AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.7.1.2

Fractional distillation and petrochemicals

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**2**
Available paper years	**2018–2020**

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.

5.7.1.2 Fractional distillation and petrochemicals

Answer 01 · Mark scheme

June 2018 | 8464/C/2H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	condenses		1	AO1 5.7.1.2
01.2	the fractions have different boiling points		1	AO1 5.7.1.2 5.7.1.3
01.3	propane	do **not** accept propene	1	AO2 5.7.1.1
01.4	C_nH_{2n+2}		1	AO1 5.7.1.1
01.5	CH_4 + **2** $O_2 \rightarrow CO_2$ + **2** H_2O	allow multiples	1	AO2 5.1.1.1 5.7.1.3
01.6	bromine water		1	AO1 5.7.1.4
01.7	to assess the environmental impact (of the stages in the life of a product)	allow to see the effect / harm / damage on the Earth / environment / planet ignore references to energy, pollution, carbon footprint, carbon dioxide, sustainability	1	AO1 5.10.2.1

5.7.1.2 Fractional distillation and petrochemicals

Answer 01 · Mark scheme

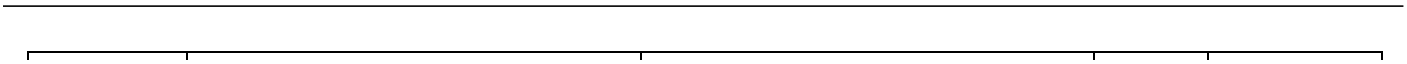
June 2018 | 8464/C/2H | Original Q1

Question	Answers	Mark	AO / Spec. Ref.
01.8	**Level 2:** Scientifically relevant features are identified; the ways in which they are similar / different is made clear and the magnitude of the similarity / difference noted.	3–4	AO3
	Level 1: Relevant features are identified and differences noted.	1–2	AO2
	No relevant content	0	
	Indicative content • burning 10 000 bags produces 10 kg more of carbon dioxide than landfill • putting 10 000 bags in landfill produces 0.02 kg more of solid residue than burning. • putting 10 000 bags in landfill produces 50% more sulfur dioxide than burning • burning 10 000 bags produces 25 kg of carbon dioxide, but landfill only produces15 kg • putting 10 000 bags in landfill produces 0.07 kg of solid residue but burning only produces 0.05 kg • landfill produces less carbon dioxide than burning • landfill produces more solid residue than burning • burning produces less sulfur dioxide than landfill		5.10.2.1 5.10.2.2 5.9.2.2
Total			**11**

5.7.1.2 Fractional distillation and petrochemicals

Answer 01 · Mark scheme

June 2018 | 8464/C/2H | Original Q1



5.7.1.2 Fractional distillation and petrochemicals

Answer 02 · Mark scheme November 2020 | 8464/C/2H | Original Q5

05.1	plankton	allow biomass allow (marine) animals / organisms ignore plants	1	AO1 5.7.1.1
	buried in mud	allow compressed under mud allow compressed in sedimentary rock ignore fossilised	1	
	over a long period of time **or** over millions of years		1	

05.2	crude oil heated		1	AO1 5.7.1.2
	(hydrocarbons / liquids) evaporate	allow (hydrocarbons / liquids) vaporise / boil	1	
	vapours / gases condense		1	
	fractions have different boiling points **or** fractions collect at different levels depending upon boiling point		1	

05.3	C_nH_{2n+2}		1	AO1 5.7.1.1

5.7.1.2 Fractional distillation and petrochemicals

Answer 02 · Mark scheme

November 2020 | 8464/C/2H | Original Q5

05.4		max **2** marks for incorrect reference to particles / bonds allow converse		
	the boiling point increases as the number of (carbon) atoms increases		1	AO1
	(because the weak) intermolecular forces increase **or** (because the weak) forces between the molecules increase		1	AO2 AO3
	(and these intermolecular forces increase) as the size of the molecules increases		1	5.2.2.4 5.7.1.3

05.5		MP2 dependent on correct response in MP1		AO3 5.7.1.3
	(as number of carbon atoms increase) the time increases		1	
	(because) the viscosity increases		1	

Total			**13**

5.7.1.2 Fractional distillation and petrochemicals

Answer 02 · Mark scheme

November 2020 | 8464/C/2H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.

5.7.1.2 Fractional distillation and petrochemicals

Answer 01 · Examiner comments

June 2018 | 8464/C/2H | Original Q1

Question 1 (standard demand)

01.1 83% of students achieved this mark. None of the other three possible answers proved to be dominant.

01.2 79% of students achieved this mark. 'The fractions have different melting points' proved to be dominant wrong answer.

01.3 49% of students gained credit, recognising the alkane to be propane. Most popular incorrect answer was butane. Some students gave a formula even though the question asked for the name of the alkane.

01.4 The correct answer of C_nH_{2n+2} was the most commonly selected response by students (77%) although C_nH_{2n} proved to be the most effective distractor.

01.5 56% of students successfully balanced equation for the combustion of methane. Multiples were regularly seen, and credit accordingly given.

01.6 The correct answer of bromine water was chosen by 67% of students. Anhydrous copper sulfate proved to be the most effective distractor.

01.7 28% of students knew the definition from the specification or were able to give an equivalent statement. A large number of vague incorrect responses were seen encompassing issues such as pollution, sustainability, energy and carbon footprint.

5.7.1.2 Fractional distillation and petrochemicals

Answer 01 · Examiner comments June 2018 | 8464/C/2H | Original Q1

01.8 In this 'extended response' question students were asked to compare the two methods for the disposal of biodegradable plastic bags using information given in Table 1.

26% of students gained full marks on this question and a further 38% of students achieved marks at level 2. To access level 2, students were expected to 'note the magnitude' of the differences, as stated in the generic level descriptor in the mark scheme.

17% of students achieved marks in level 1 by giving some comparisons of the gases and residue either in qualitative terms or by quoting values from Table 1.

The least creditworthy responses discussed in general terms the effect on the environment of burning waste plastic or the benefits of burning plastic bags to generate electricity. Students writing these responses made little reference to the information in Table 1 and many of these students ignored the key command word, 'Compare'. However, the higher-attaining students had logically worked their way down the information in Table 1, comparing and calculating differences when constructing their answer.