

Name of the Student: _____

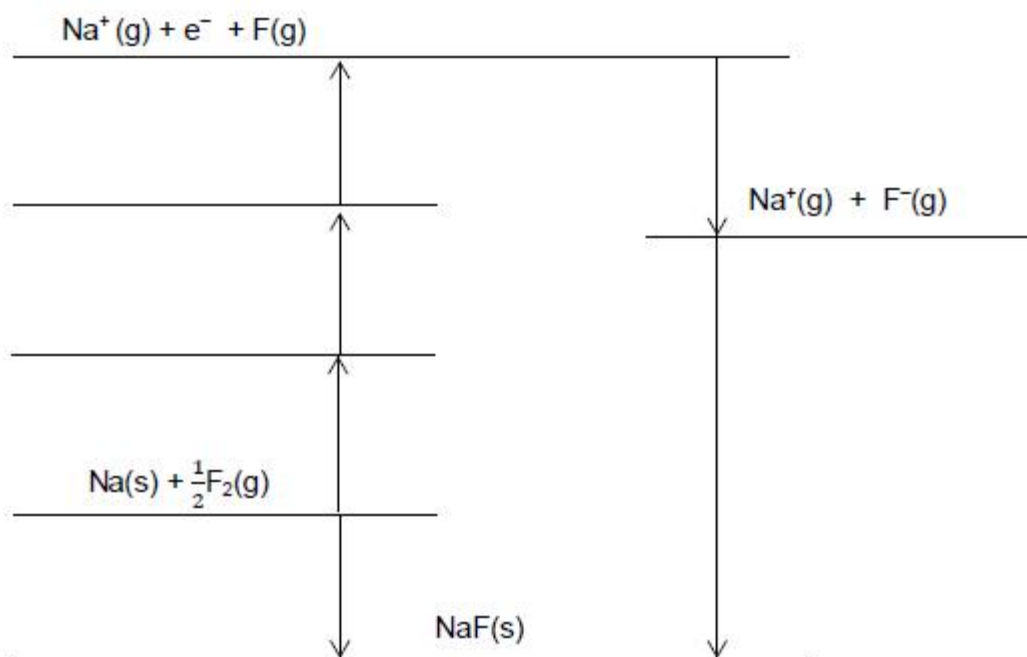
Max. Marks : 26 Marks

Time : 26 Minutes

Q1.

This question is about sodium fluoride.

- (a) Complete the Born–Haber cycle for sodium fluoride by adding the missing species on the lines.



(2)

- (b) Use the data in the table and your completed Born–Haber cycle from part (a) to calculate the enthalpy of lattice formation of sodium fluoride.

	$\Delta H^\circ / \text{kJ mol}^{-1}$
$\text{Na(s)} \rightarrow \text{Na(g)}$	+109
$\text{Na(g)} \rightarrow \text{Na}^+(\text{g}) + \text{e}^-$	+494
$\text{F}_2(\text{g}) \rightarrow 2\text{F(g)}$	+158
$\text{F(g)} + \text{e}^- \rightarrow \text{F}^-(\text{g})$	-348
$\text{Na(s)} + \frac{1}{2}\text{F}_2(\text{g}) \rightarrow \text{NaF(s)}$	-569

Enthalpy of lattice formation _____ kJ mol^{-1}

(2)

- (c) Suggest how the enthalpy of lattice formation of NaCl compares with that of NaF

Justify your answer.

How enthalpies of formation compare _____

Justification _____

(3)

- (d) Calculate the volume, in cm^3 , of fluorine gas at 298 K and 100 kPa required to produce 1.00 g of sodium fluoride by reaction with an excess of sodium.

The gas constant $R = 8.31 \text{ J } ^{-1} \text{ mol}^{-1}$

Volume _____ cm^3

(4)

(Total 11 marks)

Q2.

This question is about halogenoalkanes.

- (a) Chlorine atoms are formed in the upper atmosphere when ultraviolet radiation causes C–Cl bonds in chlorofluorocarbons (CFCs) to break.

Write **two** equations to show how chlorine atoms catalyse the decomposition of ozone.

1. _____

2. _____

(2)

- (b) Chloroethane reacts with potassium hydroxide in the presence of propan-1-ol to form ethene.

State the role of potassium hydroxide and the role of propan-1-ol in the reaction.

Role of potassium hydroxide _____

Role of propan-1-ol _____

(2)

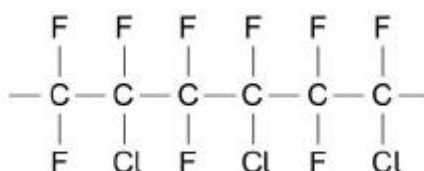
- (c) Name and outline a mechanism for the reaction in part (b) between chloroethane and potassium hydroxide to produce ethene.

Name of mechanism _____

Mechanism

(4)

- (d) The structure of polymer **A** is shown.



Draw the structure of the monomer used to form polymer **A**.

(1)

- (e) Chemical analysis shows that a chlorofluoroalkane, **B**, contains by mass 51.6% fluorine,

Chlorine exists as two isotopes, ^{35}Cl and ^{37}Cl , in the ratio 3:1
Fluorine only exists as one isotope, ^{19}F .

Determine the formula of each of the three molecular ions of **B**.

To gain full marks you must show all your working.

[illegible]

(Total 15 marks)