

MARK SCHEME

GCSE

CHEMISTRY

AQA - TRIPLE SCIENCE

C7 - TEST 4

ORGANIC CHEMISTRY

Intermediate

Mark schemes

- 1.** (a) C_6H_{14} 1
- (b) **A** 1
- (c) **B** 1
- (d) **C** 1
- (e) Propanol 1
- [5]**
- 2.** (a) (i) 2,4 drawn (as dots / crosses / e^-) 1
- (ii) Water (vapour) / steam
allow hydrogen oxide / H_2O
*do **not** accept hydroxide* 1

(b) any **two** pairs from:

carbon dioxide (1)

causes global warming (1)

allow greenhouse effect / climate change / sea level rise / melting of polar ice caps

or

carbon (particles) / soot (1)

allow particulates

causes global dimming (1)

allow blocks out sunlight / smog / prevents plant growth / causes breathing difficulties

or

carbon monoxide (1)

is toxic (1)

or

sulfur dioxide (1)

causes acid rain (1)

allow kills plants / erosion / acidifies water

4

[6]

3.

(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) C_8H_{18} smaller molecule



1

therefore there are weaker intermolecular forces

allow intermolecular bonds

do not accept breaking covalent bonds / bonds

or

weaker intermolecular forces in C_8H_{18} (1)

allow intermolecular bonds

so less energy to break (1)

1

(c) add bromine water

1

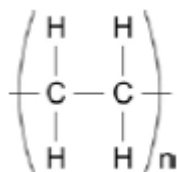
turns (from orange / yellow / red / brown) to colourless **or** decolourises

do not accept discoloured

ignore clear incorrect test = 0 marks

1

(d)



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]

4.

(a) (i) exothermic

accept combustion

*allow burning **or** oxidation **or***

redox

1

(ii) carbon monoxide / CO (is produced)

allow monoxide (is produced) ignore carbon oxide

1

because there is incomplete / partial combustion (of the fuel)

accept because there is insufficient oxygen / air (to burn the fuel)

1

- (b) 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 refer to the information in the [Marking guidance](#).

0 marks

No relevant content.

Level 1 (1-2 marks)

There is a statement that crude oil is heated **or** that substances are cooled. However there is little detail and any description may be confused or inaccurate.

Level 2 (3-4 marks)

There is some description of heating / evaporating crude oil **and either** fractions have different boiling points **or** there is an indication of a temperature difference in the column.

Level 3 (5-6 marks)

There is a reasonable explanation of how petrol is or fractions are separated from crude oil using evaporating **and** condensing.

If cracking is given as a preliminary or subsequent process to fractional distillation then ignore.

However, if cracking / catalyst is given as part of the process, maximum is **level 2**.

Examples of chemistry points made in the response could include:

- Some / most of the hydrocarbons (or petrol) evaporate / form vapours or gases
- When some of / a fraction of the hydrocarbons (or petrol) cool to their boiling point they condense
- Hydrocarbons (or petrol) that have (relatively) low boiling points and are collected near the top of the fractionating column or hydrocarbons with (relatively) high boiling points are collected near the bottom of the fractionating column
- The process is fractional distillation
- Heat the crude oil / mixture of hydrocarbons or crude oil / mixture is heated to about 350°C
- Some of the hydrocarbons remain as liquids
- Liquids flow to the bottom of the fractionating column
- Vapours / gases rise up the fractionating column
- Vapours / gases cool as they rise up the fractionating column
- The condensed fraction (or petrol) separates from the vapours / gases and flows out through a pipe
- Some of the hydrocarbons remain as vapours / gases
- Some vapours / gases rise out of the top of the fractionating column
- There is a temperature gradient in the fractionating column or the fractionating column is cool at the top and hot at the bottom

6

[9]

5.

(a) (i) *use of carbon throughout = max 1*

burning biodiesel releases CO₂

ignore burning trees

1

CO₂ is absorbed / used by the crops/plants (used to produce the biodiesel)

allow CO₂ absorbed / used by trees

1

(ii) *allow use of carbon for carbon dioxide throughout*

increases CO₂ / greenhouse effect
accept causes global warming

OR

allow causes climate change

less CO₂ is absorbed (from atmosphere)
ignore other correct effects

1

because burning trees releases CO₂
accept fewer trees to absorb CO₂
or crops / plants do not absorb as much CO₂ as trees

OR

because there is less photosynthesis
ignore habitats / biodiversity
if no other mark awarded global dimming because of smoke / particles gains 1 mark

1

(b) any **one** from:

ignore carbon neutral / cost / less harmful / environmentally friendly

- crude oil / fossil fuel is running out / non-renewable
allow biodiesel is renewable / sustainable
- demand for fuels / energy is increasing
ignore demand for biodiesel is increasing
- new legislation / protocols

1

(c) (i) uses crops / land that could be used for food

allow destroys habitats or reduces biodiversity
ignore cost

1

(ii) increases the cost of food / land

ignore cost of machinery / process
ignore cheaper to produce biodiesel

1

[7]

6.

(a) complete diagram with 2 carbon atoms and 5 hydrogen atoms each C–C and each C–H linked by a single line (bond)

1

- (b) (i) the greater the number of (carbon) atoms (in an alkane molecule) the greater its boiling point **or** vice versa
allow as the (carbon) chain gets longer the boiling point increases
ignore melting points
*do **not** accept reference to greater number of molecules* 1
- (ii) *they = hydrocarbons from the graph*
it = C₃₀H₆₂
- any **two** from:
- low boiling point / volatile
accept they are gases or liquids
 - low viscosity
 - high flammability
accept easier to burn / ignite
 - small molecules
accept short chains
ignore number of carbon atoms
 - burn completely
ignore speed of burning 2
- (c) (i) 16 (CO₂) + 18 (H₂O) 1
- (ii) (carbon dioxide in the Earth's early) atmosphere
accept from volcanoes (millions of years ago)
or from dead plants / animals
allow dead sea creatures
ignore shells 1
- (iii) increase in burning / use of fossil fuels 1
- locked up carbon (carbon dioxide) is released
allow carbon / carbon dioxide from millions of years ago is released
accept extra carbon dioxide is not 'absorbed' (by the carbon cycle) 1

[8]

- 7.** (a) (i) polyethene / poly(ethene)
accept polythene / polyethylene 1
- (ii) needs heat / energy / high temperature / fuel (for cracking)
ignore other processes 1
- produces carbon dioxide / CO₂
ignore use of CO₂ or 'produces carbon' 1
- (b) any **three** from:
- use water from local sources **or** water from close to home
 - recycle bottles in the UK / close to home
accept do not recycle in other countries / Asia
 - (reduction in distance travelled) would reduce CO₂ emitted by transport
accept use of transport with low / no carbon dioxide emissions
 - use tap water
 - use glass bottles / waxed cartons / metal bottles
*do **not** accept 'do not use plastic bottles' without an alternative material*
 - do not put in landfill **or** recycle more
 - reuse / refill plastic bottles
 - tax imported water / plastic bottles (to offset carbon cost)
 - make more / all plastic bottles in UK
answers must be about the reduction of carbon cost 3

[6]

- 8.** (a) carbon dioxide decreased (by plants / trees)
allow plants / trees absorbed carbon dioxide 1
- oxygen increased (by plants / trees)
allow plants / trees released oxygen
if neither of these marks awarded
allow plants / trees
photosynthesise for 1 mark 1

because coal 'locks up' / traps / stores carbon dioxide / carbon
allow trees 'locked up' carbon dioxide / carbon

1

(b) carbon / C

hydrogen / H

sulfur / S

all 3 correct 2 marks

1 or 2 correct 1 mark

allow H₂

ignore oxygen

2

(c) (i) 2 2

balancing must be correct

*do **not** accept changed formulae*

1

(ii) increases atmospheric pollution

carbon dioxide / CO₂ released

1

from the (thermal) decomposition of calcium carbonate **or**

*accept causes global warming **or** CO₂ is a greenhouse gas*

description of this decomposition **or** equation

ignore sulfur dioxide and effects in this part

1

decreases atmospheric pollution

sulfur dioxide / SO₂ is removed

accept less acid rain produced

1

by reaction with calcium oxide **or** calcium carbonate

*accept neutralisation **or** forms calcium sulfate*

1

[10]

9.

- (a) not broken down by microorganisms **or** not bio-degradable

accept alternative answers such as:

do not rot / corrode / fade / react with atmosphere etc

any answers which imply the inertness or non-biodegradability of this plastic

accept they don't react, they are 'inert'

ignore rusting

*do **not** accept weathering*

1

- (b) (i) (have a) double bond **or** do not have maximum number of (hydrogen) atoms attached

accept can add / react with hydrogen

accept can take part addition reactions

*do **not** accept it is a double bond*

*do **not** accept additional reactions*

*do **not** accept has 'spare' / 'free' bond*

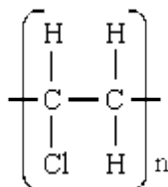
*do **not** accept alkene alone*

1

- (ii) single bond between carbon atoms

1

all atoms correct + 2 'linking' bonds
(linking bonds need not go through bracket)



1

n moved to bottom right of bracket i.e. is below $\frac{1}{2}$ way on the right

first 2 marks are possible for chain structures

accept $[-\text{CHCl}-\text{CH}_2-]_n$

1

- (iii) many molecules **or** many monomers

1

joined / bonded / linked **or** form long chain molecules / large molecules **or** to form a long chain polymer

*accept many alkenes **or** many (ethene) molecules*

*do **not** accept many ethene alone etc.*

to form a long polymer is not enough for 2nd mark

1

- (iv) no other substances formed
(A + B → C)

allow because double bond breaks so other atoms can add
allow one product only
*do **not** accept saturation occurs*

1

[8]

10.

- (a) (i) A and 3

*accept A **and** 39*

1

anomalous result

independent mark
*accept not close to other two volumes **or** correct comparison using the results*
ignore does not fit the pattern

1

- (ii) any **one** from:

- volume of water (used)
allow amount of water (used)
- time (for water to run through)
accept rate / speed (at which water runs through)
- temperature
- mass / surface area of pad
accept amount / size / volume / thickness of pad
- same filter funnel
ignore other equipment

1

- (iii) any **one** from:

ignore human error unqualified

- incorrect / volume / amount of water added
- reading / volume / amount of water collected
- some water does not go through the pad
allow spillage / poorly placed pad
- not enough time allowed for water to drain through
accept rate / speed at which water is added
- pads (from one company) not identical / faulty

1

(b) (i) any **two** from:

- it was not the best (at absorbing the water)
accept correct descriptions of 'not the best' / third best or only better than B
- (needed) to absorb more (water)
allow not absorbing enough (water)
- to improve their image / sales
accept (needs) to absorb more (water) than A and C for 2 marks

2

(ii) any **one** from:

- cost (more)
- use (more) resources
- use (more) energy
must relate to the company

1

[7]