AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.7.1.1

Crude oil, hydrocarbons and alkanes

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**109**
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.

4.7.1.1 Crude oil, hydrocarbons and alkanes

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

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 March 2007 | CHY1A | Original Q8 | Legacy

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

Answer 05 · Mark scheme March 2007 | CHY1B | Original Q1 | Legacy

One	**A**	alkanes	**2**
	B	fuels	**1**
	C	monomers	**4**
	D	polymers	**3**

Answer 06 · Mark scheme March 2007 | CHY1B | Original Q3 | Legacy

Three	**A**	ethanol	**2**
	B	ethene	**4**
	C	helium	**1**
	D	poly(propene)	**3**

Answer 07 · Mark scheme March 2007 | CHY1B | Original Q6 | Legacy

Six	**A**	hydrocarbons undergo thermal decomposition	**3**
	B	hydrocarbons are heated	**1**
	C	hydrocarbons vaporise	**2**
	D	small hydrocarbon molecules	**4**

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 08 · Mark scheme June 2007 | CHY1A | Original Q5 | Legacy

The full source mark scheme begins on page 112. Follow original question 5 in that document.

Answer 09 · Mark scheme June 2007 | CHY1B | Original Q1 | Legacy

Question	Key		
One	**A**	an additive	**3**
	B	a catalyst	**4**
	C	an emulsion	**2**
	D	a mixture	**1**

Answer 10 · Mark scheme June 2007 | CHY1F | Original Q3 | Legacy

The full source mark scheme begins on page 116. Follow original question 3 in that document.

Answer 11 · Mark scheme November 2007 | CHY1A | Original Q3 | Legacy

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

Answer 12 · Mark scheme November 2007 | CHY1A | Original Q6 | Legacy

Six	**A**	condense	**2**
	B	vaporise	**1**
	C	viscous	**4**
	D	volatile	**3**

	A	B	C	D

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 13 · Mark scheme

November 2007 | CHY1B | Original Q4 | Legacy

Four	**A**	ammonia	**3**
	B	helium	**2**
	C	methane	**1**
	D	oxygen	**4**

Answer 14 · Mark scheme

November 2007 | CHY1B | Original Q5 | Legacy

Five	**A**	alkene with the smallest molecules	**2**
	B	alkene with the largest molecules	**3**
	C	alkane	**1**
	D	polymer	**4**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 15 · 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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 15 · Mark scheme

January 2008 | CHY1F | Original Q1 | Legacy

CHY1F

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 16 · Mark scheme

Question 4

question	answers	extra information	mark
(a)(i)	monomers		1
(a)(ii)	crude oil		1
(b)	any **three** from: • metal may not corrode away / remains • plastic remains / does not break down (decay) / not affected by microorganisms • should recycle / conserve resources / mend the kettle / burn (plastic) as a fuel • landfill sites are limited / filling up • water pollution	accept non-biodegradable accept it is a waste of materials / resources ignore harms wildlife / habitats **or** problems caused by burning the kettle	3
total			5

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 16 · Mark scheme January 2008 | CHY1F | Original Q4 | Legacy

CHY1F

Answer 17 · Mark scheme March 2008 | CHY1AP | Original Q4 | Legacy

Four	**A**	condensed	**4**
	B	heated	**2**
	C	separated	**1**
	D	vaporised	**3**

Answer 18 · Mark scheme March 2008 | CHY1BP | Original Q4 | Legacy

Four	**A**	alkanes	**2**
	B	alkenes	**1**
	C	catalysts	**4**
	D	polymers	**3**

Answer 19 · Mark scheme March 2008 | CHY1BP | Original Q6 | Legacy

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

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

Answer 20 · Mark scheme June 2008 | CHY1AP | Original Q3 | Legacy

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

Answer 21 · Mark scheme June 2008 | CHY1AP | Original Q6 | Legacy

Six	**A**	C_2H_5OH	**3**
	B	C_3H_8	**2**
	C	C_2H_4	**1**
	D	S	**4**

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 22 · Mark scheme June 2008 | CHY1AP | Original Q9 | Legacy

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

Answer 23 · Mark scheme June 2008 | CHY1BP | Original Q5 | Legacy

Five	**A**	C_8H_{18}	**4**
	B	C_2H_4	**2**
	C	C_3H_8	**1**
	D	C_3H_6	**3**

Answer 24 · 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**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 25 · Mark scheme

June 2008 | CHY1F | Original Q5 | Legacy

question	answers	extra information	mark
5(a)(i)	hydrogen	must be name	1
5(a)(ii)	a line of four or more ethene molecules joined to the original two with single bonds	at least two other ethene molecules joined to the original two in a chain gains **1** mark	2
5(b)(i)	any **two** from: • non-biodegradable • landfill sites are filling up / limited • waste of a resource / could be recycled / reused	accept remains a long time accept land / space used up ignore references to tablets / animals	2
5(b)(ii)	any **one** from: • (two) different polymers / plastics / materials • need to be separated • limited collection points / many need to be collected • tablets may still be present		1
Total			**6**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 25 · Mark scheme

June 2008 | CHY1F | Original Q5 | Legacy

COMPONENT NUMBER: CHY1F

COMPONENT NAME: Science B / Chemistry

STATUS: Final

DATE: June 2008

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 26 · 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**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 27 · 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 28 · 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 29 · Mark scheme November 2008 | CHY1AP | Original Q8 | Legacy

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

Answer 30 · Mark scheme November 2008 | CHY1BP | Original Q1 | Legacy

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

Answer 31 · 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 32 · Mark scheme March 2009 | CHY1AP | Original Q6 | Legacy

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 33 · 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 34 · Mark scheme

June 2009 | CHY1BP | Original Q5 | Legacy

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 35 · Mark scheme

June 2009 | CHY1F | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)(i)	C_2H_4		1
5(a)(ii)	poly(ethene)		1
5(b)(i)	is not biodegradable		1
5(b)(ii)	not enough landfill sites / space	accept landfill sites are filling up **or** plastics remain for years **or** plastics not broken down ignore cost / waste of resources / not biodegradable / wildlife	1
5(b)(iii)	less (crude) oil / fuels / energy used	accept (crude) oil is a non-renewable resource	1
Total			**5**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 35 · Mark scheme

June 2009 | CHY1F | Original Q5 | Legacy

CHY1F

Answer 36 · 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**

Answer 37 · Mark scheme

November 2009 | CHY1AP | Original Q8 | Legacy

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

Answer 38 · Mark scheme

November 2009 | CHY1BP | Original Q9 | Legacy

No matching mark scheme was available in the supplied archive for this question.

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 39 · 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**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 39 · Mark scheme

January 2010 | CHY1F | Original Q4 | Legacy

CHY1F

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 40 · Mark scheme

January 2019 | CHY1F | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)(i)	any **one** from: • bond / join (together) • double bond opens	ignore polymerisation / heat	1
5(a)(ii)	any **one** from: • heat / energy • cost of fuels / the crude oil • construction of the factory / plant • wages / salaries	ignore many processes / distillation / cracking / polymerisation	1
5(a)(iii)	any **two** from: • non-biodegradable • landfill sites are filling up / limited • waste of a resource / could be recycled / reused	ignore gases released / burning / habitats accept remains a long time accept land / space used up accept crude oil is running out	2
5(b)	any **two** from: • renewable / sustainable • less fuel <u>burned</u> • biodegradable • <u>natural</u> resource • plants absorb carbon dioxide	ignore recycling ignore crude oil is running out accept less energy / heat needed	2
Total			**6**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 40 · Mark scheme January 2010 | CHY1F | Original Q5 | Legacy

CHY1F

Answer 41 · 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 42 · Mark scheme March 2010 | CHY1AP | Original Q9 | Legacy

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

Answer 43 · Mark scheme March 2010 | CHY1BP | Original Q4 | Legacy

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

Answer 44 · Mark scheme March 2010 | CHY1BP | Original Q8 | Legacy

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

Answer 45 · Mark scheme June 2010 | CHY1AP | Original Q4 | Legacy

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 46 · 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**

Answer 47 · Mark scheme June 2010 | CHY1AP | Original Q7 | Legacy

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

Answer 48 · Mark scheme June 2010 | CHY1BP | Original Q4 | Legacy

Four	**A**	Hydrocarbon **A**	**4**
	B	Hydrocarbon **B**	**2**
	C	Hydrocarbon **C**	**1**
	D	Hydrocarbon **D**	**3**

Answer 49 · Mark scheme June 2010 | CHY1BP | Original Q8 | Legacy

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 50 · Mark scheme

June 2010 | CHY2F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)(i)	nucleus		1
2(a)(ii)	neutron		1
2(a)(iii)	electron		1
2(b)(i)	6		1
2(b)(ii)	12		1
2(c)	14 C 6		1
2(d)(i)	CH_4		1
2(d)(ii)	compound		1
2(d)(iii)	covalent		1
Total			**9**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 50 · Mark scheme

June 2010 | CHY2F | Original Q2 | Legacy

CHY2F

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 51 · 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

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**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 52 · Mark scheme November 2010 | CHY1AP | Original Q4 | Legacy

Four	**A**	kerosene	**2**
	B	petroleum gas	**1**
	C	petrol	**3**
	D	bitumen	**4**

Answer 53 · Mark scheme November 2010 | CHY1AP | Original Q7 | Legacy

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

Answer 54 · Mark scheme November 2010 | CHY1BP | Original Q1 | Legacy

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

Answer 55 · Mark scheme November 2010 | CHY1BP | Original Q9 | Legacy

Nine	**3**	**2**	**4**	**3**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 56 · Mark scheme

January 2011 | CHY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	carbon hydrogen	accept in either order ignore number eg 2 carbons 4 hydrogens	1 1
4(a)(ii)	(a carbon carbon) double (bond)		1
4(b)	poly(ethene)		1
4(c)	any **two** from: • made from crude oil • non–renewable resources • litter • not biodegradable • use energy to make • when burned or biodegraded carbon dioxide is released • encourage customers to reuse bags / use their own bags	ignore pollution / cost / global warming / harms environment / recycling accept resources are running out accept go to landfill accept reduces carbon emissions / footprint	2
Total			**6**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 56 · Mark scheme

January 2011 | CHY1F | Original Q4 | Legacy

CHY1F

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 57 · Mark scheme

Question 7

question	answers	extra information	mark
7(a)	crude oil / it is evaporated / vaporised vapours / gases / fractions <u>cool and condense</u> (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**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 58 · Mark scheme March 2011 | CHY1AP | Original Q4 | Legacy

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

Answer 59 · 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 60 · Mark scheme March 2011 | CHY1BP | Original Q9 | Legacy

Nine	**3**	**2**	**3**	**2**

Answer 61 · Mark scheme June 2011 | CHY1AP | Original Q3 | Legacy

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

Answer 62 · Mark scheme June 2011 | CHY1AP | Original Q9 | Legacy

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

Answer 63 · Mark scheme June 2011 | CHY1BP | Original Q4 | Legacy

Four	**A**	alkenes	**2**
	B	polymers	**3**
	C	monomers	**4**
	D	alkanes	**1**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 64 · Mark scheme

June 2011 | CHY1BP | Original Q7 | Legacy

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

Answer 65 · Mark scheme

June 2011 | CHY1BP | Original Q8 | Legacy

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 66 · Mark scheme

June 2011 | CHY1F | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)(i)	distillation		1
5(a)(ii)	condense (at different temperatures)	accept they / fractions / hydrocarbons have different boiling points ignore melting point / size of molecule	1
5(b)	contains hydrocarbons has a high boiling point		1 1
5(c)	C_5H_{12}		1
Total			5

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 66 · Mark scheme

June 2011 | CHY1F | Original Q5 | Legacy

CHY1F

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 67 · Mark scheme

June 2011 | CHY1F | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)(i)	heat / high temperature / hot / vaporise catalyst **or** silica / alumina / porous pot **or** steam	if (fractional) distillation / hydrogenation mentioned as the method = max 1 allow thermal decomposition ignore evaporation do **not** accept 'burns' do **not** accept temperature < 100 ignore other named catalyst allow heat (the vapour) to a very high temperature / >800°C for **2** marks	1 1
7(a)(ii)	C_2H_3Cl	ignore attempts to balance equation	1
7(a)(iii)	single bonds between C – H, C – Cl **and** C – C	do **not** accept symbols outside the bracket	1
7(b)(i)	so that the amount of plasticiser / (sample of) PVC is the independent / only variable that affects the bending / flexibility of the samples	allow because different sizes would give different results accept because size is a control variable ignore references to reliability / precision etc	1
7(b)(ii)	to improve the reliability (of the investigation)	accept to calculate a mean accept to check for anomalous results **or** to check the range of results ignore accuracy / precision etc	1

Question 7 continues on the next page

Question 7 continued

question	answers	extra information	mark
7(b)(iii)	23	correct answer with or without working = **2** marks if answer is incorrect allow $\frac{22+23+24}{3}$ **or** 21 for **1** mark	2
7(b)(iv)	(PVC) sample had been stretched / used / tested in first three tests	accept higher temperature allow worn **or** become weaker ignore (human) error ignore more flexible / softer ignore intermolecular forces	1
7(c)	does not bend (easily / much) **or** it is not flexible **or** it is rigid	ignore non-biodegradable / low maintenance ignore sturdy / stronger / harder	1
Total			**10**

The AQA UMS Conversion Calculator is available on the Results statistics page of the AQA Website

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 68 · 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**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 68 · Mark scheme June 2011 | CHY3F | Original Q4 | Legacy

CHY3F

Answer 69 · Mark scheme November 2011 | CHY1AP | Original Q4 | Legacy

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

Answer 70 · Mark scheme November 2011 | CHY1AP | Original Q8 | Legacy

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

Answer 71 · Mark scheme November 2011 | CHY1BP | Original Q9 | Legacy

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 72 · Mark scheme

January 2012 | CH1FP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	hydrocarbons		1
3(a)(ii)	ethane has the smallest molecules heptadecane has the highest boiling point		1 1
3(a)(iii)	evaporating condense		1 1
3(b)(i)	**W** **Y**		1 1
3(b)(ii)	floats	if no answer written on line, allow correct answer indicated in the box	1
3(b)(iii)	open the tap stop the flow of liquid when the water has run out	allow let the water out ignore remove water allow until oil is left behind ignore filter	1 1
Total			**10**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 72 · Mark scheme

January 2012 | CH1FP | Original Q3 | Legacy

CH1FP

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 73 · Mark scheme

January 2012 | CH1FP | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	fermentation		1
4(a)(ii)	cloudy there is carbon dioxide / CO_2	accept milky / white accept calcium carbonate forms allow a (white) solid / precipitate forms	1 1
4(b)(i)	 (the amount of ethanol used) increases (from 1970) to 1989 then it decreases from 1989 (to 2000)	if no year(s) or incorrect year(s) indicated then max **1** correct year(s) only needs to be indicated once to gain full marks accept values in range 1987-1992	 1 1
4(b)(ii)	any **one** from: • Brazil had more oilfields • cost of crude oil had decreased • cost of ethanol / sugar (cane) had increased • demand for ethanol / sugar (cane) had increased • availability of ethanol / sugar (cane) had decreased • climate change affects growing sugar (cane)	 accept availability of land to grow sugar (cane) had decreased	1
Total			**6**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 73 · Mark scheme

January 2012 | CH1FP | Original Q4 | Legacy

CH1FP

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 74 · 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…….

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**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 74 · Mark scheme

January 2012 | CH1FP | Original Q6 | Legacy

CH1FP

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 75 · 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**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 75 · Mark scheme

June 2012 | CH1FP | Original Q3 | Legacy

CH1FP

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 76 · 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**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 76 · Mark scheme

June 2012 | CH1FP | Original Q6 | Legacy

CH1FP

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 77 · Mark scheme

June 2012 | CH1FP | Original Q8 | Legacy

Question 8

question	answers	extra information	mark
8(a)(i)	(1) 5 3 (6) 4 2	all numbers in the correct order gains both marks any two numbers in the correct position gains **1** mark	2
8(a)(ii)	water carbon dioxide	ignore formula if correct name given accept hydrogen oxide allow H_2O allow CO_2 accept carbon monoxide / CO **or** carbon / C	1 1

Question 8 continues on the next page . . .

CH1FP

Question 8 cont'd

question	answers	extra information	mark
8(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 on page 2**, and apply a 'best-fit' approach to the marking.		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 caused by using plastic shopping bags made from poly(ethene).	There is a **clear** description of both an advantage **and** a disadvantage caused by using plastic shopping bags made from poly(ethene).	There is a **detailed** description of both advantages **and** disadvantages caused by using plastic shopping bags made from poly(ethene).

examples of the chemistry/social points made in the response:
ignore cost unqualified

Advantages:

- Simple properties eg strong / low density / water resistant
- Bags can be reused (for shopping) **or** another specified use eg bin liners
- Money charged for bags can go to good causes **or** encourage reuse
- Poly(ethene) bags can be recycled eg made into milk bottle crates
- Poly(ethene) bags can be burned to provide heat for buildings/generation of electricity
- New bags are now made that can biodegrade

Disadvantages:

- (Older) bags can take many years to biodegrade
- There is a shortage of landfill space
- Bags are made from (crude) oil which is a non-renewable resource/running out
- Large amounts of energy/fuel are used for the production of poly(ethene)
- Production of poly(ethene) releases carbon dioxide/causes global warming
- Specified issue caused by litter eg visual pollution or effect on wildlife
- Burning bags release carbon dioxide / causes global warming

Total			**10**

UMS Conversion Calculator www.aqa.org.uk/umsconversion

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 78 · Mark scheme

January 2013 | CH1FP | Original Q5 | Legacy

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**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 78 · Mark scheme

January 2013 | CH1FP | Original Q5 | Legacy

CH1FP

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 79 · 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

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 80 · 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**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 81 · Mark scheme

June 2013 | CH1FP | Original Q8 | Legacy

Question 8

question	answers	extra information	Mark
8(a)(i)	exothermic	accept combustion allow burning **or** oxidation **or** redox	1
8(a)(ii)	carbon monoxide / *CO* (is produced) because there is incomplete / partial combustion (of the fuel)	allow monoxide (is produced) ignore carbon oxide accept because there is insufficient oxygen / air (to burn the fuel)	1 1

Question 8(b) continues on the next page

Question 8 continued

question	Answers	extra information	Mark
8(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 on page 5.		6

0 marks	**Level 1 (1-2 marks)**	**Level 2 (3-4 marks)**	**Level 3 (5-6 marks)**
No relevant content.	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.	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.	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

Total			**9**

UMS Conversion Calculator: www.aqa.org.uk/umsconversion

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 82 · Mark scheme

June 2013 | CH2FP | Original Q3 | Legacy

Question 3

question	answers	extra information	Mark
3(a)	(alloy) atoms / ions / particles not in layers	accept layers are distorted accept different (size) particles / atoms	1
	so, (alloy) layers / atoms / ions / particles can't slide	if no other mark awarded allow (an alloy) is a mixture of metals for **1** mark	1
3(b)	diamonds have a giant covalent structure		1
	diamonds have strong bonds between carbon atoms		1
3(c)(i)	a compound		1
3(c)(ii)	CH_4		1
3(c)(iii)	covalent		1
3(d)	methane has a low boiling point or boiling point less than 20°C		1
	because it has small molecules	accept it has forces between molecules accept weak forces between molecules for **2** marks	1
Total			9

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 83 · 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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 84 · Mark scheme

June 2014 | CH1FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
4(a)	hydrocarbons **or** hydrocarbon		1	1 / 1.4.1c	G
4(b)(i)	distillation		1	1 / 1.4.2b	G
4(b)(ii)	evaporation		1	2 / 1.4.2b	G
4(b)(iii)	condensation		1	2 / 1.4.2b	G
4(c)(i)	bond		1	1 / 1.4.2a	G
4(c)(ii)	$(C_6H)_{14}$		1	2 / 1.4.2a	G
4(c)(iii)	cracking		1	1 / 1.5.1a	G
4(d)(i)	poly(butene)	allow with or without brackets	1	1 / 1.5.2a	E
4(d)(ii)	Advantage=energy is released Disadvantage=carbon dioxide is produced	do **not** accept more than one tick in the advantage column do **not** accept more than one tick in the disadvantage column	1 1	3 / 1.5	G
Total			**10**		

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 84 · Mark scheme

June 2014 | CH1FP | Original Q4 | Legacy



4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 85 · Mark scheme

June 2014 | CH1FP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
7(a)(i)	reaction with water / steam	allow add water / steam *(to produce ethanol)* *allow H_2O or hydrogen oxide for water* *ignore mix*	1	1 / 1.5.3a	E
7(a)(ii)	filter / decant (to remove the yeast)	*allow answers in either order* *accept description of decanting* *ignore sieve*	1	2 / 1.5.3b	E
	(fractional) distillation / distil	*accept evaporation then condensation*	1		

<table>
<tr><td colspan="4">7(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 on page 5, and apply a ‘best-fit’ approach to the marking.</td><td>1+2+3 / 1.4.3e</td><td>E</td></tr>
<tr><td>0 marks</td><td>Level 1 (1–2 marks)</td><td>Level 2 (3–4 marks)</td><td>Level 3 (5–6 marks)</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>No relevant content</td><td>There is a stated advantage or disadvantage of using biodiesel or petroleum diesel.</td><td>There is a stated advantage or disadvantage of using biodiesel or petroleum diesel with a linked consequence.</td><td>There is at least one stated advantage and at least one stated disadvantage of using biodiesel or petroleum diesel with a linked consequence for each.</td></tr>
<tr><td colspan="4">Examples of points made in the response could include:
Advantages of biodiesel:
• Produces less carbon dioxide
• Produces no sulfur dioxide
• Produces less particulates
• Sustainable / renewable
• Growing crops absorb carbon dioxide
• Carbon neutral
• Produces less acid rain
• Conserves the limited amount of petroleum diesel
Disadvantages of biodiesel:
• Produces more nitrogen oxides
• Deforestation for land
• Destruction of habitats for land
• Uses land that could be used for food crops
• Creates food shortages
• Crops are not reliable</td><td></td><td></td></tr>
</table>

Total			**9**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 86 · 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**	

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 86 · Mark scheme

June 2015 | CH1FP | Original Q3 | Legacy



4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 87 · Mark scheme

June 2015 | CH1FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)(i)	the polymer is not biodegradable the polymer is waterproof		1 1	2 / 1.5.2b/c
4(a)(ii)	any **one** from: • made from a renewable/sustainable resource • is biodegradable	ignore releases less carbon dioxide allow decomposes	1	3 / 1.5.2c/d
4(b)(i)	crushing filtering	in the correct order	1 1	1 / 1.6.1a
4(b)(ii)	open the tap to allow only water to flow out **or** close the tap to leave the oil in the funnel	 allow close tap then allow oil to flow out into a separate container	1 1	2 / 1.6.1a
4(c)(i)	They provide a lot of energy		1	1 / 1.6.1b
4(c)(ii)	because the vegetable/plant absorbs / uses carbon dioxide which is released when the biofuel burns	 second marking point is dependent on first marking point allow a fossil fuel releases locked up carbon dioxide/carbon if no other mark awarded allow carbon neutral for **one** mark	1 1	1 / 1.5.2a
Total			**10**	

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 87 · Mark scheme

June 2015 | CH1FP | Original Q4 | Legacy



4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 88 · 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**	

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 89 · Mark scheme

June 2016 | CH1FP | Original Q4 | Legacy

Question 4

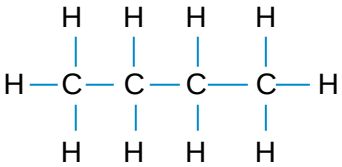
Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)(i)	fermentation		1	AO1 1.5.3b
4(a)(ii)	hydration		1	AO1 1.5.3a
4(a)(iii)	resources of crude oil are non-renewable producing ethanol from plants uses less energy		1 1	AO3 1.4.3e; 1.5.3b
4(b)(i)	turns cloudy / milky / white because carbon dioxide is produced	ignore bubbles allow CO_2 produced	1 1	AO1 1.2.1e
4(b)(ii)	filter paper		1	AO3 1.5.3b; 4.3
4(c)(i)	vegetable oils cook foods at higher temperatures than boiling water		1	AO1 1.6.1c
4(c)(ii)	(flask **A**) vegetable oil and water <u>do not mix</u> or are immiscible **or** vegetable oil <u>does not dissolve</u> in water (flask **B**) vegetable oil, water and an emulsifier form an emulsion **or** a suspension or a stable mixture	 allow correct description using hydrophilic and/or hydrophobic	1 1	AO2+AO3 1.6.2a
Total			**10**	

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 90 · 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

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

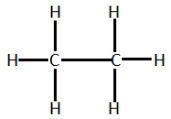
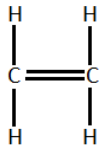
Disadvantages of using hydrogen:

- 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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 91 · 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

4.7.1.1 Crude oil, hydrocarbons and alkanes

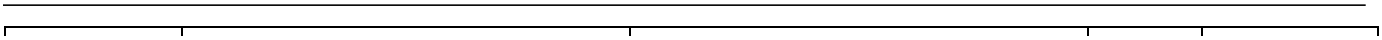
Answer 91 · Mark scheme

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**	

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 91 · Mark scheme

June 2017 | CH1FP | Original Q6 | Legacy



4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 92 · Mark scheme

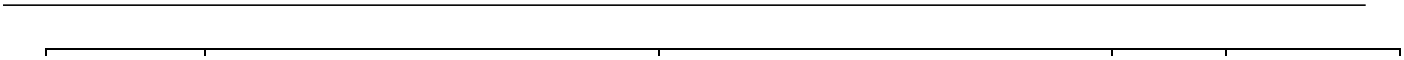
June 2017 | CH3FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	air	allow air circled in the box	1	AO1 3.5.1.a
3(a)(ii)	tick (✓) by: lowers the activation energy		1	AO1 3.3.1h
3(a)(iii)	(gases) cooled (ammonia) condensed	 ignore turn to a liquid if no other mark, allow fractional distillation for 1 mark	1 1	AO1 AO2 3.5.1b
3(b)	hydrogen ammonia	must be in correct order	1	AO1 3.5.1b
3(c)(i)	all points correctly plotted	allow 1 mark for **3** correct points allow +/- one small square	2	AO2 3.5.1b
3(c)(ii)	correctly drawn line		1	AO2 3.5.1b
3(c)(iii)	line extrapolated to at least 300°C 0.50 - 0.60		1 1	AO2 3.5.1b
3(c)(iv)	increases		1	AO2 3.5.1b
Total			11	

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 92 · Mark scheme

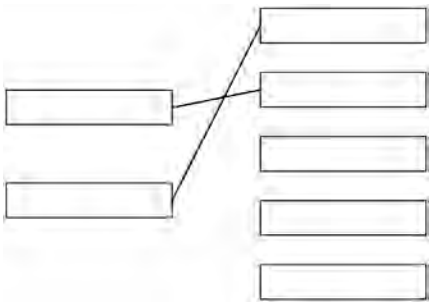
June 2017 | CH3FP | Original Q3 | Legacy



4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 93 · Mark scheme

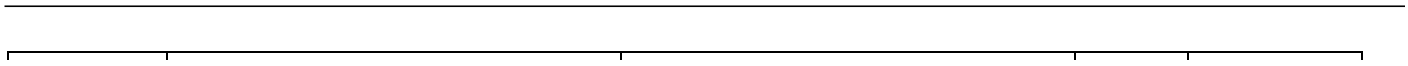
June 2018 | 8462/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	$C_{12}H_{26}$		1	AO2 4.7.1.4
02.2	alkane		1	AO2 4.7.1.1
02.3	air	allow atmosphere	1	AO2 4.9.3.1
02.4		particulates – global dimming sulfur dioxide – acid rain	1 1	AO1 4.9.3.2
02.5	carbon dioxide carbon monoxide		1 1	AO1 4.7.1.3 4.9.3.1
02.6	develop fuel efficient engines use electric cars		1 1	AO3 4.9.3.1
Total			**9**	

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 93 · Mark scheme

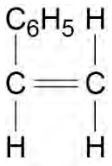
June 2018 | 8462/2F | Original Q2



4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 94 · Mark scheme

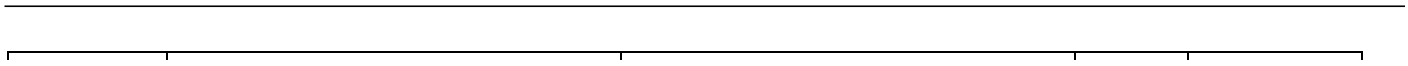
June 2018 | 8462/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1			1	AO2 4.7.3.1
06.2	polymerisation		1	AO2 4.7.3.1
06.3	monomers many polymers	must be in this order	1 1 1	AO1 4.7.3.1
06.4	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.		3–4	AO3
	Level 1: Relevant features are identified and differences noted.		1–2	AO2
	No relevant content		0	
	Indicative content for coated paper cups – accept converse for poly(styrene) **advantages** • produced from a renewable resource • biodegradable so breaks down **disadvantages** • higher energy costs • greater use of fossil fuels and consequent pollution • not recyclable so uses landfill			4.10.1.1 4.10.2.1
Total			9	

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 94 · Mark scheme

June 2018 | 8462/2F | Original Q6

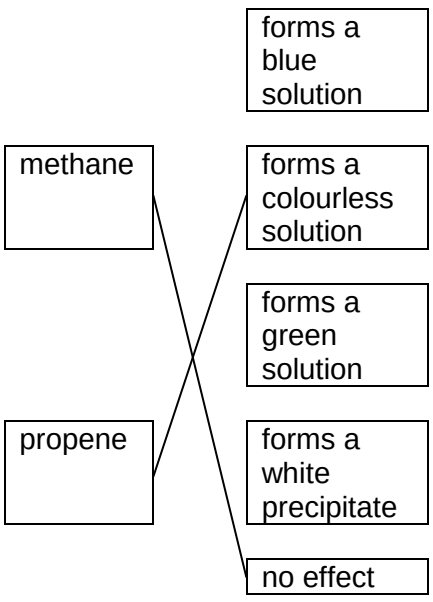


4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 95 · Mark scheme

June 2019 | 8462/2F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	nitrogen **and** methane	in either order, both required for mark allow phonetic spellings allow N_2 for nitrogen allow CH_4 for methane	1	AO2 4.9.1.1
04.2	nitrogen bar to 78% oxygen bar to 21%	ignore width of bars ignore additional bars	1 1	AO2 4.9.2.2
04.3	Titan's atmosphere contains too little carbon dioxide.		1	AO3 4.9.1.3
04.4	long wavelength radiation is reflected back to the surface of Titan.		1	AO1 4.9.2.1
04.5		an extra line from a gas to an effect on bromine water negates that mark	1 1	AO1 4.7.1.4

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 95 · Mark scheme

June 2019 | 8462/2F | Original Q4

04.6	$\frac{7 \times 21}{3}$ = 49 (g)	an answer of 49 (g) scores **2** marks.	1 1	AO2 4.7.2.2
Total			**9**	

Answer 96 · 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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 96 · 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**	

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 97 · Mark scheme

November 2020 | 8462/2F | Original Q6

Question 6

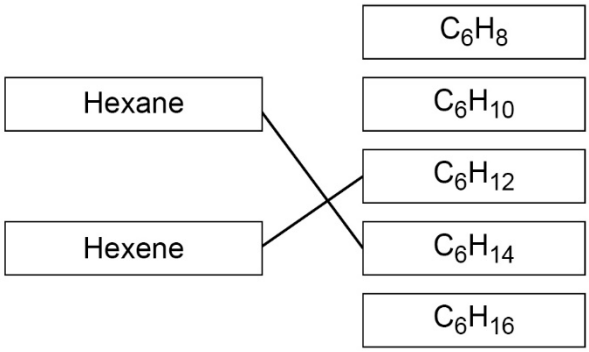
Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	disposal at the end of useful life		1	AO3 4.10.2.1
06.2	heating in a furnace shaping wet clay		1 1	AO1 4.10.3.3
06.3	polymers propene	allow (a) monomer	1 1	AO1 AO2 4.7.3.1
06.4	cracking fractional distillation		1 1	AO2 4.7.1.2 4.7.1.4
06.5	covalent		1	AO1 4.2.2.5 4.7.3.1
06.6	thermosetting		1	AO3 4.10.3.3
06.7	polymer **A** has crosslinks (between polymer molecules) **or** polymer **B** has no crosslinks (between polymer molecules)		1	AO3 4.10.3.3
Total			**10**	

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 98 · Mark scheme

November 2020 | 8462/2F | Original Q10

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	 additional line from a box on the left negates the mark for that box		1 1	AO2 4.7.1.1 4.7.2.1
10.2	(remains) orange (becomes) colourless	must be in this order allow no (colour) change ignore initial colour ignore clear	 1 1	AO2 4.7.1.4

Question 10 (continued)

Question	Answers	Mark	AO / Spec. Ref.
10.3	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar/different is made clear and (where appropriate) the magnitude of the similarity/difference is noted.	4–6	AO1 AO2
	Level 1: Relevant features are identified and differences noted.	1–3	
	No relevant content	0	4.7.1.1 4.7.1.3 4.7.1.4 4.7.2.1 4.7.2.2 4.9.3.1
	Indicative content **Structure and bonding** • both are hydrocarbons • both contain two carbon atoms (per molecule) • ethane contains six hydrogen atoms (per molecule) • (but) ethene contains four hydrogen atoms (per molecule) • both have covalent bonds • ethane contains a single C—C bond • (but) ethene contains a double bond • both contain C—H bonds • both small molecules **Reactions** • both react with oxygen in complete combustion reactions • to produce water and carbon dioxide • both react with oxygen in incomplete combustion reactions • to produce water, carbon monoxide and carbon • incomplete combustion is more likely with ethene • ethene decolourises bromine water • (but) ethane does not decolourise bromine water • ethene is more reactive (than ethane) • ethene can react with hydrogen (to produce ethane) • ethene can react with water (to produce ethanol) • ethene can react with halogens (to produce halogenoalkanes) • ethene can undergo addition reactions • ethene can polymerise (to produce poly(ethene)) ignore physical properties ignore references to flammability		

Total			10

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 99 · Mark scheme

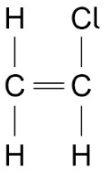
November 2021 | 8462/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	limestone sodium carbonate		1 1	AO1 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	(advantage) stronger (reason) less easily damaged		1 1	AO3 AO2 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	(advantage) lower density (reason) lighter (to install)		1 1	AO3 AO2 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4			1	AO2 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	(add damp) litmus paper (litmus paper) is bleached **or** (litmus paper) turns white	ignore (litmus paper) turns red	1 1	AO1 4.8.2.4

Question 3 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	(polymers) last a long time (wood) renewable	ignore references to cost allow break down slowly allow trees can be replanted allow aesthetic reasons	1 1	AO3 AO1 4.10.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	(percentage of aluminium =) $\frac{5.94}{6.00} \times 100$ = 99 (%)		1 1	AO2 4.10.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.8	(alloy is) harder (than pure aluminium)	allow (alloy is) stronger (than pure aluminium) ignore references to cost	1	AO2 4.2.2.7 4.10.3.2

Total			14

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 100 · 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

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**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 101 · 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 (so nonane) condenses where the column has a higher temperature	allow converse for the other alkanes allow (so nonane) collects where the column has a higher temperature	1 1	AO2 4.7.1.2

Total			8

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 102 · 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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 102 · Mark scheme

June 2022 | 8462/2F | Original Q2

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 103 · Mark scheme

June 2022 | 8462/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	78.09 (%)		1	AO2 4.9.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	ammonia methane		1 1	AO1 4.9.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	photosynthesis		1	AO1 4.9.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	dissolving carbon dioxide in oceans formation of sedimentary rocks		1 1	AO1 4.9.1.2 4.9.1.4

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 103 · Mark scheme

June 2022 | 8462/2F | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	1500 (millions of years ago)		1	AO2 4.9.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	2500 (millions of years ago)	allow a value in the range 2500 to 2700 (millions of years ago)	1	AO3 4.9.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	plankton		1	AO1 4.7.1.1 4.9.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.8	(there is) limited evidence	allow the timescale was millions / billions of years	1	AO2 4.9.1.2

Total Question 3		**10**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 104 · Mark scheme

June 2022 | 8462/2F | Original Q10

Question 10

Question	Answers	Mark	AO / Spec. Ref
10.1	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 4.10.1.1 4.10.2.1
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content **raw materials** • crude oil is finite • quarrying / mining pollute the environment • glass uses more energy to process raw materials **manufacturing** • glass uses more energy to make bottles • glass is heavier so takes more energy to transport **use and operation** • glass bottles are reusable • reuse of glass conserves (natural) resources • reuse of glass consumes energy during washing • reuse of glass consumes water during washing **disposal** • both glass and polymer bottles can be recycled • recycling polymer conserves finite resources • recycling glass and polymer uses less energy than making new glass and polymer • both methods reduce use of landfill **other points** • energy needed may be derived from fossil fuels • use of fossil fuels causes (specified) pollution • total energy for glass (bottle) (7500 kJ) is greater than total energy for polymer (bottle) (1800 kJ) **reasoned judgement**		

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 104 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.2	mass = density × volume mass = 0.40 × 40 = 16 (g)		1 1 1	AO2 4.10.1.1 4.10.2.1

Total Question 10		**9**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 105 · 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

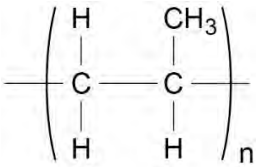
Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(poly(propene) beakers are) less easily broken	allow (poly(propene) beakers are) less likely to shatter allow (poly(propene) beakers are) tougher allow (poly(propene) beakers have a) higher resistance to impact	1	AO3 4.7.3.1 4.10.3.3

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 105 · 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 (**Stage 2** is) cracking (**Stage 3** is) polymerisation		1 1 1	AO1 AO2 AO2 4.7.1.2 4.7.1.4 4.7.3.1

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

Total Question 2	12

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 106 · Mark scheme

June 2024 | 8462/2F | Original Q1

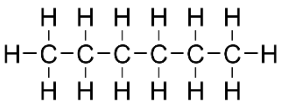
Question 1

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 106 · 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

4.7.1.1 Crude oil, hydrocarbons and alkanes

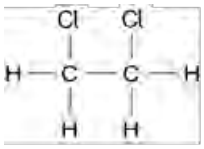
Answer 107 · Mark scheme

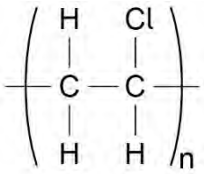
June 2024 | 8462/2F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	colourless	ignore clear	1	AO1 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	damp litmus paper		1	AO1 4.8.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3			1	AO1 4.7.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4			1	AO2 4.7.3.1

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 107 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	1.5 × 10 0.9 × 10 (ratio =) 15 : 9 = 5 : 3 **alternative approach** (ratio =) $\frac{1.5}{0.9}$ $\frac{0.9}{0.9}$ (1) 1.666 : 1 (1) = 5 **:** 3 (1)	 allow correct determination of the simplest whole number ratio from an attempt at a density ratio allow correct determination of the simplest whole number ratio from an attempt at a density ratio	1 1 1	AO2 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	the pipes will melt **or** the polymers will melt	 allow the melting point of both polymers is below 300°C	1	AO3 4.7.3.1 4.10.3.3

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 107 · Mark scheme

June 2024 | 8462/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.7	oil is non-renewable **or** paper is obtained from a renewable source	allow oil is finite	1	AO2 4.10.1.1

Total Question 6	**9**

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 108 · Mark scheme

June 2025 | 8462/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	propene		1	AO1 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	9		1	AO2 4.1.1.1 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	making a polymer		1	AO1 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	(*y*-axis 0, 20), 40, 60, 80, (100)	ignore intermediate values	1	AO2 4.7.2.1
	carbon bar drawn to 86%	allow a tolerance of ± ½ a small square	1	
	carbon bar labelled		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	(test) add bromine (water) (result) (bromine water) turns (from orange to) colourless	 allow (bromine water) decolorises ignore clear MP2 is dependent upon MP1 being awarded	1 1	AO1 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	$C_{10}H_{22} \longrightarrow C_3H_6 + C_7H_{16}$		1	AO2 4.1.1.1 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	fuels		1	AO1 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	the molecules collide more frequently at 750 °C		1	AO2 4.6.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.9	(at 750 °C the rate of reaction is) higher	allow (at 450 °C the rate of reaction is) lower	1	AO2 4.6.1.2

Total Question 2	**12**

Answer 109 · 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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 109 · Mark scheme

June 2025 | 8462/2F | Original Q9

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**

Version1.2:15/08/07

ASSESSMENT and QUALIFICATIONS ALLIANCE

GCSE

Science A 4461

Chemistry 4421

CHY1A F & H

Mark Scheme

2007 examination - June series

4.7.1.1 Crude oil, hydrocarbons and alkanes

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Dr Michael Cresswell Director General

4.7.1.1 Crude oil, hydrocarbons and alkanes

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**

4.7.1.1 Crude oil, hydrocarbons and alkanes

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**

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

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Dr Michael Cresswell, Director General.

4.7.1.1 Crude oil, hydrocarbons and alkanes

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.

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.

4.7.1.1 Crude oil, hydrocarbons and alkanes

CHY1F Question 1

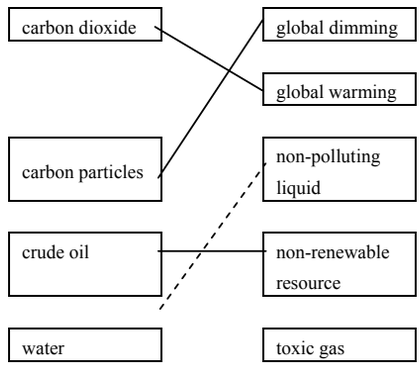
	answers	extra information	mark
(a)	low density unreactive		1 1
(b)	a polymer		1
(c)	any **one** from: • not broken down by (microorganisms) • does not decay (naturally)	ignore cannot recycle / degrade / disintegrate	1
total			4

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

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

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

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 93 · Examiner comments June 2018 | 8462/2F | Original Q2

Question 2 (low demand)

02.1 54% of students identified the correct formula with all the other distractors proving equally popular as each other.

02.2 71% of students recognised that octane was an alkane.

02.3 This question was not well answered with 87% of responses failing to score. Of these responses, about half gave 'plants / trees / photosynthesis' as the source of oxygen with the remaining suggesting 'hydrogen / carbon / oxide' or a named oxide such as 'carbon dioxide' was the source.

02.4 Most students knew that sulfur dioxide caused acid rain, although the environmental effect of particulates was less well known.

02.5 Most students realised that carbon dioxide was produced in car engines but far fewer identified carbon monoxide as the other possible product. Nitrogen was often given instead.

02.6 89% of students could identify both ways of reducing atmospheric pollution in cities.

Answer 94 · Examiner comments June 2018 | 8462/2F | Original Q6

Question 6 (low demand)

06.1 65% of students correctly identified the correct monomer.

06.2 79% of students correctly identified the correct process.

06.3 This question differentiated well, with a good spread of marks. 36% of students achieved full marks.

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 94 · Examiner comments June 2018 | 8462/2F | Original Q6

06.4 This question required an 'extended response' and was marked holistically using a 'levels' mark scheme. The command word was 'compare'. Lower-attaining students simply repeated the information in the question and gained no credit.

As a guideline, those who only identified the various properties as advantages and disadvantages were probably in level 1. 53% of responses moved beyond this into level 2, by explaining why. For example, that being made out of wood was an advantage because wood is renewable or that being non-recyclable was a disadvantage because it fills up landfill sites.

Answer 102 · 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.

Answer 103 · Examiner comments

June 2022 | 8462/2F | Original Q3

Question 3 (Low and standard demand)

03.1 Just over half of the students correctly worked out the percentage of nitrogen.

03.2 Nearly 60% of the students gained two marks, with methane being well known but ammonia less so.

03.3 Photosynthesis was correctly identified by nearly 90% of the students.

03.4 Nearly 50% of the students gained two marks, with carbon dioxide dissolving in oceans better known than formation of sedimentary rocks.

03.5 Nearly four fifths of the students could correctly read the value from the graph.

03.6 Even though the numerical scale was increasing in the backwards direction, more than 90% of the students scored this mark.

03.7 Plankton was identified by nearly 60% of the students.

03.8 The answer required the idea of limited evidence or that it was billions (or millions) of years ago. Lack of proof or data or that it was a long time ago were insufficient. Just over 20% of the students answered this question correctly.

Answer 104 · Examiner comments

June 2022 | 8462/2F | Original Q10

Question 10 (Standard demand)

10.1 In this extended response question, the command word was ‘evaluate’. This command word demands a reasoned judgement to be given for a fully complete answer and therefore for access to a Level 3 mark. Isolated comments such as ‘I think polymer is a better material than glass’ are not reasoned judgments. The vast majority of students did not go further than this and were therefore capped at four marks. Very few students gained 5 or 6 marks.

Most students scored a Level 1 mark (merely by comparing the values given in the table) or a Level 2 mark (by introducing one or two pieces of ‘added value’ information about the impacts of the data provided). Nearly 30% of students gained a Level 2 mark, whilst a further 15% or so did not attempt the question.

10.2 This straightforward calculation presented no difficulties for the majority of students. Well over 70% of the students gained all three marks.

4.7.1.1 Crude oil, hydrocarbons and alkanes

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account of how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 105 · 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.

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 106 · 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 106 · 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.

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 107 · Examiner comments

June 2024 | 8462/2F | Original Q6

Question 6 (low and standard demand)

06.1 The test for unsaturation is not well known by students. The question includes that bromine water is orange but only one in five students were able to correctly identify the colour change

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Answer 107 · Examiner comments

June 2024 | 8462/2F | Original Q6

when bromine water is added to ethene. The most common incorrect responses were brown, black, and clear.

06.2 Just over 60% of students correctly identified the test for chlorine.

06.3 Around half of the students were able to correctly identify the displayed structural formula of the compound produced when chlorine reacts with ethene.

06.4 Around two thirds of students were able to correctly identify the structure of poly(chloroethene).

06.5 Over half the students successfully processed the density values and correctly evaluated them for two marks. Only two out of five of these students then went on to determine the simplest whole number ratio and achieve all three marks. Incorrect responses included the use of temperature values rather than density or simply rounding the density values to the nearest whole number.

06.6 Three out of five students were able to correctly identify why neither polymer was suitable to carry steam at 300 °C. Incorrect responses included those that just quoted values from the table or stated low melting temperatures without including any consequence of the high temperature to either the pipe or the polymer. An incorrect unit for temperature was frequently seen in responses.

06.7 ‘Sustainable’ is a poorly understood term with only one third of students correctly answering this question. Incorrect responses included reference to different stages in a life cycle assessment including comparisons in terms of the environmental consequences of different disposal methods for each material. Some students struggled to express that paper was made from a renewable resource, suggesting that paper is renewable or that paper can be regrown.

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 108 · Examiner comments June 2025 | 8462/2F | Original Q2

Question 2

02.1 Half of the students correctly identified the alkene as propene. Both butene and ethene were commonly seen.

02.2 Over 80% of students were able to give the number of atoms in the molecule as 9.

02.3 Over two thirds of students correctly identified the use of alkenes.

02.4 Nearly 80% of students scored all three marks for plotting the bar chart. Of the remaining students, most scored two marks, the most common error was to plot the bar at 92, rather than 86.

02.5 The test for alkenes is not well known. Slightly more than 1 in 10 students scored either mark on this question. A full range of tests was seen, with nearly 30% of students did not attempt this item.

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02.6 Nearly two thirds of students correctly completed the formula in the equation. Many students recognised that the number should be 7, but did not follow the conventions of writing formulas, so did not gain the mark because the 7 was too large. When writing formulas, it is expected that the tops of numbers are discernibly below the tops of upper-case letters.

02.7 Over half of students correctly identified the use of alkanes as fuels. Both distractors were frequently seen.

02.8 Nearly 90 % of students correctly answered this item.

02.9 Three quarters of students correctly compared the rates, with many explaining why the rate changes using the ideas from the previous item.

4.7.1.1 Crude oil, hydrocarbons and alkanes

Answer 109 · 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.

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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.