UNIT TEST 6251/01 UT1 Jan '03

Section A

1 (a) $Cu(NO_2)_3.6H_2O_{(s)} \rightarrow CuO_{(s)} + 2NO_2(g) + \frac{1}{2}O_2(g) + 6H_2O(g)$ **(1)**

(1)

(2 marks)

ACCEPT multiples x2 [then $12H_2O(g)$]

(b) Brown gas (given off)

turns black / dark brown

Solid forms a solution / dissolves / forms a liquid/bubbles of gas

Misty fumes /steam / water vapour given off / condensation seen (in upper part of test-tube).

Any two

(2 marks)

2 (a) (i) NO_3^-

(ii) CrO_4^{2-} **(2 marks)**

(b) Ag^+ , CrO_4^{2-} or names **(1 mark)**

(c) $2Ag^+(aq) + CrO_4^{2-}(aq) \rightarrow Ag_2CrO_4(s)$
Formulae and balancing **(1)**
State symbols **(1)** **(2 marks)**

3 (a) $\frac{20}{1000} \times 0.5 = 0.01$ **(1 mark)**

(b) Energy change = 20 x 4.18 x 26.3 = (2198.68)
$\Delta H = (-) \frac{2198.68}{0.01}$ **(1)**

-220, *ALLOW 4sf* –219.9, *no units needed*
OR – 220,000 J **(1)** **(2 marks)**

SECTION A TOTAL 12 MARKS

SECTION B

4 (a) A Acid base / neutralisation **(1)**

B **thermal** decomposition/redox/dehydration **(1)** **(2 marks)**

(b) (i) Pipette **(1 mark)**

(ii) Burette **(1 mark)**

(iii) eg methyl orange **(1)**
Yellow → red/pink/orange *OR*
Orange → red/pink **(1)**

ACCEPT other indicators (p.123 Book of data) eg

Phenolphthalein	pink → colourless *NOT* clear
Screened methyl orange	green →purple
Bromothymol blue	blue → yellow
Bromophenol blue	blue → yellow

Colour change must match the indicator.
Colour change mark can only be given if indicator named.

NOT litmus/U.I. **(2 marks)**

(iv) 20 cm^3 / 0.02 dm^3 *MUST have correct units*
(1 mark)

(v) Evaporate / boil off **some** of the water **(1)**
Evaporate to dryness **(0 out of 3)**
Leave to cool **(1)**
Filter off/decant crystals and dry with filter paper **(1)**
Ovens must have a low temperature quoted
(3 marks)

(c) (i) 80 ($g\ mol^{-1}$) **(1 mark)**

(ii) $\frac{4}{80} = \frac{1}{20}$ or 0.05 *ALLOW T.E. from (i)*
(1 mark)

(iii) 0.05 x 24 = 1.2 dm^3 / 1200 cm^3
MUST have correct units
(1 mark)

(Total 13 marks)

5. (a) **Electrons** can only have **particular amounts of energy** / are quantised (so transitions between energy levels only have discrete amounts of energy).

(1 mark)

(b) n = 5 to n = 4 **(1 mark)**

(c) (i) see diagram (from lowest energy level **(1)** to n = ∞ or above **(1)**) **(2 marks)**

(ii) $H(g) \rightarrow H^+(g) + e^{(-)}((g))$ *OR* $H(g) - e^- \rightarrow H^+(g)$
Formulae correct **(1)**
State symbols **(1)** **(2 marks)**

(Total 6 marks)

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6. (a) (i) $(46 \times 8 + 47 \times 7.3 + 48 \times 74 + 49 \times 5.5 + 50 \times 5.2) \div 100 = 47.926$
$= 47.9$
Method **(1)**
Correct answer to three significant figures **(1)** **(2 marks)**

(ii) mass spectrometer **(1 mark)**

(b) (i) $1s^2 2s^2 2p^6 3s^2 3p^6$ **(1)** $4s^2 3d^2$ *OR* $3d^2 4s^2$ **(1)** **(2 marks)**

(ii) Transition metals /elements *OR* d block **(1 mark)**

(c) (i) reduction or redox **(1 mark)**

(ii) $940 - 2 \times 110 = +720$ kJ mol^{-1}
Method **(1)**
Value **(1)**
Sign and units **(1)** **(3 marks)**

(iii) Hess / Law of Conservation of Energy / First Law of Thermodynamics **(1 mark)**

(iv) Carbon monoxide / CO is produced **(1)**
which is toxic / poisonous **(1)** **(2 marks)**

(Total 13 marks)

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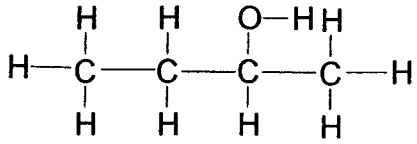
7. (a)



OH on second carbon atom **(1)**
All of molecule displayed **(1)**
Butan-2-ol **(1)**

(3 marks)

(b) (i) $CH_3CH_2CH_2CH_2OH$ *OR* $CH_3CH(CH_3)CH_2OH$ *OR* CH_3CHCH_2OH (CH_3 branch)

NOT displayed
NOT C_4H_9OH

(1 mark)

(ii) Butanone **(1)**

Butanal and butanoic acid *OR*
2-methylpropanal and 2-methylpropanoic acid **(2)**

IF Ketone , Aldehyde + Carboxylic acid **1 (out of 3)**

(3 marks)

(c) (i) Suitable flask with contents and heat **(1)**
Vertical Liebig condenser **(1)**
Water flow correct **(1)**

(3 marks)

IF distillation and correctly drawn **1 max** *ie for flask and heat*

Penalties
Poor diagram **–1**
Sealed apparatus **–1**

(ii) (Fractional) distillation

(1 mark)

(d) (i) $CH_3CH=CHCH_3$ or $CH_3CHCHCH_3$ **(1)**
ALLOW cis and trans forms for 2 marks
ALLOW displayed

$CH_3CH_2CH=CH_2$ **(1)**

But-2-ene and but-1-ene or cis-but-2-ene and trans-but-2-ene **(1)**

(3 marks)

(ii) purple/(pale) pink to colourless/brown

(1 mark)

(iii) Bromine (water) *NOT* bromine gas

(1 mark)

Total 16 marks

TOTAL FOR SECTION B: 48 MARKS