6251

SECTION A

1. (a) 31e, 38n, 31p
All correct → **(2)**
2 correct → **(1)** **(2 marks)**

(b) $\frac{(69\times60) + (71\times40)}{100}$ **(1)**
$= (4140 + 2840)/100$
$= 69.8$ **(1)**
-1 *for more or less than 3 SF* **(2 marks)**

(c) Metallic / metal **(1 mark)**

2. (a) (i) 4gS = 1/8 mol / 0.125 mol **(1 mark)**

(ii) 1/8mol S → 1/8 mol SO_2 (stated or implied) **(1)**
Volume = 24/8 = 3 dm^3 / 3.0 dm^3 / 3.00 dm^3 / 3000 cm^3 **(1)**
-1 for incorrect/missing units **(2 marks)**

(b) $\underbrace{SO_2 + 2OH^-}_{(1)} \rightarrow \underbrace{SO_3^{2-} + H_2O}_{(1)}$ **(2 marks)**

(c) Tasteless,
odourless,
non-toxic/not poisonous,
acceptable colour,
colourless,
harmless to humans,
preservative must be stable
NOT non-irritant
NOT unreactive
NOT does not react with food
NOT does not react with packaging
NOT antioxidants owtte
Any one
Look for properties of the preservative, not outcomes **(1 mark)**

SECTION A TOTAL: 11 Marks

SECTION B

3. (a) (i) lilac/ purple/ violet /mauve/qualified purple e.g. pinky-purple
NOT pink, red, blue **(1 mark)**

(ii) electrons are excited / jump to higher level / shell / orbital / outer shell **(1)**
fall back emitting light of particular frequencies
allow references to quanta, packets of energy, photons **(1)** **(2 marks)**

(b) (i) $(1s^2\ 2s^2)\ 2p^6\ 3s^2\ 3p^6$ **(1 mark)**

(ii) chloride
as fewer protons / smaller nuclear charge
or alternative argument for K^+ **(1 mark)**

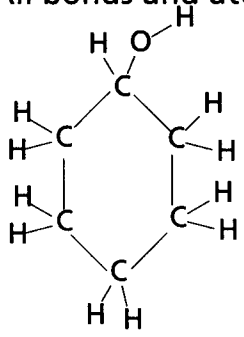
(c) (i) $K(g) \rightarrow K^+(g) + e^-$
or $K(g) - e^- \rightarrow K^+$ } **(2)**

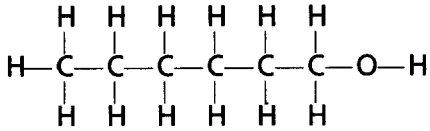
-1 for incorrect state symbols **(2 marks)**

(ii) Outer electron further from nucleus / at a higher energy level in potassium than in sodium **(1)**
so force / attraction / influence of nucleus on electron weaker **(1)**
OR
Potassium has an extra **shell** of electrons **(1)**
Outer electrons more shielded **(1)**

(2 marks)
Total 9 marks

4. (a) (i) All bonds and atoms shown for each alcohol





(2 marks)

(ii) Molecular formulae are different / different number of hydrogen atoms in each **(1 mark)**

(iii) cyclohexanol secondary **(1)**
hexan-1-ol primary **(1)** **(2 marks)**

(iv) $CH_3CH_2\ CH_2\ CH_2\ CH_2CHO$ **(1)**

Hexanal **(1)** **(2 marks)**

(v) Warm with Benedict's / Fehling's solution **(1)**
Hexan-1-ol: blue solution goes brown / red-brown / red / orange / yellow / green (ppt) **(1)**
Cyclohexanol: no change/ stays blue **(1)**
Use of bromine to test for an alkene **(0)**
Use of sodium carbonate to distinguish hexanoic acid from cyclohexanone, described correctly **(3)**
OR test with suitable acidified dichromate
OR manganate(VII)
Product of hexan-1-ol: orange → green with dichromate
purple → colourless with permanganate
Product of cyclohexanol: no change **(3 marks)**

(b) (i) Elimination/ dehydration **(1 mark)**

(ii) Labelling not required if apparatus recognisable
Round-bottom / pear-shaped flask + heat **(1)**
cyclohexanol + conc sulphuric acid / phosphoric acid **(1)**
condenser with correct water flow **(1)**
receiving vessel OR closed flask + vent **(1)**
OR tube containing mineral wool + heat
(heat left hand side of tube) **(1)**
Cyclohexanol in wool + aluminium oxide / Al_2O_3 **(1)**

Penalties
Apparatus would not work e.g. no stopper above flask **-1**
Poor diagram **–1**
Completely sealed apparatus **–1** **(4 marks)**

(iii) Add anhydrous / fused calcium chloride or anhydrous sodium / magnesium sulphate
Accept formula
Decant / filter off drying agent **(1)**
For (re-)distilling without mentioning drying agent
Accept fractional distillation **(1)** **(2 marks)**

Total 17 marks

5. (a) (i) $Sr(s) + 2H_2O(l) \rightarrow Sr(OH)_2(aq) + H_2(g)$
hydrogen as product **(1)**
correctly balanced (accept multiples) **(1)** **(2 marks)**

(ii) loses electrons/ turns to positive ion / increases oxidation number
No marks for "gains oxygen" **(1 mark)**

(b) (i) To ensure solution is saturated owtte
NOT reacts completely **(1 mark)**

(ii) $(16.9)(0.100)(10^{-3}) = 1.69 \times 10^{-3}$ / 0.00169 **(1 mark)**

(iii) mol $Sr(OH)_2$ reacting = $1.69 \times 10^{-3}/2 = (0.845 \times 10^{-3})$ / 0.000845 **(1)**
mol $Sr(OH)_2$ in 1 $dm^3 = \frac{0.845 \times 10^{-3} \times 1000}{25} = 0.0338$ **(1)**
first mark is for correct use of mole ratio
allow TE from (ii) and within (iii) **(2 marks)**

(iv) mass 1 mol $Sr(OH)_2$ = 122 **(1)**
solubility = (122)(0.0338) = 4.12 (g dm^{-3}) **(1)** **(2 marks)**

(c) (i) Evaporate/boil off some of the water / oven must have a low temperature quoted **(1)**
Leave to cool **(1)**
Filter off/decant crystals and dry with filter paper / with propanone / in desiccator **(3 marks)**

(ii) $2Sr(NO_3)_2.4H_2O \rightarrow \mathbf{8}H_2O + \mathbf{2}SrO + \mathbf{4}NO_2 + \mathbf{O_2}$
oxygen produced **(1)**
equation balanced **(1)** **(2 marks)**

(iii) $Sr(NO_3)_2(aq) + K_2SO_4(aq) \rightarrow 2KNO_3(aq) + SrSO_4(s)$
Balanced equation **(1)**
State symbols. **(1)**
ACCEPT ionic equation: $Sr^{2+}(aq) + SO_4^{2-}(aq) \rightarrow SrSO_4(s)$
(2 marks)
TOTAL 16 marks

6. (a) (i) H_2O is proton / H^+ / hydrogen ion donor **(1 mark)**

(ii) Strong base ionises completely in water/solution
or weak base does not ionise/ interact to any extent in water
or strong base is a better proton acceptor than weak base
Don't allow definitions based on rate **(1 mark)**

(b) (i) $2N_2(g) + 6H_2(g) + 5O_2(g)$

Correct diatomic elements with state symbols **(1)**
Balanced cycle **(1)** **(2 marks)**

(ii) ie $\Delta H = 4(90.2) + 6(-241.8) - 4(-46.1)$ **(2)**
$= 360.8 - 1450.8 + 184.4$
$= -905.6$ kJ mol^{-1}
$= -906$ kJ mol^{-1} **(1)**

-1 for incorrect significant figures

correct use of Hess cycle **(1)**
correct use of multiples **(1)**
consequential answer with correct sign and units **(1)** **(3 marks)**

Total 7 marks