**SECTION A-46 MARKS**

**Attempt** all **questions in this section.**

1. The elements **tin** and **lead** belong to **group (IV)** of the periodic table.
2. Write **equation** for the preparation of the **tetra chlorides** of the elements: (@01 mark)

* Tin

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* Lead

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1. **Tin (IV) chloridefumes in moist air**. **Explain**this **observation**.

(03 marks)

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1. Complete **the following nuclear reactions**.
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     2. + ……………….. + (01 mark)
2. It takes **5 days** for **0.025mg** of bismuth**-214** to disintegrate in to **0.0125mg** of bismuth**-210**.Calculate the **time** required for **0.016mg** bismuth**-214** to change in to **0.001mg** bismuth**-210**. (03 marks)

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1. At **25°C**,**0.1M** solution of ethylamine is **7.3%** ionized.

Write an **equation** for the **ionization** of ethylamine in water.(01 mark)

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b) Calculate the **concentration** of hydroxide ions at equilibrium. (01 mark)

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c) **1.0 x 10-2mol** of ethylamine hydrochloride was added to **1dm3** of ethylamine solution in **(a).**Calculate the hydroxide ion concentration of the resultant solution. State**any assumption** made. (04 marks)

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1. Draw a **structure** and **name the shape** of the followings**anion**. (03 marks)



b) Name a reagent (s) which can be used to distinguish between SO32- and SO42- ions, State what would be observed.

Regent (s): (01 mark)

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Observation(s): (01 mark)

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* + - 1. (a). (i). State the **condition (s)** under which chlorine gas reacts with sulphur dioxide gas. (01 mark)

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

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(b).Chlorine gas was bubbled through sodium thiosulphate and lead (II) nitrate solution added to the resultant solution.

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

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(ii). Write**equation (s)** for the **reaction (s)** that took place. (02 marks)

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1. **Phenol** was added to **bromine water**.
2. State what **was observed**. (01 mark)

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1. Write **an equation for the reaction**.(01 mark)

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1. Name a **reagent** which can be used to distinguish between phenol and cyclohexanol. State what would be **observed** if the reagent is treated with each compound.

Reagent: (01 mark)

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Observations: (01 mark)

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1. Write equation show how phenol may be prepared from benzene diazonium chloride. (01 mark)

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1. Write equation for the reaction between sodium hydroxide solution:
2. Aluminium oxide. (01 mark)

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1. Chlorine gas.(01 mark)

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1. Sodium hydroxide solution was added to nickel (II) sulphate solution.
2. State what was observed. (01 mark)

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1. Write equation for the reaction. (01 mark)

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1. State **Graham’s law** of gaseous diffusion. (01 mark)

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1. A mixture of carbon monoxide and carbon dioxide gas diffuses through a porous partition in half the time taken for the same volume of bromine vapour. Calculate the **percentage** of carbon dioxide gas in the gas mixture. (04 marks)

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1. The atomic number of **element T** is **32**.
2. Write down the **electronic configuration of element T**. (01 mark)

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1. Write the **formula** of the: (@0½ mark)
2. **Hydride** of **T**.

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1. **Chloride** of **T**.

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1. Water was added to the **chloride of T**. State whether the **resultantsolution** was **neutral**, **acidic** or **alkaline**. **Explain your answer** giving an **equation for the reaction**. (03 marks)

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**SECTION B-54 MARKS**

**Attempt** ANY **SIX questions in this section.**

1. When heated, carbon dioxide gas decomposes according to the equation below.



If at a certain temperature and **1 atmospheric pressure**,**60%** of the original carbon dioxide **gas remained undissociated**.

1. Calculate the **equilibrium constant, Kp** for the reaction. (05 marks)

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1. State and explain the effect of:
2. Increasing the pressure to **2atmospheres** on the equilibrium concentration of oxygen gas.(02 marks)

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1. Carrying out the decomposition at a lower temperature on the value of the equilibrium constant,Kp. (02 marks)

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1. Complete the following equations and write suggested mechanism for the reaction:



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1. (a). Define the following terms: (@01 mark)
2. Lattice energy.

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1. Standard heat of formation of a substance.

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1. The standard heat of formation of phosphorus trichloride is **-306KJ/mol**.The bond dissociation energy and enthalpy of atomization of chlorine and phosphorus are **314**&**242KJ/mol** respectively.
2. Draw a **Born-Haber** cycle for the formation of phosphorus trichloride.(02 marks)

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1. Use your cycle to **calculate** the P-Cl**bond energy**.(02 marks)

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1. Calculate the standard heat of formation of ethane if the standard heats of combustion of graphite, hydrogen and ethane are **403**,**285** and **1395 KJ/mol** respectively. 03 marks)

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1. (a).Silver chromate is sparingly soluble in water. Write:
2. An **equation for the solubility of silver chromate in water**. (01 mark)

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1. Write **an expression of the solubility product constant**,Ksp for silver chromate. (01 mark)

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1. The solubility of silver chromate is **6.64 x 10-4g/100g** of water at a certain temperature. Calculate the **solubility product** of silver chromate. (04 marks)

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1. Calculate the **solubility of silver chromate in 1.0dm3 of 1.0M** silver nitrate. (03 marks)

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1. (a). Explain what is meant by the term order of a reaction. (03 marks)

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1. The following kinetics data was obtained for the reaction between an alkylhalide**S** and aqueous sodium hydroxide.



1. Determine the **order of the reaction** with **respect** to **S** and sodium hydroxide solution.Give a reason for your answer. (03 marks)

Order with respect to **S**:……………………………………………………………...

Reason*:*

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Order with respect to **OH-**:…………………………………………………………

Reason*:*

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1. Write **an equation** for the **rate of reaction**. (01 mark)

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1. Calculate the **rate constant** and **give its units**. (01 mark)

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1. Write the **general structure** of **S**. (01 mark)

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1. (a).Write the name and formula of one ore from which aluminium can be extracted. (@0½ mark)

Name:…………………………………………………………………………………………

Formula of the ore:………………………………………………………..……………

1. (i). Describe how the ore is purified. (04 marks)

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(ii).Describe the reaction of aluminium metal with acids. (04 marks)

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1. Compound **F** contains **62.1%** carbon,**10.3%**hydrogen, the rest being oxygen.
2. Calculate the **empirical formula of F**. (03 marks)

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1. **F** distils in steam at **98°C** and **1.01 X 105Nm2**.If the vapour pressure of water at **98°C** is **9.5 X 104Nm2**.
2. Calculate the **molecular mass of F** if the distillate contained **16.67%** by mass of **F**. (02 marks)

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1. Determine the **molecular formula of F**. (01 mark)

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1. **F** formed a grey precipitate when treated with ammoniacal silver nitrate. Write**equation** and **outlines a mechanism** for the reaction between **F** and **sodium hydrogen sulphite solution**. (03 marks)

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1. To **25.0cm3** of **0.1M** zinc sulphate solution was added **25.0cm3** of **1.7M**aminomethane. The resultant solution was shaken with trichloromethane and left to settle.**10.0cm3**of the aqueous layer required **16.5cm3** of **0.5M** nitric acid. If the partition coefficient for the distribution of aminomethane between water and trichloromethane is **25** at **25°C**.
2. Calculate the concentration of aminomethane in the organic layer. (04 marks)

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1. The concentration of aminomethane that formed a complex with zinc ions. (03 marks)

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1. Use your answer in (b) to write an equation for the reaction between aminomethane and zinc ions. (02 marks)

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