

GCSE Chemistry

Cracking

Mark Scheme

Time available: 63 minutes

Marks available: 63 marks



Mark schemes

1.

(a) $C_{12}H_{26}$

1

(b) alkane

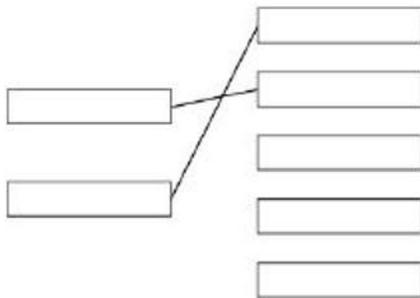
1

(c) air

allow atmosphere

1

(d)



particulates – global dimming

1

sulfur dioxide – acid rain

1

(e) carbon dioxide

1

carbon monoxide

1

(f) develop fuel efficient engines

use electric cars

1

[9]

2.

(a) C_6H_{14}

1

(b) **A**

1

(c) **B**

1

(d) **C**

1

(e) Propanol

1

[5]



3.

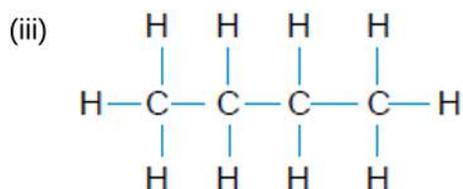
- (a) (i) high temperature
allow heating / hot / 250-900 °C
- catalyst or steam
allow named catalyst eg zeolite, Al₂O₃, silica, ceramic
allow in the absence of air / oxygen
- ignore any references to pressure*

1

1

- (ii) colourless
allow decolourised
ignore clear / discoloured

1



1

- (b) (i) 20.3(0) (kJ)
if answer incorrect allow 1 mark for 24.36/1.2

2

- (ii) use a lid
allow insulate beaker or use draught shield
- reduce energy / heat loss
ignore references to thermometer or repeats or distance of flame or loss of water vapour
allow stir (1) to distribute energy / heat (1)
allow use a metal can (1) as it's a better conductor (1)

1

1

- (iii) carbon/soot
ignore tar, smoke
- (produced by) incomplete combustion
allow from a limited supply of oxygen/air

1

1

- (iv) hexane gives out the greatest energy (per 1.0 g)
ignore more energy

1

hexane produces the least smoke / carbon / soot
allow has the cleanest flame
ignore less smoke / carbon / soot

1



- (c) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

Level 3 (5 – 6 marks):

Descriptions of advantages **and** disadvantages that are linked to their own knowledge.

Level 2 (3 – 4 marks):

Descriptions of an advantage **and** a disadvantage with some use of their knowledge to add value.

Level 1 (1 – 2 marks):

Statements made from the information that indicate whether at least one statement is an advantage **or** a disadvantage **or** a linked advantage or disadvantage

0 marks:

No relevant content

Examples of the added value statements and links made in the response could include:

Note that link words are in bold; links can be either way round.

Accept reverse arguments and ignore cost throughout.

Advantages of using hydrogen:

- Combustion only produces water **so** causes no pollution
- Combustion does not produce carbon dioxide **so** this does not contribute to global warming or climate change
- Combustion does not produce sulfur dioxide **so** this does not contribute to acid rain
- Incomplete combustion of petrol produces carbon monoxide **that is** toxic
- Incomplete combustion of petrol produces particulates **that** contribute to global dimming
- Petrol comes from a non-renewable resource **but** there are renewable/other methods of producing hydrogen
- Hydrogen releases more energy **so** less fuel needed or more efficient

Disadvantages of using hydrogen:

- Hydrogen is a gas **so** is difficult to store or transfer to vehicles
- Hydrogen gas is very flammable **so** leaks cause a greater risk of explosion
- Most hydrogen is produced from fossil fuels **which** are running out
- Cannot be used in existing car engines **so** modification / development or replacement is needed
- Lack of filling stations **so** difficult to refuel your vehicle

6

[18]

4.

(a) (i) D

1

(ii) B

1

(iii) A

1



- (iv) E 1
- (v) E 1
- (b) (i) high temperature
ignore hot / heat
allow temperature quoted (range 300-900 °C) 1
- catalyst **or** steam 1
- (ii) C₈H₁₈ smaller molecule
It = C₈H₁₈ 1
- therefore there are weaker intermolecular forces
allow intermolecular bonds
*do **not** accept breaking covalent bonds / bonds*
- or**
- weaker intermolecular forces in C₈H₁₈ (1)
allow intermolecular bonds
- so less energy to break (1) 1
- (c) add bromine water 1
- turns (from orange / yellow / red / brown) to colourless **or** decolourises
do not accept discoloured
ignore clear incorrect test = 0 marks 1
- (d)
- $$\left(\begin{array}{cc} \text{H} & \text{H} \\ | & | \\ \text{---C} & \text{---C---} \\ | & | \\ \text{H} & \text{H} \end{array} \right)_n$$
- single C – C bond* 1
- four carbon-hydrogen bonds in place and two trailing bonds* 1
- structure in brackets and n at bottom right* 1

[14]



5. (a) (i) alkanes **and** alkenes
any order
*allow saturated **and** unsaturated (hydrocarbons)* 1
- (ii) high temperature
allow temperatures from 300 – 900 °C
allow vapours
*ignore heat / hot **or** pressure* 1
- catalyst **or** steam
allow zeolite / aluminium oxide
ignore names of other catalysts 1
- (iii) oxygen could react / *burn* with the hydrocarbons
allow oxygen could cause an explosion 1
- (iv) (fractional) distillation 1
- (b) (i) displayed structure of butene drawn 1
- (ii) many monomers **or** many butene molecules 1
- form chains **or** very large molecules*
*if no other mark awarded allow double bond breaks / opens up **or***
*double bond forms a single bond for **1** mark* 1
- [8]
6. (a) vaporise / evaporate
allow boil for vaporise 1
- different condensing points / temperatures
accept condense at different levels
ignore different size molecules or different densities
*mention of cracking = max **1***
*allow boils at different temperatures and condenses for **2** marks*
if no other marks awarded allow
*fractional distillation for **1** mark* 1
- (b) (i) 3 (C₂H₄)
accept +C₄H₈ 1



(ii) (decane / naphtha / hydrocarbon) vaporise / evaporate

allow crude oil

allow boil for vaporise

1

(passed over) a catalyst / alumina / porous pot

ignore other names of catalysts

1

(c) any **two** from:

'they' must be clarified

- alkanes / butane (molecules) do not have a (carbon carbon) double bond / are saturated / have (carbon carbon) single bonds
- alkenes / ethene (molecules) have (carbon carbon) double bonds

or

are unsaturated

- alkenes / ethene molecules are able to bond to other molecules

2

(d) single bonds between carbon atoms

$- C - C -$

1

the $-CH_3$ group appears on each pair of carbons on the 'chain'

NB any double bonds = 0 marks

1

[9]