

JANUARY 2001

ADVANCED LEVEL/ADVANCED SUBSIDIARY CHEMISTRY 9080/8080

MARK SCHEME

UNIT 6241 (Unit Test: C1)

1. (a) (i) C diagrams or clear arrows OK (1)
(ii) A (1)
(iii) D (1)
(iv) B (1)

- (b) allow multiples of equations and ignore state symbols
(i) $2K + 2H_2O \rightarrow 2KOH + H_2$ (1)
(ii) $2Ca + O_2 \rightarrow 2CaO$ (1)
(iii) $MgO + 2HNO_3 \rightarrow Mg(NO_3)_2 + H_2O$ (2)
1 mark for species; 1 mark for balancing

Total 8 marks

2. (a) (i) potassium or K or KO_2 (or Rb or Cs versions) (1)
(ii) any group 1 nitrate but NOT lithium nitrate
allow name or correct formula
or name/symbol of element (1)
(iii) potassium hydrogen sulphate/ iodine/ hydrogen iodide
hydrogen sulphide/ sulphur/ sulphur dioxide/
potassium sulphate
name or correct formula (1)
(iv) Hydrogen chloride or HCl or hydrochloric acid (1)
(b) Since $6dm^3$ have a mass of 9.5 g
 $24 dm^3$ have a mass of 38g
Molar mass = $38 g mol^{-1}$
Group 7 are diatomic
so F_2
marks 38 (1) F_2 (1) **don't allow F** justification (1) (3)

Total 7 marks

3. (a) Chlorine: yellow/green (1) gas(1) not vapour
brown solution or grey solid or black particles (1) (3)
Bromine: red/brown (1) liquid(1) not orange or yellow
brown or darker brown solution or grey solid or
black particles (1) (3)
last boxes must be observations

- (b) (i) sharing (1) a pair of electrons (1) (2)
(ii) weak intermolecular forces (1)
require little energy to break (1)
Non-polar/ temporary dipoles/ v.d.w. or
some valid comment on weak interaction (1)

NB Breaking covalent bonds scores 0.

- (c) (i) Intermolecular forces depend upon the number
of protons / electrons or the size of the molecule
NOT mass (1)
This number or size increases $HCl < HBr < HI$
so (more energy needed) to separate molecules (1)

NB the relationship between the strength of the intermolecular
forces
and boiling/melting missed in (b)(ii) could be awarded in (c)(i)

- (ii) HF has hydrogen bonding OR HF is more polar OR
 HF has bigger electronegativity difference OR
 F is more electronegative than Cl (1)
 Stronger intermolecular forces in HF than in HCl (1)

Total 15 marks

4. (a) (i) $\text{Mg (s)} + \text{Cl}_2 \text{(g)} \rightarrow \text{MgCl}_2 \text{(s)}$ (2)
 (1) for species and balancing
 (1) for 3 correct state symbols
 (ii) strong attractions between ions (1)
 needs lots of energy to break or giant lattice (1)
 (b) (Covalency is the result of polarisation of the anion by the
 cation. The magnesium ion is polarising)
 The iodide (ion) is larger than the chloride (ion) (1)
 The iodide (ion) is more easily polarised leading to
 covalency (1)
 (c) The attraction between (1)
 positive ions (1)
 in a sea of (mobile) electrons (1)

Total 9 marks

5. (a) formal charge (1)
 an atom would have in a compound if ionic (1)
 OR
 number of electrons lost or gained (1)
 control of / used for bonding (1)
 (b) (i) 0 +1 -1 (ignore everything else) (1)
 (ii) One of the chlorines in each molecule has lost
 an electron / been oxidised (1)
 The other chlorine in the chlorine molecule has
 gained an electron / been reduced (1)
 NB a simple statement / definition of disproportionation max 1
 (c) reacts / changes / dissociates / ionises / ...
 HCl donates a proton to the water (1)
 $\text{H}^+ \text{(aq)}$ or $\text{H}_3\text{O}^+ \text{(aq)}$ ions (1)
 (d) white precipitate (1) soluble in ammonia. (1) chloride
 cream ppt (1) slightly soluble in ammonia (1) bromide
 yellow ppt (1) insoluble in ammonia (1) iodide (6)
 NB if only 3 colours without any mention of ppt max 1 out of 3

Total 13 marks

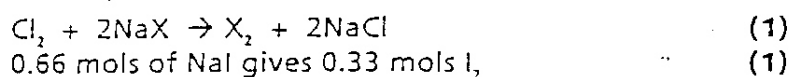
6. (a) (i) electron configuration or $3d^64s^2$ or $4s^2$ or number of **outer** electrons (1)
- (ii) 26 protons, 26 electrons, 30 neutrons all 3 (2) any 2 (1) (2)
- (iii) atoms (of same element) with same number of protons or same atomic number (1)
different number of neutrons or mass number (1)
- (b) (i) A ionisation not vaporisation (1)
B acceleration (1)
C deflection (1)
D detection (1)
- (ii)
$$\frac{(5.8 \times 54) + (91.6 \times 56) + (2.2 \times 57) + (0.33 \times 58)}{100}$$

= 55.87 (1)
(1)

Total 11 marks

7. (a) (i) energy (enthalpy change) required to remove an electron from 1 mole of gaseous atoms (1)
(1)
(1)
- (ii) increases across the period due to increasing nuclear charge / no. of protons constant shielding / same number of shells (1)
(1)
- (iii) $\text{Cl (g)} + e^- \rightarrow \text{Cl}^- \text{ (g)}$ (2)
 $\text{Cl} + e^- \rightarrow \text{Cl}^-$ (1)
gas (1) but only if (s) or (l) absent
- (b) Processes
Ratio $\text{Cl}_2 : \text{NaX}$ is 1:2 (1)
0.33 mol iodine (1)
0.17 mol chlorine unreacted (1)
0.17 mol bromine formed (1)

OR



This uses 0.33 mols Cl_2 (1)

$0.50 - 0.33 = 0.17$ mols Cl_2 gives 0.17 mols Br_2 (1)

mark consequentially

Total 12 marks

Overall total 75 marks