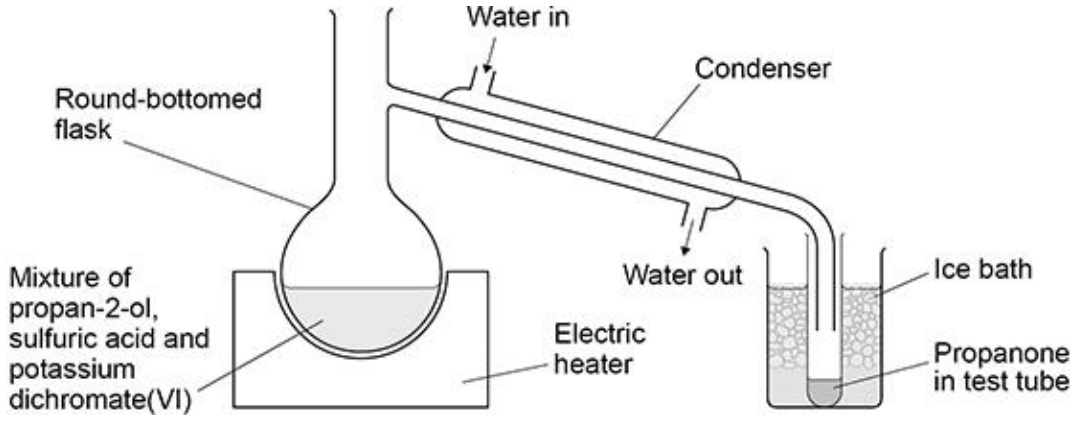
Q1.

Propanone can be made by reacting propan-2-ol with an excess of acidified potassium dichromate(VI).

The propanone is removed from the reaction mixture by distillation.

(a) The figure below shows the apparatus set up by a student to make propanone by this method. Suitable clamps are used to hold all the apparatus firmly in place.



There are **three** problems with the apparatus set up in the figure above.

For each problem:

- identify the problem
- describe the issue it would cause
- suggest how the problem can be solved.

(6)

Another student completes the experiment using apparatus that is set up correctly.

(b) The student reacts 2.0 cm^3 of propan-2-ol ($CH_3CH(OH)CH_3$) with an excess of acidified potassium dichromate(VI).

The student obtains 0.954 g of propanone (CH_3COCH_3).

Calculate the percentage yield of propanone in this experiment.
Give your answer to the appropriate number of significant figures.

Density of propan-2-ol = 0.786 g cm^{-3}

Percentage yield _____

(4)

(c) Molecules of propan-2-ol and propanone each contain three carbon atoms.

Complete the table below to suggest the shape and a bond angle around the central C atom in a molecule of each compound.

Compound	propan-2-ol $CH_3CH(OH)CH_3$	propanone CH_3COCH_3
Shape around central C atom		
Bond angle around central C atom		

(2)

(d) Explain why propanone has a lower boiling point than propan-2-ol.

_____

_____

_____

_____

_____

_____

(3)

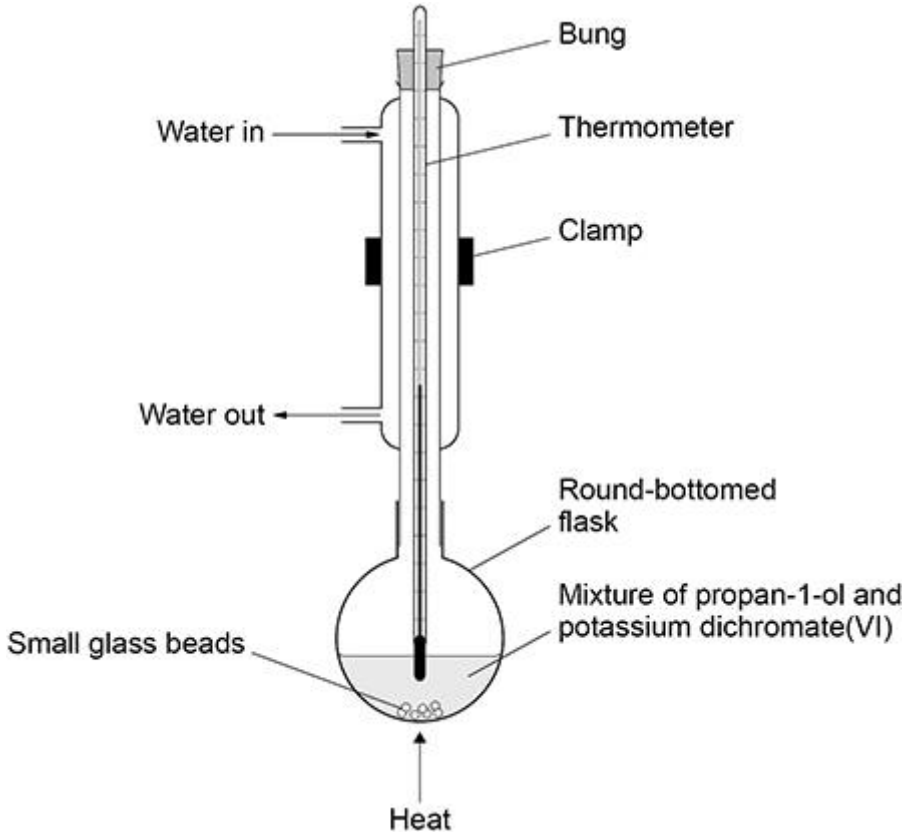
(Total 15 marks)

Q2.

A student plans an experiment to investigate the yield of propanoic acid when a sample of propan-1-ol is oxidised.

The figure below shows the apparatus that the student plans to use for the experiment.

The student's teacher says that the apparatus is not safe.



(a) Give **two** reasons why the apparatus shown in above figure is not safe.

1 _____

_____

2 _____

_____

(2)

(b) Give **one** additional reagent that is needed to form any propanoic acid.

_____

(1)

(c) State **two** more mistakes in the way the apparatus is set up in above figure.

1 _____

_____

2 _____

_____

(2)

(d) State the purpose of the small glass beads in the flask in above figure.

_____

_____

_____

(1)

(e) After correcting the mistakes, the student heats a reaction mixture containing 6.50 g of propan-1-ol with an excess of the oxidising agent.
The propanoic acid separated from the reaction mixture has a mass of 3.25 g

State the name of the technique used to separate the propanoic acid from the reaction mixture.

Calculate the percentage yield of propanoic acid.

Technique _____

Percentage yield _____

(4)

(f) State a simple chemical test that distinguishes the propanoic acid from the propan-1-ol.

Give **one** observation for the test with each substance.

Test _____

Propanoic acid _____

Propan-1-ol _____

(3)

(Total 13 marks)

Q3.

Which compound is produced when 1-phenylethanol reacts with acidified potassium dichromate(VI)?

A $C_6H_5CH_2CH_2OH$ ⬭

B $C_6H_5CH_2CHO$ ⬭

C $C_6H_5COCH_3$ ⬭

D $C_6H_5CH(OH)CH_3$ ⬭

(Total 1 mark)

Q4.

This question is about ethanedioic acid ($H_2C_2O_4$) which is a dicarboxylic acid.

(a) Draw the skeletal formula of ethanedioic acid.

(1)

(b) Ethanedioic acid is formed by the oxidation of ethane-1,2-diol ($HOCH_2CH_2OH$).

State suitable reagent(s) and a condition for this reaction.

Reagent(s) _____

_____

Condition _____

_____

(2)

(c) Ethanedioic acid reacts with an excess of sodium hydroxide to form sodium ethanedioate.

$$H_2C_2O_4\ (aq) + 2\ NaOH\ (aq) \rightarrow Na_2C_2O_4\ (aq) + 2\ H_2O\ (l)$$

A student mixes 10.0 cm^3 of 0.400 mol dm^{-3} ethanedioic acid with 50.0 cm^3 of 0.200 mol dm^{-3} sodium hydroxide.

Show that the sodium hydroxide is in excess.

Calculate the mass, in mg, of sodium ethanedioate that can be formed in this reaction.

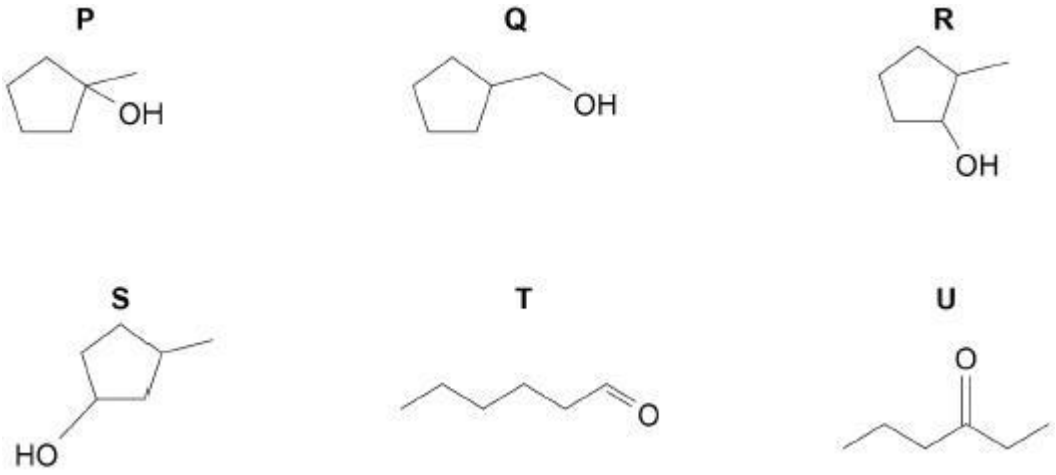
Mass of sodium ethanedioate _____ mg

(5)

(Total 8 marks)

Q5.

This question is about the structural isomers shown.



(a) Identify the isomer(s) that would react when warmed with acidified potassium dichromate(VI).

State the expected observation when acidified potassium dichromate(VI) reacts.

Isomer(s) _____

Expected observation _____

_____

(2)

(b) Identify the isomer(s) that would react with Tollens' reagent.

State the expected observation when Tollens' reagent reacts.

Isomer(s) _____

Expected observation _____

_____

(2)

(c) Separate samples of each isomer are warmed with ethanoic acid and a few drops of concentrated sulfuric acid. In each case the mixture is then poured into a solution of sodium hydrogencarbonate.

Identify the isomer(s) that would react with ethanoic acid.

Suggest a simple way to detect if the ethanoic acid reacts with each isomer.

Give a reason why the mixture is poured into sodium hydrogencarbonate solution.

Isomer(s) _____

Suggestion _____

_____

_____

Reason _____

_____

(3)

(d) State the type of structural isomerism shown by isomers **P**, **Q**, **R** and **S**.

_____

(1)

(e) Describe fully how infrared spectra can be used to distinguish between isomers **R**, **S** and **T**.
Use data from **Table A** in the Data Booklet in your answer.

_____

_____

_____

_____

_____

_____

(4)

(f) State why mass spectrometry using electrospray ionisation is **not** a suitable method to distinguish between the isomers.

_____

_____

(1)

(Total 13 marks)

Q6.

Which compound reacts to form a ketone when warmed with an acidified solution of potassium dichromate(VI)?

A $CH_3CH_2CH_2OH$ ⬭

B $(CH_3)_2CHOH$ ⬭

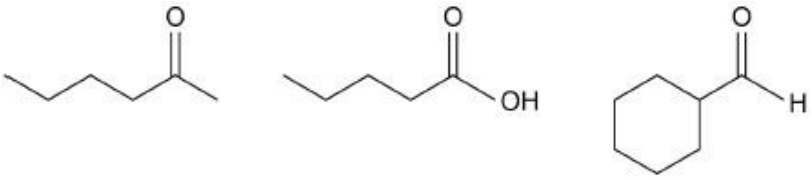
C CH_3CH_2CHO ⬭

D $(CH_3)_2CHCOOH$ ⬭

(Total 1 mark)

Q7.

The structures of three organic compounds A, B and C are shown.



Compound **A** Compound **B** Compound **C**

These compounds can be distinguished by simple test-tube reactions.

For each pair of compounds in questions **(a)** and **(b)**, give a reagent (or combination of reagents) that could be added separately to each compound to distinguish between them.

State what is observed in each case.

(a) Compounds **A** and **B**

Reagent _____

Observation with **A** _____

_____

Observation with **B** _____

_____

(3)

(b) Compounds **A** and **C**

Reagent _____

Observation with **A** _____

_____

Observation with **C** _____

_____

(3)

(Total 6 marks)

Q8.

Propanal can be prepared by the oxidation of propan-1-ol with acidified potassium dichromate(VI).

An ionic equation for this reaction is

$$3\ CH_3CH_2CH_2OH + Cr_2O_7^{2-} + 8\ H^+ \rightarrow 3\ CH_3CH_2CHO + 2\ Cr^{3+} + 7\ H_2O$$

(a) Calculate the minimum volume, in cm^3, of 0.40 mol dm^{-3} potassium dichromate(VI) solution needed to oxidise 6.0 cm^3 of propan-1-ol to propanal.

M_r of propan-1-ol = 60.0
Density of propan-1-ol = 0.80 g cm^{-3}

Minimum volume _____ cm^3

(b) The reaction is done in a pear-shaped flask.

Complete the diagram to show the assembled apparatus needed to prepare propanal from propan-1-ol in this way.

Label the diagram.

(3)

(Total 6 marks)

Q9.

Which compound can be oxidised to form $(CH_3)_2CHCOCH_3$?

A 2-methylpropan-1-ol ⬭

B 2,2-dimethylpropanol ⬭

C 2-methylbutan-2-ol ⬭

D 3-methylbutan-2-ol ⬭

(Total 1 mark)

Q10.

This question is about isomers.

(a) Give a reagent and observations for a test-tube reaction to distinguish between 2-methylbutan-1-ol and 2-methylbutan-2-ol.

Reagent _____

_____

Observation with 2-methylbutan-1-ol _____

_____

_____

Observation with 2-methylbutan-2-ol _____

_____

_____

(3)

(b) Compounds **A** and **B** both have the molecular formula $C_4H_8Br_2$
A has a singlet, a triplet and a quartet in its ^1H NMR spectrum.
B has only two singlets in its ^1H NMR spectrum.

Draw a structure for each of **A** and **B**.

A **B**

(2)

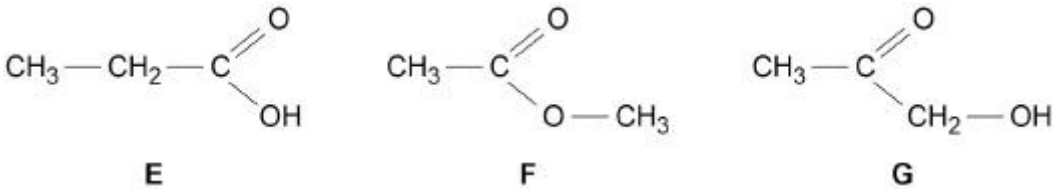
(c) Compounds **C** and **D** both have the molecular formula $C_6H_3Br_3$
C has two peaks in its ^{13}C NMR spectrum.
D has four peaks in its ^{13}C NMR spectrum.

Draw a structure for each of **C** and **D**

C **D**

(2)

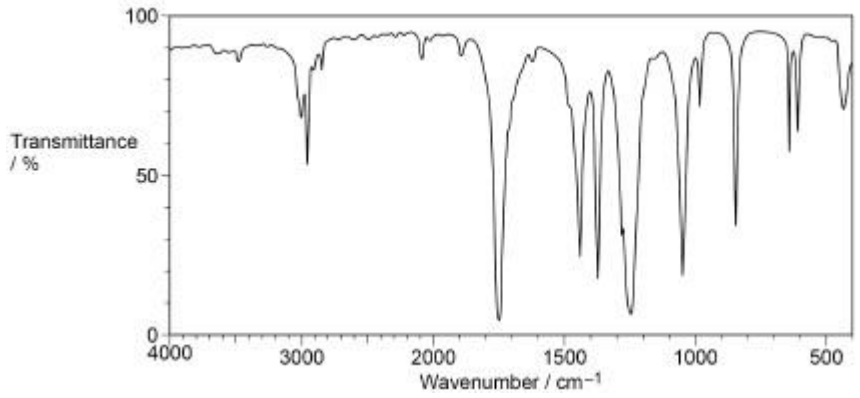
(d) Compounds **E**, **F**, and **G** are isomers.

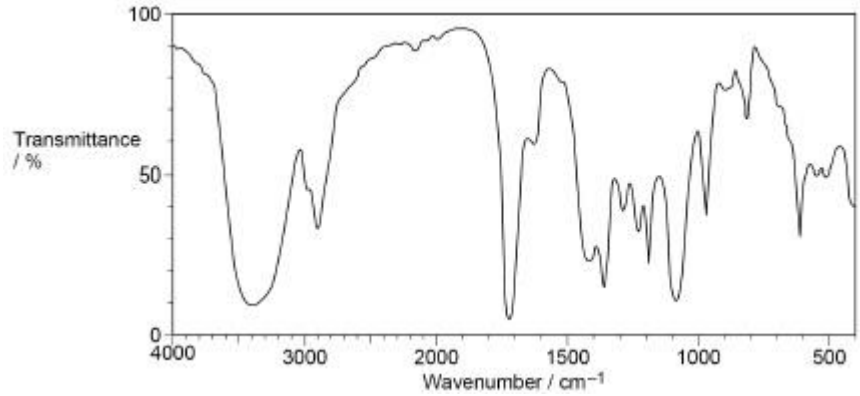


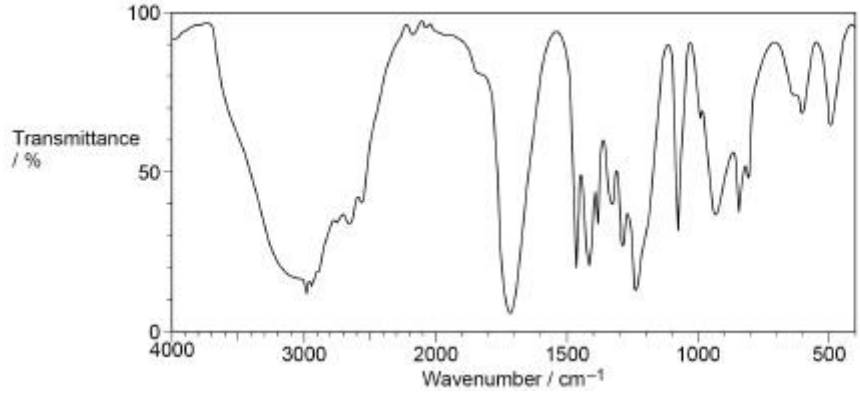
E **F** **G**

The diagrams below show the infrared spectra of these isomers, but not necessarily in the same order.

Label each spectrum with the correct letter **E**, **F**, and **G** in the box.







(1)

(Total 8 marks)

Q11.

Aqueous $NaBH_4$ reduces aldehydes but does not reduce alkenes.

(a) Show the first step of the mechanism of the reaction between $NaBH_4$ and 2-methylbutanal.
You should include two curly arrows.

Explain why $NaBH_4$ reduces 2-methylbutanal but has no reaction with 2-methylbut-1-ene.

First step of mechanism

Explanation _____

_____

_____

_____

_____

_____

_____

(5)

(b) A student attempted to reduce a sample of 2-methylbutanal but added insufficient $NaBH_4$
The student confirmed that the reduction was incomplete by using a chemical test.

Give the reagent and observation for the chemical test.

Reagent _____

_____

Observation _____

_____

(2)

(Total 7 marks)

Mark schemes

Q1.

(a)

This question is marked using levels of response. Refer to the Mark Scheme Instructions for Examiners for guidance on how to mark this question.	
Level 3 **5-6 marks**	**All stages are covered and each stage is generally correct and virtually complete** (6 v 5) Answer is well structured, with no repetition or irrelevant points, and covers all aspects of the question. Accurate and clear expression of ideas with no errors in use of technical terms.
Level 2 **3-4 marks**	**All stages are covered but stage(s) may be incomplete or may contain inaccuracies OR two stages are covered and are generally correct and virtually complete** (4 v 3) Answer has some structure and covers most aspects of the question. Ideas are expressed with reasonable clarity with, perhaps, some repetition or some irrelevant points. If any, only minor errors in use of technical terms.
Level 1 **1-2 marks**	**Two stages are covered but stage(s) may be incomplete or may contain inaccuracies OR only one stage is covered but is generally correct and virtually complete** (2 v 1) Answer includes statements which are presented in a logical order and/or linked.
Level 0	Insufficient correct chemistry to gain a mark.

Stage 1
Anti-bumping granules
1a no anti-bumping granules / add anti-bumping granules
1b to create smaller bubbles / to prevent large bubbles / to prevent mixture jumping into condenser

Stage 2
Open system with no thermometer
2a system should be closed (above flask) to prevent gases escaping
2b should be closed with (bung +) thermometer
2c to allow collection of propanone (only) / to prevent distillation of other components / to stay in suitable temperature range

Stage 3
The water direction in the condenser
3a water flows in wrong direction through condenser / change water direction
3b condenser not cool enough / not full of water
3c product may not condense / comes through as gas

(b) **M1** mass of propan-2-ol = 2.0 x 0.786 (= 1.572 g to at least 2sf)

M2 amount of propan-2-ol = $\frac{1.572}{60.0}$ (= 0.0262 to at least 2 sf) mol

M3 mass of propanone expected = 0.0262 x 58.0 (= 1.52 g to at least 2sf)

M4 % yield = $\left(\frac{0.954}{1.52} x\ 100\right)$ = 63% (2sf only)

Alternative for M3/4

M3 *amount of propanone formed =* $\frac{0.954}{58.0}$ *(= 0.0164) mol*

M4 *% yield =* $\left(\frac{0.0164}{0.0262} x\ 100\right)$ *= 63% (2sf only)*

Allow ECF at each step

4

(c) **M1** propan-2-ol: tetrahedral and 109.5°

M1 *allow 104–110°*

1

M2 propanone: trigonal planar and 120°

M2 *allow 115–123°*

Any two correct boxes scores one mark

1

(d) **M1** propan-2-ol has stronger intermolecular forces

*Penalise **M1** and **M2** for any reference to breaking covalent bonds, (but **M3** could score)*

1

M2 propan-2-ol has hydrogen bonds between molecules

*For **M2** ignore reference to dipole-dipole forces in propan-2-ol*

1

M3 propanone has dipole-dipole forces and/or van der Waals' forces

1

[15]

Q2.

(a) **M1** flask not clamped

allow *<u>only</u> the condenser is clamped*

1

M2 sealed system / bung in condenser

allow *explanation of effect of bung being there e.g. pressure build up*

not *reference to incorrect water direction*

1

(b) sulfuric acid needs adding

allow *hydrochloric / nitric / phosphoric*

ignore *conc/dil*

not *just acid/H^+*

1

(c) **M1** direction of water flow through condenser

allow *reference to water direction from answer to (a)*

1

M2 thermometer not needed

allow *references to safety issue(s) if* ***not*** *given in (a)*

ignore *reference to position of thermometer*

1

(d) to prevent 'bumping'

allow *prevent large bubbles / ensure small bubbles*

not *increases rate*

1

(e) **M1** (fractional) distillation

1

M2 $\frac{6.5}{60}$ mol propan-1-ol (= max $\frac{6.5}{60}$ mol propanoic acid) (0.108)

M2 $\frac{6.5}{60}$ *mol propan-1-ol (= max* $\frac{6.5}{60}$ *mol propanoic acid)*

1

M3 $\frac{6.5 \times 74}{60}$ = 8.02 g (i.e. M2 x 74)

M3 $\frac{3.25}{74}$ *mol propanoic acid formed*

1

M4 $\frac{3.25 \times 100}{8.02}$ = 40.5 %

M4 $\frac{3.25/74}{6.5/60} \times 100$ *= 40.5 %*

1

(f) **M1** add sodium carbonate/hydrogencarbonate

1

M2 effervescence / bubbles

not *gives off (CO_2) gas*

1

M3 no (visible) change/reaction

not *nothing / no observation*

allow *acidified sodium/potassium dichromate*

no visible change / stays orange

orange to green

allow *named alcohol + sulfuric acid plus sweet smell and no change/reaction*

allow *named carboxylic acid + sulfuric acid plus no change/reaction and sweet smell*

not *pH measurement*

incorrect reagent = 0/3

incomplete reagent – mark on

1

[13]

Q3.

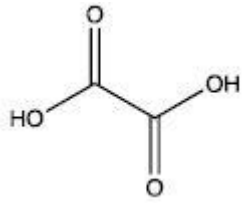
C

$C_6H_5COCH_3$

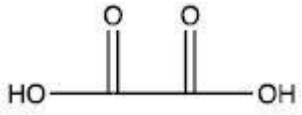
[1]

Q4.

(a)



Any correct skeletal representation, but alcohol H's should be shown and C atoms should not be shown



1

(b) **M1** acidified potassium dichromate(VI) or sulfuric acid & potassium dichromate(VI)

M1 *H_2SO_4 and $K_2Cr_2O_7$ or H^+ and $K_2Cr_2O_7$*

do not need (VI), but if oxidation state given it must be correct

allow other strong acids

1

M2 reflux

M2 *need an attempt at an oxidising agent in* ***M1***

1

(c) **M1** amount of $H_2C_2O_4$ = $0.400 \times \frac{10}{1000}$ = 0.004 mol

1

NaOH in excess

M2 amount of NaOH = $0.200 \times \frac{50}{1000}$ = 0.010 mol

NaOH in excess: *allow ECF from* ***M1/2*** *to* ***M3*** *as long as the amounts do have NaOH in excess*

1

M3 amount of NaOH needed for reaction = 0.008 mol or amount of left over NaOH needed for reaction = 0.002 mol or 0.005 mol of $H_2C_2O_4$ needed for all NaOH to react

M3 *Allow any reasoned justification using moles to show that NaOH is in excess (it must take into account the 2:1 ratio in some way)*

1

Yield

M4 amount of $Na_2C_2O_4$ formed = 0.004 mol

1

M5 mass of $Na_2C_2O_4$ = 134.0 x 0.004 = 0.536 g = 536 mg

Yield: *allow ECF from* ***M1*** *to* ***M4****, and from* ***M4*** *to* ***M5***

536 mg scores ***M1,4,5***

0.536 g scores ***M1,4***

1

[8]

Q5.

(a) **M1** Q, R, S, T

M1 Allow the mark for candidates who correctly name or draw the isomers.

1

M2 (Orange solution) turns green

Independent

1

(b) **M1** T

As above

1

M2 Silver mirror

Allow grey/black ppt

1

(c) **M1** P, Q, R, S

As above

1

M2 Sweet smelling (liquid)

1

M3 To react with (remove excess) acid / neutralise

Allow easier to identify the smell

1

(d) Position

Allow positional

1

(e) **M1** R & S have an O-H alcohols peak at 3230-3550 cm^{-1}

Allow value within the range

1

M2 T has C=O peak at 1680-1750 cm^{-1}

1

M3 R & S (unique) fingerprint region or below 1500 cm^{-1}

1

M4 Compare to a database / known spectra (and look for an exact match)

1

(f) All have the same M_r

Allow

same (molecular) ion M/Z peak

same molecular formula

1

[13]

Q6.

B

[1]

Q7.

(a) **M1** Named carbonate / hydrogencarbonate / bicarbonate (or Mg / Na)

Allow any correct chemical test.

*Allow name or formula of suitable reagent in **M1***

1

M2 No (visible/observed) reaction/change/effect

1

M3 effervescence / bubbles (of gas) / fizzing

*If no reagent or incorrect reagent in **M1**, CE = 0 and no marks for **M2** or **M3***

*In **M3** ignore reference to name/formula of correct gas, but penalise reference to name/formula of incorrect gas*

*In **M3** allow reference to limewater going cloudy as an alternative*

*Penalise incorrect formula of correct reagent (or incomplete reagent) in **M1**, but mark on for **M2** and **M3***

Where there is no reaction, ignore "nothing (happens)" or "no observation"

1

OR

M1 universal indicator

M2 neutral / no change / pH7

M3 orange / red / pH < 7 / acidic

*If use of named alcohol in **M1**, allow no reaction for **M2** and sweet smell for **M3***

Allow use of other suitable indicators (e.g. litmus)

(b) **M1** Tollens' (reagent) OR ammoniacal silver nitrate OR a description of making Tollens'

1

M2 No (visible/observed) reaction/change or stays colourless

1

M3 silver mirror or black solid / precipitate

1

OR

M1 Fehling's (solution) or Benedict's solution

M2 no (visible/observed) reaction/change or stays blue

M3 red solid / precipitate (credit orange or brown)

OR

M1 acidified potassium dichromate or $K_2Cr_2O_7/H_2SO_4$ ***or*** $K_2Cr_2O_7/H^+$ ***or*** acidified $K_2Cr_2O_7$

M2 no (visible/observed) reaction/change or stays orange

M3 (orange to) green solution ***or*** goes green

OR

M1 acidified potassium manganate(VII) or $KMnO_4/H_2SO_4$ ***OR*** $KMnO_4/H^+$ ***OR*** acidified $KMnO_4$

M2 no (visible/observed) reaction/change or stays purple

M3 (purple to) colourless solution **OR** goes colourless

Allow any correct chemical test.

*If no reagent or incorrect reagent in **M1**, **CE = 0** and no marks for **M2** or **M3***

*Allow name or formula of suitable reagent in **M1***

*Penalise incorrect formula of correct reagent in **M1**, but mark on for **M2** and **M3***

*For Tollens' reagent: for **M1** ignore either $AgNO_3$ or $[Ag(NH_3)_2^+]$ or "the silver mirror test" on their own, or "Tolling's reagent", but mark **M2** and **M3**; for **M3** allow silver precipitate/deposit*

*For Fehling's/Benedict's solution: for **M1** Ignore $Cu^{2+}(aq)$ or $CuSO_4$ or "Fellings" on their own, but mark **M2** and **M3***

*For acidified potassium dichromate(VI): if "dichromate" or "(potassium) dichromate(IV)" or incorrect formula or no acid, penalise **M1** but mark **M2** and **M3**; for **M3** ignore dichromate described as "yellow" or "red".*

*For acidified potassium manganate(VII): If "manganate" or "(potassium manganate(IV)" or incorrect formula or no acid, penalise **M1** but mark **M2** and **M3**.*

*Credit alkaline / neutral $KMnO_4$ for possible full marks but **M3** gives brown precipitate or solution goes green*

Where there is no reaction, ignore "nothing (happens)" or "no observation"

[6]

Q8.

(a) **M1** moles of propan-1-ol $= \frac{6.0 \times 0.80}{60.0}$ (= 0.080)

67 cm³ scores 3 marks

1

M2 moles of $K_2Cr_2O_7 = \frac{M1}{3}$ (= 0.0267)

*Allow ECF for **M2** and **M3***

1

M3 volume of $K_2Cr_2O_7 = \frac{M2}{0.40} \times 1000 = 67\ (cm^3)$

(allow 66.666…. to 68)

final answer to at least 2 sf

200 (cm³) scores 2 marks;

66.6 (cm³) is outside range and scores 2 marks;

66.·6 (cm³) (i.e. 66.6 dot scores 3 marks)

1

(b) **M1** an attempt to draw apparatus that is clearly for (fractional) distillation

On this occasion, the apparatus does not need a thermometer or a collection container

1

M2 suitable drawing of distillation apparatus with condenser attached to side of distillation head

- condenser must have outer tube for water that is sealed at the ends but have two openings for water in/out (that are open)
- condenser must have downwards slope
- condenser must be open at each end
- as this is a cross-section, there should be a continuous flow through the diagram from the flask to the end of the open condenser (there should be no lines drawn across implying a seal of any sort)
- there must be no gaps at joints between apparatus where vapour could escape
- there must be some opening to the system at the collection end

*Ignore any fractionating column in **M1** and **M2** between the flask and condenser.*

1

M3 condenser labelled including labels for water in and water out (water must come in at lower end)

*For **M3**, if water in and out clearly stated, ignore direction of any arrows drawn. Allow 'condensing tube' or 'condensing column' or similar for name of condenser.*

1

If a reflux diagram is drawn (any diagram with a condenser attached vertically into the flask is a reflux set up, even with a downwards tube from the top of the condenser):

- *cannot score **M1** or **M2***
- *could score **M3** for condenser labelled including labels for water in and water out (water must come in at the lower end)*

[6]

Q9.

D

3-methylbutan-2-ol

[1]

Q10.

(a) **Must be a single test-tube reaction**

If incorrect reagent then no marks

M1 Reagent: acidified potassium dichromate ***OR*** **$K_2Cr_2O_7/H_2SO_4$** ***OR*** **$K_2Cr_2O_7/H^+$** ***OR*** **acidified $K_2Cr_2O_7$**

*For acidified potassium dichromate: if "dichromate" or "(potassium) dichromate(IV)" or incorrect formula or no acid, penalise **M1** but mark on - ignore dichromate described as "yellow" or "red".*

1

M2 ….-1-ol (orange to) green solution ***OR*** **goes green**

1

M3 ….-2-ol no (visible/observed) reaction/change or NVR or stays orange

1

OR

M1 Reagent: acidified potassium manganate(VII) or $KMnO_4/H_2SO_4$ ***OR*** **$KMnO_4/H^+$** ***OR*** **acidified $KMnO_4$**

M2….-1-ol (purple to) colourless solution ***OR*** **goes colourless**

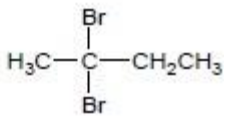
M3….-2-ol no (visible/observed) reaction/change or stays purple

*For acidified potassium manganate(VII): If "manganate" or "(potassium manganate(IV)" or incorrect formula or no acid, penalise **M1** but mark on*

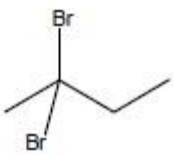
*Credit alkaline / neutral KMnO4 for possible full marks but **M2** gives brown precipitate or solution goes green*

(b)

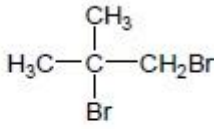
A



OR



B



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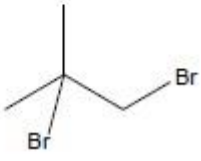
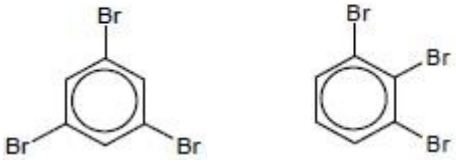


2

(c)

C D



Allow Kekulé structures

Penalise missing aromatic ring each time

2

(d) **F**

G

E

1

[8]

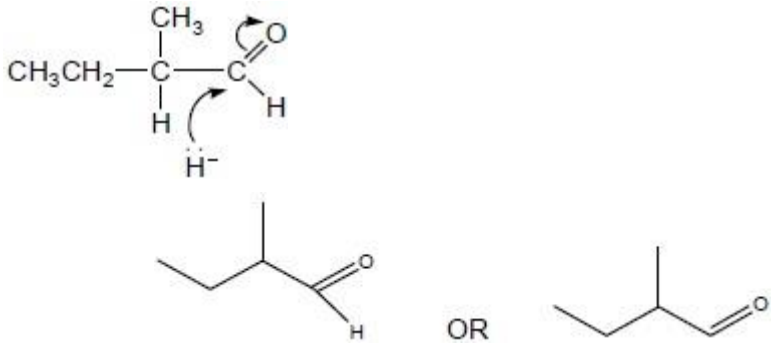
Q11.

(a) **M1** for structure of 2-methylbutanal

Allow C_2H_5 for CH_3CH_2

1

M2 for **2** curly arrows and lp on hydride, i.e.



1

Explanation:

*Penalise **M2** for wrong partial charges on C=O*

Ignore product

M3 H^- ion / nucleophile is attracted to δ+ C

1

M4 electron rich C=C

1

M5 H^- ion / nucleophile is repelled by C=C

OR

C=C only attacked by/reacts with electrophiles

1

(b) Tollens' (reagent) OR ammoniacal silver nitrate OR description of making Tollens'

1

Silver mirror/ppt OR black solid / precipitate / deposit

1

NOT dichromate

For Tollens' reagent:

*for **M1** ignore either $AgNO_3$ or $[Ag(NH_3)_2^+]$ or "the silver mirror test" on their own, or "Tolling's reagent", but mark on*

OR Fehling's/ Benedict's (solutions)

red solid / precipitate (allow orange or brown)

For Fehling's/Benedict's solution:

*for **M1** Ignore $Cu^{2+}(aq)$ or $CuSO_4$ or "Fellings" on their own, but mark on*

[7]