

Name of the Student: _____

Max. Marks : 27 Marks

Time : 27 Minutes

Mark Schemes

Q1.

- (a)
- Functional group
- (isomerism)

1

- (b)

M1 Tollens' (reagent)
*(Credit ammoniacal silver nitrate
 OR a description of making
 Tollens')*
*(Ignore either AgNO_3 or $[\text{Ag}(\text{NH}_3)_2]^+$
 or "the silver mirror test" on their
 own, but mark M2 and M3)*

M2 silver mirror**OR**

black solid/precipitate
(NOT silver precipitate)

M3 (stays) colourless
 or no change or no reaction

M1 Fehling's (solution) or
 Benedict's solution
*(Ignore $\text{Cu}^{2+}(\text{aq})$ or
 CuSO_4 on their own, but mark on
 to M2 and M3)*

M2 Red solid/precipitate
(Credit orange or brown solid)

M3 (stays) blue
 or no change or no reaction

Mark on from an incomplete/incorrect attempt at the correct
 reagent, penalising M1

*No reagent, CE=0**Allow the following alternatives***M1** (acidified) potassium dichromate(VI) (solution)**M2** (turns) green**M3** (stays) orange/no change*OR***M1** (acidified) potassium manganate(VII) (solution)**M2** (turns) colourless**M3** (stays) purple/no change*For M3**Ignore "nothing (happens)"**Ignore "no observation"*

3

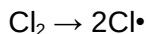
- (c) (Both have)
- $\text{C}=\text{O}$
- OR**
- a carbonyl (group)

1

- (d) (i) (Free-) radical substitution ONLY
Penalise "(free) radical mechanism"

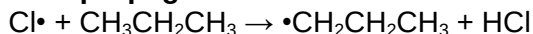
1

(ii) **Initiation**



Penalise absence of dot once only.

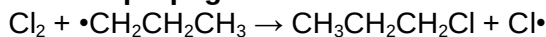
First propagation



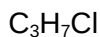
Penalise incorrect position of dot on propyl radical once only.

Penalise $\text{C}_3\text{H}_7\cdot$ once only

Second propagation

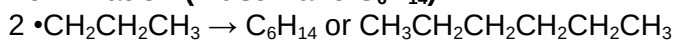


OR



Accept $\text{CH}_3\text{CH}_2\text{CH}_2\cdot$ with the radical dot above/below/to the side of the last carbon.

Termination (must make C_6H_{14})



Use of the secondary free radical might gain 3 of the four marks

4

(e) $M_r = \underline{44.06352}$ (for propane)

$M_r = \underline{43.98982}$ (for carbon dioxide)

Mark independently

M1 a correct value for both of these M_r values.

M2 a statement or idea that two peaks appear (in the mass spectrum)

OR

two molecular ions are seen (in the mass spectrum).

2

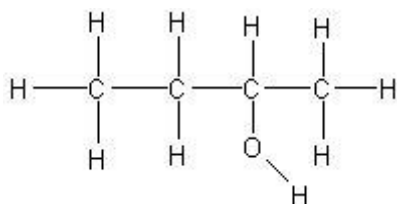
[12]

Q2.

(a)

M1

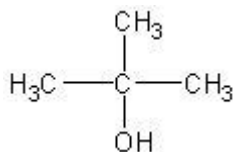
Displayed formula for butan-2-ol



M1 displayed formula must have all bonds drawn out, including the O—H but ignore angles

Penalise “sticks”

M2 Alcohol X is



M2 structure must be clearly identifiable as 2-methylpropan-2-ol and may be drawn in a variety of ways.

M3 Alcohol Y is named (2)-methylpropan-1-ol ONLY

M3 must be correct name, but ignore structures

3

(b)

M1 The infrared spectrum shows an absorption/peak in the range

3230 to 3550 (cm^{-1})(which supports the idea that an alcohol is present)

In M1, allow the words “dip”, “spike”, “low transmittance” and “trough” as alternatives for absorption.

M2 Reference to the ‘fingerprint region’ or below 1500 (cm^{-1})

M3 Match with or same as known sample/database spectra

Check the spectrum to see if alcohol OH is labelled and credit.

OR

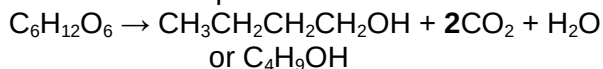
M2 Run infrared spectra (of the alcohols)

M3 Find which one matches or is the same as this spectrum.

3

(c)

M1 balanced equation



Or multiples for M1 and M3

In M1 and M3 penalise use of $\text{C}_4\text{H}_{10}\text{O}$ or butan-2-ol once only

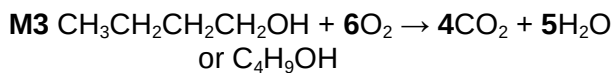
M2 Any one from

- excess/adequate/sufficient/correct amount of/enough/plenty/ a good supply of oxygen or air

- good mixing of the fuel and air/oxygen

For M2, do not accept simply “oxygen” or “air” alone

Ignore reference to "temperature"



M4 A biofuel is a fuel produced from (renewable) biological (re)source(s)

OR

(renewable) (re)source(s) from (a specified) plant(s)/fruit(s)/tree(s)

In M4

Ignore references to "carbon neutral"

Ignore "sugar" and "glucose"

4

(d) **M1** butan-1-ol is a primary or 1° (alcohol)

M2 Displayed formula (ONLY) for butanal $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$

M3 Displayed formula (ONLY) for butanoic acid $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$

M2 and M3 displayed formula must have all bonds drawn out including the O—H but ignore angles.

If butanal and butanoic acid formulae are both correctly given but not displayed, credit one mark out of two.

M4 Oxidation (oxidised) OR Redox

M5 orange to green

Both colours required for M5

Ignore states

5

[15]