

Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

Mark Schemes

Q1.

- (a) (i) (Free-) radical substitution
Both words needed
1
- (ii) UV light/Ultra-violet light/sunlight
OR high temperature/ $150\text{ }^{\circ}\text{C} \leq T \leq 500\text{ }^{\circ}\text{C}$
1
- (iii) Propagation (Step)
Ignore "first" or "second"
Accept phonetic spelling
1
- (iv) **M1** Termination (Step)
M2 $2\text{CH}_3\text{CH}_2\text{CH}_2\cdot \longrightarrow \text{C}_6\text{H}_{14}$
In M2
 C_6H_{14} may be drawn out as $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
The dot may be anywhere around the terminal CH_2 on the radical
Accept $\text{C}_3\text{H}_7\cdot$ with dot anywhere
Penalise the absence of any radical dot
2
- (v) $\text{C}_3\text{H}_8 + 8\text{Br}_2 \longrightarrow \text{C}_3\text{Br}_8 + 8\text{HBr}$
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.

Penalise M2 for ion formation from bromine

For M2, do not credit dipole formation solely as a consequence of electronegativity

2

(ii) Electrophilic addition

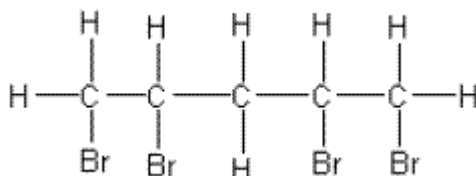
Both words needed

Accept phonetic spelling

1

(iii) Structure for 1,2,4,5-tetrabromopentane, for example
 $\text{BrCH}_2\text{CHBrCH}_2\text{CHBrCH}_2\text{Br}$

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) single (C-C) bonds only/no double (C=C) bonds 1
Allow all carbon atoms bonded to four other atoms
Single C-H bonds only = 0
C=H CE

C and H (atoms) only/purely/solely/entirely
Not consists or comprises
Not completely filled with hydrogen
CH molecules = CE
Element containing C and H = CE 1
- (ii) C_nH_{2n+2}
Formula only
 C_xH_{2x+2} 1
- (b) (i) $C_5H_{12} + 8O_2 \rightarrow 5CO_2 + 6H_2O$
Accept multiples
Ignore state symbols 1
- (ii) gases produced are greenhouse gases/contribute to Global warming/effect of global warming/climate change
Allow CO_2 or water is greenhouse gas/causes global warming
Acid rain/ozone CE = 0 1
- (c) carbon
Allow C
Allow soot 1
- (d) (i) $C_9H_{20} \rightarrow C_5H_{12} + C_4H_8$
OR
 $C_9H_{20} \rightarrow C_5H_{12} + 2C_2H_4$
Accept multiples 1
- (ii) Plastics, polymers
Accept any polyalkene/haloalkanes/alcohols 1
- (iii) so the bonds break **OR** because the bonds are strong
IMF mentioned = 0 1
- (e) (i) 1,4-dibromo-1-chloropentane/1-chloro-1,4-dibromopentane
Ignore punctuation 1
- (ii) Chain/position/positional
Not structural or branched alone 1

[11]