

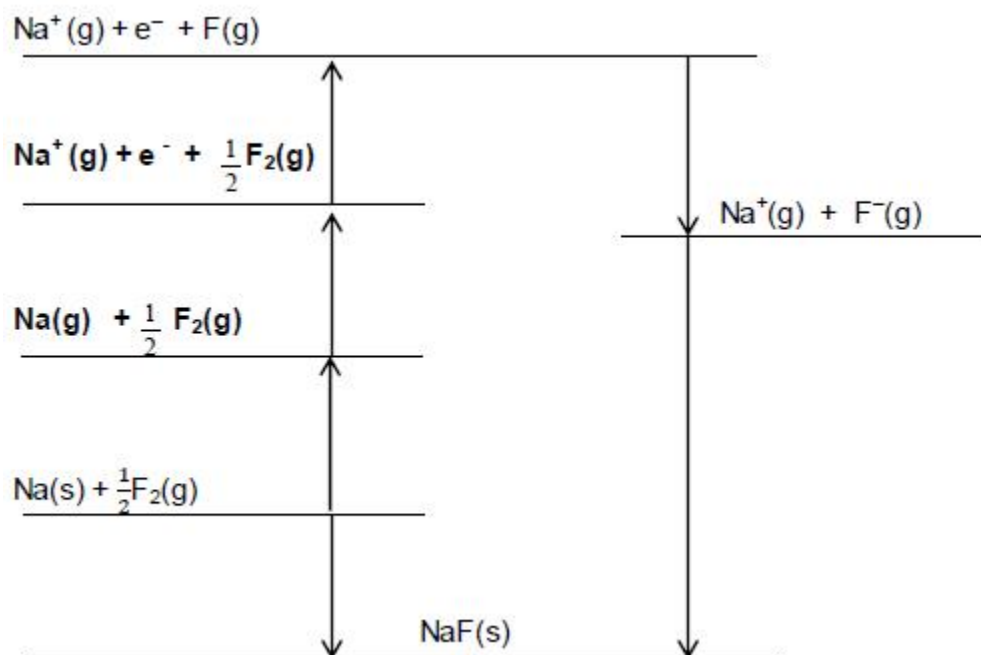
Name of the Student: _____

Max. Marks : 26 Marks

Time : 26 Minutes

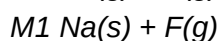
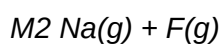
Mark Schemes

Q1.

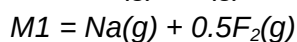
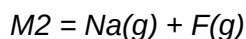


(a) 6

or



or



2

(b) $LE = -109 - 494 - 158/2 + 348 - 569$

1

$$= -903 \text{ (kJ mol}^{-1}\text{)}$$

1

(c) NaCl enthalpy of lattice formation will be less negative **OR** less exothermic

1

Cl^- ion bigger (than F^-)

1

So attraction of halide ion to Na^+ is weaker

Allow so ionic bonding is stronger

1

(d) Amount of NaF = $1/42 = 2.38 \times 10^{-2}$ mol

1

Amount of $F_2 = (2.38 \times 10^{-2})/2 = 1.19 \times 10^{-2}$ mol

1

$V = nRT/p = (1.19 \times 10^{-2} \times 8.31 \times 298)/100000$

1

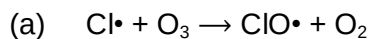
$V = 2.95 \times 10^{-4} \text{ m}^3$

$= 295 \text{ cm}^3$

1

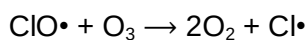
[11]

Q2.



Allow dot in free-radical on either O or Cl.

1



1

(b) (KOH acts as a) base

1

(propan-1-ol acts as a) solvent.

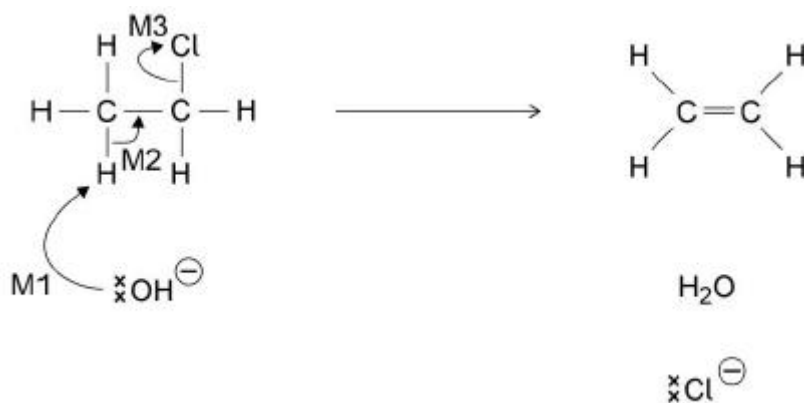
Allow product of reaction between KOH and propan-1-ol / $\text{CH}_3\text{CH}_2\text{CH}_2\text{O}^-$ acts as base.

1

(c) (Name of mechanism) Elimination

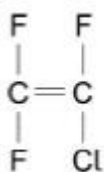
1

mechanism: 3 arrows (1 mark each).



3

(d)



1

(e) This question is marked using levels of response. Refer to the Mark Scheme Instructions for Examiners for guidance on how to mark this question.

Level 3

All stages are covered & the explanation of each stage is generally correct and virtually complete. Stages 1 and 2 are supported by correct data. Answer communicates the whole process coherently and shows a logical progression from stage 1 to stage 2 and then stage 3.

Steps in stage 3 are in logical order and working is shown. If there is no working for ratio or statement of ratio then full marks cannot be awarded.

If the formulae of the three molecular ions are not correct (2d) then the student can't access Level 3 (any incorrect chemistry drops the student to the bottom mark within the level they have achieved).

5-6 marks

Level 2

Stage 2 is attempted (2a-2c do not need to be explicitly stated) but the calculation may contain inaccuracies **OR** the explanation may be incomplete **OR** first two stages are covered and the explanations are generally correct and virtually complete. Answer is mainly coherent and shows a progression through the first two stages. Some steps in each stage may be incomplete.

If percentage of carbon is missing or incorrect (1a) then student can't access Level 2.

3-4 marks

Level 1

Stage 1 needs to be attempted but may contain inaccuracies.

OR

Stage 3 attempted but may contain inaccuracies / molecular formula not determined.

Answer includes some isolated statements, but these are not presented in a logical order or show confused reasoning.

1-2 marks

Level 0

Insufficient correct chemistry to warrant a mark.

0 marks

Indicative Chemistry content

Stage 1 (determines empirical formula)

1a 16.3% carbon

1b Divide by A_r

1c Divide by smallest (0.904)

1d Convert ratio in simplest integer (x 2)

C	Cl	F
$\frac{16.3}{12.0} = 1.358$	$\frac{32.1}{35.5} = 0.904$	$\frac{51.6}{19.0} = 2.716$
$\frac{1.358}{0.904}$	$\frac{0.904}{0.904}$	$\frac{2.716}{0.904}$
3	2	6

Stage 2 (determines formulae of three molecular ions)

2a For E.F. M_r (corresponds to the molecule) = 221

2b since $M_r = 221$ lies within molecular ion range 220–224

2c Thus empirical formula = molecular formula

2d Three correct formulae

2e Correct M_r for each of three molecules

$\text{C}_3\text{}^{35}\text{Cl}_2\text{F}_6^+$	$\text{C}_3\text{}^{35}\text{Cl}^{37}\text{ClF}_6^+$	$\text{C}_3\text{}^{37}\text{Cl}_2\text{F}_6^+$
220	222	224

Stage 3 (explains the ratio of 3 molecular ion peaks)

3a Working

2b Correct (simplified) ratio 9:6:1

Note: 9:3:1 will be a common incorrect answer (max 5).

Working:

$\text{C}_3\text{}^{35}\text{Cl}_2\text{F}_6^+$	$\text{C}_3\text{}^{35}\text{Cl}^{37}\text{ClF}_6^+$	$\text{C}_3\text{}^{37}\text{Cl}_2\text{F}_6^+$
220	222	224
$^{35}\text{Cl}_2 = \left(\frac{3}{4}\right)^2 = \frac{9}{16}$	$^{35}\text{Cl}^{37}\text{Cl} \text{ and } ^{37}\text{Cl}^{35}\text{Cl} = 2 \times \frac{1}{4} \times \frac{3}{4} = \frac{6}{16}$	$^{37}\text{Cl}_2 = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$

[15]