

MARK SCHEME

GCSE

CHEMISTRY

AQA - TRIPLE SCIENCE

C7 - TEST 6

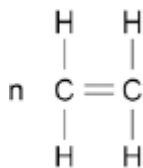
ORGANIC CHEMISTRY

Advanced

Mark schemes

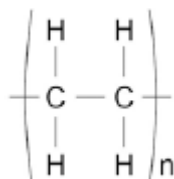
1.

(a) (ethene)



1

(polyethene)



1

(b) any **four** from:

- poly(ethene) produced by addition polymerisation whereas polyester by condensation polymerisation
- poly(ethene) produced from one monomer whereas polyester produced from two different monomers
- poly(ethene) produced from ethene / alkene whereas polyester from a (di)carboxylic acid and a diol / alcohol
- poly(ethene) is the only product formed whereas polyester water also produced
- poly(ethene) repeating unit is a hydrocarbon whereas polyester has an ester linkage

4

[6]

2.

(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]

3.

(a) it is a mixture (of hydrocarbons) **or** contains hydrocarbons with different boiling points

accept to separate (crude) oil (into fractions) or obtain the naphtha (fraction)

accept to get useful products

ignore removal of impurities

1

(b) (i) heat / vaporise

mention of hydrogen = max 1

accept thermal (decomposition) for heat

allow boil

do not allow temperatures below 100°C

ignore steam

1

catalyst

allow alumina / porous pot

ignore other catalysts

1

(ii) $4 \times C - H$ **and** $C = C$

ignore brackets with or without an 'n' before them

do not allow poly(ethene)

1

- (c) *ignore ideas about carbon dioxide formation / photosynthesis or cost / economics / environmentally friendly*

any **four** from:

candidates are only awarded 1 mark if they use equivalent pairs of bulleted points

must be at least **one** advantage and **one** disadvantage for all four marks

crops

advantages eg:

crude oil

disadvantages eg:

- renewable (resource) / sustainable
 - *non-renewable (resource) / finite / running out*
- low / less energy / fuel needed for process **or** lower temperature [ignore heat or quoted temperatures]
 - *high / more energy needed for process **or/** higher temperature*
- can use waste plant / crop material
- carbon neutral
 - *not carbon neutral **or** releases locked up carbon*
- low safety risk (processes)
 - *high safety risk (process)*
- low technology
 - *high technology*
 - *risk of major oil spillage*
 - *can be used to make other products*

disadvantages eg:

advantages eg:

- batch process / process is slow
 - *continuous process / process is fast*
- many steps in the process
 - *few steps in the process*
- ethanol is impure / may contain water
 - *ethanol is pure*
- food shortages
 - *'conserves' food*
- need very large areas of (arable) land to grow crops **or** can only grow in certain areas / climates

- destruction of woodland / habitat
- slow growth of crops
- labour intensive
 - *can accept reverse arguments*

4

a conclusion

with a reasoned argument based on valid advantages **and** disadvantages

there must be at least one advantage and one disadvantage, however, a matched pair, although only awarded one mark would allow the conclusion mark to be awarded

1

[9]

4.

(a) water

allow H₂O

1

*allow hydrogen chloride **or** HCl*

1

(b) single C–C bond and nothing added to the trailing bonds

1

3 × H and CH₃ correct

must be four single bonds

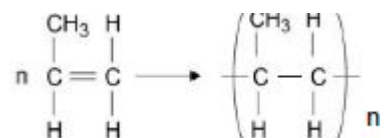
1

n at bottom right

1

*must be fully correct to score all **3** marks*

an answer of



*scores **3** marks*

- (c) any **two** from:
- poly(propene) comes from a non-renewable source
allow poly(propene) will run out
 - poly(propene) requires a lot of energy to make
 - poly(propene) is not biodegradable
 - a wool carpet needs replacing more often
must refer to the carpet, not just the fibre
 - wool requires the use of large areas of land (which could be used to grow food crops)
ignore references to cost
ignore pollution
ignore landfill
allow converse arguments

2

- (d) any **four** from:

advantages of polyester

- better flame resistance (so burns less easily)
allow good flame resistance so protects the firefighter
- higher melting point (so melts less easily)
allow high melting point so uniform is not damaged
- absorbs water so less likely to ignite

disadvantages of polyester:

- high density so uniform is heavy
- absorbs water so firefighter gets wet
- absorbs water so uniform becomes heavy
- justified conclusion

4

allow converse arguments throughout.

max 3 marks if only advantages or only disadvantages of one type of fibre

[10]

5.

- (a) any **two** from:

- fuel
allow source of energy
- solvent
allow perfume / aftershave
- antiseptic
allow antibacterial

2

- (b) Hydrogen 1
- (c) (i) oxidation 1
do not allow redox
- (ii) correct structure 1
- (iii) ethanoic acid is a weak / weaker acid 1
it = ethanoic acid
- because it does not completely ionise.
allow because it does not completely dissociate
allow it has a lower concentration of hydrogen ions
allow converse for hydrochloric acid
do not allow ionising 1
- (d) (i) ethyl ethanoate 1
- (ii) acid 1
allow any strong acid
allow correct formulae
- (iii) evaporates easily / quickly 1
allow low boiling point
do not allow flammable

[10]

- 6.** (a) (i) many ethene / molecules / monomers 1
accept double bonds open / break
accept addition polymerisation
- join to form a long hydrocarbon / chain / large molecule
ignore references to ethane
correct equation gains 2 marks 1
- (ii) (can be deformed but) return to their original shape (when heated or cooled) 1
ignore 'it remembers its shape'

(iii) cross links / extra bonds in PEX

it = PEX throughout

accept inter-molecular bonds

ignore inter-molecular forces

1

molecules / chains in PEX are held in position

accept rigid structure

1

molecules / chains in PEX unable to slide past each other / move

1

(b) any **four** from:

ignore costs / sustainability / non-renewable

- less (hydrocarbon) fuels used
allow less energy
- less / no electrical energy used
allow no electrolysis
- reduce carbon / carbon dioxide emissions
allow less global warming
- reduce / no pollution by sulfur dioxide / acid rain
allow less / no transportation
- continuous process
- conserve copper which is running out or only low-grade ores available
allow less waste
- reduce the amount of solid waste rock that needs to be disposed
allow less mining
- reduce the need to dig large holes (to extract copper ores)

4

[10]

7.

(a) chloroethene

1

(b) double bond in monomer

1

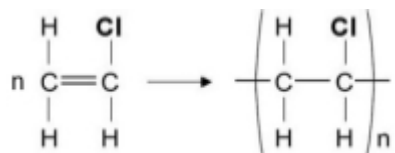
in polymer one C–C bond **and** two open ended bonds

1

'n' in front of monomer

1

an answer of:



scores **3** marks

(c) addition

1

(d) –OH

allow alcohol

1

(e) –COOH

1

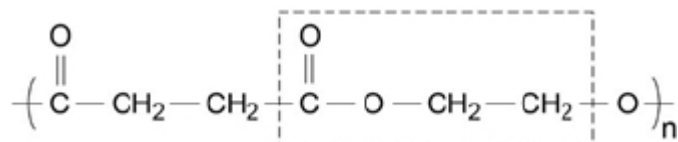
(f) C=O bond

1

2 × C–O bonds

1

an answer of:



scores **2** marks

(g) water

1

(h) glucose

1

amino acids

1

(i) any **two** from:

- two polymer chains
- double helix
- four different monomers / nucleotides

2

[14]

8.

(a) any **four** from:

- (crude oil is) heated
- to evaporate / vaporise / boil (the substances / hydrocarbons)
- the column is hotter at the bottom or is cooler at the top
- (vapours / fractions) condense
- at their boiling points or at different levels.

marks can be taken from a diagram

max 3 marks for reference to cracking

allow fractional distillation allow vapours (enter the column)

allow temperature gradient or (vapours) cool as they rise

allow description e.g. vapour turns to liquid)

allow they have different boiling points

4

(b) acid rain is caused by

allow consequences of acid rain

1

sulfur dioxide or oxides of nitrogen

second marking point is dependent on first marking point

1

they react with / are neutralised by calcium carbonate or limestone

OR

global warming is caused by

carbon dioxide

carbon dioxide will react or dissolve in suspension of limestone

allow greenhouse effect is caused by or allow consequences of global warming

1

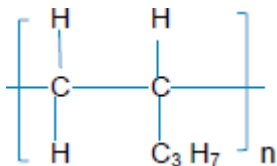
(c) (i) C_2H_4

must be formula

ignore any name

1

(ii) a single bond between carbon atoms



would score 3 marks

1

other four bonds linking hydrogen atoms and C_3H_7 group plus two trailing / connecting bonds

1

n at the bottom right hand corner of the bracket

1

- (iii) has a shape memory
or
(a smart polymer) can return to original shape (when conditions change)

1

[12]