g of graphite yielded 39.4kJ of heat?

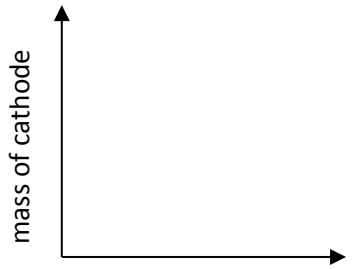
A. 394 $kJmol^{-1}$ B. -3.94 $kJmol^{-1}$

C. + 3.94 $kJmol^{-1}$ D. + 394 $kJmol^{-1}$

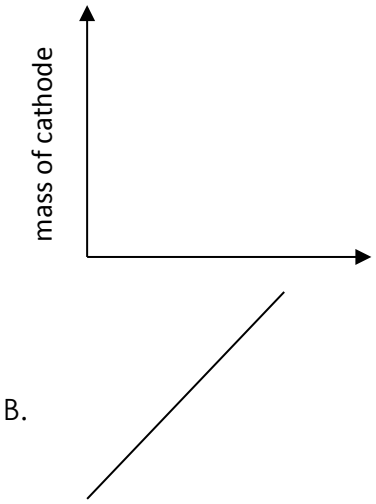
10. Which one of the following pairs of substances dissolves in water evolving heat?
    A. Sulphuric acid and sodium hydroxide.
    B. Ammonia and Sulpuric acid
    C. Sodium hydroxide and Ammonia
    D. Ammonia and hydrochloric acid

11. Which one of the following graphs describes the change in mass of the cathode during the electrolysis of copper(II) sulphate solution using copper electrodes.

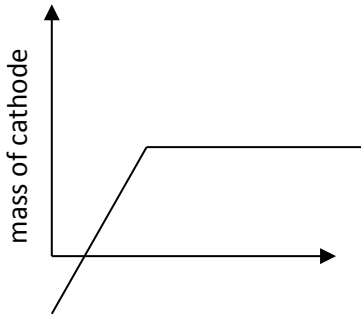
A.



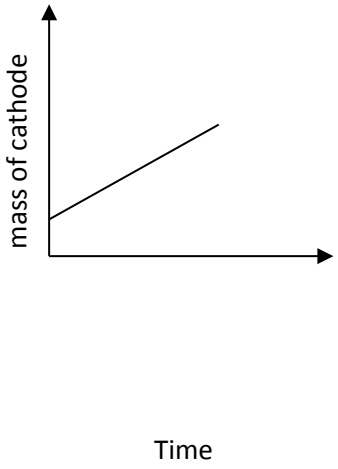
B.



C.



D.



Time

12. Complete combustion of a hydrocarbon X yielded 8.8g of carbon dioxide and 3.6g of water. The mass of X burnt was
A. 2.8g B. 1.4g C. 3.6g D. 8.8g

13. Which one of the following reagents is used to test for gases?
A. Silver nitrate solution C. Potassium dichromate solution
B. Barium chloride solution D. Hydrogen chloride solution

1. The substance that does not cause air pollution is:-
A. Carbondioxide C. Hydrogen Sulphide
B. Sulphurdioxide D. Water vapour

2. Which one of the following is not a property of ammonia?
A. An alkaline gas C. Soluble in water
B. A reducing agent D. Denser than air

3. Which one of the following structures has a giant ionic structure?
A. Sodium chloride C. Hydrogen chloride
B. Carbondioxide D. Diamond

4. During vulcanicity of rubber, Sulphur is added to:-
A. Lower melting point of Sulphur
B. From strong elastic bonds with carbon atoms
C. Make rubber pure
D. Make rubber appear better

5. The metal which can be extracted from its ore only by electrolysis is:-
A. Zinc B. Copper C. Iron D. Magnesium

6. 5.3KJ of heat energy are required to vapourize 13g of a liquid X if molar mass 78. The molar heat of vaporization of X in $kJmol^{-1}$ is:-
A. $\frac{5.3 \times 78}{13}$ B) $\frac{13 \times 78}{5.3}$ C) $13 \times 5.3 \times 78$ D) $\frac{5.3 \times 13}{78}$

7. The rate of the chemical reaction between magnesium and dilute hydrochloric acid can be determined by measuring the
A. Concentration of hydrogen produced

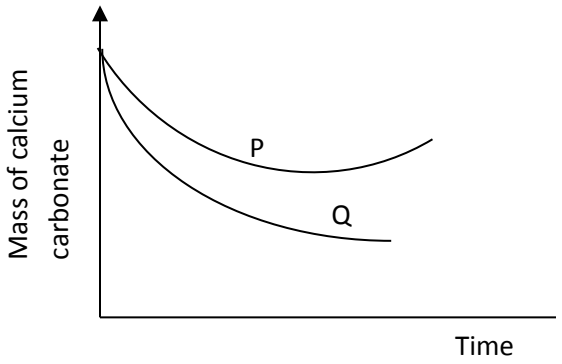
B. Temperature of hydrogen produced
C. Volume of hydrogen produced
D. Pressure of hydrogen produced

8. Carbonmonoxide reacts with hydrogen according to the equation:-
$CO(g) + 2H_2(g) \longrightarrow CH_3OH(l) \quad \Delta H = 91kJ$
What mass of Carbonmonoxide would cause a heat change of +82kJ? (C=12, O=16)
A. 2g B. 28g C. 56g D. 273g

9. The equations below show reactions between elements X, Y and Z.
i) $Z(s) + X^{2+}(aq) \longrightarrow Z^{2+}(aq) + X(s)$
ii) $Y(s) + Z^{2+}(aq) \longrightarrow Y^{2+}(aq) + Z(s)$
The order of reactivity of the elements starting with the least reactive is

A. X,Z,Y B.Y,X,Z C. Y,Z,X D.Z,Y,X

10. Curve P in the graph below shows the variation in mass of calcium carbonate powder with time when it is reacted with excess hydrochloric acid at room temperature.



To obtain curve Q, one would keep all the conditions the same except;

A. Increase the concentration of the acid
B. Increase the mass of the carbonate powder
C. Reduce the temperature
D. Use the same mass of marble chips

11. Which one of the following gases can cause greenhouse effect?
A. Nitrogen B. Oxygen C. Carbonmonoxide D. Carbondioxide

12. One of the following substances reacts with ammonium Sulphate to form a white precipitate.
    A. Silver nitrate
    B. Sodium Hydroxide
    C. Hydrochloric acid
    D. Barium Chloride

13. A white solid R was kept in an open container. After some days, the solid became liquid R is likely to be
    A. Calcium oxide
    B. Magnesium hydroxide
    C. Fused calcium chloride
    D. Sodium carbonate crystals

14. Which one of the following substances is an example of an allotropic element?
    A. Copper B. Bronze C. Sulphur D. Solder

15. The solubility of copper (II) Sulphate at 30^0c is 25g per 100g of water. The mass of copper (II) Sulphate that would crystallize in a solution containing
    A. 12.5g B. 25.0g C. 50.0g D. 75.0g

16. Sulphurdioxide reacts with oxygen to form sulphur trioxide according to the equation

$$SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) + heat$$

    Which one of the following conditions favour the formation of Sulphur trioxide?
    A. Low pressure and low temperature
    B. High pressure and high temperature
    C. Low pressure and high temperature
    D. High pressure and low temperature

17. Which one of the following contains the same number of atoms as 8g of Sulphur? (C= 12, S= 32, Ca=40)
    A. 20g calcium
    B. 10g Calcium
    C. 12g Carbon
    D. 4g Carbon

18. Which one of the following acids decomposes when heated?
    A. Carbonic acid
    B. Nitric acid
    C. Hydrochloric acid
    D. Sulphuric acid

19. Chlorine gas was bubbled into water the mixture exposed to sunlight. The observation made was
    A. Bubbles of a colorless gas
    B. Greenish- yellow solution was formed.
    C. Bubbles of a colorless gas which fumes in moist air.
    D. A solution which turns red litmus blue

20. When a mixture of sodium hydroxide and solution X is warmed, a colourless gas is evolved. X contains

A. NH_4^+ B. Al^{3+} C. Zn^{2+} D. Pb^{2+}

21. What volume of 0.1M potassium iodide will precipitate 4.62g of lead iodide when added to lead nitrate solution? [Pb=208, I=127]

$$Pb(NO_3)_2(aq) + 2KI(aq) \longrightarrow PbI_2(s) + 2KNO_3(aq)$$

A. 15cm^3 B. 100cm^3 C. 200cm^3 D. 50cm^3

22. Dilute sodium hydroxide was electrolyzed using graphite electrodes. The product formed at the positive electrode was:-
A. Sodium C. Oxygen
B. Hydrogen D. Oxygen and Hydrogen

23. When sodium hydroxide solution was added to an aqueous solution X, a white precipitate soluble in excess sodium hydroxide was formed. When ammonia solution was added, there was no observable change. The likely cations in X are:-
A. Ca^{2+}, Ba^{2+}, Al^{3+} B. Al^{3+}, Pb^{2+}, Zn^{2+}
C. Al^{3+}, Pb^{2+} D. Mg^{2+}, Al^{3+} , Pb^{2+}

24. A mixture of solid Z and concentrated sulphuric acid evolved a colourless gas which furmed in moist air. Z is likely to be:-
A. Carbonate C. Sulphite
B. Sulphate D. Chloride

25. Which one of the following is utilized when separating a mixture of sodium carbonate and sodium hydrogen carbonate?
A. Difference in boiling points B. Difference in solubility
C. Difference in molecular mass D. Difference in melting point

26. Which one of the following reactions is a neutralization reaction.
A. $MgO(s) + HCl(aq) \longrightarrow MgCl(aq) + H_2O(l)$
B. $Mg(s) + 2HCl(aq) \longrightarrow MgCl_2(aq) + H_2(g)$
C. $CuSO_4(aq) + 2NaOH(aq) \longrightarrow Cu(O)_2(s) + Na_2SO_4(aq)$
D. $H_2(g) + Cl_2(g) \longrightarrow 2HCl(g)$

27. Ammonia reacts with Copper (II) Oxide according to the following equation.

$$2NH_3(g) + 3CuO(s) \longrightarrow 3H_2O(l) + N_2(g) + 3Cu(s)$$

The volume of ammonia at s.t.p that will react with 6.0g of copper (II) oxide is; [H=1, N=14, O=16, Cu=64; 1 mole of gas occupies 22.4dm^3 at s.t.p]
A. 3.3dm^3 B. 2.52dm^3 C. 1.68dm^3 D. 1.12dm^3

Each of the questions 41 to 50 consists of an assertion (statement) on the left hand side and a reason on the right hand side.
Select

A. If both the assertion and the reason are true statements and reason is a correct explanation of the assertion.

B. If both the assertion and the reason are true statements but reason is not a correct explanation of the assertion.

C. If the assertion is true but the reason is not a correct statement.

D. If the assertion is not correct but the reason is a correct statement.

Summary of Instructions

Assertion	Reason
A. True	True (Reason is a correct explanation)
B. True	True (Reason is not a correct explanation)
C. True	Incorrect
D. Incorrect	Correct

28. Electrolysis of bromine using graphite electrodes yields chlorine at the positive electrode **Because** Chloride ions are discharged at the positive electrode

29. The same volume of hydrogen gas is evolved when equal volumes of 2m hydrochloric acid and 1m sulphuric acid are reacted with the same mass of magnesiu **Because** Both hydrochloric acid and sulphuric acid are strong acids

30. Iron is extracted from its ore by heating with coke **Because** Carbon is a stronger reducing agent than iron

31. When hydrogen chloride gas is bubbled into potassium iodide solution, a brown solution is formed. **Because** Chlorine displaces Iodine from its aqueous solution

32. When a piece of phosphorous is lowered into a jar of chlorine, white fumes are observed. **Because** Hydrogen chloride is formed during the reaction

In each of the questions 40 to 45, one or more answers given may be correct. Indicate the correct answer A, B, C or D according to the following.

A) if 1,2 3 only are correct

B) if 1, 3 only are correct

C) if 2,4 only are correct

D) if 4 only is correct

INSTRUCTIONS SUMMARIZED

A	B	C	D
1,2,3 only correct	1,3 only correct	2,4 only correct	4 only correct

33. Which of the following anions will be precipitated when Barium nitrate is added to a solution containing ions?
    1. SO_4^{2-}
    2. Cl^-
    3. CO_3^{2-}
    4. O^{2-}
34. Chlorine gas was bubbled through a cold solution of sodium hydroxide. The resultant solution contained
    1. OCl^{-1}
    2. Cl^-
    3. Na^+
    4. ClO_3^- and OH^-

35. Which of the following is/ are true about electroplating Iron with silver?
    1. Silver nitrate solution is used as electrolyte
    2. Silver is made the anode
    3. Iron is made the cathode
    4. Iron (II) Sulphate solution is used as electrolyte

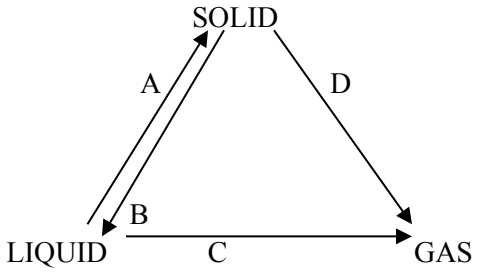
36. Descending down the group of the periodic table,
    1. Atomic number increases
    2. Number of shells increases
    3. Ionic radius increases
    4. Non- metallic character increases

37. The following is/ are correct about polythene
    1. It is a thermo softening plastic
    2. It is a thermo setting plastic
    3. It is hydrocarbon
    4. It conducts heat and electricity

Chemistry paper 2

SECTION A (50 Marks)

1. The following diagram shows the three states of matter and how they can be interchanged.



i. Name the changes A to D. ***(04 marks)***

A: ……

B: ……..

C: …….

D: ……..

ii. Name any substance which can undergo change D. ***(01 mark)***

……

2. The number of protons and neutrons in atoms K, A, B and S are shown in the table below.

Atom	Protons	Neutrons
K	1	0
A	8	9
B	13	15
S	8	8

a. (i) Which atoms are isotopes of an element? Give a reason for your answer. ***(01 mark)***

.....

.....

(ii) Write electronic configuration of B. ***(01 mark)***

.....

b. What type of bonding exists in the compound formed when A reacts with K? ***(01 mark)***

.....

c. The compound formed between in (b) above combines with K^+ ion.

(i) State whether the product would be a cation, anion or neutral molecule. ***(01 mark)***

.....

(ii) What type of bond occurs in (c) (i)? ***(01 mark)***

.....

3. The table below indicates the periods and groups of part of the period table. The letters are not the usual symbols of the elements.

A						B		
	C							
							D	
E							F	

a. Sate the type of bonding in a compound formed when E reacts with F. ***(01 mark)***

.....

b. Write the formula of the compound formed when B reacts with D. ***(01 mark)***

.....

c. Which of the elements reacts most vigorously with

(i) Cold water. ***(01 mark)***

.....

(ii) Heated zinc. ***(01 mark)***

.....

d. Write the formula of the ion formed from C. ***(01 mark)***

.....

4. What is meant by the following terms? ***(05 marks)***

i. Amphoteric oxide

.....

.....

ii. Acidic oxide.

.....

.....

iii. Neutral oxide.

.....

.....

iv. Basic oxide.

.....

.....

v. Electrochemical series.

.....

.....

5. a) State the approximate percentage of oxygen in the atmosphere. ***(01 mark)***

.....

b) Name the process by which oxygen is

i) Used up from the atmosphere. ***(01 mark)***

.....

ii) Replaced in the atmosphere. ***(01 mark)***

.....

c) State what would be observed if a piece of burning phosphorus is lowered into a jar of oxygen? ***(01 mark)***

.....

.....

ii) Write the equation for the reaction. ***(01 mark)***

.....

6. Write the formula of ions present in the following compounds. ***(05 marks)***

i) Sodium chlorate.

.....

ii) Barium peroxide.

.....

iii) Calcium phosphate.

.....

iv) Iron (II) sulphide.

.....

v) Copper (II) sulphate.

.....

7. Write equation only to show the reaction that would take place if each of the following was strongly heated in air.
   a) KNO_3. ***(1½ marks)***

   .....

   .....

   b) $FeCO_3$. ***(1½ marks)***

   .....

   .....

   c) $Na_2CO_3 \cdot 10H_2O$. ***(01 mark)***

   .....

   .....

   d) HgO. ***(01 mark)***

   .....

   .....

8. (a) Oxygen can be prepared using sodium peroxide and water.
   i) Write an equation for the reaction between sodium peroxide and water. ***(1½ marks)***

   .....

   .....

   ii) Name one other substance from which oxygen can be prepared in the laboratory. ***(01 mark)***

   .....

   (b) (i) State the condition(s) under which oxygen can react with iron. ***(01 mark)***

   .....

   .....

   (ii) Write an equation for the reaction that takes place when iron is treated with oxygen under the condition(s) you have stated in b(i). ***(1½ marks)***

   .....

   .....

9. Calculate the number of hydroxide ions contained in 34g of the hydroxide. ***(05 marks)***
   .....

.....

.....

.....

.....

.....

.....

.....

.....

.....

10. Calculate the percentage composition of each element in ammonium nitrate. ***(05 marks)***

.....

.....

.....

.....

.....

SECTION B (30 marks)

*(All questions carry equal marks. Answer **only two** questions in this section)*

11. (a) (i) Name the three fundamental particles in an atom. ***(1½marks)***

(ii) With the aid of a labelled diagram, describe how the three particles are located in an atom. ***(04 marks)***

(b) The full symbol of the atom of an element is $^{32}_{16}Q$. State what the numbers 16 and 32 stand for? ***(02 marks)***

(c) If the full symbol of another atom is $^{34}_{16}R$. State the;

(i) Similarity and the difference between the atoms Q and R. ***(01 mark)***

(ii) Name given to the atoms Q and R. ***(01 mark)***

(d) The atomic numbers of elements W, X and Y are 6, 12 and 17 respectively.

(i) Write the electronic configurations of W, X and Y. ***(1½ marks)***

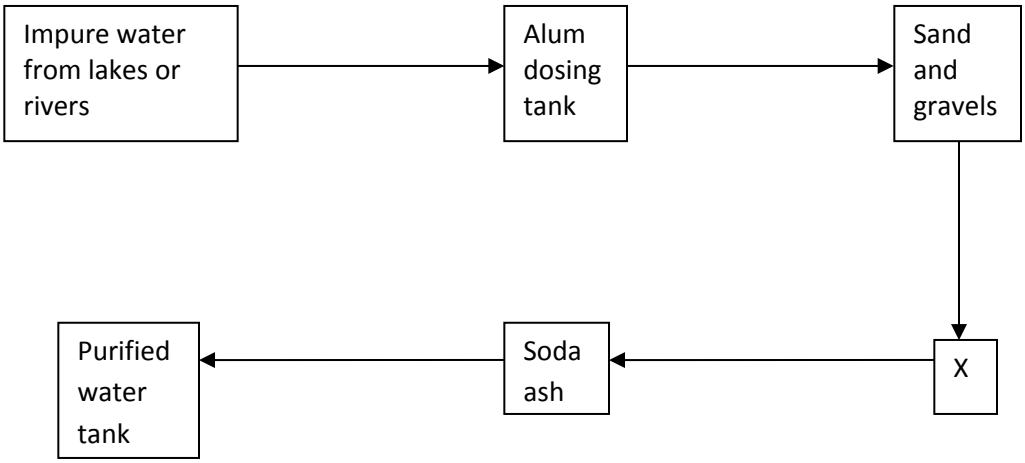
(ii) Using the outermost shell electrons only, draw a diagram to show how W and Y form a compound. (01 mark)

(iii) State the type of bond formed between X and Y; W and Y. ***(02 marks)***

(iv) Identify the element that exists as a diatomic molecule. ***(01 mark)***

12. Oxygen can be prepared from hydrogen peroxide in the presence of a catalyst only.
    (a) (i) Name the catalyst used. ***(01 mark)***
    (ii) With aid of diagram, describe how a dry sample of the gas can be prepared in the laboratory. ***(05½marks)***
    (iii) Write the equation for the equation for the formation of oxygen. ***(01½ marks)***
    (b) Sodium was burnt in plentiful of the gas above in (a)(ii)
    (i) State what was observed ***(02 marks)***
    (ii) Write the equation for the reaction ***(1½ marks)***
    (c) The product formed in was dissolved in water.
    (i) Write the equation for the reaction that occurred. ***(1½ marks)***
    (ii) State what was observed.***(02 marks)***

13. (a) What is meant by the term **hard water**? ***(01 mark)***
    (b) State two advantages and disadvantages of hard water. ***(04 marks)***
    (c) State two types of hardness in water. ***(01 mark)***
    (d) The flow diagram below shows the general scheme used in water purification



    (i) State the purpose of the alum dosing and the sand and gravels. ***(02 marks)***
    (ii) Identify X and state its purpose. ***(02 marks)***
    (iii)State the role of soda ash. ***(02 marks)***
    (iv)Write equations to show the role of soda ash. ***(03 marks)***

14. (a) (i) Describe how you would obtain a sample of sugar crystals from sugar cane. ***(7½ marks)***
    (ii) State two uses of sugar in the world of the sick. ***(02 marks)***
    (b) Concentrated sulphuric acid was added to sugar.
    (i) What was observed? ***(½ mark)***
    (c) Name one process by which the following components of mixtures can be separated. ***(01 mark each)***
    (i) Pigments of a green leaf.
    (ii) Water and ethanol
    (iii) Iodine and potassium chloride
    (iv) Copper (II) sulphate and sand.
    (v) Brine.

1. A crystal of potassium manganate(VII) was placed at bottom of the water in the dish then allowed to stand. State what was observed; (02marks)

……

……

(a) .Name the process that occurred. (01mark)

……..

(b) .State what the experiment above demonstrates. (01mark)

……

(c).State one other evidences to back up the above observation. (01mark)

……

2. Complete the table by stating one method by which components of the mixtures described can be separated; (05marks)

Components in mixture	**Method of separation;**
(a) Two immiscible liquids	
(b) Pigments in a leaf	
(c) Two miscible liquids	
(d) A soluble salt and a solvent.	
(e) Two soluble salts with different solubilities	

3.(a).(i).Name the substance which can be reacted with sodium sulphite to produce Sulphur dioxide gas in the laboratory ($0^1/_2$mark)

……

(ii).State the conditions under which reaction takes place. (01mark)

……

……

……..

(iii).Write an ionic equation of reaction leading to the formation of sulphur dioxide gas above ($01^1/_2$marks)

……

……..

(b).(i).Name the reagent that can be used to test for sulphur dioxide gas.($0^1/_2$ marks)

……..

(ii).State what would be observed if sulphur dioxide gas was reacted with the reagent you have named in (b) (ii) above. (01mark)

……

……

(c).Sulphur dioxide gas was passed into a dish containing a moist red flower.

(i).State what was observed? ($0^1/_2$marks)

……

(ii).Give a reason for your explanation. ($0^1/_2$marks)

……

……

(d).State any one industrial use of sulphur dioxide gas ($0^1/_2$marks)

……

4. The numbers of protons, neutrons and electrons of some particles (ions and atoms) A, B, C, D, E and F are shown in the table below. Sturdy it and answer questions that follow.

Particle	Protons	Neutrons	Electrons
A	17	18	17
B	12	12	10
C	16	16	18
D	15	16	18
E	11	12	10
F	17	20	17

a).Identify which of the above particle (s) is (are); (02 marks)

(i).Cation (s)

……..……..

(ii).Anion (s)

……

b).(i) .State two particles which are atoms of the same elements (01mark)

……

……

(ii).Give a reason for your answer in (b) (i) above. (0½ marks)

……

……

(iii).Write down the formula of the compound when particle B is combined with particle F. . (0½ marks)

……

(iv).State the type of bond formed when particle B combines with particle F. (0½ mark)

……

5.(a).Name the two substances from which ammonia gas can be prepared in the laboratory. (01mark)

……

……..

(b) (i).Write equation of reaction leading to the formation of ammonia gas in the laboratory; ($01^1/_2$marks)

……

……..

(ii).State the condition of above reaction. ($0^1/_2$marks)

……

(iii).Name the substance that can be used to dry ammonia gas. ($0^1/_2$marks)

……

c).Ammonia gas was passed over heated copper (II) oxide

(i).State what was observed (01mark)

……

……

(ii).Write equation for the reaction that took place ($01^1/_2$marks)

……

(d).State one industrial use of ammonia gas ($0^1/_2$marks)

……

6.(a).In its crude form, natural rubber is soft and sticky.

(i).Name the process by which the mentioned properties of natural rubber are improved. ($0^1/_2$marks)

……

(ii).State how the mentioned properties of natural rubber are improved. (01mark)

……

……

(b).(i).State two reasons why the process named in (a)(i) is carried out. (01mark)

……

……

(ii).State the uses of the product formed after the process in (a) (i) above. (01mark)

……

……

7.(a)4.0g of a mixture of iron and silver was reacted with excess dilute sulphuric acid. 900 cm^3 of hydrogen gas was given off, measured at s.t.p.

(a). write equation of reaction. (01½ marks)

……

……

(b). Calculate the percentage of silver in the mixture. (05 marks)

……

……

……

……

……

……

……

8.(a).When nitrate of a metal X was strongly heated, brown fumes were observed together with a solid residue which was yellow when hot and white when cooled

(i).Identify **X.** ($0^1/_2$marks)

……

(ii).Write formula of nitrate of metal **X.** ($0^1/_2$marks)

……

(iii).Write equation leading that took place ($01^1/_2$marks)

……

(b).(i).The residue from (a) was heated with dilute sulphuric acid. Write equation for the reaction that took place. ($01^1/_2$marks)

……

……

(ii).To the product in (b) dilute ammonia solution was added drop wise until there was no further changes, state what was observed; ($01^1/_2$marks)

……

……

9.When solid potassium nitrate was strongly heated in a test tube, it gives off a colourless gas **X**.

(a) (i) Identify gas **X.** ($0^1/_2$marks)

……

(ii).Write equation of reaction leading to the formation of gas **X.** (01mark))

……

(b).Write equation of reaction for the reaction between gas **X** and

(i).Ammonia in the presence of heated platinum. (01mark)

……

……

(ii).Nitrogen monoxide. (01mark)

……

……

c).State how the product formed in (b) (ii) can be converted to nitric acid. ($01^1/_2$marks)

……

……

……

……

d).State one industrial use of nitric acid. ($0^1/_2$ marks)

……

……..

10.(a).Define enthalpy of combustion. (01mark)

……

……

……..

(b).When 2.24g of methanol was bunt in excess air, the heat produced raised the temperature of 50g of water from 25.3^{o}c to 45.3^{o}c.

(i).Write equation for the complete combustion of methanol in excess air ($01^1/_2$marks)

……

……

……

(ii).Calculate the enthalpy heat of combustion of methanol in joules per mole;

[Specific heat capacity of water C = 4.2J/g/K, density of water = 1.0/cm^3, H= 1, O = 18]

……

……

……

……

……

SECTION B.(30 Marks)

Attempt any two questions

11.(a).When hydrogen peroxide solution was added to a black oxide Z in the flask, oxygen gas was evolved, which was then collected over water.

(i).Identify **Z** ($0^1/_2$marks)

(ii).Write equation of reaction that took place. (01mark)

(iii).State the role of the black oxide Z in the preparation of oxygen gas. (01mark)

(b).(i).Draw a well labeled diagram of the setup of apparatus that was used to prepare oxygen gas in (a) above. (03marks)

(ii).Give a reason for the method of collection of oxygen gas used above. ($0^1/_2$marks)

(c).Describe an experiment to determine the percentage of oxygen gas in air and Show how the percentage of oxygen can be calculated from the results. ($05^1/_2$marks)

(d).A piece of burning sodium was lowered into a gas jar full of oxygen gas.

(i).Write the formula of the product formed. ($0^1/_2$marks)

(ii).Water was added to the resultant product formed above; state what was observed and write the equation of reaction that took place ($02^1/_2$marks)

(iii).State any one industrial use of oxygen gas;

12. Explain the following observations; write equation (s) of reaction(s) where necessary.

(a).When excess ammonia solution is added to a solution containing copper (II) ions, a pale blue precipitate is formed, which then dissolves later readily forming a deep blue solution. (04marks)

(b).Carbon dioxide gas cannot be prepared satisfactorily in the laboratory using dilute Sulphuric acid with calcium carbonate. (03marks)

(c).An aqueous solution of sodium chloride conducts electric current, but in solid state, it does not. (02 marks)

(d).When red flowers were dropped into a gas jar containing chlorine gas, the flowers turned white. (04marks)

(e).Nitrogen monoxide gas is a colorless gas, but when exposed to air, brown fumes are formed. (02marks)

13. (a) what is a salt.

(b).Below is a table containing three salts and their ways of preparation

Salt	Preparation
Lead(II) carbonate	By reacting lead(II) nitrate solution and sodium carbonate solution
Iron (II) sulphide	By strongly heating a mixture of iron powder and sulphur powder
Sodium sulphate	By reacting sodium hydroxide solution and dilute sulphuric acid

(b).State the general method used in the preparation of; (01$^1/_2$marks)

(i).Lead (II) carbonate.

(ii).Iron (II) sulphide.

(iii).Sodium sulphate.

(c).Write the;

(i).Ionic equation leading to the formation of lead(II) carbonate salt. (01mark)

(ii).Equation leading to the formation of iron (II) sulphide. (01mark)

(iii).Equation leading to the formation of sodium sulphate. (01mark)

(d).A mixture of lead (II) carbonate and sodium sulphate was shaken with excess water, then flittered identify.

(i).The cation in the residue. (0$^1/_2$mark)

(ii).The anion in the filtrate. (0$^1/_2$marks)

(iii).The anion in the residue. (0$^1/_2$marks)

(e).(i).Name the reagent (s) that can be used to test the anion in the filtrate, state what is observed when the reagent(s) are used to test the anion in the filtrate and write the ionic equation of reaction that would take place. (03marks)

(ii).Dilute nitric acid was added to the portion of residue formed in (d) above. State what was observed and write the equation of reaction that took place. (01$^1/_2$marks)

(iii).State the application of the reaction in (ii) above in the qualitative. (0$^1/_2$marks)

(iv).Few drops of dilute sulphuric acid and aqueous potassium iodide solution were separately added to 2cm^3 of the resultant solution formed in (e) (ii) above; State

what was observed in each case, and write the ionic equation of reaction that took place in each case. (03marks)

14.(a).Define water pollution. (02 marks)

(b).One of the substances that cause water pollution is sewage. Sewage is a mixture effluent and sludge.

(i).State the difference between effluent and sludge. (01mark)

(ii). State any two uses of sludge. (01mark)

(c). (i).Name any other two substances that cause water pollution.(01mark)

(ii). Describe how each of the substances named in (c) (i) above can cause was pollution (02marks)

(d). Describe the process of treatment and purification of polluted water ($04^1/_2$marks)

(e).State the condition (s) of reaction(s) and write the equation(s) of reaction that would take place when water reacts with each of the following metals.

(i).Sodium. ($01^1/_2$marks)

(ii).Iron fillings. (02marks)

CHEMISTRY

Paper 1

1. The nuclear composition of four atoms W,X,Y and Z are shown in the table below

Atom	W	X	Y	Z

Number of protons + Neutrons	12	23	14	24
Number of neutrons	6	11	6	12

Which of these atoms are isotopes?

A: W and Y B: W and Z
C: X and Z D: Z and Y

2. The reagent most suitable to differentiate between Zn^{2+} and Mg^{2+} is:

A: Sodium carbonate solution B: Potassium iodide solution
C: Sodium hydroxide solution D: Ammonia solution

3. Which of the following substances leaves no residue when heated in excess air?

A: Phosphorus B: Lead (II) sulphate
C: Magnesium D: Calcium carbonate

4. The volume of 2g of each of Methane CH_4, ethane C_2H_6, Propane C_3H_8 and butane C_4H_{10} was measured at room temperature. Which of the volumes is that of methane?

A: 828 cm^3 B: 1,091 cm^3
C: 1,600 cm^3 C: 3,000 cm^3

5. Which of the following will result in the oxidation of halide ions?

A: Iodide added to hydrochloric acid
B: Chloride added to aqueous hydrogen iodide
C: Bromine added to aqueous sodium chloride
D: Chlorine added to aqueous sodium chloride

6. A solution contains 34.2g of anhydrous aluminum sulphate, $Al_2 (SO_4)_3$ in one litre. The concentration of Sulphate ions in moles per litre is: [$Al_2 (SO_4)_3$ = 342]

A: 0.1 B: 0.15 C: 0.3 D: 3

7. The diagram in figure 1 represents a cell diagram. If the two electrodes in the cell diagram were joined by a conducting wire, which of the following changes would take place?

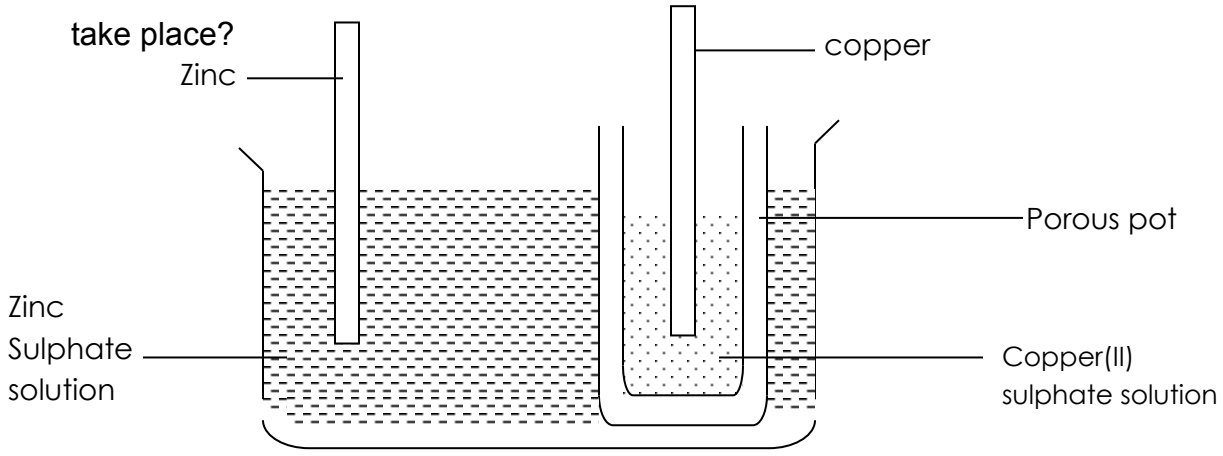


Fig. 1

A: $Cu^{2+}_{(aq)} + 2e \longrightarrow Cu_{(s)}$ only
B: $Zn_{(s)} \longrightarrow Zn^{2+}_{(aq)} + 2e$ only
C: Both $Cu^{2+}_{(aq)} + 2e \longrightarrow Cu_{(s)}$ and $Zn^{2+}_{(aq)} + 2e \longrightarrow Zn_{(s)}$
D: Both $Cu^{2+}_{(aq)} + 2e \longrightarrow Cu_{(s)}$ and $Zn_{(s)} \longrightarrow Zn^{2+}_{(aq)} + 2e$

8. Which of the following metals forms Hydroxide which is insoluble in water but soluble in both aqueous sulphuric acid and aqueous sodium hydroxide?

A: Magnesium B: Aluminium
C: Calcium D: Copper

9. Which of the following statements is correct about electrolysis of dilute sulphuric acid?

A: Hydrogen is liberated at the anode
B: Sulphate ion is discharged at the cathode
C: Acidity decreases at the cathode
D: Alkanity decreases at the cathode

10. Hydrogen gas burns in chlorine to form misty fumes. The misty fumes are?

A: Smoke from the burning Hydrogen
B: Droplets of hydrochloric acid
C: Chlorine water formed
D: Water droplets

11. Copper (II) carbonate is heated strongly in a test tube. State what is observed.

A: A colourless gas is evolved
B: The blue solid turns to black
C: The green solid turns to black
D: lime water turns milky

12. 25cm^3 of 0.2 M potassium hydroxide solution was found to react completely with 0.2 M Sulphuric acid. The volume of sulphuric acid used is:

A: $\frac{0.2 \times 25}{0.4} cm^3$ B: $\frac{0.2 \times 0.4}{25} cm^3$

C: $\frac{25 \times 0.4}{0.2} cm^3$ D: $\frac{25}{0.2 \times 0.4} cm^3$

13. What is finally observed when excess Carbon dioxide gas is passed through calcium hydroxide solution?

A: Colourless solution B: White solution
C: White precipitate D: White solid

14. Thermoplastics are plastics that are:

A: Hardened by heating
B: softened by heating
C: not affected by heating
D: Decompose on heating and can't be remoulded.

15. Which one of the following gases dissolves in water to form neutral solution?

A: Nitrogendioxide B: Carbonmonoxide
C: Carbondioxide C: Sulphurdioxide

16. On heating 16.0g of hydrated copper (II) sulphate, $CuSO_4$. A H_2O,10.20g of anhydrous salt remained. The formula of the hydrated salt is:

A: $CuSO_4.2H_2O$ B: $CuSO_4.3H_2O$
C: $CuSO_4.4H_2O$ D: $CuSO_4.5H_2O$

17. Which one of the following groups consists only of compounds?

A: Cl_2, H_2, H_2O B: H_2S, HCl, H_2O

C: H_2S, HCl, S_8 D: Cl_2, S_8, H_2

18. 0.1 M hydrochloric acid reacts with excess iron fillings at room temperature according to the equation

$2HCl_{(aq)} + Fe_{(s)} \longrightarrow FeCl_{2(aq)} + H_{2(g)}$.

The volume of 0.1M hydrochloric acid required to produce 120cm^3 of hydrogen is:

A: 50 cm^3 B: 5 cm^3

C: 10 cm^3 D: 100 cm^3

19. The gas produced when concentrated nitric acid is heated with sulphur is:

A: Sulphur dioxide
B: Sulphur trioxide
C: Nitrogen dioxide
D: Hydrogen sulphide

20. Which of the following substances will undergo a physical change when strongly heated?

A: lead (II) nitrate B: Sodium carbonate

C: Copper (II) hydroxide D: Sodium nitrate

21. Metallic bond is formed when a:

A: Metal loses electrons which are gained by non-metals
B: metal gains electrons
C: metal loses its mobile electrons
D: metal loses its valence electrons

22. Which of the following is not a redox reaction?

A: $2H_{2(g)} + O_{2\,(g)} \longrightarrow 2H_2O_{\,(1)}$

B: $Fe_2O_3\,(S) + 3CO_{\,(g)} \longrightarrow 2Fe_{(s)} + 3CO_{2\,(g)}$

C: $Zn_{(s)} + CuSO_{4\,(aq)} \longrightarrow ZnSO_{4\,(aq)} + Cu_{\,(s)}$

D: $CuO_{(S)} + H2_{\,(g)} \longrightarrow Cu_{(s)} + H_2O_{\,(1)}$

23. Ethane burns in oxygen according to the equation;

$C_2H_{6(g)} + 3\ ½\ O_{2(g)} \longrightarrow 2CO_{2\,(g)} + 3H_2O_{\,(1)}$, ΔH= -1560kJ mol^{-1}.

The heat evolved when 1,200 cm^3 of ethane is burnt at room temperature is

A: -1872J B: +1872J

C: -78 kJ D: -7.8 kJ

24. 20gm of a saturated sodium chloride was evaporated and 12g of solid sodium chloride left. The solubility of sodium chloride is

A: $\frac{12\times100}{20}$ B: $\frac{12\times100}{8}$

C: $\frac{8\times100}{12}$ D: $\frac{20\times100}{12}$

25. Element M forms an ion of formula M^{3-}. The atomic number of M is;

A: 13 B: 15

C: 3 D: 5

26. The role of limestone in the extraction of iron is:

A: to produce carbon monoxide used for the reduction

B: to combine with the ore to form impurities

C: to accelerate the extraction of ore

D: to remove the impurities in the ore

27. Neon has two isotopes. The percentage abundance of $^{20}_{10}Ne$ is 90% and $^{22}_{10}Ne$ is 10%. The relative atomic mass of Ne is

A: 21 B: 18

C: 22 D: 20.2

28. 11.2g of element M combines with oxygen to form 16.0 g of oxide. The formula of the oxide is: (M= 56)

A: MO_2 B: MO_5

C: M_20_3 D: M_2O_5

29. When testing for a sulphate ion in solution, dilute nitric acid is added before barium nitrate solution in order to:-

A: catalyse the reaction
B: acidify the medium for the reaction
C: eliminate any sulphite or carbonate present
D: change sulphite to Sulphate

30. Nitrogen reacts with hydrogen according to the equation.

$N_{2(g)} + 3H_{2\,(g)} \rightleftharpoons 2NH_{3(g)}$

The volume of ammonia formed when $60cm^3$ of nitrogen were mixed with $120cm^3$ of hydrogen is:

A: $80\ cm^3$ B: $180\ cm^3$
C: $120\ cm^3$ D: $60\ cm^3$

31. Which of the following polymers is synthetic?

A: wool B: cotton
C: nylon D: silk

32. Which of the following reactions proceeds fast under ordinary conditions?

A: Iron and water
B: Copper (II) oxide and hydrogen
C: Iron and chlorine
D: Calcium and nitric acid

33. Polythene cause pollution because they:

A: form of giant molecules
B: are coloured with dyes
C: are not attacked by bacteria
D: are easily carried away by wind

34. When temporary hard water is boiled,

A: it changes to permanent hard water
B: a white precipitate of calcium oxide is formed
C: a white precipitate of calcium hydrogen carbonate is formed
D: a white precipitate of calcium carbonate is formed

35. When sulphur dioxide gas is bubbled through Iron (III) Sulphate solution,

A: the brown solution turns to colourless

B: the brown solution turns to green

C: the brown solution remains unchanged

D: a yellow solution is formed

36. The gases formed when steam is passed over white hot coke are:

A: hydrogen and carbon monoxide

B: hydrogen and carbon dioxide

C: water vapour and carbon monoxide

D: water vapour and carbon dioxide

37. 1.74 g of an oxide of Chlorine of formula $Cl_x O$ is found to contain 0.02 moles. The value of x is: (Cl = 35.5)

A: 7 B: 4

C: 2 D: 1

38. Nitrogen is relatively unreactive because,

A: it has five electrons in the outer most shell

B: it reacts by only gaining three electrons

C: it has triple bond

D: it is a non metal

39. Which of the following substances will not dissolve in water?

A: $PbCO_3$ B: $FeCl_2$

C: K_2CO_3 D: NaOH

40. Which one of the following gases is most soluble in water?

A: SO_2 B: Cl_2

C: O_2 D: HCl

In each of the questions 41 to 45, one or more of the answers given may be correct. Read each question carefully and then indicate the correct answer according to the following.

A If 1, 2 and 3 only are correct
B. If 1 and 3 only are correct
C. If 2 and 4 only are correct
D. If 4 only is correct

41. Covalent compounds

1. Are formed by transfer of electrons
2. Have high solubilities in water
3. Are strong electrolytes
4. Have low melting point

42. Which of the following gases can be collected over water?

1. CO_2 2. NH_3 3. H_2 4. HCl

43. In the contact process, the yield of sulphur trioxide can be increased by

1. use of V_2O_5 as a catalyst
2. increasing the temperature of the system
3. lowering the pressure of the system
4. increasing the pressure of the system

44. A mixture of copper (II) oxide and coke is heated and the gaseous product passed through calcium hydroxide solution. Which of the following is/are observed?

1. calcium hydroxide solution turns to colourless
2. calcium hydroxide solution turned milky
3. black residue
4. brown residue

45. A metal forms a hydroxide which is soluble in water. The metal will form a chloride that

1. is soluble in water
2. has high melting point

3. conducts electricity in aqueous state
4. is soluble in methylbenzene

Each of the questions 46 to 50 consists of an assertion (Statement) on the left hand side and a reason on the right hand side. Select

A. If both assertion and reason are true statements and the reason is a correct explanation of the assertion
B. If both assertion and reason are true statements but the reason is not a correct explanation of the assertion
C. If the assertion is true but the reason is not a correct statement
D. If the assertion is not correct but the reason is a true statement

Instructions summarized	
Assertion	***Reason***
A. True	True(reason is a correct explanation)
B. True	True (reason is not a correct explanation)
C. Tue	Incorrect
D. Incorrect	True

46. Fluorine and Chlorine belong to group (VIII) in the periodic table ***because*** Fluorine and Chlorine are called Halogens

47. When a solution of Copper (II) Sulphate is electrolyzed using copper Electrodes, the mass of the anode ***because*** The anode itself becomes oxidised during electrolysis

Decreases.

48.	Lead (II) hydroxide is soluble in excess Aqueous ammonia	***because***	Lead (II) hydroxide is amphoteric	
49.	Soap can remove both dirt and oil From cloth	***because***	Soap is made from oil	
50.	Silver Chloride is Prepared by precipitation	***because***	Silver Chloride is soluble	

CHEMISTRY

SECTION A. (30MARKS)

1. Which one of the following compounds contains an ionic bond?
   A. H_20 B. CI_2
   C. N_2 D. NaCI

2. A mixture of ink can be separated by;
   A. Fractional distillation B. Crystallisation
   C. Paper chromatography D. Filtration

3. Which one of the following elements can displace lead from lead (II) nitrate solution?
   A. Calcium B. Silver
   C. Copper D. Hydrogen

4. Which one of the following substances undergoes a chemical change?
   A. Sulphur B. Iodine
   C. Wax D. Iron (III) chloride

5. The full symbols of atoms of elements **R, T, X, Y** and Z are; ${}^{29}_{14}R$, ${}^{31}_{1415}T$,

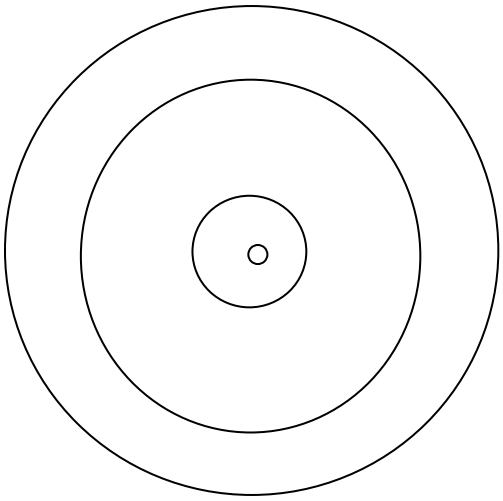
   ${}^{30}_{15}Y$, ${}^{34}_{16}X$, and ${}^{35}_{17}Z$ respectively

Which one of the following is an isotope of **Y**?

A. R B. T C. X D. Z

6. Which one of the following metals will react with oxygen to form an amphoteric oxide?
   A. Iron B. Copper
   C. Zinc D. Magnesium

7. The electronic structure of an atom of element **Y** is shown in the diagram below.



Which one of the following is the formula of an oxide of **Y**?

A. $Y0_3$ B. $Y0_5$ C. Y_20_3 D. Y0

8. The atomic numbers of elements **U, V, W** and **X** are 13, 14, 16 and 17 respectively. Which one of the elements will react with oxygen to form and ionic compound? (Atomic number of oxygen is **8**).

A. U B. V C. W D. X

9. Which one of the following is an alloy?
   A. Zinc B. Copper
   C. Tin D. Brass

10. The following are basic oxides except.
    A. Sodium oxide B. Calcium oxide
    C. Aluminium oxide D. Potassium oxide

11. Which one of the following substances will melt on heating strongly?
    A. Iodine
    B. Sodium chloride
    C. Ammonium chloride
    D. Iron (III) chloride

12. Which one of the following gases lights a glowing splint?
    A. Carbon dioxide
    B. Hydrogen
    C. Nitrogen
    D. Oxygen

13. The atomic number of an element is 13. Which one of the following is the number of electrons in the outermost energy level of particle M^{3+}?
    A. 2 B. 3 C. 8 D. 10

14. Which one of the following mixtures is best separated using a separating funnel?
    A. Oil and water
    B. Sugar and water
    C. Ethanol and water
    D. Sand and water

15. The valency of **X** in $X_2 (SO_4)_3$ is;
    A. 2 B. 3 C. 4 D. 1

16. The chemical formula of ammonium carbonate is
    A. $(NH^4)_2 CO_3$
    B. $NH_4 CO_3$
    C. $NH_4(CO_3)_2$
    D. $(NH_4)_2 (C0_3)_3$

17. Which one of the following is a triatomic molecule?
    A. Cl_2
    B. H2
    C. O_3
    D. N_2

18. The metal that burns in oxygen with a bright yellow flame is…
    A. Calcium
    B. Sodium
    C. Copper
    D. Phosphorus.

19. Which one of the following is the method that can be used to separate a mixture of potassium chloride and charcoal?
    A. Distillation
    B. Magnetisation
    C. Sublimation
    D. Filtration

20. Which one the following catalysts is used during preparation of oxygen?

A. Platinum
B. Manganese (IV) oxide
C. Vanadium (V) oxide
D. Finely divided iron

21. Ionic compounds have high melting and boiling points because,
A. They are made up of ions
B. They have strong ionic bonds
C. They have weak intermolecular forces
D. They are simple molecules.

22. The full symbol of an atom is $^{39}_{19}Z$. The number of protons, electrons and

neutrons in the ion formed by Z are.

	Electrons	**Protons**	**Neutrons**
A.	19	19	20
B.	18	19	20
C.	19	18	20
D.	18	20	19

23. The atomic number of atom of R is 13. The electronic configuration of an atom of **R** is

A. 2: 8: 2
B. 2: 8: 3
C. 2 :8: 4
D. 2: 8 :5

24. The formula of a compound is $Y_3(P0_4)_2$. The electronic configuration of the atom of **Y** is

A. 2: 8: 2
B. 2: 8: 3
C. 2: 8: 4
D. 2: 8: 5

25. Which one of the following substances is not a mixture?

A. Bronze
B. Steel
C. Water
D. Air

26. The formula of Bismuth sulphate is $Bi_2(SO_4)_3$
The formula of bismuth chloride will be

A. $BiCl_3$ B. Bi_3Cl

C. Bi_2Cl_3 D. Bi_3Cl_2

27. The chemical formula of rust is;

A. $F_2O_3 \cap H_2O$ B. $Fe_2O_3 \cap H_2O$

C. $FeO \cap H_2O$ D. $Fe_3O_2 \cap H_2O$

28. Which one of the elements has a variable valency?

A. Zinc B. Iron

C. Magnesium D. Sodium

29. What is not true about atoms ${}^{12}_{6}A$ and ${}^{14}_{6}Y$

A. They have the same number of protons

B. They have the same number of electrons

C. They are atoms of the same element

D. They have the same number of neutrons

30. Which of the following determines the chemical properties of an element?

A. Protons B. Electrons

C. Neutrons D. Atomic number

SECTION B. (20 MARKS)

31. Hydrogen can be prepared by reacting zinc granules and dilute hydrochloric acid.

a) Write the equation for the reaction that occurs. (1½ mks)

……

……

……

……

b) Draw a diagram to show how hydrogen gas is prepared in the laboratory.

(04mks)

c) State any other metal that can be used instead of zinc.

(01mk)

32. Balance the following equations where necessary.

(01mk)

a) $Na_{(s)} + O_{2(g)} \longrightarrow Na_2O_2\ (s)$

……

……

b) $Cu(NO_3)_2\ (s) \longrightarrow CuO(s) + NO_{2(g)} + O_2(g)$

……

……

c) $NaHCO_3\ (s) \longrightarrow Na_2CO_3(aq) + CO_{2(g)} + H_2O_{(s)}$

……

……

d) $NaNO_3\,(s) \longrightarrow NaNO_2(s) + O_2\,(g)$

……

……

33. The full symbol of an atom of element **X** is $^{27}_{13}X$

a) i) State the number of protons in **X** .
(01mk)

……

……

b) i) Write the electronic configuration of **X.**
(01mk)

……

……

iii) State the group in the Periodic Table to which **X** belongs. (½ mk)

……

……

b) i) Write the formula of the oxide of **X** .

(01mks)

……

……

ii) State the type of bond that exists in the oxide of **X.**

(01mk)

……

……

34. State whether the following oxides are acidic, basic or amphoteric.

a) Al_2O_3 …… (01m

b) CO_2 …… (01m

c) MgO …… (01m

d) CO …… (01m

e) ZnO ……

(01mk)

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