

FORM FOUR CLUSTER KCSE MODEL8

CHEMISTRY PAPER 1 QUESTION

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

Explain

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?

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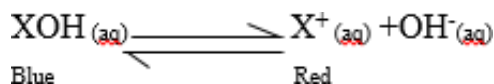
- b) The bond formed between atoms of A?

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- c) An element whose oxide has a PH of below 7

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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.



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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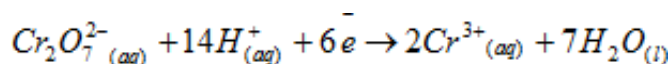
6. Boiling points of alkanols (Alcohols) are usually higher than those of hydrocarbons of approximately equal molecular mass.

Explain.

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7. The hydrogen bonds✓1 in alkanols are stronger than the van-der-waals forces ✓1 in alkanes.

This explains why alkanols have higher boiling points than alkanes.✓1



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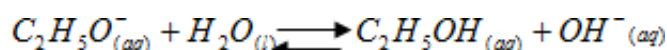
- ii) State one property of the dichromate ion as indicated by the change in oxidation states.

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8. Natural gallium consists of isotopes ^{69}Ga and ^{71}Ga in the ratio 3: 2 respectively. Determine the relative atomic mass of gallium. (3marks)

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

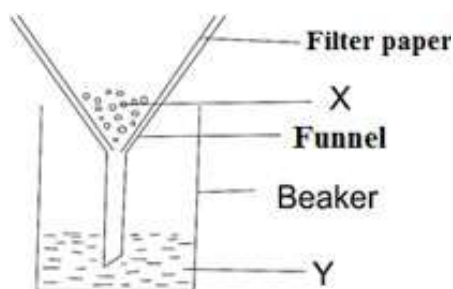


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10. 10. Starting with lead (II) oxide, describe how you would prepare a solid sample of lead (II) carbonate

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11. . Filtration is carried out in the apparatus shown.



i) Name X and Y.

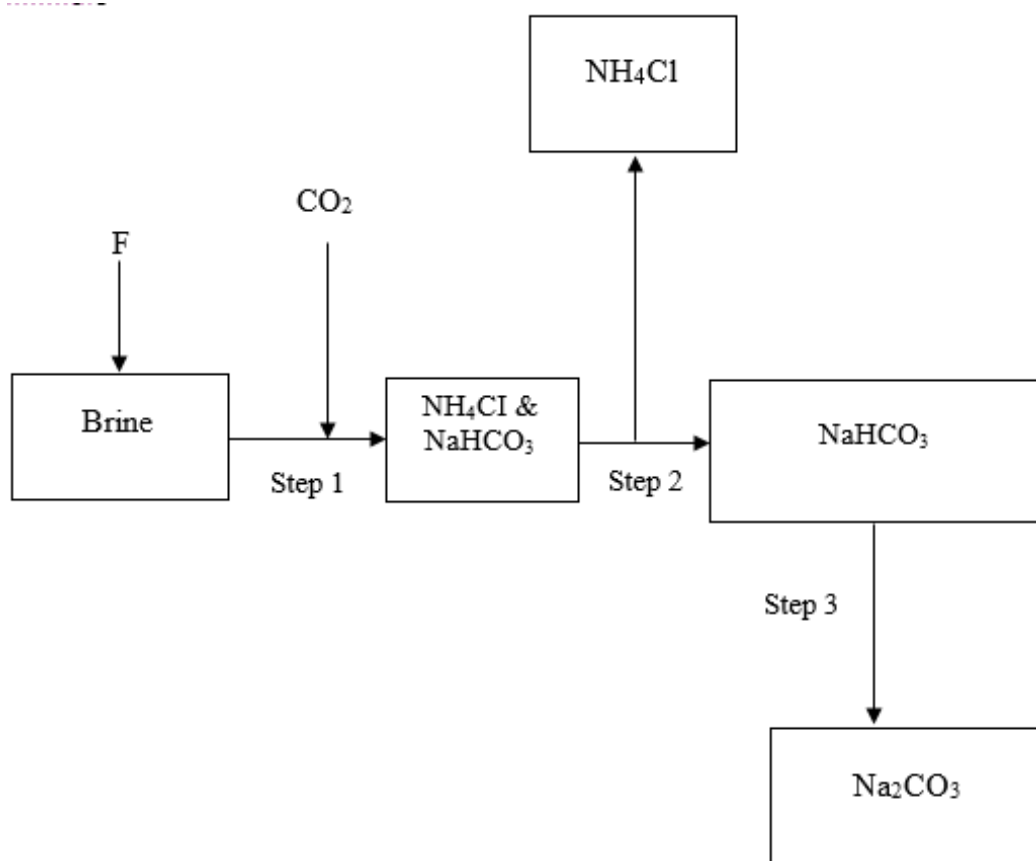
X.....

Y.....

12. 1.8cm³ of dilute sulphuric (VI) acid required 25cm³ 0.2M sodium hydroxide solution for complete neutralization. Calculate the concentration of sulphuric (VI) acid in moles per litre.

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13. The simplified flow chart below shows some steps in the manufacture of sodium carbonate by solvay process.



a) Identify substance F

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b) Name the process taking place in step 2

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c) Write an equation for the reaction which takes place in step 3.

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14. The table below shows tests carried out in separate samples of water drawn from a well and results obtained.

Test	Results
(i) Addition of excess aqueous ammonia	White precipitate
(ii) Addition of few drops of dilute sulphuric (VI) acid	No white precipitate formed
(iii) Addition of dilute hydrochloric acid followed by few drops of BaCl ₂	White precipitate

Identify the cation and anion present in the water.

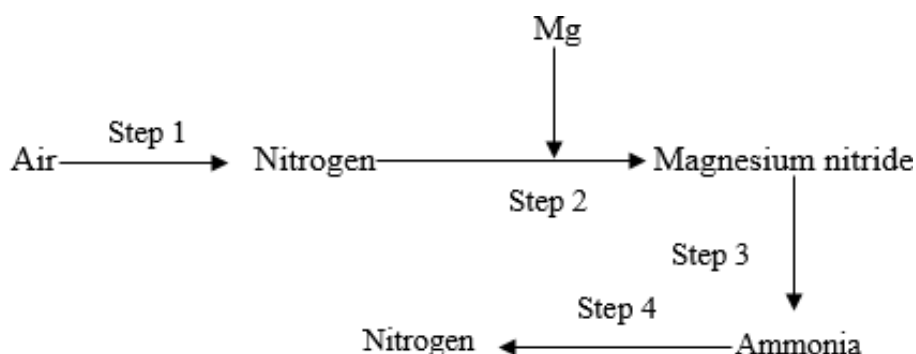
Cation

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Anion

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15. Study the sequence of reactions below and answer the questions that follow.



a) Name the process in step I.

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b) i) What reactant is used to achieve step 4.

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..... ii) Write a balanced chemical equation for step 3

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16. . Use the information in the table below to answer the question that follows

Element	Fluorine	Chlorine	Bromine
B.P $^{\circ}\text{C}$	-180	-35	59

Explain the trend in the boiling points

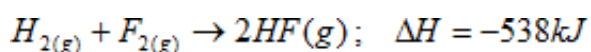
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17. What observation will be made when a few drops of concentrated sulphuric (VI) acid is added to crystals of sugar?

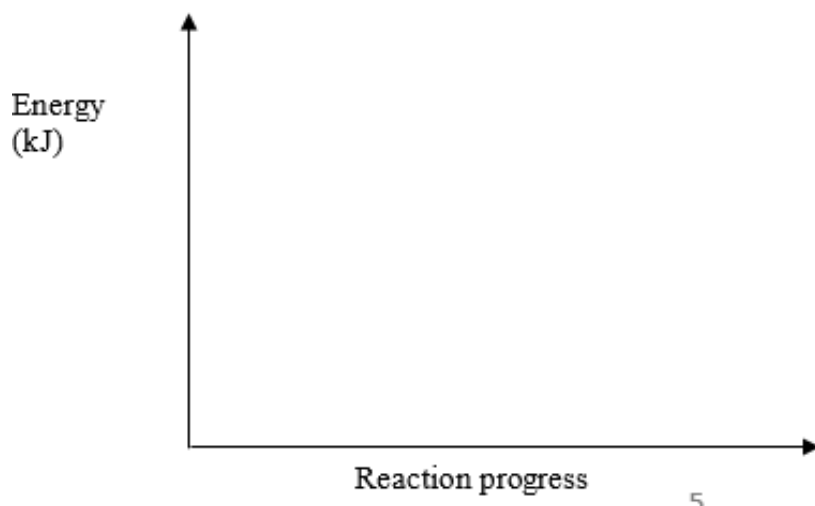
Explain your answer

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18. Hydrogen and Fluorine react according to the equation.



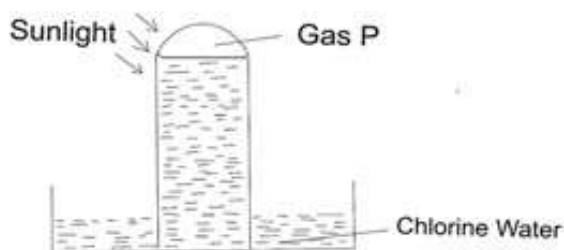
- a) On the grid provided below sketch the energy level diagram for the reaction.



- b) Calculate the molar enthalpy of formation of HF

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19. Form three students at Kongoni high school set up the apparatus shown the apparatus shown below to investigate the action of sunlight on chlorine water.



a. Identify gas P.

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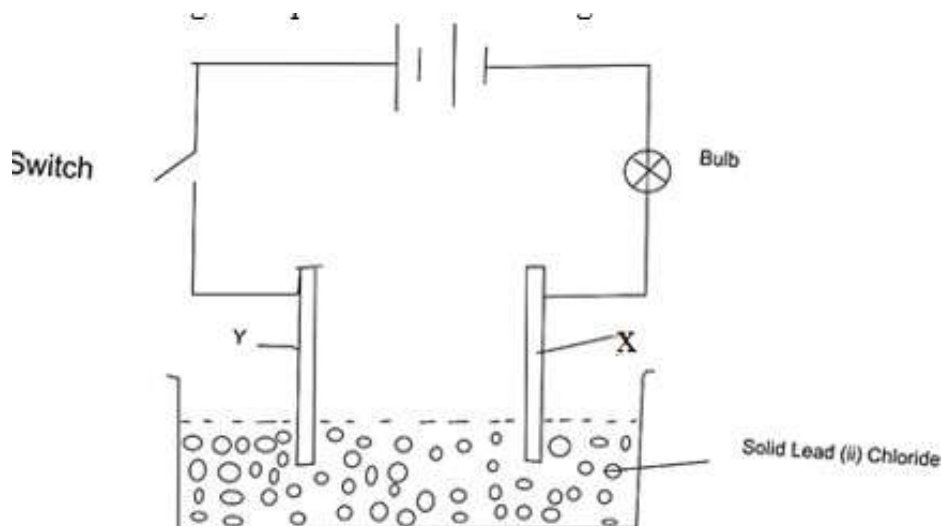
b. Write an equation to show how gas P is formed.

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c. State one commercial use of gas P.

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20. The following set-up was used to investigate the effect of an electric current on lead (II) chloride.



a) Identify the electrodes labelled X and Y.

X.....

Y.....

b) When the switch was closed, the bulb did not light. Explain

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21. State and explain what happens to the masses of the following substances when they are separately heated in open crucibles.

i) Copper metal

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ii) Sulphur powder.

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22. 22. An organic compound has the following composition by mass: 60% carbon, 13.33% hydrogen and the rest oxygen. Determine the empirical formula of the compound (C= 12, H = 1, O=16)

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23. The table below shows the first ionization energies of elements A and B.

Element	Ionization energy (kJ/mole)
A	500
B	740

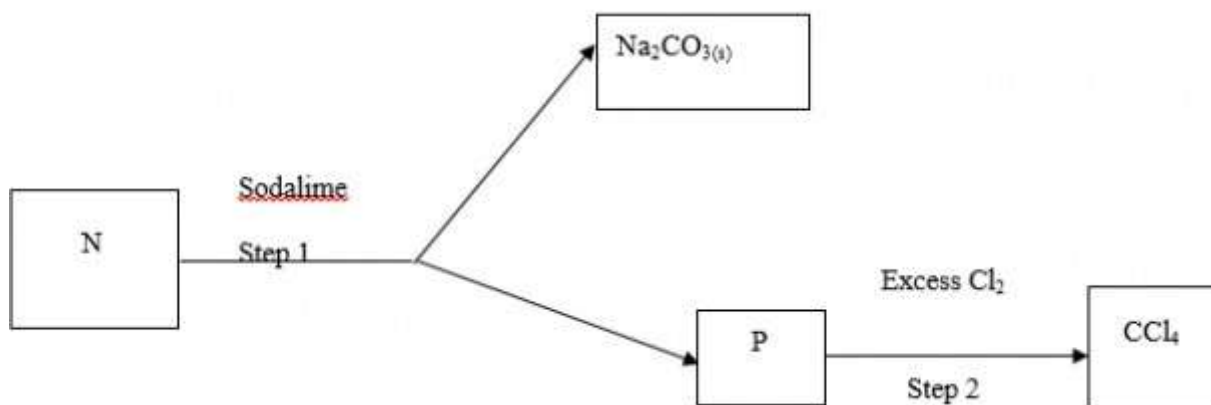
a) Define the ionization energy.

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b) What do these values suggest about the reactivity of B compared to A? Explain

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24. Study the flow chart below and answer the questions that follow.



i) Identify N and P.

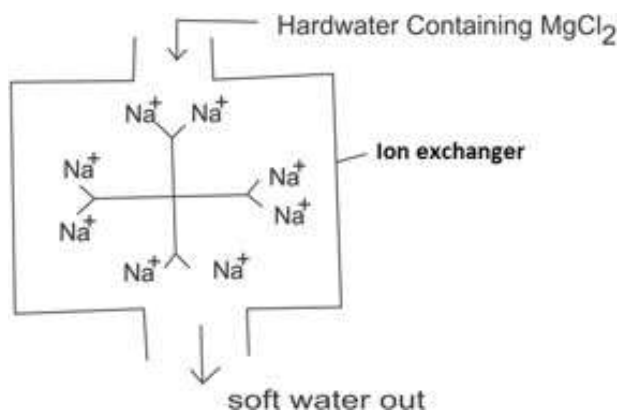
N.....

P.....

ii) What name is given to the type of halogenation in step 2?

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25. A student added 1g of zinc powder to 50cm³ of 0.2M copper (II) sulphate solution and stirred the mixture gently using a thermometer. The temperature at the beginning of the experiment was 21°C and rose to a maximum of 28°C. Calculate the molar heat of displacement of copper (density of solution = 1gcm⁻³, specific heat capacity of water = 4.2kJkg⁻¹K⁻¹)
26. a) The diagram below shows an ion exchange column.



- i) Draw the ion exchanger and show how it will appear at the end of softening process.
- ii) How is the ion exchanger recharged after exhaustion?

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- iii) State one advantage of hard water.

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27. . a) State Gay Lussac's law

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- b) 10cm³ of a gaseous hydrocarbon, C₂H_x required 30cm³ of oxygen for complete combustion. If steam and 20cm³ of carbon (IV) oxide gas were produced, what is the value of x

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28. a) Explain why copper metal reacts with concentrated nitric (V) acid does not react with concentrated hydrochloric acid.

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- b) Write an equation for the reaction between copper and concentrated nitric (V) Acid.

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29. The table below gives the melting points of oxides of elements in period 3. Study it and answer the questions that follow.

Formula of oxide	Na ₂ O	MgO	Al ₂ O ₃	SiO ₂	P ₄ O ₁₀	SO ₃
M.p	1190	3080	2050	1730	560	-73

a) Identify the compound in the table above that will dissolve in dilute hydrochloric acid and dilute sodium hydroxide.

b) Explain the difference in melting points of MgO and P₄O₁₀

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