Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Mark Schemes

Q1.

(a) (i) (Free-) radical substitution
Both words needed
1

(ii) UV light/Ultra-violet light/sunlight
OR high temperature/150 °C ≤ T ≤ 500 °C
1

(iii) Propagation (Step)
Ignore "first" or "second"
Accept phonetic spelling
1

(iv) **M1** Termination (Step)

M2 **2**$CH_3CH_2CH_2\bullet \longrightarrow C_6H_{14}$
In M2
C_6H_{14} may be drawn out as $CH_3CH_2CH_2CH_2CH_2CH_3$
The dot may be anywhere around the terminal CH_2 on the radical
Accept $C_3H_7\bullet$ with dot anywhere
Penalise the absence of any radical dot
2

(v) C_3H_8 + **8**$Br_2 \longrightarrow C_3Br_8$ + **8**HBr
Or multiples
1

(b) (i) **M1** Double bonds are

electron-rich

OR electron pair donors

OR centres of electron density.

M2 Bromine becomes polarised/becomes polar

OR forms an induced dipole

OR becomes δ+/δ–
M1 QoL – require one of these terms
Ignore "(very) negative" and "nucleophile" as applied to the double bond.

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Penalise M2 for ion formation from bromine

For M2, do not credit dipole formation <u>solely</u> as a consequence of electronegativity

2

(ii) <u>Electrophilic addition</u>

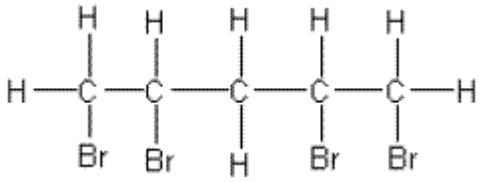
Both words needed

Accept phonetic spelling

1

(iii) Structure for 1,2,4,5-tetrabromopentane, for example $BrCH_2CHBrCH_2CHBrCH_2Br$

OR



Must be clear that they have drawn 1,2,4,5-tetrabromopentane and does NOT need to be displayed

Credit use of "sticks" for each C-H bond

1

(c) +

M1 Structure of CH_3CHCH_3

M2 (Secondary) Carbocation OR (secondary) carbonium ions

Mark independently

For M1 the positive charge must be on the central carbon atom

Penalise bond to positive charge

Penalise answers which show more than the correct carbocation e.g. the mechanism, unless the intermediate is clearly identified

Credit use of "sticks" for each C-H bond

For M2, penalise "primary" or "tertiary"

2

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Q2.

(a) (i) **3**-bromo-**3**-methylpentane ONLY

Must be correct spelling but ignore hyphens and commas

1

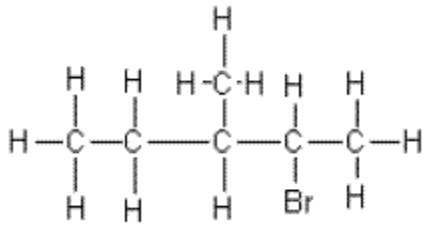
(ii) <u>Electrophilic addition</u> (reaction)

Both words needed

Accept phonetic spelling

1

(iii) **M1** Displayed formula of 2-bromo-3-methylpentane



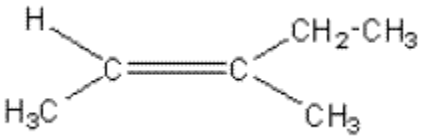
All the bonds must be drawn out but ignore bond angles

M2 Position(al) (isomerism)

Do not forget to award this mark

2

(iv) Structure of (E)-3-methylpent-2-ene



The arrangement of groups around the double bond must be clear with the ethyl group attached in the correct order. Ignore bond angles.

Accept C_2H_5 for ethyl

Be lenient on C ─ C bonds. The main issue here is whether they have drawn an (E) isomer.

Accept "sticks" for C ─ H bonds and correct skeletal formula

1

(b) (i) **M1** R is represented by **Spectrum 2**

M2 Spectrum 2 shows an infrared absorption/spike/dip/ trough/peak with any value(s)/range within the range 1620 to 1680 (cm^{-1}) OR this range quoted/identified <u>and</u> this is due to <u>C=C</u>
OR this information could be a correctly labelled absorption on the spectrum

OR Spectrum 1 does not have an infrared absorption in range 1620 to 1680 (cm^{-1}) <u>and</u> does not contain <u>C=C</u>.

Award M1 if it is obvious that they are referring to the second spectrum (or the bottom one)

M2 depends on a correct M1

Ignore other correctly labelled peaks

Ignore reference to "double bond" or "alkene"

2

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(ii) Functional group (isomerism)

1

(iii) Cyclohexane

OR

Methylcyclopentane etc.

Named correctly

Ignore structures and ignore numbers on the methyl group of methylcyclopentane

1

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