

MARK SCHEME

GCSE

CHEMISTRY

AQA - COMBINED SCIENCE

C7 - TEST 4

ORGANIC CHEMISTRY

Intermediate

Mark schemes

1.

- (a) Compound A has fewer C atoms
or Compound B has fewer H atoms

Compound A has C = C/double bond
or Compound A is unsaturated

each for 1 mark

(accept converse i.e compound B has not ...)

2

- (b) Compound A is reactive
or can be used to make many substances
or can be used in polymerisation/making plastics/named plastic
or can be used as a fuel

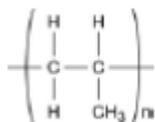
any one for 1 mark

1

[3]

2.

- (a)



one mark for single bonds between carbon atoms and between carbon and hydrogen atoms

one mark for open ended bonds from carbon atoms

2

- (b) add bromine water

allow bromine

1

(bromine water changes from orange) to colourless

accept decolourised

ignore clear

accept iodine (solution) for one mark

(iodine solution changes from orange) to colourless for one mark

1

[4]

3.

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

- gasoline / petrol / it contains short(er) chains / hydrocarbons
or small(er) molecules **or** contains few(er) carbons

*accept fuel oil contains long(er) chain length / large(r) molecules **or** contains many carbons*

ignore particles

- gasoline / petrol / it has weak(er) / small(er) intermolecular forces

accept fuel oil has strong(er) / great(er) intermolecular forces

1

(b) only accept figures if used in a comparative statement

any **two** from:

- gasoline / petrol / it is in high demand
accept fuel oil is in low demand
- gasoline / petrol / it is in short supply
accept fuel oil is plentiful
accept answers such as 'gasoline / petrol / its supply is less than demand for 2 marks
or gasoline / petrol / its percentage in crude oil is less than demand for 2 marks
- (high) tax / duty
- cracking costs in terms of money / energy
accept cracking expensive

2

(c) any **two** from:

ignore particles

- (fuel oil / it) heated / vaporised
- with catalyst
accept a named catalyst
if first two bullet points are not awarded 'cracking' gains 1 mark
- (to give / form / produce) short(er) chains / hydrocarbons **or** small(er) molecules **or** contains few(er) carbons
if wrong process named max 1 mark

2

[5]

4.

(a) decane

1

(b) icosane

1

(c) ethene

1

(d)

Level 3: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5-6
Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logically linking. The resulting account is not fully clear.	3-4
Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1-2
No relevant content	0
Indicative content <ul style="list-style-type: none">• crude oil is heated• hydrocarbons/compounds vaporise• vapours enter the fractionating column near the bottom• there is a temperature gradient in the column or <p>the column is hotter at the bottom and cooler at the top</p> <ul style="list-style-type: none">• vapours / hydrocarbons / fractions condense• to become liquid• at their boiling points• different substances have different boiling points• so the different fractions collect at different levels• hydrocarbons / fractions with smallest molecules have lowest boiling points• collect as gases at top of the column where temperature is lower• hydrocarbons / fractions with larger molecules have higher boiling points• so collect nearer the bottom• where temperature is higher	

6

[9]

5.

(a) (i) ethanol

1

(ii) oxidised

1

(iii) **Test**

add any named carbonate or hydrogen carbonate

*the first mark is for the test; the second is for the result
if the test is incorrect award 0 marks.*

1

Result

A will effervesce (carbon dioxide) **or B** will not effervesce.

if the result is incorrect, award the first mark only

1

or

*candidates do not have to name a gas but penalise an incorrect
gas.*

Test

add a named (magnesium, aluminium, zinc, iron or tin) metal

give credit to any test that will work.

Result

A will effervesce (hydrogen), **B** will not

allow a test that would identify B.

or

Test

add an acid-base indicator

Result

credit any acid colour for that indicator eg for universal indicator allow red,
yellow or orange

give credit for the neutral colour for **B**

or

Test

add an alcohol (+ acid catalyst)

Result

sweet or fruity smell of esters.

(b) (i) H₂O

1

(ii) ethyl ethanoate

1

(iii) any **one** from:

- flavourings
- perfumes
- solvents
- plasticisers

allow any correct use of esters

1

[7]

6.

(a) crude oil / it is evaporated / vaporised

ignore heated

1

vapours / gases / fractions cool and condense

accept named fraction(s)

1

(different) vapours / gases / fractions (condense) at different temperatures

accept (different) vapours / gases / fractions have different boiling points

*max 2 marks for description of laboratory method **or** mention of cracking*

1

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

- range of boiling points
- range of carbon atoms

1

(ii) greater the number (of carbon atoms) the higher the boiling point

*do **not** accept molecules / particles*

1

(c) (i) burning / combustion

allow oxidation / redox

1

(ii) any **two** from:
reaction with hydrogen gains max of 1 mark only

- cracking / (thermal) decomposition
- heat / vaporise
- catalyst / aluminium oxide

allow porous pot

ignore names of other catalysts

2

[8]

7.

(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 = $C_{30}H_{62}$

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) $16 (CO_2) + 18 (H_2O)$

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]

8.

(a) heat to vaporise (the crude oil)
*do **not** accept cracking / burning*

1

vapours condense

1

at different temperatures
allow they have different boiling points

1

(b) (alkanes) are hydrocarbons **or** are compounds of hydrogen and carbon only

1

alkanes are saturated **or** have only (carbon-carbon) single bonds
accept have no (carbon-carbon) double bonds
accept general formula is C_nH_{2n+2} for 2 marks

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.

0 marks

No relevant content.

Level 1 (1-2 marks)

There is a basic description of at least one advantage or one disadvantage of extracting petroleum products from oil sands.

Level 2 (3-4 marks)

There is a clear description of an advantage and a disadvantage of extracting petroleum products from oil sands.

Level 3 (5-6 marks)

There is a detailed description of both advantages and disadvantages of extracting petroleum products from oil sands.

Examples of the chemistry/environmental/economic/social points made in the response

Advantages:

- the oil sands are needed because crude oil is running out
- this crude oil is needed because demand is increasing
- the oil sands contain a large amount of crude oil
- the oil sands could improve Canada's economy
- the oil sands provide employment for a lot of people
- the trees / forest are used for wood products / fuel

Disadvantages:

- destruction of environment / habitats
- fewer trees / forests to absorb carbon dioxide
- specified pollution, for example, visual, noise, atmospheric (including dust), water (including river or drinking) with cause, e.g. gases / particulates from burning diesel
- large amounts of methane (natural gas) are used to provide energy
- energy / fuel needed for cracking and fractional distillation
- burning fuel releases carbon dioxide
- crude oil / natural gas contains locked up carbon
- crude oil is non-renewable

6

[11]

9.

(a) A compound made from carbon and hydrogen (not mixture etc.)

1

(b) C_5H_{12}

1

(c) (i) Break down

by heat

(ii) Speeds up reaction

(iii) C_8H_{16}

each for 1 mark

4

[6]

10.

(a) (i) the greater the number (of carbon atoms), the higher its boiling point

do not accept hydrocarbons for carbon atoms

allow converse

allow melting point

1

(ii) accept answers in the range 344 to 350

1

(iii) 216

1

(b) (i) **EITHER**

shortage of petrol **or** demand for petrol is higher than supply

diesel is in excess **or** supply of diesel is higher than demand

1

OR

petrol low supply **and** diesel high supply (1)

petrol high demand **and** diesel low demand (1)

petrol / diesel not specified = max 1

1

(ii) any **one** from:

- use diesel to make petrol

*accept crack diesel **or** description of cracking*

- make diesel cheap(er) (than petrol)

or make petrol more expensive

accept lobby the government to reduce the tax on diesel / increase tax on petrol

- mix ethanol with petrol

ignore biodiesel

1

[6]

11.

(a) low

1

hydrogen

1

(b) any **three** from

- flame
accept it is a blue / yellow colour
- reacts with oxygen
accept burns in oxygen / bonds broken
- carbon dioxide carbon monoxide forms
accept CO₂ arco / bonds forming in CO₂/CO and H₂O
bonds forming 1 mark max
*accept an oxide of hydrogen **or** H₂O*
- water (vapour) forms
*accept heat **or** light released / temperature increase / exothermic*
- energy released

3

[5]