Unit Test 6243/02

1 (a) Barium / Ba^{2+} **(1 mark)**

(b) $BaSO_4$ / barium sulphate **(1 mark)**

(c) Nitrogen dioxide / NO_2 **(1 mark)**

(d) Ammonia / NH_3 **(1)**
Nitrate / NO_3^- **(1)** *stand alone mark* **(2 marks)**

(e) $Ba(NO_3)_2$ **(1 mark)**

(Total 6 marks)

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2 (a) C=C / alkene / carbon-carbon double bond
NOT "unsaturated hydrocarbon" **(1 mark)**

(b) AgI / silver iodide **(1 mark)**

(c) *Penalise missing Hs on (c) and (d) once only*
Full structure including C=C and C–I and all other atoms and bonds correct.
I can be on any C atom
halogen atom consequential on (b) **(1 mark)**

(d) Structure from (c) with Br atoms added across C=C **(1 mark)**

(Total 4 marks)

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3 (a) 20 g plus some working and must have units **(2)** e.g.
40 **(1)** x 5 x 0.100 = 20 **g (1)** **(2 marks)**

(b) $\frac{23.50 \times 0.0500 \times 2}{25.0} = 0.0940$ (mol dm^{-3})
correct use of 2:1 mole ratio **(1)**
method **(1)**
answer **(1)** **(3 marks)**

(c) (i) Adds 5 dm^3 of water not makes up to 5 dm^3 solution.
ALLOW NaOH container was not re-weighed
OR solid/NaOH left in its container
NOT "use volumetric flask"
NOT "NaOH lost"
NOT " failure to wash out NaOH container" **(1 mark)**

(ii) Reference to absorbing moisture and/or (named) acidic gas(es) **(1 mark)**

(d) (i) Causes burns / damage to / destroys living tissue
OR damage to work bench
NOT just "harmful"
NOT "corrodes" **(1 mark)**

(ii) Wear gloves **(1 mark)**

(Total 9 marks)

4 (a) Density = 1.0 g cm^{-3}
OR 1 cm^3 (of water) weighs 1 g **(1 mark)**

(b) (ΔT = 38.1 – 19.5 =) 18.6 (°C) *calculated or correctly used* **(1)**

$\frac{200 \times 4.18 \times 18.6}{1000}$ = 15.5/15.55 (kJ) **(1)**
Correct answer with some working **(2)** **(2 marks)**

(c) (Mass used = 198.76 – 197.68 =) 1.08 *calculated or correctly used* **(1)**
Moles = $\frac{1.08}{46.0}$ = 0.0235 / 0.02348 **(1)** **(2 marks)**

(d) Answer to (b) **(1)**
Answer to (c)

e.g. $\frac{15.5}{0.0235}$

negative sign and kJ mol^{-1} **(1)**
answer correct to 3sf **(1)** **(3 marks)**

(e) (i) Ethanol vaporises/evaporates **(1 mark)**

(ii) Carbon/soot **(1)**
Incomplete **combustion**/insufficient oxygen so reaction does not go to completion **(1)** **(2 marks)**

(Total 11 marks)

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5 (a) (Heating under) reflux **(1)**
Distillation/simple distillation **(1)**
NOT fractional distillation **(2 marks)**

(b) (i) $\frac{137}{74}$ x 3.70 **(1)** = 6.9/6.85(g) **(1)**
(2 marks)

(ii) $\frac{4.60}{\text{answer to (i)}} \times 100 = 67 / 66.67 / 66.7\ \%$
(1 mark)

(iii) Slow/reaction takes a long time / high activation energy. **(1 mark)**

(iv) Measure boiling temperature/point **(1)**
Compare with data book/literature/known value **(1)** **(2 marks)**

(c) (i) Orange to green **(1 mark)**

(ii) **Oxidation** continues **(1)**
carboxylic acid formed **(1)** **(2 marks)**

(iii) Aldehyde/first product distilled off as it forms/removed from reaction mixture **(1 mark)**

(Total 12 marks)

6. **READ THE WHOLE PLAN THROUGH FIRST**

Procedure and measurements

- Weigh test tube empty ✓P1
- Weigh test tube + QCO_3 ✓P2
- Heat QCO_3 **to constant mass** ✓P3

Results and Identification

- $\frac{\text{loss in mass}}{M_r\ CO_2}$ (= moles CO_2) = moles QCO_3 ✓R1
- $\frac{\text{Mass of } QCO_3}{\text{Moles } QCO_3} = M_r\ QCO_3$ ✓R2
- $M_r\ QCO_3 - 60 = A_r\ Q$ ✓R3

ALLOW credit via QO route

- $\frac{\text{loss in mass}}{M_r\ CO_2}$ (= moles CO_2) = moles QO ✓R1
- $\frac{\text{mass QO}}{\text{moles QO}} = M_r\ QO$ ✓R2
- $M_r\ QO - 16 = A_r\ Q$ ✓R3

Alternative correct methods can score up to three 'R' marks.

Errors and significance

- Incomplete decomposition/reaction *OR* impure sample of QCO_3/carbonate ✓E1
- Not significant since need only match A_r to nearest Group 2 element ✓E2 **(8 marks)**

(Total 8 marks)