



MS4
£4.00

GCE MARKING SCHEME

**CHEMISTRY (NEW)
AS/Advanced**

SUMMER 2009

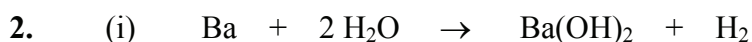
CH2

Section A

1.

Conducts electricity		Melting temperature		Bonding	
Yes	No	High	Low	Covalent	Ionic
✓		✓		✓	

[1]



[1]

(ii) Reagent: e.g. sulfuric acid

[1]

Observation: white precipitate

[1]

3. (i) There is no free rotation **about a double bond** / the compound has two different groups either side of the double bond

[1]

(ii) potassium dichromate(VI) / $\text{K}_2\text{Cr}_2\text{O}_7$ / dichromate / $\text{Cr}_2\text{O}_7^{2-}$

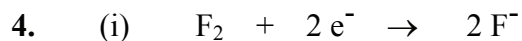
[1]

(iii) oxidation / redox

[1]

(iv) (relative) molecular mass / molar mass

[1]



[1]

(ii) (A) fluorine (atom) needs to gain an electron to have a full (outer) shell / fluorine has a high electronegativity

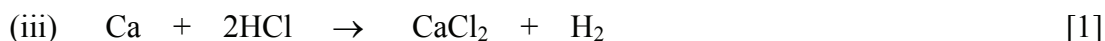
[1]

Section A Total [10]

Section B

5. (a) (i) atom economy = $\frac{34 \times 100}{(2 \times 53.5) + 74}$ (1) = 19 (1) [2]

(ii) $45 \text{ g} / 100 \text{ cm}^3 \equiv 450 \text{ g dm}^{-3}$ (1)
 concentration = $\frac{450}{111} = 4.05$ (accept 4.1) mol dm^{-3} (1) [2]

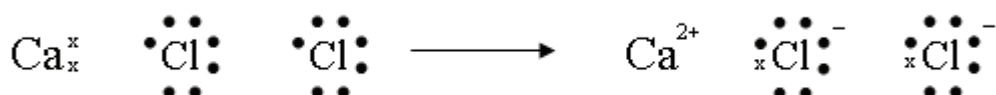


(iv) orange-red / brick red [1]

(v) Reagent: silver nitrate / AgNO_3 / Ag^+ / silver ions [1]

Observation: white precipitate [1]

(vi)



left hand side correct (1) right hand side correct (1) [2]

(vii) 111g of calcium chloride removes / react with 2×18.0 g water (1)

$$\begin{aligned} \therefore 5.55 \text{ g of calcium chloride mass removes / reacts with} &= \frac{5.55 \times 2 \times 18.0}{111} \\ &= 1.80 \text{ (g)} \quad (1) \end{aligned}$$

or in moles:

moles of calcium chloride 0.05 (1) moles of water 0.10 (1)

[2]

(viii) a covalent bond where one of the atoms (of the bond) provides both electrons [1]

Total [13]

6. (a) (i) \bullet Na⁺ \circ Cl⁻ [1]

(ii) 6 : 6 [1]

(iii) 8 : 8 (1)

Cs⁺ ion / cation is much larger than the Cl⁻ ion / anion (1)

[2]

(b) (i) Na⁺ ions are attracted to (δ-) oxygen of water molecules (1)

Cl⁻ ions are attracted to (δ+) hydrogen of water molecules (1)

[2]

(ii) I Mass of evaporating basin + sodium chloride solution = 140.57 g

Mass of evaporating basin = 72.00 g

∴ Mass of sodium chloride solution = 68.57 g

Mass of evaporating basin + dry sodium chloride = 90.57 g

Mass of evaporating basin = 72.00 g

∴ Mass of dry sodium chloride = 18.57 g

[1]

II 50.00 g [1]

III $2 \times 18.57 = 37.14 \text{ g / } 100 \text{ g water}$ [1]

IV temperature [1]

(c) the **outer** electron of an atom is an s electron [1]

(d) $4 \text{ Na} + \text{TiCl}_4 \rightarrow \text{Ti} + 4 \text{ NaCl}$

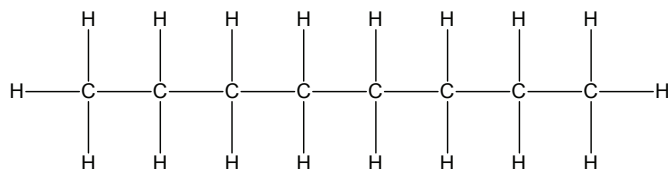
0 +4 (-1 x 4) 0 4 (+1) 4(-1) (1)

sodium has increased its oxidation number i.e. oxidation (1) [2]

Total [13]

7. (a) (i) Separation of the alkanes by differences in their boiling temperatures [1]
(ii) C₉H₂₀ [1]
(iii) Breaking of larger (alkane) molecules into smaller molecules (1) which are more useful / in relative short supply (1) [2]

(iv)



[1]

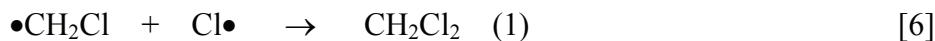
- (b) (i) The chlorine molecule is split by UV light (1) by homolytic fission (1) giving two chlorine free radicals



In the propagation stage radicals react to produce new radicals

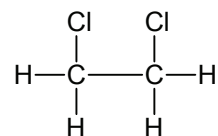


In the termination stage two radicals combine giving dichloromethane



(QWC) organise information clearly and coherently, using specialist vocabulary when appropriate [1]

- (ii) C₂H₄Cl₂ (1) displayed formula is



(accept the displayed formula of 1,1-dichloroethane) (1)

formed by the reaction together of two •CH₂Cl radicals (1)

[3]

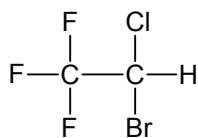
Total [15]

8. (a) (i) I the colour changes from red/brown/orange to colourless [1]
- II the name of the compound is 1,2,3-tribromobutane /
1,3-dibromobutan-2-ol / 1,2-dibromobutan-3-ol [1]
- (ii) I (warm) with (aqueous) sodium hydroxide / NaOH / alkaline solution [1]
- II this would give a white precipitate with aqueous silver nitrate /
a source of chloride ions [1]
- III the precipitate is not completely soluble in dilute aqueous ammonia /
the precipitate is soluble in concentrated aqueous ammonia [1]
- (b) (i) The sample would give a (broad) signal at $2500 - 3550 \text{ cm}^{-1}$ (1)
characteristic of the O–H bond (1)
accept answers based on C–O [2]
- (ii) Both molecules possess van der Waals forces (1)
Both molecules possess dipole-dipole forces (1) e.g. $\text{C}^{\delta+} - \text{Br}^{\delta-}$ or $\text{C}^{\delta+} - \text{OH}^{\delta-}$ (1)
But-2-en-1-ol has hydrogen bonding and the bromo compound does not (1)
Hydrogen bonding is stronger than other intermolecular forces (1)
therefore more energy is needed to separate the molecules (1) [6]
- (QWC) Ensure that text is legible and that spelling, punctuation and grammar are accurate so that the meaning is clear [1]*
- Select and use a form and style of writing appropriate to purpose and to complex subject matter [1]*

Total [15]

9. (a) (i) lone pair / bonding pair repulsion is greater than bonding pair / bonding pair repulsion [1]
- (ii) nitrogen and hydrogen have different electronegativities (1) and this results in polarity / unequal electron distribution in the bond (1) [2]
- (b) (i) e.g.
$$\begin{array}{c} \text{H} & & \text{H} \\ & \backslash & / \\ & \text{C} = & \text{C} \\ & / & \backslash \\ \text{H} & & \text{H} \end{array} + \text{H}_2 \rightarrow \begin{array}{c} \text{H} & \text{H} \\ | & | \\ \text{H}-\text{C} & - & \text{C}-\text{H} \\ | & | \\ \text{H} & \text{H} \end{array}$$
- equation using displayed formulae (1)
- ethane named (1) [2]
- (ii) e.g. spectacle frames / teeth brace [1]
- (iii) $109^\circ 28'$ / $109\frac{1}{2}^\circ$ / 109° [1]
- (c) (i) 60 – 70 atmospheres [1]
- (ii) I e.g. Al_2O_3 / porous pot / concentrated sulphuric acid / concentrated phosphoric acid [1]
- II elimination / dehydration [1]

(d) (i)



[1]

(ii) e.g. refrigerants / dry cleaning / solvents / pesticides / polymers [1]

(iii) Any TWO from:

the C – Br bond is the weakest and this has the greatest effect on the ozone layer, seen in CHClF_2 (0.05) and CBrClF_2 (10) (1)

increasing numbers of C – Cl bonds increase the RODP effect (1)

there is a marked increase in effect when going from 1 chlorine atom in a molecule to 2 chlorine atoms (1)

there is not such a marked change in effect when going from 2 chlorine atoms in a molecule to 3 chlorine atoms (1)

the C – F bond is the strongest and does not cause destruction of the ozone layer / has little effect on the ozone layer (1)

[2]

Total [14]

Section B Total [70]