

Edexcel GCE
Chemistry
6243/02

June 2006

advancing learning, changing lives

Results Mark Scheme

Edexcel GCE

Chemistry
6243/02

1 (a) Gas
ammonia/ NH_3

Cation
ammonium/ NH_4^+
If formula given must be correct

Anion
Sulphate / SO_4^{2-} OR Hydrogen sulphate / HSO_4^-

Formula of A
 $(\text{NH}_4)_2\text{SO}_4$ OR NH_4HSO_4
IGNORE names

ALLOW $(\text{NH}_4)_2\text{CO}_3$ or $(\text{NH}_4)_2\text{SO}_3$ consequential on anion (4 marks)

(b) Cation
Sodium/ Na^+

Gas
Oxygen/ O_2

Anion
 Cl^- / Chloride *NOT* chlorine or Cl

Compound B
Sodium chlorate
OR sodium chlorate(III) / (V) / (VII) *ALLOW* sodium chlorate(I)
OR NaClO_3 / NaClO_2 / NaClO_4 *ALLOW* NaClO / NaOCl

ALLOW correct name or formula for B based on consequential cation, provided it gives a flame test.

ALLOW correct name or formula for B based on consequential bromide anion.

(4 marks)

If chlorine given, can still get mark for B.

If both name and formula of B given, they must agree

Total 8 marks

- 2 (a) **Carbon dioxide**
lime water goes cloudy / milky/ white ppt (1)
IGNORE lighted splint extinguished

Sulphur dioxide

(potassium) dichromate((VI))/chromate((VI)) (1)
goes green (1) *ALLOW* goes blue *OR*
(potassium) permanganate/ manganate((VII)) (1)
goes colourless (1)

(3 marks)

IGNORE any reference to litmus going red

(b) **Route I**

add **solution** of any soluble Group II compound (to both) (1)

CO_3^{2-} white precipitate (1)

HCO_3^- no precipitate (1)

White precipitate on boiling (1)

Penalise once if an insoluble group II compound is used or solution not mentioned.

Route II

Use pH detection - pH meter/pH paper/ UI paper/ UI solution/ named indicator $\text{pK}_{\text{in}} > 9$ /phenolphthalein (1)

CO_3^{2-} pH 11-14 or correct colour (1)

HCO_3^- pH 7-9 or correct colour *NOT* pH 7 alone (1)

Boil/ heat pH changes to 11-14/ rises/ increases (1)

Max 3 marks routes

Boil/heat (1) *NOT warm*

CO_3^{2-} no CO_2 (1)

HCO_3^- correct test for CO_2 *NOT* bubbles (1)

OR pH detection, as for Route II above, and boil (1)

CO_3^{2-} no change (1)

HCO_3^- rises *NOT* changes (1)

Notes

- Allow magnesium ions/calcium ions/barium ions
- If use magnesium/calcium max (3)
- No marks for tests for CO_2 with acid
- Addition of any acid followed by tests on this solution (0)
- Addition of acid followed by tests on a fresh solution, *IGNORE acid*

4 marks)

Total 7 marks

- 3 (a) Cannot be weighed as it is a gas
ALLOW "measure" instead of "weigh" (1 mark)
- (b) Solution will not be 250 cm³/ will not know exact volume/ standard solutions contain mols per dm³ of **solution**. (1 mark)
- (c) (i) 2 and 3 (1)
- as these are within 0.2 cm³ of each other/ No.1 is too far away from the others/closest/most similar/concordant/ No. 1 is a rough titration (1) (2 marks)
NOT consistent/better agreement
- (ii) 30.4(0) (cm³)
consequential on part (i) (1 mark)
- (iii) $\frac{25.00}{1000} \times 0.0500 = 1.25 \times 10^{-3}$ (mol) (1 mark)
- (iv) 2 x (iii) (1 mark)
- (v) Value from (iv) x 1000 / mean titre from (ii) (1)
[Should be $2.5 \times 10^{-3} \times 1000 / 30.40$]
= 0.0822 mol dm⁻³ (1) - *value, units and 3 sig figs* (2 marks)
- NOTE*
- *the value must be reasonable ie between 0.01 and 0.1*
 - *if '1000' omitted in parts (iii) and (v), penalise once only*

Total 9 marks

- 4 (a) To make sure the decomposition/ reaction is complete / all the carbon dioxide has been given off. (1 mark)
Reference to burning (0)
NOT "maximum CO₂"

IGNORE significant figures in (b) and (c)

- (b) (i) 2.2(0) (g) (1 mark)
- (ii) $\frac{2.20}{44} = 0.05(00)$ mark is for $\div 44$ (1 mark)
- (iii) 0.05(00) (1 mark)
- (iv) $\frac{5.75}{0.0500} (1) = 115 \text{ (g mol}^{-1}\text{)}$ (1 mark)
- (v) $115 - (12 + 48) = 55$
Consequential BUT answer must be sensible (1 mark)
- (c) (i) Molar mass error = $\frac{115 \times 0.91}{100} = (\pm) 1(.05) (1)$
Consequential on (b)(iv)
ALLOW a range of 2 x error (1 mark)
- (ii) 114 to 116
Consequential on (i) (1 mark)
- (iii) 54 to 56
Consequential on (ii) (1 mark)
- (iv) "Could be Mn or Fe"
Consequential on (iii)
MUST be metals and must give all possible in range (1 mark)

Total 10 marks

5 (a) C=C / carbon carbon double bond (1)

ALLOW alkene

NOT just "double bond"

-OH/ hydroxyl/ OH (1)

NOT hydroxide

NOT OH⁻

NOT alcohol

(2 marks)

(b) Isomers of C₄H₈O - these could be

Unsaturated alcohols

butanal or methylpropanal

butanone

Saturated cyclic alcohols

Unsaturated ethers

ALLOW cis-trans isomers

Any carbon carbon double bonds must be shown

NOTE penalise skeletal formulae with no H atoms once only

(2 marks)

Total 4 marks

- 6 (a) (i) To act as solvent/allow mixing /to dissolve halogenoalkanes/
increase miscibility (1 mark)
- (ii) It makes sure all solutions are the same temperature / heated
equally (1 mark)
- (iii) Too slow at room temp
OR High activation energy
OR (covalent) bond (energy) too strong to break at room
temperature
NOT to increase rate of reaction (1 mark)
- (b) Chlorine/ chloride: white, bromine/ bromide: cream
and iodine/ iodide: yellow(1)
Add ammonia (1)
- Cl: ppt soluble in dil ammonia
Br: ppt soluble in conc ammonia *ALLOW* partial in dilute
I: ppt insoluble in conc ammonia } (1) (3 marks)
- (c) Use equal amounts (1)
of 1-bromobutane *OR* 1-bromo-2-methylpropane,
AND 2-bromobutane,
AND 2-bromo-2-methylpropane (1) - *stand alone*
- ALLOW names or structures*
IGNORE incorrect names if structures are correct
- at 60 °C / heat to same temp (between 40 and 75°C) (1)
- add (equal volume of) silver nitrate(solution) to each (1)
- observe time for ppt to be produced / order in which ppts form (1)
- Shortest time equivalent to fastest rate/*vice versa* (1)
- If add NaOH, only first 3 marks available*
- If use KMnO₄/K₂CrO₄/K₂Cr₂O₇ allow halogenoalkane names mark only*
- IGNORE statements of the expected result even if wrong*

(6 marks)

Total 12 marks
Total for paper: 50 marks