Unit 3 & 4 Chemistry
VCE Trial Examination 2024
Marking Scheme

Section A – Multiple-choice questions

_____

Question 1

Option B is correct. The higher the average bond enthalpy, the stronger the covalent bond.

According to Item 10 of the Data Book, the average bond enthalpies of bonds in decreasing order are C-H 414 kJ mol^{-1} > C-C 346 kJ mol^{-1} > C-Cl 324 d C-I 228 kJ mol^{-1}

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.9.

Question 2

Option D is correct. The original equation coefficients have been doubled, so the equilibrium constant value is squared (raised to the power of 2).

$(3.51)^2 = 12.3$

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.3.

Question 3

Option B is correct.

Option B will increase the yield of NO_2. According to Le Chatelier's principle, decreasing pressure (reducing concentration) will cause the system to partially oppose the change by favouring the side of the reaction with most particles (2 on product side vs 1 on reactant side).

Option A will lead to a decreased yield of nitrogen dioxide by the system moving left to partially oppose the decrease in N_2O_4 from its removal. Option C will not change yield of product. Option D will lead to a decrease in the yield of product by the system moving towards the left to partially oppose the increase in pressure moving to the side of the reaction with fewer particles.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.3.

Question 4

Option A is correct.

Equations 1 and 2 are exothermic reactions. To increase yield, the temperature of these systems should be decreased. Equation 1 has 2 particles on the product side versus 4 particles on the reactant side, therefore increasing pressure would result in a forward reaction to the side with fewer particles. However, Equation 2 has the same number of particles on both sides of the equation so changing pressure will have no effect on yield.

Equations 3 and 4 are both endothermic, so a decrease in temperature will lead to a backwards reaction increasing the formation of the reactants. Equations 3 and 4 have more particles on the right side of the equation, so increasing pressure will cause the system to move in the backward direction to partially oppose the change.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.3.

Question 5

Option A is correct.

Options B, C and D are all suitable techniques that can be used in a school laboratory Option A – there would not be a volume change.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.1.

Question 6

Option B is correct.

The species present in this electrolytic cell are $Na^+(aq)$, $I^-(aq)$ and $H_2O(l)$. Iodide ions, I^- are a stronger reducing agent than water molecules and are oxidized at the anode to form $I_2(s)$.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.5.

Question 7

Option B is correct.

- **VCAA defines resolution as :** *The smallest change in the quantity being measured that causes a perceptible change in the value indicated on the measuring instrument. This has implications for determining the number of decimal places to which a quantity may be quoted.* For example, if the measurement scale on a 50 mL burette is at 0.1 mL intervals, the resolution of the burette is said to be 0.1 mL. In a titration, the user must estimate the volume between the two marked intervals on the burette so that the value reported will be to two decimal places. For example, measurement readings of 16.60 mL or 16.55 mL are possible, but a measurement reading of 16.57mL cannot be claimed. The meniscus of the liquid will either be on the burette line marking, in which case the reading would be 16.50, or it will lie between 16.50 and 16.60, in which case it is measured as 16.55 mL.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2.

Question 8

Option B is correct.

$n(CH_3CH_2OH) = \frac{m}{M} = \frac{30.00}{[(2 \times 12.0)+(6 \times 1.0)+16.0)]} = 0.652 \; mol$

$n(O_2) = \frac{V}{V_m} = \frac{40.0}{24.8} = 1.61 \; mol$

Mole ratio $CH_3CH_2OH:O_2$ = 1:3

$n(\text{ethanol reacting with 1.61 mol } O_2) = \frac{1.61}{3} = 0.537 \; mol$

0.537 mol < 0.652 mol so ethanol is in excess

Therefore, oxygen is the limiting reactant

Ethanol is in excess by 0.652 – 0.537 = 0.115 mol

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.3.

Question 9.

Option D is correct.

The molecule is non-polar, most of the bonds are C-C or C-H. Therefore a non-polar solvent such as cyclohexane would be the most suitable.

Options A, B and C are incorrect because water, ethanol and methanoic acid are all polar solvents.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.6.

Question 10

Option A is correct. The x-axis is m/z ratio which is typical of a mass spectrum.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.5.

Question 11

Option B is correct.

There are 5 different carbon environments in this molecule, therefore there will be 5 peaks on the ^{13}C NMR spectrum.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.4.

Question 12

Option D is correct

$n(I_2) = \frac{m}{M} = \frac{2.10}{2 \times 126.9} = 0.00827$ mol

$n(DHA) = \frac{m}{M} = \frac{16.29}{328.5} = 0.0496$ mol

Mole ratio $= \frac{n(C=C)}{n(iodine)} = \frac{0.04959}{0.008274} = 5.99$

Therefore, there are 6 C=C double bonds in DHA

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2.

Question 13

Option C is correct.

Pentanoic acid will have hydrogen bonding in dimers as the strongest form of intermolecular bonding and will have the highest boiling point. Pentan-1-ol will also form hydrogen bonding between adjacent molecules so will have the next highest boiling point. Pentane has only dispersion forces between adjacent molecules so will have the lowest boiling point of the three compounds.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.1.

Question 14

Option A is correct. The bromine water test is a qualitative test for the presence of C=C double bonds in molecules. Options B, C and D are all qualitative tests that signify the presence of a carboxyl group.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.1.

Question 15

Option A is correct.

This is an esterification reaction between a carboxylic acid (butanoic acid) and an alcohol (propan-1-ol). The products are an ester (propyl butanoate) and water.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.1.3.
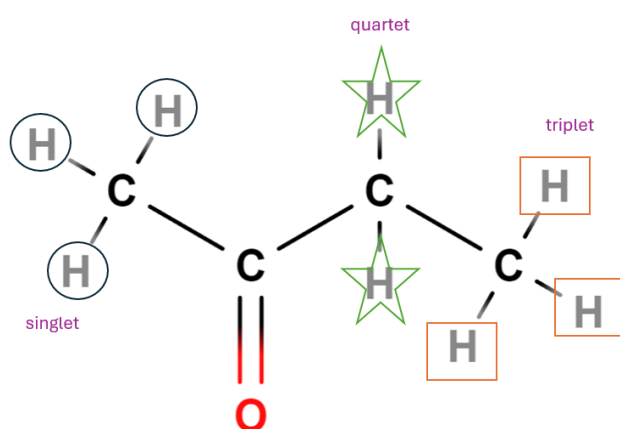
Question 16

Option C is correct..

% atom economy $= \frac{\text{molar mass of desired product}}{\text{molar mass of reactants}}$ x 100 $= \frac{(7 \times 12.0)+(14 \times 1.0)+(2 \times 16.0)}{[(4 \times 12.0)+(8 \times 1.0)+(2 \times 16.0)]+[(3 \times 12.0)+(8 \times 1.0)+(1 \times 16.0)]} =$

$\frac{130.0}{148.0}$ x 100 $= 87.84$ %

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.1.4.

Question 17

Option C is correct.

Pentanoic acid has 5 hydrogen environments and would have one singlet, 2 triplets, a quartet and a multiplet. 2,3,3-trichloropentane has 4 hydrogen environments including 2 quartets, a doublet and a triplet. Hex-3-ene has 3 hydrogen environments due to symmetry. It has 2 triplets and a multiplet.
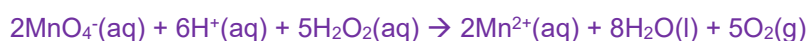
For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.4.

Question 18

Option A is correct.

Write the oxidation numbers above each element for all species. The oxidising agent causes the other species to be oxidised, but itself is reduced so the oxidation number of the element in the oxidising agent decreases in the reaction.

The oxidation number of manganese decreases (reduces) from +7 to +2 during the course of the reaction.

+7 -2   +1   +1 -1   +2   +1 -2   0

$2MnO_4^-(aq) + 6H^+(aq) + 5H_2O_2(aq) \rightarrow 2Mn^{2+}(aq) + 8H_2O(l) + 5O_2(g)$

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2.

Question 19

Option B is correct.

According to the electrochemical series, Pb^{2+} is the strongest oxidising agent and Fe(s) is the strongest reducing agent. There is a negative gradient between these two species on the electrochemical series so a spontaneous reaction will take place. Lead(II) ions will be reduced at the cathode (the lead electrode, which has a positive polarity in a galvanic cell, Red Cat), while at the anode (iron electrode which has a negative polarity in a galvanic cell, An Ox) iron metal will be oxidised to form iron(II) ions.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.7.

Question 20

Option C is correct.

This reaction will take place at the anode.

D is incorrect. At the cathode, oxygen gas (the oxidizing agent) is reduced to form water. Option A is incorrect. This is an oxidation half-equation and in this cell water is the product. B is incorrect, while this is a reduction half-equation, the electrolyte is acidic, not basic (indicated by hydroxide ions)

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.8.

Question 21

Option C is correct.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.1.

Question 22

Option B is correct.

The equation shows a triglyceride reacting in a transesterification reaction with 3 mol of methanol to produce glycerol and 3 mol of biodiesel.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.1.3.

Question 23

Option A is correct.

Fossil fuels, blue hydrogen and grey hydrogen are all non-renewable sources of energy.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.1.

Question 24

Option A is correct

The Data Book has diagrams that represent both circular and linear economies.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.1.4.

Question 25

Option D is correct.

Reduction always takes place at the cathode (RedCat), so electrons should be present on the reactant side of the equation. The stem of the question mentions 'alkaline' conditions so hydroxide ions should be present in the equation.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.5.

Question 26

Option D is correct.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.7

Question 27

Option D is correct.

$$\frac{n(unknown)}{n(known)} = \frac{n(carbon\ dioxide)}{n(propane)} = \frac{3}{1}$$

Therefore $n(CO_2)$ = 3 x $n(C_3H_8)$ = 3 x 5.00 = 15.0 mol

$m(CO_2)$ = n x M = 15.0 x 44.0 = 660 g

$V(CO_2)$ = n x V_m = 15.0 x 24.8 = 372 L

Greenhouse gases include $CO_2(g)$, $CH_4(g)$ and $H_2O(g)$. In this reaction, the only type of greenhouse gas present is CO_2 since the state of water is liquid under SLC.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.3.

Question 28

Option A is correct. From the calibration curve, a peak area of 6996 corresponds to a concentration of caffeine of 350 mg L^{-1}.

One can of the drink contained 375 mL. Therefore, the caffeine content of one can = 350 x $\frac{375}{1000}$ = 131 mg.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.5.

Question 29

Option B is correct. Links to reliable sources of information should be included in both the introduction and discussion sections of a scientific poster/report.

Question 30

Option A is correct.

Octane is non-polar while methanoic acid, ethanoic acid and propanoic acid all contain a polar carboxyl group. As the length of the non-polar hydrocarbon chain in the carboxylic acids increases, the overall polarity of the molecule decreases. Thus, methanoic acid is the most polar molecule and will be the most soluble in the polar mobile phase and will elute first. Octane is non-polar and will be most strongly adsorbed to the stationary phase.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.5.

Section B
Question 1

a.

Energy = (6.3 x 17kJ) + (13.3 x 16 kJ) + (2.1 x 37 kJ) = 107.1 + 212.8 + 77.7 = 4.0×10^2 kJ/100g

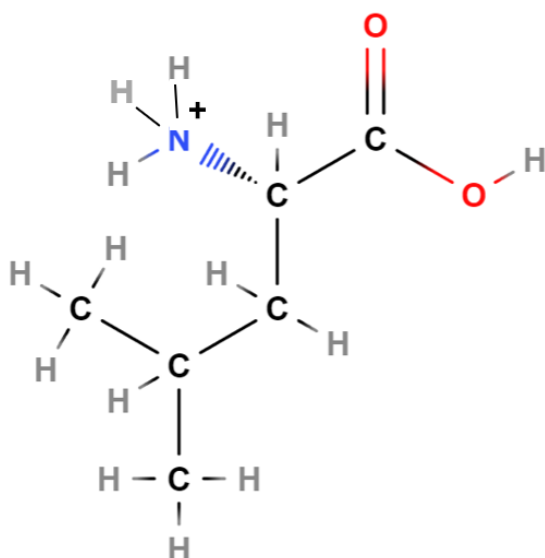**(1 mark)**

Energy per serve = $\frac{40}{100}$ x 398 = 1.6×10^2 kJ per serve **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.5.

b.i.

Complete structural formula **(1 mark)**

The positive sign must be next to the N atom. **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.7.

b.ii. Non-polar **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.7.

b.iii. Dispersion forces (1 mark)

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.7.

c.i.

Overall percentage yield = 0.214 x 0.744 x 0.161 x 0.627 x 0.403 x 100 = 0.648 % **(1 mark)**

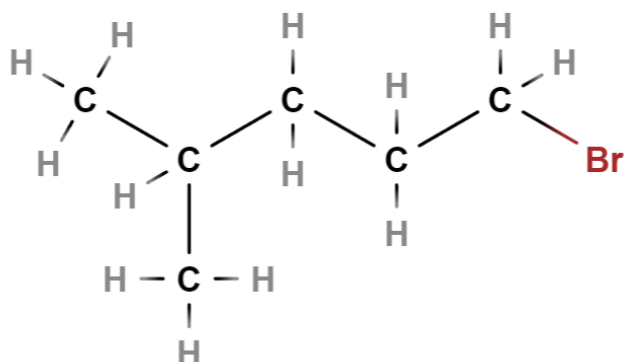For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.1.4.

c.ii.

percentage atom economy = $\frac{\text{molar mass of desired product}}{\text{molar mass of reactants}} \times 100 = \frac{(6 \times 12.0)+(13 \times 1.0)+(1 \times 79.9)+(1 \times 16.0)}{[((6 \times 12.0)+(14 \times 1.0)++(1 \times 16.0)]+(2 \times 79.9)} =$

$\frac{180.9}{261.8}$ x 100 = 69.10% **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.1.4

c. iii.

(1 mark)

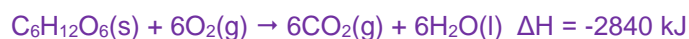For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.1.1

c.iv

MnO_4^-/H+ heat/reflux or $Cr_2O_7^{2-}$/H+ heat/reflux **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.1.3

d. Hydrolysis **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.1.3

e.i.

$C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$ ΔH = -2840 kJ

1 mark balanced equation

1 mark states and enthalpy change including sign

State $C_6H_{12}O_6$ as solid as per Item 13 of the databook

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.4

e.ii.

$C_6H_{12}O_6(aq) \rightarrow 2C_2H_5OH(aq) + 2CO_2(g)$

1 mark balanced equation

1   mark states

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.2

e.iii.

Distillation / fractional distillation **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.1

Question 2 (13 marks)

a.

Type of bond	Number of bonds	
N≡N	1	**(1 mark)**
H-H	3	**(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.9

b.

Type of bond	Number of bonds
N-H	6

(1 mark)

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.9

c. ΔH = Σ (bond breaking) – Σ (bond forming)
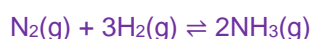
= [(1 x 945) + (3 x 436)] – (6 x 391) **(1 mark)**

= 2253 - 2346

= -93 kJ **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.9

d. Exothermic because the sign on the enthalpy change is negative**. (1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.2

e. An Equilibrium arrow should be used instead of a full reaction arrow to show that the equation is reversible **(1 mark)**

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.2

f. i. $K = \frac{[NH_3]^2}{[N_2][H_2]^3}$ M^{-2} **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.3

f.ii.

	N_2	$3H_2$	$2NH_3$
n(initial) mol	27.8	76.2	0
n(change) mol	-24.5	-73.5	+49.0
n(equilibrium) mol	3.3	2.7	49.0 **(1 mark)**
[equilibrium] M	0.66	0.54	9.80

$K = \dfrac{[NH_3]^2}{[N_2][H_2]^3} = \dfrac{9.80^2}{(0.66)(0.54^3)} = 924 \text{ M}^{-2} = 9.2 \times 10^2 \text{ M}^{-2}$ to 2sf   **(1 mark)**

1 mark (change n(N_2 and H_2)

1 mark (initial n(N_2) and (H_2)

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.3

f.iii

significant quantities of reactants and products **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.3

g.
forward direction **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.3

Question 3

   a. Experiment Y   **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.1

   b.

In Experiment Y there will be more HI/product particles per unit volume (1 mark). Thus there will be more frequent collisions and more frequent successful collisions (thus a faster rate of the reverse reaction). (1 mark)

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.1

   c.

Wear breathing apparatus to avoid inhalation / use a fume hood to avoid inhalation / wear personal protective equipment including gloves and goggles to avoid contact with skin and eyes. **(1 mark)**
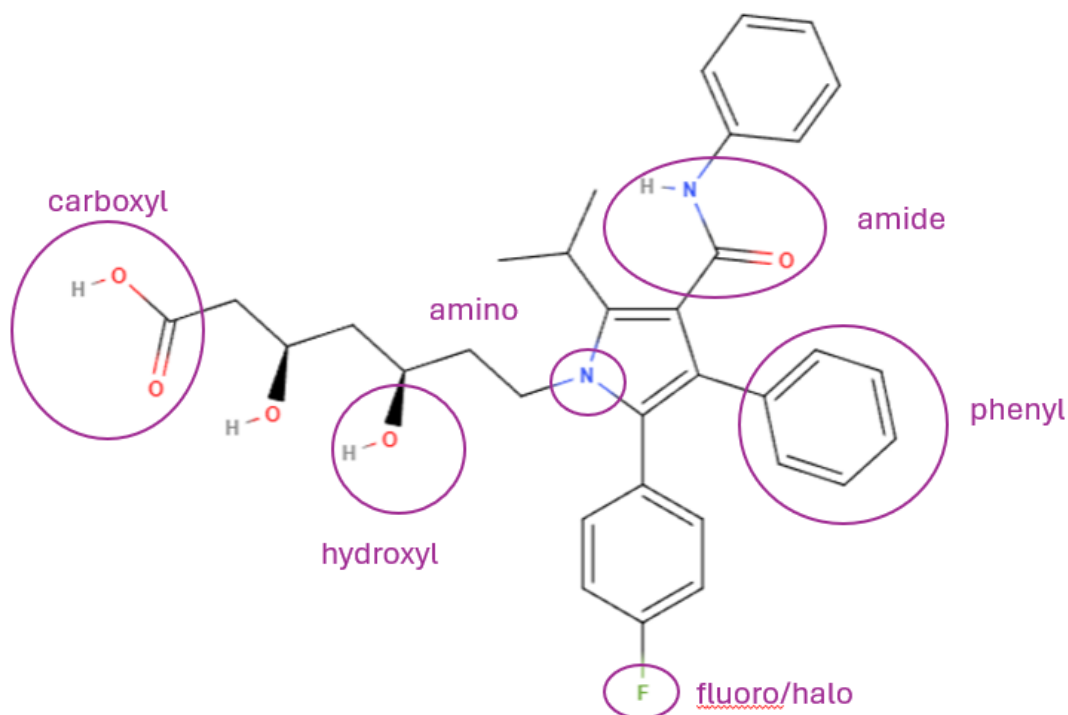
Question 4
   a.

Level of protein structure	Type(s) of bonding involved
primary	Covalent (amide/peptide links -CONH-) **(1 mark)**
secondary	Hydrogen bonding **(1 mark)**
tertiary	Hydrogen bonding, dispersion forces, ionic interactions, covalent (disulfide-bridges -S-S-) **(1 mark)**
quaternary	Hydrogen bonding, dispersion forces, ionic interactions, covalent (disulfide-bridges -S-S-) **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.7

   b. The enzyme is denatured and the activity declines **(1 mark).** This is due to secondary, tertiary and quaternary structures being (permanently) impacted changing the shape of the active site **(1 mark).**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.7
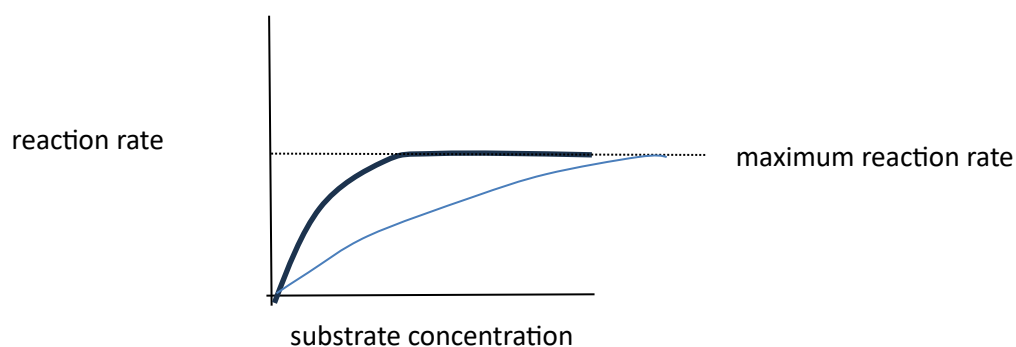
Question 5

a.   Amide, amino, hydroxyl, carboxyl, fluoro/halo, phenyl **(1 mark each correct)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.6

b.   A competitive inhibitor is a molecule that binds to the active site of an enzyme thereby preventing the substrate from binding to the enzyme. **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.7

c.

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.7

Question 6

   a. Temperature **(1 mark)** 60 ^oC, 70^oC, 80^oC, 90^oC vs. 4^oC

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2

   b. concentration of vitamin C in grapefruit juice Or titre of iodine **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2

   c. e.g. 120 second pasteurisation treatment,
Concentration of iodine **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2

d.i. $C_6H_8O_6(aq) \rightarrow C_6H_6O_6(aq) + 2H^+(aq) + 2e^-$ **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.6

d.ii.
$I_2(aq) + 2e^- \rightarrow 2I^-(aq)$ **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.6

e.

$n(I_2) = c(I_2)$ x V(average concordant titre) = 9.521×10^{-4} x 19.35×10^{-3} = 1.842×10^{-5} mol. **(1 mark)**
$n(C_6H_8O_6) = n(I_2) = 1.842 \times 10^{-5}$ mol. **(1 mark)**
$m(C_6H_8O_6) = 1.842 \times 10^{-5}$ mol x [(6 x 12.0) + (8 x 1.0) + (6 x 16.0)]
= 1.842×10^{-5} mol x 176.0 g mol^{-1}
= 0.003242 g **(1 mark)**
$c(C_6H_8O_6)$ = % m/m = $\frac{m(vitamin\ C)}{m(grapefruit\ juice)}$ x 100 = $\frac{0.003242}{4.88}$ x 100 = 0.0664% **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2

   f. Introduction or Discussion **(1 mark)**

   g. As the pasteurisation temperature increases, the concentration of vitamin C in grapefruit juice decreases **(1 mark).**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2

h.

     more than 3.77 x 10^{-3} M **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2

i.

For example

The concentration of the iodine solution was greater than the stated value leading to a smaller titre volume than would otherwise be the case. This would lead to an underestimation of the moles of iodine used and thus moles of vitamin C, mass of vitamin C in the titre and hence underestimation of the concentration of vitamin C in the grapefruit juice. (1 mark)

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2

j.   i.
How close a measured/calculated value is to the true value (1 mark)
j.ii.

This is the correct technique. It will not affect the n(vitamin C) in the flask and have no impact on the titre obtained, so will not affect accuracy. (1 mark)

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2

k.

Initial burette reading (mL)	10.25
Final burette reading (mL)	29.85
Titre (mL)	19.60 need 2 dp **(1 mark**)

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2

l.

     19.95   mL   20.00 mL   20.05 mL   **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2

m.Many options including
- comparing vitamin C content of fresh/commercial juices.
- effect of storage temperature/time on vitamin C content. **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2

Question 7

    a. Achiral **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.6

    b.
       $(9 \times 12.0) + (8 \times 1.0) + (4 \times 16.0) = 180.0$ g mol^{-1} **(1 mark)**

    c.

$n(\text{aspirin}) = \dfrac{m}{M} = \dfrac{0.500}{(9 \times 12.0)+(8 \times 1.0)+(4 \times 16.0)} = \dfrac{0.500}{180.0} = 2.78 \times 10^{-3}$ mol **(1 mark)**

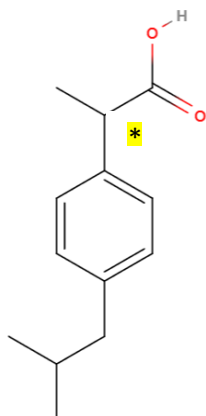   **d.**
      180 m/z **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.3

    e.

$C_9H_8O_4 + e^- \rightarrow C_9H_8O_4^+ + 2e^-$ **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.3

f.

(1 mark)
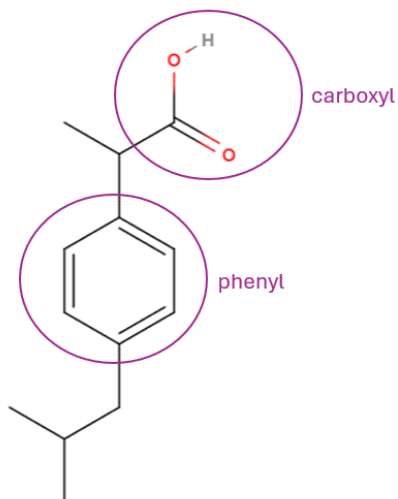For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.6

g.

Carboxyl, phenyl **(1 mark each)**

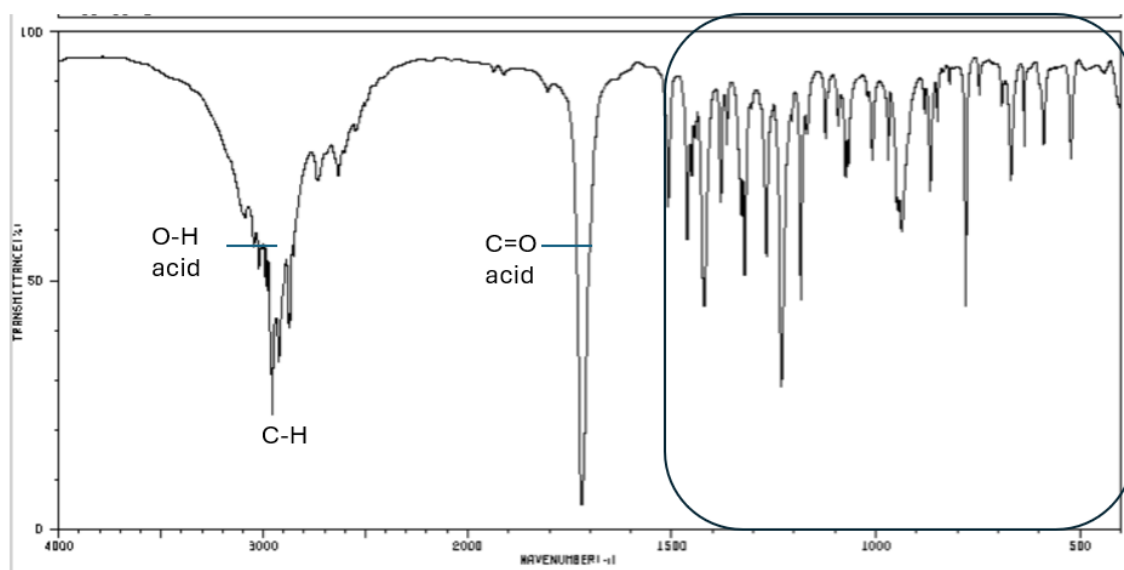For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.6

h.

<1500 cm^{-1} **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.3

i.

Source: https://sdbs.db.aist.go.jp/IrSpectralView.aspx?fname=NIDA57772&sdbsno=10570

1 mark for correctly identifying O-H (acid) or C=O (acid).

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.3

Question 8

    a.

        Al^{3+}(in cryolite) + 3e$^-$ → Al(l) **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.5

    b.

        3C(s) + 6O$_2$-(in cryolite) 4Al^{3+}(in cryolite) → 3CO$_2$(g) + 4Al(l) (1 mark)
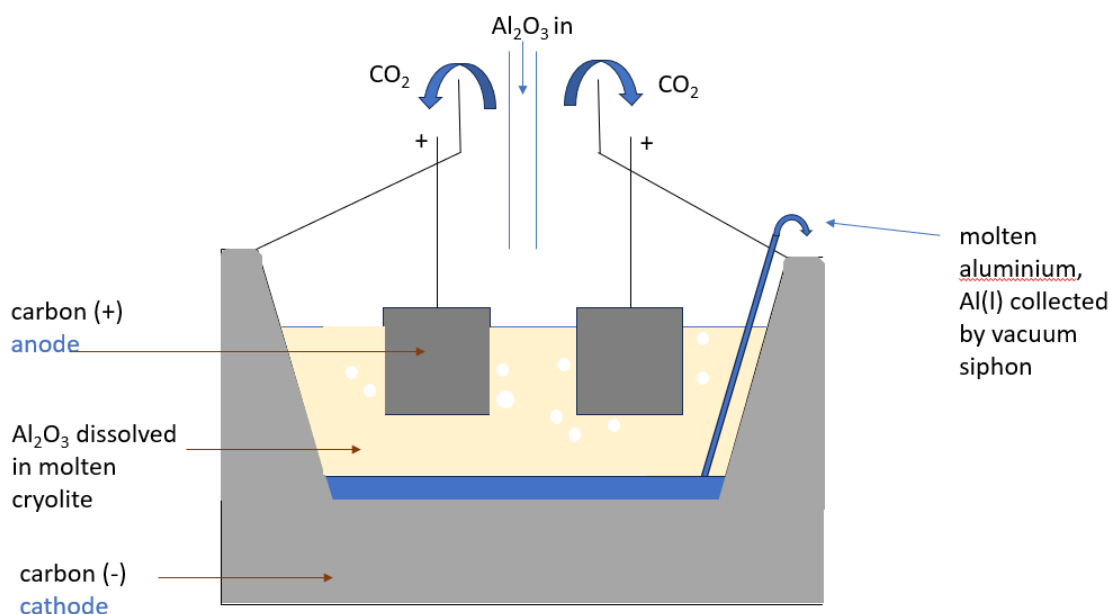
For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.5

    c.

To reduce the melting point of the alumina / aluminium oxide./ save energy **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.5

d.

(1 mark)

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.5

e.

$n(Al_2O_3) = \frac{m}{M} = \frac{1000000}{(2 \times 27.0)+(3 \times 16.0)} = \frac{1000000}{102.0} = 9.804 \times 10^3 \, mol$

$n(Al^{3+})$ = 2 x $n(Al_2O_3)$ = 1.961 x 10^4 mol **(1 mark)**

$n(e^-)$ = 3 x $n(Al^{3+})$ = 3 x1.961 x 10^4 = 5.882 x 10^5 mol **(1 mark)**

Q = $n(e^-)$ X F = 5.882 x 10^5 x 96500 = 5.677 x 10^9C **(1 mark)**

$t = \frac{Q}{I} = \frac{5.677 \times 10^9}{150000} = 3.784 \times 10^5$ s

$= 10.51 \, hours$ (**1 mark**)

Taking into account efficiency, t = 10.51 x $\frac{100}{92.8} = 11.3 \, hours$ (**1 mark**)

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.6

f.　　To avoid water being preferentially reduced**. (1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.2.5

Question 9

a. From the Data Book, Item 12, p.10 energy content of fats and oils is 37 kJ g^{-1}.

Energy content of olive oil = mass x energy kJ g^{-1}

= 3.61 x 37 = 133.57 kJ = 1.3 x 10^{5}J **(1 mark)**

Energy absorbed by water = 133.57 x 10^3 x $\frac{(100-76)}{100}$ = 32057 J = 3.2 x 10^{4}J **(1 mark)**

E = mcΔT

32057 = 250.0 x 4.18 x ΔT

ΔT = $\frac{32057}{250.0 \times 4.18}$ = 31 ^{o}C **(1 mark)**

Final temperature = 52 ^{o}C **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.5

b. Systematic **(1 mark)**

c. One of **(1 mark)**
- Insulate the beaker
- Put a lid on the beaker
- Put a non-flammable sleeve around the burner to reduce heat loss to the surroundings
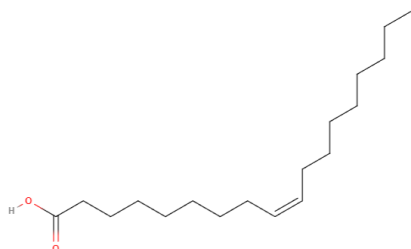- Position the flame of burner closer to the beaker

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 3.1.5

d. i.

One degree of unsaturation / one **(1 mark)**

For more practice exam-style questions for this Key Knowledge Dot Point go to Lorikeet Science MCQ Quiz 4.2.2

ii.

(1 mark)

END OF TRIAL EXAM

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