# FORM FOUR CLUSTER KCSE  MODEL 4
# CHEMISTRY PAPER 1 QUESTIONS

**1. The figure produced from the Bunsen burner when the air – hole is completely closed is sooty and bright yellow. Explain**

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**2. The table below shows the atomic and ionic radii of some period 3 elements**

| Element | Atomic radius (nm) | Ionic radius (nm) |
|---------|-------------------|-------------------|
| A | 0.186 | 0.175 |
| B | 0.160 | 0.135 |
| C | 0.104 | 0.184 |

**Which of the elements is: a) The strongest reducing agent? (1mark)**

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**b) The bond formed between atoms of A? (1mark)**

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**c) An element whose oxide has a PH of below 7. (1mark)**

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**3. An acid – base indicator is a substance with a specific colour for both acidic and alkaline medium. A particular indicator used in a chemistry laboratory attains the following equilibrium state.**

$$XOH_{(aq)} \rightleftharpoons X^+_{(aq)} + OH^-_{(aq)}$$

Blue                 Red
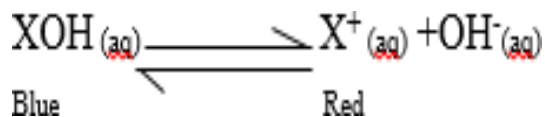
**State and explain the colour of this indicator when added to:**

**a) Sodium hydroxide solution.**

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**b) Ethanoic acid solution.**

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**4. At room temperature, silicon (IV) oxide is a solid whereas carbon (IV) oxide is gas although silicon**

**and carbon belong to the same group. Explain the observation.**

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**5. Usually zinc ore is mixed with lead ore. What property of zinc makes it possible to separate it from**

**the mixture with lead metal?**

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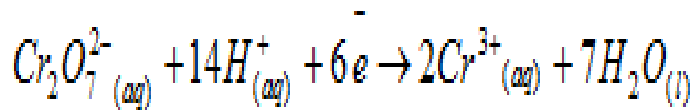
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**6. Boiling points of alkanols (Alcohols) are usually higher than those of hydrocarbons of**

**approximately equal molecular mass. Explain**

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**7. i) In the following half reaction, determine the change in oxidation of chromium**

$$Cr_2O_7^{2-}{}_{(aq)} + 14H^+{}_{(aq)} + 6\bar{e} \rightarrow 2Cr^{3+}{}_{(aq)} + 7H_2O_{(l)}$$

**ii) State one property of the dichromate ion as indicated by the change in oxidation states. ............**

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**8. Natural gallium consists of isotopes 69Ga and 71Ga in the ratio 3: 2 respectively. Determine the**

**relative atomic mass of gallium.**

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**9. In reaction below, identify the base and give a reason for your answer**

$$C_2H_5O^-{}_{(aq)} + H_2O_{(l)} \rightleftharpoons C_2H_5OH_{(aq)} + OH^-{}_{(aq)}$$
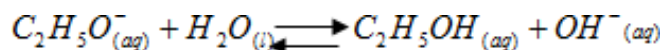
**10. Study the sequence of reactions below and answer the questions that follow**

| Air | → | Nitrogen | Mg, Step 1 → | Substance **T** |

Step 3, PbO ↑ | H₂O / Step 2 ↓

Ammonia
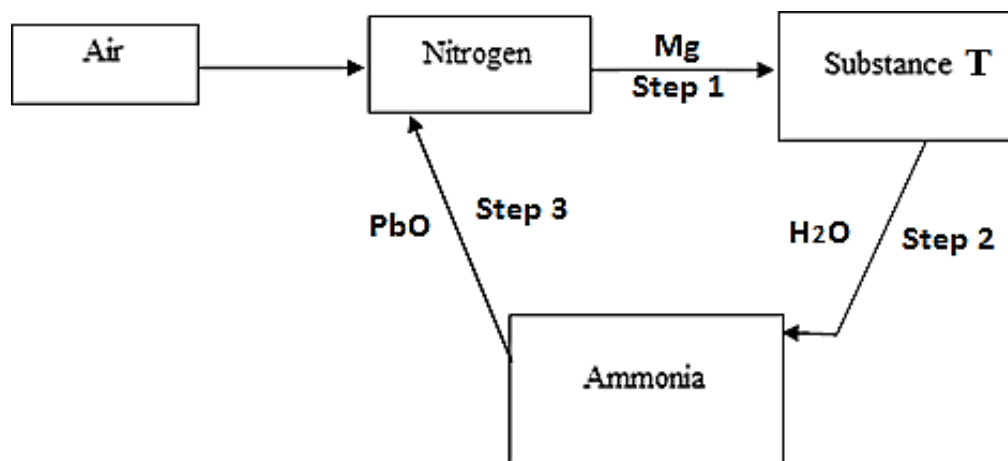
**a)      Write down the formula of substance T. (1mark)**

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**b)** **Write equations for reactions that occur in steps 2 and 3.**

**Step 2**

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**Step 3**

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**11.** **Salt Q has a solubility of 25g/100g of water 40g of salt Q is stirred in 45g of a solution that contains 5g of salt Q. Determine how much more of salt Q will dissolve in the solution.**

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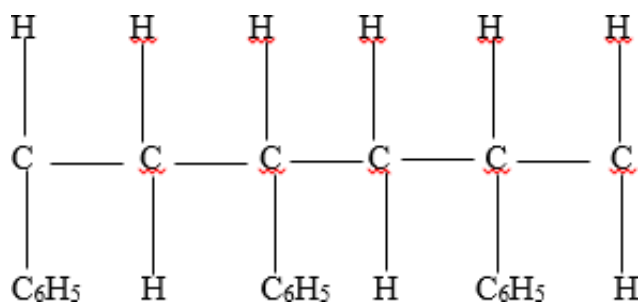………………………………………………………………………………………………………… …………………………

**12. a) Write down the structural formula of:**

**i) 3, 3 – dimethyl pentane**

**ii) 2 – bromo – 4- methylpentan – 2 –ol.**

**b) Below is the structure of phenylethene**



**Draw monomer of one unit of the phenylethene.**

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13. 60cm3 pf oxygen gas diffused through a porous partition in 50 seconds. How long did it take

90cm3 of Sulphur (IV) oxide to diffuse through the same porous under the same conditions? (S=

32, O=16)

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14. Write down the electronic configuration of Sulphur in H2S.

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15. The following are observations made on two solid substances X and Y.

| Solid | Electrical conductivity in solid | Solubility | Boiling point |
|---|---|---|---|
| X | Poor | Insoluble | Sublimes |
| Y | Poor | Soluble | High |

State the most likely type of bonding in:- i) Solid X

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ii) Solid Y.

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16. Temporary water hardness can be removed by boiling.

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**a) What is water hardness?**

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**b) Write an equation to show how temporary hardness is removed by boiling.**

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**c) State one advantage of a hard water.**

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**17. The set up below represent electrolysis of acidified water.**

**Write**
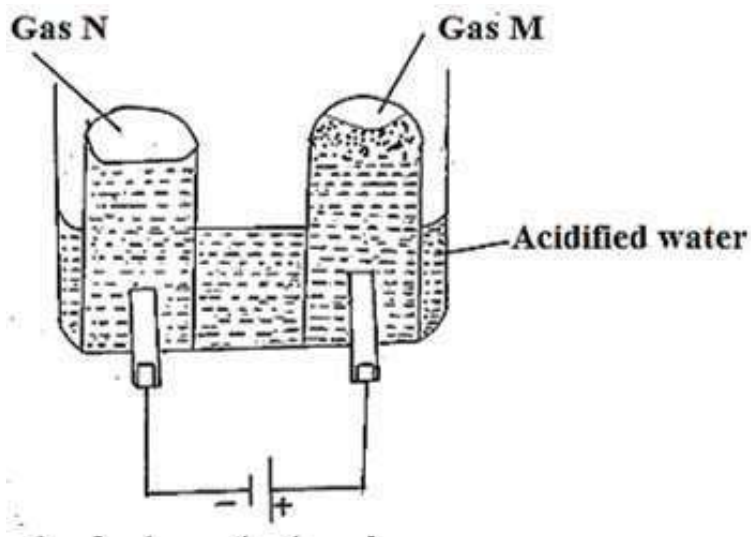


**Write the ionic equation for the production of gas**

**i)      M**

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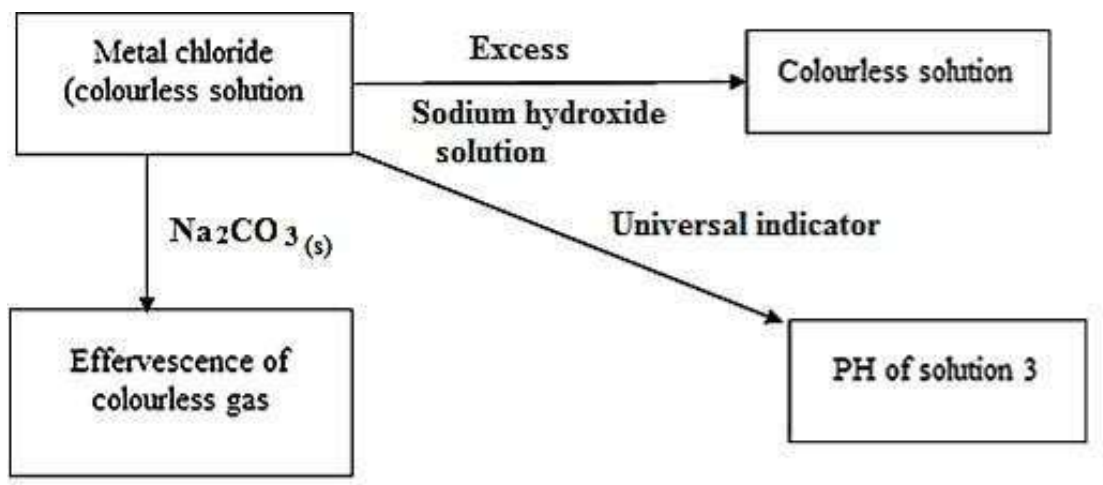
**ii)      N**

**18.** Starting with copper (II) oxide, describe how you can prepare copper (II) sulphate crystals.

**19.** Study the reaction scheme below and answer the questions that follow.



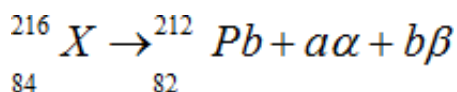**i) Identify the possible cation in the salt of the metal.**

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**ii) Write an ionic equation between the metal ion and excess sodium hydroxide solution. ................**

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**20.** A radio-active element X decays as shown in the equation:

$$^{216}_{84}X \rightarrow\ ^{212}_{82}Pb + a\alpha + b\beta$$

**Determine the value of a and b.**

**21.** Aqueous ammonia is added to copper (II) nitrate solution drop-wise. A blue precipitate is formed on adding excess ammonia, the precipitate dissolves to give a deep blue solution. Explain the two observations..............................................................................................................................

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**22.** **Determine the enthalpy of formation of methane using the data given below.**

|  | $\Delta H^\theta_C$ KJmol$^{-1}$ |
|---|---|
| $\Delta H^\theta_C$ of carbon | -393 |
| $\Delta H^\theta_C$ of hydrogen | -286 |
| $\Delta H^\theta_C$ of methane | -890 |

**23. Explain why ammonia molecule combines with a hydrogen ion to form ammonium ion.**

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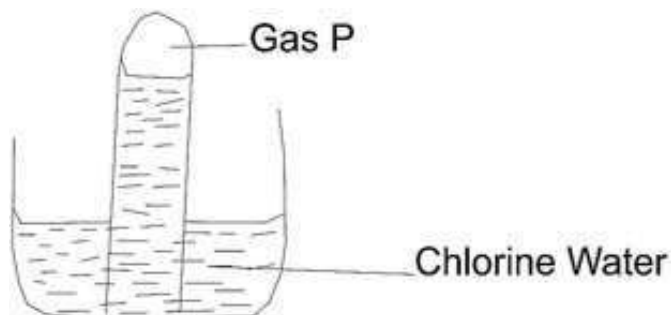
**24. Study the set- up below and answer the questions that follow.**



**i)** **Name the gas P.**

**ii) Explain why the solution of chlorine water bleaches litmus paper.**

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**25.** **22.2cm3 of sodium hydroxide solution containing 4.0g per litre of solution were required for**

**complete neutralization of 1g of a dibasic acid H2A. Calculate the relative formula mass of the**
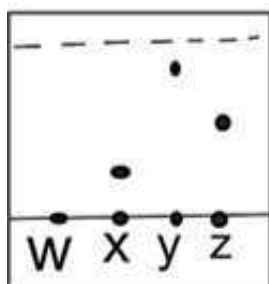
**dibasic acid. (Na =23, O= 16, H=1)**

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**26.** **The diagram below represents an incomplete paper chromatogram of pure dyes X, Y, Z and**

**mixture W.**

**i)**



**i) Which is the most soluble dye in the solvent used?**

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**ii) Mixture W contains dyes Y and Z only. Complete the chromatograph to show how mixture W**

**separates.** ................................................................................................ ..............

**27.** **Water gas is a mixture of carbon (II) oxide and hydrogen gas producer gas is a mixture of carbon**

**(II) Oxide and nitrogen gas. Bothe water gas and producer gas are used as fuel. i) What is a fuel?**

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**ii) Explain why water gas is a better fuel than producer gas.**

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**28. Explain the following observations.**

**a) Aluminium alloys are preferred to pure aluminium in the construction of parts of aeroplanes.**

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**b) Aluminium is a reactive metal and yet is used to make kitchen utensils.**

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**29. Soap is prepared by boiling vegetable oil with sodium hydroxide solution and adding a solution of**

**sodium chloride to the reaction.**

**i) What name is given to the reaction leading to the formation of soap?**

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**ii) Why is sodium chloride solution added to the reaction mixture?**

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**iii) State one advantage of using soap over soapless detergent.**

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