AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.7.1.3

Properties of hydrocarbons

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**55**
Available paper years	**2007–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.7.1.3 Properties of hydrocarbons

Answer 01 · Mark scheme

Question 5

	answers	extra information	mark
(a)(i)	poly(ethene)	accept polythene	1
(ii)	cracking		1
(iii)	hydrogen		1
(b)(i)	bar labelled 9 bar drawn to correct height		1 1
(ii)	(boiling point) increases		1
(iii)	heat / evaporate (the crude oil) cool / condense (hydrocarbons at different temperatures)	accept separate by boiling point accept smaller molecules go to top / larger molecules stay at bottom accept fractional distillation for two marks **or** distillation / fractionation for **one** mark	1 1

Continued on next page

4.7.1.3 Properties of hydrocarbons

Answer 01 · Mark scheme

	answers	extra information	mark
(c)	**yes** any **two** from: • because plastic does not biodegrade **or** running out of space for landfills **or** land cannot be used for a long time • it provides heat energy • which can be used to generate electricity / heat homes or greenhouses • any other advantage of burning • any other disadvantage of landfill **or** **no** • burning plastic produces carbon dioxide / carbon emissions / toxic gases • causes global warming / climate change / increase greenhouse effect / global dimming / acid rain • any other disadvantage of burning • any other advantage of landfill	accept landfill does not produce carbon dioxide / carbon emissions	2
total			10

4.7.1.3 Properties of hydrocarbons

Answer 02 · Mark scheme March 2007 | CHY1A | Original Q1 | Legacy

One	**A**	an alkane	**3**
	B	carbon	**2**
	C	crude oil	**1**
	D	sulfur dioxide	**4**

Answer 03 · Mark scheme March 2007 | CHY1A | Original Q3 | Legacy

Three	**A**	0	**3**
	B	5	**1**
	C	8	**2**
	D	70	**4**

Answer 04 · Mark scheme June 2007 | CHY1A | Original Q5 | Legacy

The full source mark scheme begins on page 53. Follow original question 5 in that document.

Answer 05 · Mark scheme June 2007 | CHY1F | Original Q3 | Legacy

The full source mark scheme begins on page 57. Follow original question 3 in that document.

Answer 06 · Mark scheme November 2007 | CHY1A | Original Q3 | Legacy

Three	**A**	carbon	**4**
	B	carbon monoxide	**3**
	C	carbon dioxide	**1**
	D	oxygen	**2**

4.7.1.3 Properties of hydrocarbons

Answer 07 · Mark scheme

January 2008 | CHY1F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
(a)(i)	made up of one sort of atom	accept it is in the periodic table **or** has its own symbol	1
(a)(ii)	nitrogen / N / N_2 **or** oxygen / O / O_2	do **not** accept argon **or** helium do **not** accept oxide	1
(b)(i)	compound carbon		1 1
(b)(ii)	bond		1
total			5

4.7.1.3 Properties of hydrocarbons

Answer 07 · Mark scheme January 2008 | CHY1F | Original Q1 | Legacy

CHY1F

Answer 08 · Mark scheme June 2008 | CHY1AP | Original Q3 | Legacy

Three	**A**	alkane	**3**
	B	engine	**1**
	C	oxygen	**2**
	D	petrol vapour	**4**

Answer 09 · Mark scheme June 2008 | CHY1AP | Original Q9 | Legacy

Nine	**2**	**4**	**2**	**2**

Answer 10 · Mark scheme June 2008 | CHY1BP | Original Q6 | Legacy

Six	**A**	catalysis	**2**
	B	polymerisation	**3**
	C	combustion	**4**
	D	thermal decomposition	**1**

	A	**B**	**C**	**D**

4.7.1.3 Properties of hydrocarbons

Answer 11 · Mark scheme June 2008 | CHY1F | Original Q8 | Legacy

question	answers	extra information	mark
8(a)	any **one** from: • gasoline / petrol / it contains short(er) chains / hydrocarbons **or** small(er) molecules **or** contains few(er) carbons • gasoline / petrol / it has weak(er) / small(er) intermolecular forces	 accept fuel oil contains long(er) chain length / large(r) molecules **or** contains many carbons ignore particles accept fuel oil has strong(er) / great(er) intermolecular forces	1
8(b)	any **two** from: • gasoline / petrol / it is in high demand • gasoline / petrol / it is in short supply • (high) tax / duty • cracking costs in terms of money / energy	only accept figures if used in a comparative statement accept fuel oil is in low demand 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 accept cracking expensive	2
8(c)	any **two** from: • (fuel oil / it) heated / vaporised • with catalyst • (to give / form / produce) short(er) chains / hydrocarbons **or** small(er) molecules **or** contains few(er) carbons	ignore particles accept a named catalyst if first two bullet points are not awarded 'cracking' gains **1** mark if wrong process named max **1** mark	2
Total			**5**

4.7.1.3 Properties of hydrocarbons

Answer 12 · Mark scheme November 2008 | CHY1AP | Original Q3 | Legacy

Three	**A**	hydrogen, H_2	**1**
	B	ammonia, NH_3	**4**
	C	methane, CH_4	**2**
	D	carbon monoxide, CO	**3**

Answer 13 · Mark scheme November 2008 | CHY1AP | Original Q5 | Legacy

Five	**A**	alkane **A**	**4**
	B	alkane **B**	**1**
	C	alkane **C**	**3**
	D	alkane **D**	**2**

	A	**B**	**C**	**D**

Answer 14 · Mark scheme November 2008 | CHY1AP | Original Q8 | Legacy

Eight	**4**	**2**	**3**	**3**

Answer 15 · Mark scheme November 2008 | CHY1BP | Original Q1 | Legacy

One	**A**	combustion	**2**
	B	condensation	**1**
	C	cracking	**3**
	D	hardening	**4**

Answer 16 · Mark scheme March 2009 | CHY1AP | Original Q5 | Legacy

Five	**A**	Molecule **A**	**2**
	B	Molecule **B**	**1**
	C	Molecule **C**	**3**
	D	Molecule **D**	**4**

	A	**B**	**C**	**D**

Answer 17 · Mark scheme March 2009 | CHY1AP | Original Q6 | Legacy

Six	**2**	**1**	**3**	**3**

4.7.1.3 Properties of hydrocarbons

Answer 18 · Mark scheme

June 2009 | CHY1AP | Original Q5 | Legacy

Five	**A**	Substance **A**	**1**		
	B	Substance **B**	**2**		
	C	Substance **C**	**3**		
	D	Substance **D**	**4**		
	A		**B**	**C**	**D**

Answer 19 · Mark scheme

November 2009 | CHY1AP | Original Q4 | Legacy

Four	**A**	diesel, steady speed	**2**
	B	diesel, slowing down	**1**
	C	petrol, accelerating	**3**
	D	petrol, slowing down	**4**

4.7.1.3 Properties of hydrocarbons

Answer 20 · Mark scheme January 2019 | CHY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	elements		1
4(b)(i)	nucleus		1
4(b)(ii)	six		1
4(c)(i)	CH_4		1
4(c)(ii)	bond		1
4(d)(i)	oxygen		1
4(d)(ii)	any **one** from: • (water) does not pollute • (only) water is produced • no carbon dioxide / monoxide (is produced)	 accept no harmful gas(es) allow less pollution accept no greenhouse gas(es) / effect **or** no global warming	1
Total			**7**

4.7.1.3 Properties of hydrocarbons

Answer 20 · Mark scheme January 2010 | CHY1F | Original Q4 | Legacy

CHY1F

Answer 21 · Mark scheme March 2010 | CHY1AP | Original Q5 | Legacy

Five	**A**	Anaesthetic **A**	**2**
	B	Anaesthetic **B**	**4**
	C	Anaesthetic **C**	**3**
	D	Anaesthetic **D**	**1**

	A	**B**	**C**	**D**

Answer 22 · Mark scheme March 2010 | CHY1AP | Original Q9 | Legacy

Nine	**3**	**1**	**3**	**4**

Answer 23 · Mark scheme March 2010 | CHY1BP | Original Q4 | Legacy

Four	**A**	Kevlar	**3**
	B	Acrylic	**1**
	C	66 Nylon	**2**
	D	Polyester	**4**

Answer 24 · Mark scheme June 2010 | CHY1AP | Original Q4 | Legacy

Four	**A**	LPG	**1**
	B	Diesel	**4**
	C	Ethanol	**3**
	D	Hydrogen	**2**

Answer 25 · Mark scheme June 2010 | CHY1AP | Original Q5 | Legacy

Five	**A**	nitrogen dioxide	**4**
	B	carbon monoxide	**3**
	C	carbon dioxide	**2**
	D	soot (carbon)	**1**

	A	**B**	**C**	**D**

4.7.1.3 Properties of hydrocarbons

Answer 26 · Mark scheme

June 2010 | CHY3F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	straight line through the 'points' and extended to C_8H_{18}	do **not** accept multiple lines	1
6(a)(ii)	5500	range 5400 *to* 5600 accept ecf from their graph	1
6(a)(iii)	it is a straight line graph	allow directly proportional accept constant difference between (energy) values accept C_5H_{12} close to values on the graph **or** C_5H_{12} comes in middle of the graph ignore 'fits the pattern' unqualified ignore 'line of best fit' ignore 'positive correlation'	1
6(a)(iv)	expected ranges for working are: (5400 to 5600) – (2800 to 2900) = (2500 to 2800) **or** their value from (a)(ii) – a value from 2800 to 2900 **or** (5400 to 5600) / their (a)(ii) divided by 2 **or** a value from 2800 to 2900 × 2 no / not quite / almost / yes	accept correct numerical answer as evidence of working this mark is only awarded on evidence from their correct working	1 1

4.7.1.3 Properties of hydrocarbons

6(b)(i)	incorrect / no **or** partially correct bio-ethanol produces least energy **or** bio-ethanol produces 29 kJ	ignore references to hydrogen mark independently	1 1
6(b)(ii)	any **two** from: • hydrogen produces only H_2O • coal produces SO_2 • coal produces smoke • both renewable and non-renewable fuels produce CO_2 • (both) the non-renewable fuels produce CO_2 • (both) renewable fuels produce no smoke • (both) renewable fuels produce no SO_2	ignore incorrect / correct accept hydrogen does not produce harmful gases / CO_2 / SO_2 allow coal causes acid rain / respiratory problems allow coal causes global dimming accept bio-ethanol and natural gas / coal produce CO_2 / global warming accept coal and natural gas produce CO_2 / global warming accept hydrogen and bio-ethanol do not produce smoke / global dimming accept hydrogen and bio-ethanol do not produce SO_2 / acid rain	2
Total			**9**

4.7.1.3 Properties of hydrocarbons

Answer 27 · Mark scheme

November 2010 | CHY1AP | Original Q7 | Legacy

Seven	**1**	**4**	**3**	**2**

Answer 28 · Mark scheme

November 2010 | CHY1BP | Original Q1 | Legacy

Question	Key		
One	**A**	Crack	**2**
	B	Evaporate	**1**
	C	Polymerise	**4**
	D	Burn	**3**

4.7.1.3 Properties of hydrocarbons

Answer 29 · Mark scheme

January 2011 | CHY1F | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	crude oil / it is evaporated / vaporised vapours / gases / fractions cool and condense (different) vapours / gases / fractions (condense) at different temperatures	ignore heated accept named fraction(s) accept (different) vapours / gases / fractions have different boiling points max **2** marks for description of laboratory method **or** mention of cracking	1 1 1
7(b)(i)	any **one** from: • range of boiling points • range of carbon atoms		1
7(b)(ii)	greater the number (of carbon atoms) the higher the boiling point	do **not** accept molecules / particles	1
7(c)(i)	burning / combustion	allow oxidation / redox	1
7(c)(ii)	any **two** from: • cracking / (thermal) decomposition • heat / vaporise • catalyst / aluminium oxide	reaction with hydrogen gains max of **1** mark only allow porous pot ignore names of other catalysts	2
Total			**8**

4.7.1.3 Properties of hydrocarbons

Answer 30 · Mark scheme

March 2011 | CHY1AP | Original Q4 | Legacy

Four	**A**	Ethane	**1**
	B	Pentane	**3**
	C	Hexane	**4**
	D	Dodecane	**2**

Answer 31 · Mark scheme

March 2011 | CHY1BP | Original Q5 | Legacy

Five	**A**	Formula **A**	**2**
	B	Formula **B**	**3**
	C	Formula **C**	**1**
	D	Formula **D**	**4**

	A	**B**	**C**	**D**

Answer 32 · Mark scheme

June 2011 | CHY1AP | Original Q3 | Legacy

Three	**A**	Methane	**1**
	B	Ethane	**3**
	C	Butane	**2**
	D	Nonane	**4**

Answer 33 · Mark scheme

June 2011 | CHY1AP | Original Q9 | Legacy

Nine	**4**	**2**	**2**	**2**

4.7.1.3 Properties of hydrocarbons

Answer 34 · Mark scheme June 2011 | CHY3F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	orange		1
4(a)(ii)	colourless		1
4(a)(iii)	a carbon carbon double bond		1
4(b)(i)	C		1
4(b)(ii)	B		1
4(b)(iii)	only produces water **or** does not produce carbon dioxide	do **not** accept CO^2	1
Total			**6**

4.7.1.3 Properties of hydrocarbons

Answer 34 · Mark scheme June 2011 | CHY3F | Original Q4 | Legacy

CHY3F

Answer 35 · Mark scheme November 2011 | CHY1AP | Original Q4 | Legacy

Four	**A**	Methane	**2**
	B	Ethane	**4**
	C	Propane	**1**
	D	Butane	**3**

Answer 36 · Mark scheme November 2011 | CHY1AP | Original Q6 | Legacy

Six	**4**	**2**	**2**	**4**

Answer 37 · Mark scheme November 2011 | CHY1AP | Original Q8 | Legacy

Eight	**3**	**1**	**2**	**3**

4.7.1.3 Properties of hydrocarbons

Answer 38 · Mark scheme

January 2012 | CH1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	C_7H_{16}	mark answer line first answer may be given in the table	1
6(a)(ii)	C_nH_{2n+2}		1
6(b)(i)	carbon monoxide	do **not** accept carbon oxide do **not** accept water ignore CO	1
6(b)(ii)	because of partial / incomplete combustion (in reaction 2) **or** complete combustion (in reaction 1)	allow because there is less / insufficient oxygen (in reaction 2) **or** sufficient oxygen (in reaction 1) allow different amounts of oxygen used (in the reactions) **or** $19O_2$ (in reaction 1) **and** $13O_2$ (in reaction 2) ignore air	1
6(c)(i)	15 (%)	ignore units	1
6(c)(ii)	water (vapour)/steam	allow H_2O / OH_2 / hydrogen oxide	1

Question 6 continues on the next page…….

4.7.1.3 Properties of hydrocarbons

CH1FP

Question 6 cont'd…..

question	answers	extra information	mark
6(c)(iii)	sulfur in petrol / crude oil (reacts with oxygen)	it = sulfur dioxide	1
6(c)(iv)	because nitrogen **and** oxygen (are in the air and) react	allow nitrogen **and** oxygen burn accept nitrogen + oxygen → nitrogen oxide **or** symbol equation ignore air	1
	at high temperature (inside a petrol engine)	allow heat / hot (engine)	1
6(d)	because carbon dioxide / it causes global warming **or** because carbon dioxide / it has an impact on oceans	allow because carbon dioxide / it causes greenhouse effect / climate change	1
	because this carbon dioxide / carbon / it was 'locked up' (in fossil fuels) **or** because the percentage/amount of carbon dioxide / it in the atmosphere is increasing		1
Total			**11**

4.7.1.3 Properties of hydrocarbons

Answer 38 · Mark scheme

January 2012 | CH1FP | Original Q6 | Legacy

CH1FP

4.7.1.3 Properties of hydrocarbons

Answer 39 · Mark scheme June 2012 | CH1FP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)	Aluminium has a low density Aluminium is resistant to corrosion		1 1
3(b)(i)	(an alloy) is a mixture of metals	accept (an alloy) can be a metal mixed with another metal **or** iron mixed with carbon / a non-metal	1
3(b)(ii)	pure metals are soft **or** alloys are hard	allow weak allow strong / keep their shape ignore rust / corrosion	1
3(c)(i)	crude oil		1
3(c)(ii)	hydrocarbons		1
3(c)(iii)	oxygen		1
3(d)(i)	hydrogen	allow H_2 or H	1
3(d)(ii)	only water is produced (from the fuel) **or** no carbon dioxide is produced (from the fuel)	 allow less carbon dioxide produced **or** less global warming allow carbon dioxide causes global warming	1
Total			**9**

4.7.1.3 Properties of hydrocarbons

Answer 39 · Mark scheme

June 2012 | CH1FP | Original Q3 | Legacy

CH1FP

4.7.1.3 Properties of hydrocarbons

Answer 40 · Mark scheme

June 2012 | CH1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	6 oxygen		1 1
6(b)(i)	heating the hydrocarbon to a high temperature the presence of a catalyst		1 1
6(b)(ii)	all bonds correct four C—H bonds **and** one C=C bond		1
6(b)(iii)	water	accept hydrogen oxide/steam allow H_2O	1
6(c)(i)	carbon dioxide	allow CO_2	1
6(c)(ii)	by filtering/decanting/centrifuging (to remove yeast) (fractional) distillation (to separate ethanol from water)	ignore sieving accept a description of (fractional) distillation	1 1
Total			**9**

4.7.1.3 Properties of hydrocarbons

Answer 40 · Mark scheme

June 2012 | CH1FP | Original Q6 | Legacy

CH1FP

4.7.1.3 Properties of hydrocarbons

Answer 41 · Mark scheme

question	answers	extra information	mark
5(a)	Methane has the lowest melting point and icosane has the highest boiling point Decane and icosane are liquid at 100°C		1 1
5(b)	water / H_2O carbon dioxide / CO_2	either order allow hydrogen oxide	1 1
5(c)(i)	fermentation		1
5(c)(ii)	any **two** from: • sugar cane/plants absorb carbon dioxide • growing sugar cane/plants reduces global warming • renewable resource/sustainable	ignore oxygen released allow ethanol from plants is carbon neutral accept conserves fossil fuels / petrol	2
5(c)(iii)	any **two** from: • destruction of habitats/forests (to grow sugar cane/crops) • fermentation releases carbon dioxide • production plants cause visual pollution • pollution from the transportation of sugar cane / Ethanol • growing sugar cane / plants uses a lot of land		2
Total			**9**

4.7.1.3 Properties of hydrocarbons

Answer 41 · Mark scheme

January 2013 | CH1FP | Original Q5 | Legacy

CH1FP

4.7.1.3 Properties of hydrocarbons

Answer 42 · Mark scheme

January 2013 | CH1FP | Original Q7 | Legacy

question	answers	extra information	mark
7(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
7(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

4.7.1.3 Properties of hydrocarbons

CH1FP

question	answers	extra information	mark

7(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. — 6

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant content.	There is a basic description of at least one advantage or one disadvantage of extracting petroleum products from oil sands.	There is a clear description of an advantage and a disadvantage of extracting petroleum products from oil sands.	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

Total		11

UMS conversion calculator www.aqa.org.uk/umsconversion

4.7.1.3 Properties of hydrocarbons

Answer 43 · Mark scheme June 2013 | CH1FP | Original Q2 | Legacy

Question 2

question	Answers	extra information	Mark
2(a)	oxygen	must be name do **not** accept oxide or dioxide	1
2(b)(i)	2 x C–C and 5 x C–H	all single (line) bonds	1
2(b)(ii)	C_3H_8	must be formula do **not** accept lower case h	1
2(b)(iii)	water		1
2(c)	ethane and butane boil at temperatures less than 20°C ethene and hexene each have a carbon-carbon double bond		1 1
2(c)	ethane and butane boil at temperatures less than 20°C ethene and hexene each have a carbon-carbon double bond		1 1
Total			**6**

4.7.1.3 Properties of hydrocarbons

Answer 44 · Mark scheme

June 2013 | CH3FP | Original Q4 | Legacy

Question 4

question	Answers	extra information	Mark
4(a)(i)	42 000	correct answer gains **2** marks with or without working allow 42 kJ if answer incorrect : correct substitution 500 x 4.2 x 20 gains **1** mark	2
4(a)(ii)	any **two** from: • eye protection • lab coat • heat-proof mat • (heat-proof) gloves • (long) hair tied back • stand up • secure the beaker		2
4(a)(iii)	Stir the water before measuring the temperature. Place a lid on the beaker.		1 1
4(b)	the products → S the activation energy → Q the energy released by the reaction → P		1 1 1
4(c)	carbon dioxide produced (crude oil / propane) non-renewable	it =propane allow converse arguments allow greenhouse gas / global warming / atmospheric pollution allow crude oil running out	1 1
Total			**11**

4.7.1.3 Properties of hydrocarbons

Answer 45 · Mark scheme June 2015 | CH1FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	mixture (of different substances)		1	1 / 1.4.1a
3(a)(ii)	boiling (points)		1	1 / 1.4.2c
3(a)(iii)	distillation		1	1 / 1.4.1b
3(b)(i)	combustion		1	1 / 1.4.3b
3(b)(ii)	(reactant) oxygen (products) carbon dioxide **and** water	allow correct formulae products in any order allow carbon or carbon monoxide allow water vapour or steam or hydrogen oxide	 1 1	2 / 1.4.3b
3(b)(iii)	(burning sulfur) produces sulfur dioxide / SO_2 causes acid rain	allow it/sulfur reacts with oxygen ignore sulfur oxide	1 1	1+2 / 1.4.3c/d
3(c)(i)	propane is a fuel		1	2 / 1.5.1e
3(c)(ii)	double bond drawn between carbon atoms	do not allow any other bonds or symbols	1	1 / 1.5.1c
3(c)(iii)	orange to colourless		1	1 / 1.5.1d
3(c)(iv)	poly(pentene)	allow polymer(s)	1	1 / 1.5.1d
Total			**12**	

4.7.1.3 Properties of hydrocarbons

Answer 45 · Mark scheme

June 2015 | CH1FP | Original Q3 | Legacy



4.7.1.3 Properties of hydrocarbons

Answer 46 · Mark scheme June 2016 | CH1FP | Original Q2 | Legacy

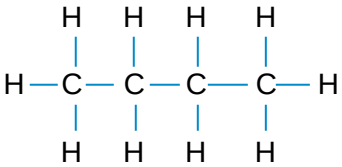
Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	the Earth's (surface) temperature was high **or** at/above 100 °C	allow the Earth's (surface) temperature was too/very hot **or** water evaporated/ boiled **or** turned to steam/gas allow because of heat from volcanoes ignore the Earth's (surface) was covered by volcanoes ignore water turned to water vapour	1	AO3 1.7.2b
2(a)(ii)	plates	allow plate	1	AO1 1.7.1d
2(b)(i)	air ——— mixture carbon dioxide ——— compound argon ——— element	allow only one line from each substance	1 1 1	AO1 1.1.1a; 1.1.3a; 1.7.2a
2(b)(ii)	oxygen		1	AO1 1.4.3b
2(b)(iii)	about 80 %		1	AO1 1.7.2a
2(c)(i)	0.03(0) (%)		1	AO2 1.7.2 c
2(c)(ii)	increased slowly then rapidly	allow figures from graph to indicate increase	1 1	AO2 1.7.2i
2(c)(iii)	any **two** from: • use of fossil fuels • deforestation • cars/transport • industry/factories	ignore more people allow less trees / plants	2	AO3 1.7.2i
Total			**12**	

4.7.1.3 Properties of hydrocarbons

Answer 47 · Mark scheme June 2016 | CH1FP | Original Q5 | Legacy

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)(i)	high temperature catalyst or steam	allow heating / hot / 250-900 °C allow named catalyst eg zeolite, Al_2O_3, silica, ceramic allow in the absence of air / oxygen ignore any references to pressure	1 1	AO1 1.5.1a
5(a)(ii)	colourless	allow decolourised ignore clear / discoloured	1	AO1 1.5.1d
5(a)(iii)			1	AO2 1.4.2a
5(b)(i)	20.3(0) (kJ)	if answer incorrect allow **1** mark for 24.36/1.2	2	AO2 1.4.3b
5(b)(ii)	use a lid reduce energy / heat loss	allow insulate beaker or use draught shield 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	AO3 4.3.2b/c/d
5(b)(iii)	carbon/soot (produced by) incomplete combustion	ignore tar, smoke allow from a limited supply of oxygen/air	1 1	AO1+AO2 1.4.3a/b
5(b)(iv)	hexane gives out the greatest energy (per 1.0 g) hexane produces the least smoke / carbon / soot	ignore more energy allow has the cleanest flame ignore less smoke / carbon / soot	1 1	AO3 1.4.2c; 1.4.3a/b

4.7.1.3 Properties of hydrocarbons

Answer 47 · Mark scheme

June 2016 | CH1FP | Original Q5 | Legacy

QWC Mark Scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(c)			6	AO1+AO2+ AO3 1.1.3b; 1.4.1b/c; 1.4.3a/b/c/d ;1.7.2h/i

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 on page 5 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content	Statements made from the information that indicate whether at least one statement is an advantage **or** a disadvantage **or** a linked advantage or disadvantage	Descriptions of an advantage **and** a disadvantage with some use of their knowledge to add value.	Descriptions of advantages **and** disadvantages that are linked to their own knowledge.

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

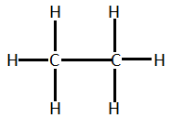
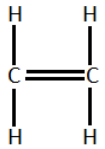
Disadvantages of using hydrogen:

- 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

Total			18

4.7.1.3 Properties of hydrocarbons

Answer 48 · Mark scheme June 2017 | CH1FP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)(i)	electronic structure drawn	allow any representation of an electron allow 2,4	1	**AO2** 1.1.1h
6(a)(ii)	six / 6 protons (protons) are positively charged	 do **not** allow electrons in nucleus otherwise ignore electrons do **not** allow nucleus is neutral allow (protons are) + / +1 / 1+ ignore statements about mass if no other mark awarded allow one mark for nucleus	1 1 1	**AO1** **AO2** 1.1.1c;d;e
6(b)	(a hydrocarbon is) made up of hydrogen and carbon (atoms) only	do **not** allow mixture	1	**AO1** 1.4.1a;c
6(c)(i)	 	ethane correctly drawn with another hydrogen on each carbon and another three single bonds ethene correctly drawn with a double bond between the carbon atoms	1 1	**AO1** 1.4.2a 1.5.1c
6(c)(ii)	as the number of carbon atoms increases the boiling point increases	allow converse ignore alkene	1	**AO3** 1.4.2c

4.7.1.3 Properties of hydrocarbons

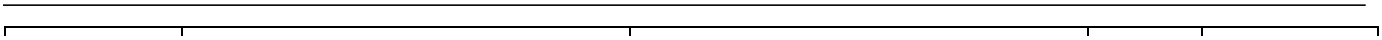
Answer 48 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(c)(iii)	the boiling points of alkanes are higher than the boiling points of alkenes	allow the boiling points of alkenes are lower than the boiling points of alkanes	1	AO2 1.4.2b;c
	that has the same number of carbon atoms	consequential on first marking point	1	
	or state a correct example	e.g. hexane has a higher boiling point than hexene **or** hexane boils at 69°C hexene boils at 64°C		
		if no other mark awarded allow both alkanes and alkenes have the same pattern of the more carbon atoms the higher the boiling point for one mark		
6(d)	(alkane molecules are) cracked	allow break down / up **or** decompose **or** split up	1	AO1 AO2 AO3
	to produce small(er) molecules / alkanes / hydrocarbons	allow short chain for small	1	1.5.1a;b;d
	and alkenes **or** a named alkene	allow molecules that have a double bond **or** are unsaturated	1	
		if no other mark awarded allow evaporate **or** boil for one mark		
		ignore turns to gas		
Total			**13**	

4.7.1.3 Properties of hydrocarbons

Answer 48 · Mark scheme

June 2017 | CH1FP | Original Q6 | Legacy



4.7.1.3 Properties of hydrocarbons

Answer 49 · Mark scheme

June 2019 | 8462/2F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	a temperature between 400 (°C) and 500 (°C) inclusive	allow a temperature range entirely within 400 (°C) and 500 (°C) inclusive	1	AO3 4.7.1.2
08.2	(diesel oil has a) lower boiling point / range than heavy fuel oil (but diesel oil has a) higher boiling point / range than kerosene	ignore quoted values for boiling points ignore references to melting points ignore references to intermolecular forces or chain length allow temperature of vaporisation / condensation for boiling points throughout allow the boiling range (of diesel oil) is between those of heavy fuel oil and kerosene for **2** marks.	1 1	AO2 4.7.1.2
08.3	any **two** from: • (too) viscous • not (very) flammable • boiling point (too) high	ignore references to cost allow references to difficulty of flow allow references to difficulty of ignition / burning do **not** accept bitumen takes more energy to burn allow not (very) volatile	2	AO2 4.7.1.3
08.4	C_6H_{14}		1	AO2 4.7.1.1

4.7.1.3 Properties of hydrocarbons

Answer 49 · Mark scheme June 2019 | 8462/2F | Original Q8

08.5	high temperature any **one** from: • steam • catalyst	ignore references to pressure allow a quoted temperature above 320 °C ignore hot / heat ignore name of catalyst allow alumina allow aluminium oxide allow porous pot allow zeolite	1 1	AO1 4.7.1.4
08.6	greater demand (for smaller molecules) any **one** from: (because smaller molecules are) • more useful • better fuels • used to make alkenes • used to make polymers	allow converse argument for larger molecules allow a named polymer ignore plastics	1 1	AO1 4.7.1.4
08.7	C_3H_6		1	AO2 4.1.1.1 4.7.1.4
Total			**11**	

4.7.1.3 Properties of hydrocarbons

Answer 50 · Mark scheme

November 2021 | 8462/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	fuel		1	AO1 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	propene		1	AO2 4.7.2.1 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	(percentage yield =) $\frac{380}{400} \times 100$ = 95 (%)		1 1	AO2 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	some ethanol changes back into ethene and steam some ethanol escapes from the apparatus		1 1	AO2 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	C_2H_5OH + **3** O_2 → 3 H_2O + 2 CO_2	allow multiples	1	AO2 4.1.1.1 4.3.1.1 4.7.2.3

4.7.1.3 Properties of hydrocarbons

Question 7 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	(advantages) (fermentation) low energy usage (fermentation) uses renewable raw materials (disadvantages) (fermentation) produces impure ethanol (fermentation) slow rate of reaction		 1 1 1 1	AO3 4.7.2.2 4.7.2.3 4.10.1.1

Total			**11**

4.7.1.3 Properties of hydrocarbons

Answer 51 · Mark scheme

November 2021 | 8462/2F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	all five points plotted correctly	allow a tolerance of ± ½ a small square allow **1** mark for three or four points plotted correctly	2	AO2 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	98 (°C)	allow a value in the range 92 to 104 (°C)	1	AO3 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	the boiling point is lower than 0 (°C)	allow the graph cannot show negative temperatures	1	AO3 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	gas	allow (g)	1	AO2 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	C_9H_{20}		1	AO2 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6	(nonane) has a higher boiling point	allow converse for the other alkanes	1	AO2 4.7.1.2
	(so nonane) condenses where the column has a higher temperature	allow (so nonane) collects where the column has a higher temperature	1	

Total			8

4.7.1.3 Properties of hydrocarbons

Answer 52 · Mark scheme

June 2022 | 8462/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	**C** **B** **A**	must be in this order	1	AO3 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	higher lower	must be in this order	1 1	AO2 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	scale labelled at 20, 30, 40, (50) % at 2 cm intervals (**K**) bar drawn to 44%	 allow a tolerance of ± ½ a small square	1 1	AO2 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	contains more kerosene	allow **K** contains less kerosene	1	AO3 4.7.1.3 4.7.1.4

4.7.1.3 Properties of hydrocarbons

Answer 52 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	a catalyst steam		1 1	AO1 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	$C_{11}H_{24}$		1	AO2 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	a single bond between two carbon atoms		1	AO1 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	carbon dioxide water		1 1	AO1 4.7.1.3

Total Question 2		**12**

4.7.1.3 Properties of hydrocarbons

Answer 53 · Mark scheme

June 2023 | 8462/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(the poly(propene) beaker will begin to) melt (the poly(propene) beaker will) burn / ignite	allow poly(propene) has a low melting point allow poly(propene) is flammable	1 1	AO3 4.7.3.1

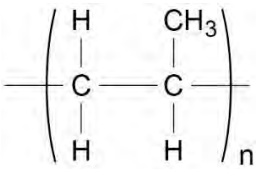
Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(poly(propene) beakers are) less easily broken	allow (poly(propene) beakers are) less likely to shatter allow (poly(propene) beakers are) tougher allow (poly(propene) beakers have a) higher resistance to impact	1	AO3 4.7.3.1 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	boron trioxide		1	AO1 4.10.3.3

Question	Answers	Mark	AO / Spec. Ref.
02.4	<table><tr><th>Symbol for element</th><th>Name of element</th><th>Number of atoms of element in one molecule of propene</th></tr><tr><td>C</td><td>carbon</td><td>3</td></tr><tr><td>H</td><td>hydrogen</td><td>6</td></tr></table> if no other mark awarded allow **1** mark for a correct column	1 1	AO1 AO2 4.1.1.1 4.7.2.1

4.7.1.3 Properties of hydrocarbons

Answer 53 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5			1	AO2 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(**Stage 1** is) fractional distillation		1	AO1
	(**Stage 2** is) cracking		1	AO2
	(**Stage 3** is) polymerisation		1	AO2
				4.7.1.2 4.7.1.4 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	alkene		1	AO2 4.7.2.1
	monomer		1	4.7.3.1

Total Question 2	**12**

4.7.1.3 Properties of hydrocarbons

Answer 54 · Mark scheme

June 2024 | 8462/2F | Original Q1

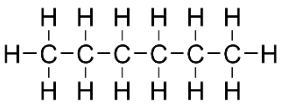
Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	carbon hydrogen	ignore C ignore H	1 1	AO1 4.1.1.1 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	20		1	AO2 4.1.1.1 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	C_nH_{2n+2}		1	AO2 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	alkanes		1	AO2 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5			1	AO2 4.7.1.1

4.7.1.3 Properties of hydrocarbons

Answer 54 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	fuel	allow fossil fuel	1	AO1 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	soot carbon monoxide		1 1	AO1 4.9.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8	C_6H_{12}		1	AO2 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.9	bar drawn to 84% bars labelled C / carbon **and** H / hydrogen	allow a tolerance of ± ½ a small square	1 1	AO2 4.7.1.1

Total Question 1	12

4.7.1.3 Properties of hydrocarbons

Answer 55 · Mark scheme

June 2025 | 8462/2F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	fractional distillation		1	AO1 4.1.1.2 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	(heater) evaporation (column) condensation	allow liquid to gas allow boiling allow gas to liquid	1 1	AO1 4.2.2.1 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	petrol		1	AO3 4.7.1.2

Question	Answers	Mark	AO / Spec. Ref.
09.4	heavy fuel oil ⟶ diesel oil ⟶ kerosene	1	AO3 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	C_4H_{10}		1	AO2 4.2.1.4 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6	butane		1	AO1 4.7.1.1

4.7.1.3 Properties of hydrocarbons

Answer 55 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.7	C_3H_8 + 5 O_2 → **3** CO_2 + **4** H_2O	allow **1** mark for **3** CO_2 allow **1** mark for **4** H_2O	2	AO2 4.1.1.1 4.3.1.1 4.7.1.3

Total Question 9	**9**

4.7.1.3 Properties of hydrocarbons

Version1.2:15/08/07

ASSESSMENT and QUALIFICATIONS ALLIANCE

GCSE

Science A 4461

Chemistry 4421

CHY1A F & H

Mark Scheme

2007 examination - June series

4.7.1.3 Properties of hydrocarbons

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Dr Michael Cresswell Director General

4.7.1.3 Properties of hydrocarbons

CHY1A (Products from Rocks)

Foundation Tier

Question	Key		
One	**A**	atom	**3**
	B	compound	**2**
	C	element	**4**
	D	symbol	**1**
Two	**A**	gold (Au)	**3**
	B	lithium (Li)	**4**
	C	calcium (Ca)	**1**
	D	sulfur (S)	**2**
Three	**A**	a bond	**3**
	B	an electron	**2**
	C	a molecule	**4**
	D	a nucleus	**1**
Four	**A**	Aluminium	**2**
	B	Iron	**3**
	C	Mercury	**1**
	D	Potassium	**4**
Five	**A**	one	**2**
	B	four	**3**
	C	five	**1**
	D	seven	**4**
Six	**A**	hard	**3**
	B	resistant to corrosion	**4**
	C	easily shaped	**2**
	D	brittle	**1**

	A	B	C	D
Seven	**2**	**4**	**3**	**2**
Eight	**1**	**2**	**2**	**3**
Nine	**1**	**2**	**4**	**3**

4.7.1.3 Properties of hydrocarbons

CHY1A (Products from Rocks)

Higher Tier

Question	Key		
One	**A**	hard	**3**
	B	resistant to corrosion	**4**
	C	easily shaped	**2**
	D	brittle	**1**
Two	**A**	an alloy	**4**
	B	an element	**1**
	C	a hydrocarbon	**2**
	D	a mixture of compounds	**3**

	A	B	C	D
Three	**1**	**2**	**2**	**3**
Four	**1**	**2**	**4**	**3**
Five	**3**	**2**	**1**	**1**
Six	**4**	**4**	**3**	**3**
Seven	**3**	**2**	**3**	**3**
Eight	**1**	**3**	**2**	**3**
Nine	**2**	**3**	**2**	**3**

4.7.1.3 Properties of hydrocarbons

Version 1.0: 0707

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462 / Chemistry 4421

CHY1F Unit Chemistry 1

Mark Scheme

2007 examination - June series

4.7.1.3 Properties of hydrocarbons

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Dr Michael Cresswell, Director General.

4.7.1.3 Properties of hydrocarbons

MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

4.7.1.3 Properties of hydrocarbons

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

4.7.1.3 Properties of hydrocarbons

CHY1F Question 1

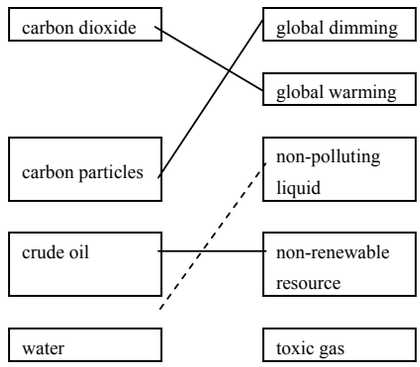
	answers	extra information	mark
(a)	low density unreactive		1 1
(b)	a polymer		1
(c)	any **one** from: • not broken down by (microorganisms) • does not decay (naturally)	ignore cannot recycle / degrade / disintegrate	1
total			4

CHY1F Question 2

	answers	extra information	mark
(a)(i)	additive		1
(b)	any **three** from: • colour 1 is made up of only one colour / dye • colour 2 is made up of only one colour / dye • colour 3 is made up of two colours / dyes **or** more colours (than colours 1 and 2) • colours 1, 2 and 3 are all different • colour 1 is less dark than colour 2	accept colour 3 is a mixture of colours 1 and 2 for **3** marks accept E-number or additive instead of colour ignore comments about height / level	3
total			4

4.7.1.3 Properties of hydrocarbons

CHY1F Question 3

	answers	extra information	mark
(a)	hydrogen	ignore formulae	1
(b)	any **two** from: • different sized molecules / more or less (carbon) atoms (in molecules) • fuels have <u>different</u> boiling points • fuels condense at <u>different</u> temperatures	ignore different densities	2
(c)		all three correct = **3** marks two correct = **2** marks one correct = **1** mark	3
total			6

4.7.1.3 Properties of hydrocarbons

CHY1F Question 4

	answers	extra information	mark
(a)(i)	any **one** from: • iron ore is a limited resource / non-renewable • iron is in high demand • provide jobs • economic advantage		1
(ii)	any **two** from: • would damage (wildlife) habitats / countryside / greenfield sites • extra traffic • visual (pollution) / eyesore • noise (pollution) / sound (pollution) • dust (pollution) • river (pollution) • carbon dioxide (from traffic) / adds to greenhouse effect / global warming • damage roads / buildings by <u>vibrations</u> / <u>shockwaves</u>		2
(b)(i)	carbon monoxide / carbon	accept formulae CO / C	1
(ii)	atoms are all the same (size) / type	accept (particles) are all the same (size) / type for one mark	1 1

Continued on next page

4.7.1.3 Properties of hydrocarbons

Question 4 continued

	answers	extra information	mark
(iii)	any **two** from: • impurities / carbon / different (sized) atoms **or** elements **or** metals • changes the structure / disrupts the pattern or layers • prevents layers sliding over each other • it is an alloy		2
total			8

4.7.1.3 Properties of hydrocarbons

CHY1F Question 5

	answers	extra information	mark
(a)	core	ignore outer or inner	1
	mantle		1
(b)(i)	carbon dioxide	accept formula CO_2	1
	oxygen	accept formulae O_2 / O	1
(ii)	4%		1
(iii)	carbon dioxide has <u>decreased</u> / from 95% to 0%		1
	oxygen has <u>increased</u> / from 0% to 21%		1
	any **one** from: (carbon dioxide decrease) • carbon dioxide used during photosynthesis / by plants • carbon dioxide dissolves in oceans • carbon dioxide is locked up in rocks / carbonates / fossil fuels (oxygen increase) • oxygen released during photosynthesis / by plants		1
total			8

4.7.1.3 Properties of hydrocarbons

CHY1F Question 6

	answers	extra information	mark
(a)	any **two** from: • nitrogen • carbon dioxide • water (vapour) / steam	 accept formulae N / N_2 accept formula CO_2 ignore CO accept formula H_2O	2
(b)	any **three** from: <u>limestone</u> • abundant / local • natural material **or** no 'processing' needed • relatively easy to cut • appearance better <u>concrete</u> • <u>raw materials</u> are abundant • can be reinforced (by steel rods) / strong(er) / supported (by steel rods) • concrete mixture can be poured / moulded / constructed on site • less reactive with acid rain / weathering / erosion	no mark for 'limestone' or 'concrete' on first line – mark advantages only ignore ideas of speed of production or easier to use accept 'can build higher' ignore density / extraction / quarrying / pollution / cost	3
total			5

4.7.1.3 Properties of hydrocarbons

CHY1F Question 7

	answers	extra information	mark
(a)(i)	$Cu_2S + 2O_2 \rightarrow 2CuO + SO_2$	accept fractions and multiples	1
(ii)	any **two** from: • sulfur dioxide • causes acid rain • consequence of acid rain eg kills fish / plants	 accept sulphur dioxide / sulphur oxide / SO_2 ignore other comments eg global warming / ozone / global dimming / greenhouse effect	2
(b)	any **two** from: • heat (copper oxide with carbon) • oxygen is removed by carbon **or** carbon monoxide / carbon dioxide is produced **or** carbon displaces copper • because carbon is more reactive than copper	 accept copper (oxide) loses oxygen **or** carbon gains oxygen accept carbon oxide accept a correct word or balanced symbol equation allow a correct comparison of reactivity	2
(c)(i)	electrolysis	accept electroplating	1
(ii)	(electrical) wiring / appliances / coins / pipes / cladding for buildings / jewellery / making alloys **or** named alloys		1

Continued on next page

4.7.1.3 Properties of hydrocarbons

Question 7 continued

	answers	extra information	mark
(d)	any **three** explanations from: <u>for recycling</u> • less acid rain (pollution) • copper reserves last longer / conserved **or** do not run out • energy for extraction (saved) **or** less energy required • less mining / quarrying • less waste (copper) / electrical appliances dumped **or** less landfill <u>against recycling</u> • collection problems • transport problems • difficult to separate copper from appliances • energy used to melt the collected copper	ignore electrolysis / pollution ignore ideas about less machinery / plant ignore idea of cost	3
total			10

4.7.1.3 Properties of hydrocarbons

Answer 52 · Examiner comments

June 2022 | 8462/2F | Original Q2

Question 2 (Low demand)

02.1 A large majority of the students put the fractions in the correct order.

02.2 Nearly 50% of the students gained two marks for correctly identifying the trend in both viscosity and flammability in the three crude oil fractions.

02.3 The bar chart was largely very well drawn with correct scales. More than 80% of students gained both marks.

02.4 Around a third of students answered correctly in terms of the proportion of kerosene in the fractions. Other students did not appear to understand the requirements of the question.

02.5 Nearly 40% of the students gained two marks for identifying the use of a catalyst or steam in cracking. Ozone was the most common incorrect response.

02.6 Most students could work out the number of hydrogen atoms but some did not write 24 as a subscript and therefore did not gain the mark.

02.7 More than 40% of the students gained the mark, but nearly half incorrectly suggested a double bond between two carbon atoms.

02.8 Only 20% of the students gained two marks, although carbon dioxide was often seen alongside an incorrect response, usually hydrogen.

4.7.1.3 Properties of hydrocarbons

Answer 53 · Examiner comments

June 2023 | 8462/2F | Original Q2

Question 2 (Low demand)

02.1 More than two thirds of students were able to use the information provided in the table to provide two correct reasons as to why poly(propene) beakers should not be used to heat liquids. More students suggested that poly(propene) would burn rather than melt. Common incorrect responses did not refer to the effect of heat on poly(propene) instead referring to the effect of the liquid being heated on the polymer.

02.2 More than half of students used the information in the table to suggest a reason why using poly(propene) beakers could save money. The most common incorrect responses did not include a comparison to the glass beakers so that the unqualified 'because they are tough' added no value to the data in the table. Some students used the wrong column and said the poly(propene) does shatter (on impact) even though this then made no sense in the context of saving money.

02.3 More than half of students successfully identified boron trioxide as a raw material for making borosilicate glass.

02.4 More that 90% of students obtained at least one mark on this question (usually for completing the 'name' column correctly) with just over 50% achieving both marks. The most common incorrect response was to incorrectly identify the number of carbon atoms. A minority of students failed to identify the number of atoms but instead calculated the mass of each element.

02.5 This question was very well answered with over 80% of students correctly identifying the repeating unit of poly(propene). The distractors attracted roughly equal support.

02.6 Students struggled to recognise and correctly identify the stages needed to produce poly(propene) from the descriptions provided in the question. Quite often, correct processes were identified but sequenced incorrectly. Less than one-third of students obtained all three marks and less than half achieved 2 marks.

02.7 Just over one third of students achieved 2 marks to identify both of the words that described a hexene molecule during a polymerisation reaction. About half of students achieved 1 mark by identifying hexene as an alkene or by identifying it as a monomer.

4.7.1.3 Properties of hydrocarbons

Answer 54 · Examiner comments June 2024 | 8462/2F | Original Q1

Question 1 (low and standard demand)

01.1 The vast majority of students scored both marks and correctly identified the elements present in a hydrocarbon.

01.2 Over 80% of students correctly identified the number of atoms in the formula provided. The most common distractor was to identify the number of elements present.

01.3 About 70% of students correctly identified the general formula of the alkanes.

01.4 Just over half the students correctly identified the compound as being an alkane.

01.5 Less than 40% of students correctly completed the displayed structural formula of the alkane. The most common incorrect response was to omit the bonds between the carbon atoms. A small percentage of students went on to include additional bonds attached to the ends of the molecule or to include one or more double bonds between carbon atoms. Over a third of students did not attempt this question.

01.6 This question was not well answered with fewer than one third of students correctly identifying petrol as being a fuel. Over 60% of students incorrectly identified alternative general names to describe the reaction of petrol when burned including combustion (complete and incomplete), burning and exothermic.

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Answer 54 · Examiner comments June 2024 | 8462/2F | Original Q1

01.7 This question was a good discriminator with roughly one third of students correctly identifying both of the atmospheric pollutants. Just over one third of students correctly identified one pollutant most commonly the gaseous pollutant carbon monoxide. The most commonly seen incorrect responses included to identify coal as the solid pollutant and sulfur dioxide as the gaseous pollutant.

01.8 Just over 60% of students correctly completed the equation. Many failed to gain credit because the numbers were not subscripts but the same size as the letters. The most commonly seen incorrect formula was C_3H_7.

01.9 More than 80% of students were able to complete and label the bar chart correctly with a further 10% obtaining one mark. Students should use a ruler when drawing bars to ensure their line stays within the tolerance stated in the mark scheme.

4.7.1.3 Properties of hydrocarbons

Answer 55 · Examiner comments June 2025 | 8462/2F | Original Q9

Question 9

09.1 Fractional distillation was given by about 40% of the students. Few of the rest gave distillation alone, the most common incorrect responses were cracking and fracking.

09.2 Just over a quarter of students correctly identified both changes of state. It was clear that many students did not understand what a change of state and only gave a state at each point.

09.3 Two thirds of students correctly identified petrol from the table.

09.4 A third of students made the correct link between boiling point and flammability, gaining a mark for this item.

Answer 55 · Examiner comments June 2025 | 8462/2F | Original Q9

09.5 Half of students wrote out the correct molecular formula, using the expected format. Some students wrote general formulas, and some had the carbon and hydrogen atoms the wrong way round.

09.6 A quarter of students named butane correctly. Propane was the most common incorrect answer.

09.7 2 in 5 students balanced the equation correctly. A further 25% balanced one of the two components.