TOPIC 7 TEST MARK SCHEME

1. (a) (i) fractional distillation or fractionation

1

(ii) C_9H_{20} only

1

(iii) $C_{11}H_{24} + 17O_2 \rightarrow 11CO_2 + 12H_2O$

1

(iv) $C_{11}H_{24} + 6O_2 \rightarrow 11C + 12H_2O$

1

(b) (i) $C_{10}H_{22} \rightarrow C_3H_6 + C_7H_{16}$

1

(ii) correctly drawn structure of methylpropene

(insist on clearly drawn C-C and C=C bonds)

1

(c) Any two from

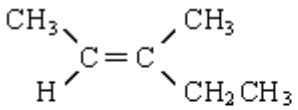
- chemically similar or chemically the same or react in the same way
- same functional group
- same general formula
- differ by CH_2

(penalise same molecular formula or same empirical formula)

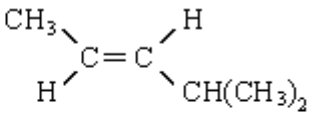
2

[8]

2. (a) Structures of **Q** and **R**:



and



NOT C_3H_7

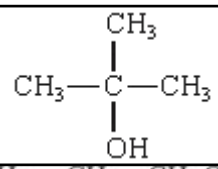
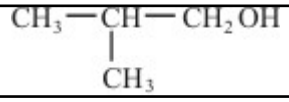
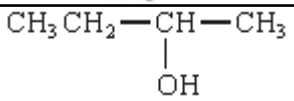
(1) **(1)**

Q and R in any order

2

[2]

3.

Isomer	Name
$CH_3CH_2CH_2CH_2OH$	butan-1-ol
	2-methylpropan-2-ol
	*(2-)methyl propan-1-ol* **(1)** NOT prop-1-ol
	*butan-2-ol* **(1)** NOT but-2-ol *OR 2-butanol* NOT hydroxy No RE

Allow e in the names

2

(ii) Structural **(1)**
OR chain and position(al)

3

[3]

4.

Ml credit a correct structure for either geometrical E-Z isomer and its designation as either *cis* or *trans.*
OR credit two correct geometrical E-Z isomer structures (ignore the names)
OR credit two correct names for *cis* pent-2-ene and *trans* pent-2-ene (ignore the structures)

1

M2 credit a second mark if all four parts of the required structures and names are correct.

(credit "linear" structures)
(insist on the alkyl groups being attached clearly by C-C bonds)

1

5. (a)
- (Same) General formula/allow a named homologous series with its general formula
- Chemically similar/same (chemical) reactions
- Same functional group
- Trend in physical properties/eg inc bp as M_r increases
- (Molecules) increase by CH_2/M_r = 14

Any two points

2

(b) Fractional distillation/fractionation/chromatography

Allow GLC

1

(c) (Molecules/compounds/substances) with the same molecular formula/same number and type of atoms

Allow alkanes with same molecular formula

Allow same chemical formula in M1 = 0 but can allow M2

1

but different structural formula/different displayed formula/different arrangement of atoms/different structures

Not different positions in space

1

2,4-dimethylhexane

M2 dependent on M1

1

C_4H_9

Ignore the absence of dash and/or commas

1

(d) less surface contact/less surface area/less polarisable molecule

1

so fewer/weaker/less Van der Waals'/vdw forces

Allow more spherical or fewer points of contact

Not smaller molecule/not more compact molecule/not shorter chain

Allow converse arguments

Must be comparative answer ie not just few VDW forces

QoL

Assume 'it' refers to the branched isomer

1

[9]

6. (a) 2-bromo-2,3-dimethylbutane

Ignore punctuation.

1

$C_nH_{2n+1}Br$ or $C_nH_{2n+1}X$ or $C_xH_{2x+1}Br$

Any order.

1

Stronger / more <u>vdw</u> (forces) <u>between molecules</u> (of 1-bromohexane)

QoL

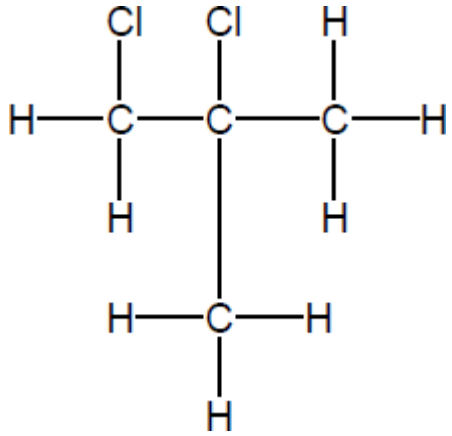
Allow converse arguments for Z

Not just more IMF.

Ignore size of molecule.

1

(b)



1

C_2H_4Cl

Any order

1

[5]

7. (a) (i) (Compounds with the) same molecular formula

Allow same number and type of atom for M1

Ignore same general formula.

1

But different structural formula / different displayed formula / different structures / different skeletal formula

M2 dependent on M1

Not different positions of atoms / bonds in space.

1

(ii) But-2-ene

Allow but-2-ene.

Allow but 2 ene.

Ignore punctuation.

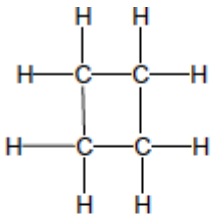
1

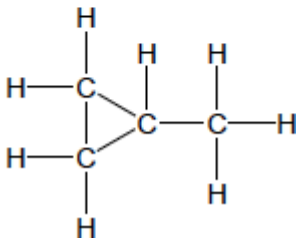
(iii) (2)-methylprop-(1)-ene

Do not allow 2-methyleprop-1-ene.

1

(iv)





Do not allow skeletal formulae.

Penalise missing H and missing C

1

(b) (i) $C_4H_8 + 2O_2 \rightarrow 4C + 4H_2O$

Accept multiples.

1

(ii) Exacerbates asthma / breathing problems / damages lungs / smog / smoke / global dimming

Ignore toxic / pollutant / soot / carcinogen.

Do not allow greenhouse effect / global warming / acid rain / ozone.

1

(c) (i) $C_{16}H_{34}$

Allow $H_{34}C_{16}$

C and H must be upper case.

1

(ii) Jet fuel / diesel / (motor) fuel / lubricant / petrochemicals / kerosene / paraffin / central heating fuel / fuel oil

Ignore oil alone.

Not petrol / bitumen / wax / LPG / camping fuel.

1

(d) (i) $C_8H_{18} + 25NO \rightarrow 8CO_2 + 12.5\ N_2 + 9H_2O$

Accept multiples.

1

(ii) Ir / iridium

OR

Pt / platinum

OR

Pd / palladium

OR

Rh / rhodium

1

[11]

8. (i) **M1**: compounds with the <u>same structural formula</u>

1

M2: but the bonds/groups/atoms have different spatial arrangements or orientation or configuration/are arranged differently in space/3D

(ignore reference to the same molecular formula for M1)

1

(ii) **M1**: correct structural representation for cis-but-2-ene <u>and</u> its name or its identification as the cis isomer

1

M2: correct structural representation for trans-but-2-ene and its name or its identification as the trans isomer

(accept representations which are 90° to linear)

(award one mark for two correct structures but either wrong/no names)

(maximum 1 mark for an incorrect alkene)

1

(iii) geometric(al) or cis-trans

1

[5]

9. B

[1]

10. B

[1]

11. C

[1]

12. C

[1]

13. C

[1]