



A-Level Chemistry
Introduction to Organic
Chemistry
Mark Scheme

Time available: 63 minutes
Marks available: 58 marks

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Mark schemes

1.

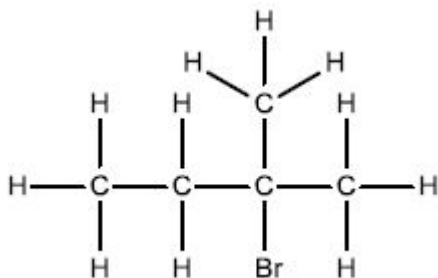
(a)



Must be a skeletal structure

1

(b)



Must be a displayed structure

1

(c) Any correct structural representation of alkene with 4 C atoms, either:

but-1-ene or
but-2-ene or
methylpropene

allow butadiene

1

[3]

2.

(a) (i) Alkane(s)

Ignore C_nH_{2n+2}

1

(ii) $C_8H_{18} + 12.5O_2 \rightarrow 8CO_2 + 9H_2O$

Allow multiples

1

(iii) 2, 2, 4-trimethylpentane

1

(b) (i) But-1-ene
Ignore (E or Z) 1

(ii) $C_{14}H_{30}$ 1

(iii) Thermal
If catalytic CE = 0 1

High pressure / 7000kPa / 70 atms

and

High temperature/temperature in range 400-1000°C (673–1273K)

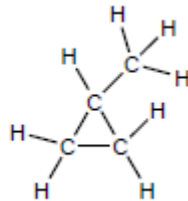
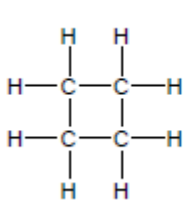
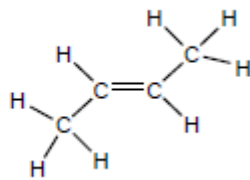
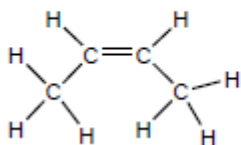
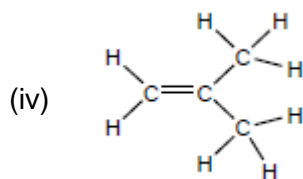
(Allow ≥ 1000 kPa or ≥ 10 atms – no upper value)

Allow high temperature and pressure or high pressure and temperature

If no units for temperature allow 673-1000

Must show unambiguous structure

Penalise lack of displayed formula once only 1



1

1

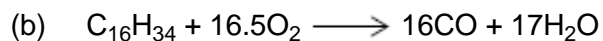
1

[10]

3.

(a) Saturated – single bonds only / no double bonds 1

Hydrocarbon – contains carbon and hydrogen (atoms) only 1



Allow multiples

1

(c) (On combustion) SO_2 produced

Allow equation to produce SO_2 . Ignore sulfur oxides.

1

Which causes acid rain

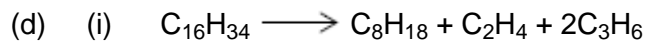
If formula shown it must be correct

M2 is dependent on M1. But if M1 is sulfur oxides, allow M2.

For M2 allow consequence of acid rain or SO_2 .

Ignore greenhouse effect and toxic

1



Allow multiples

1

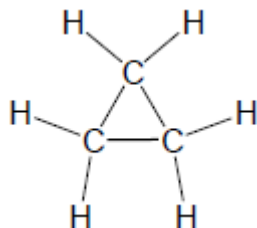
(ii) polypropene / propan(-1 or 2-)ol / propane(-1,2-)diol / isopropanol / propanone / propanal

Accept alternative names

Ignore plastic and polymer

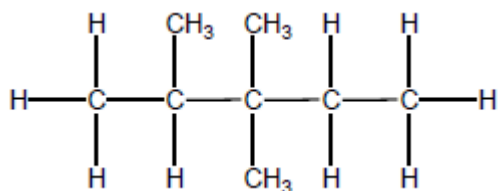
1

(iii)



1

(e)



Allow any unambiguous representation

1

(f) 2,4-dichloro-2,4-dimethylhexane

Only but ignore punctuation

1

[10]

4.

- (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.

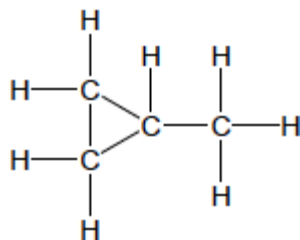
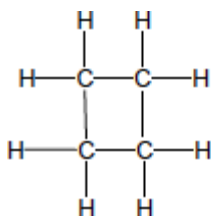
1

- (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



Allow $H_{34}C_{16}$

C and H must be upper case.

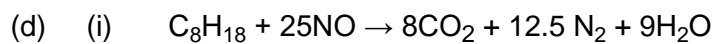
1

- (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



Accept multiples.

1

- (ii) Ir / iridium

OR

Pt / platinum

OR

Pd / palladium

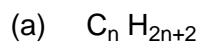
OR

Rh / rhodium

1

[11]

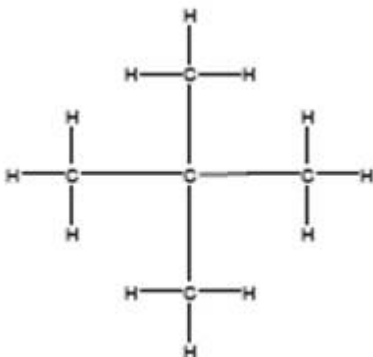
5.



Allow x in place of n

1

- (b)



Chain

Must show every bond

Allow branched chain

2

- (c) C_9H_{20}
Only 1
- To break the (C-C and/or C-H) bonds
M2=0 if break C=C 1
- To make products which are in greater demand / higher value / make alkenes
Not more useful products
Allow specific answers relating to question 1
- (d) $C_5H_{12} + 3O_2 \rightarrow 5C + 6H_2O$
Allow other balanced equations which give C and CO/CO₂ 1
- Causes global dimming / exacerbates asthma / causes breathing problems / makes visibility poor / smog
Apply list principle
Ignore causes cancer / toxic 1
- (e) $\frac{106.5}{143} (x 100)$ 1
- 74.48%
Allow 74.5% 1
- 3
Only 1
- (f) 2,3-dichloro-3-methylpentane
Ignore punctuation 1
- C_3H_6Cl
Only 1

[13]

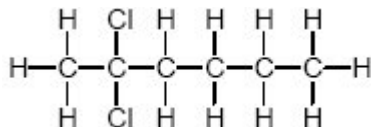
6.

- (a) General formula;
Chemically similar;
Same functional group;
Trend in physical properties eg inc bp as M_r increases;
Contains an additional CH_2 group;

Any two points.

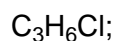
2 max

- (b) (i)



All bonds and atoms must be shown.

1



Allow any order of elements.

Do not allow EF consequential on their wrong displayed formula.

1

- (ii) Same Molecular formula/ both $\text{C}_6\text{H}_{12}\text{Cl}_2$ / same number and type of atoms;

1

Different structural formula/ different structure/ different displayed formula;

Not atoms or elements with same MF

CE=O.

Allow different C skeleton.

If same chemical formula can allow M2 only.

M2 insufficient to say atoms arranged differently.

M2 consequential on M1.

1

- (c) $M_r = 228$ for total reactants;

1

$$\frac{155 \times 100}{228} = 67.98\%;$$

Allow 67.98 or 68.0 or 68%.

1

- (d) (i) Bp increases with increasing (molecular) size/ increasing M_r / increasing no of electrons/increasing chain length;

Atoms CE = 0.

1

Increased VDW forces (between molecules) (when larger molecule)/ bigger IMFs;

QWC

Not dipole-dipole or hydrogen bonds.

If VDW between atoms in M2 CE = 0.

1

- (ii) Fractional distillation/ fractionation/ GLC/chromatography;

1

[11]