

8464-C2F Commentary

Item Comments

General Points

Please be sure to read the Information to Examiners at the beginning of the mark scheme.

If there is no attempt at a response (i.e. a blank space) give “-”

If there is an incorrect attempt (worth no credit) give “0”

All questions are marked by inputting a number into the box at the bottom of the screen. There are no “indirectly marked” questions. You can choose to add ticks to the screen to help you count marks; if you do, one tick must equal one mark. **Do not enter ticks for the extended response question 07.1.** This type of question is not marked by points and is marked holistically, so ticks are not appropriate.

Brackets around part of the mark scheme mean that the contents of the brackets are not needed for the mark but must not be contradicted.

If a student has written on the ‘additional pages’ at the back of the question paper, this part of the student’s response will be added to the item which examiners will see and mark (additional sheets no longer exist!).

If a response is completely crossed out and there is no replacement answer, we mark the crossed-out response unless the crossing out is so dense this becomes impossible. If it is impossible to read the response, award 0 and do not escalate. If a crossed-out response has a replacement answer, the replacement is marked.

A clip should ONLY be escalated if it contains inappropriate material, if it contains a response to a different question, if there is a potential safeguarding issue, or for some calculations (see below).

MP1, MP2 etc refer to the marking points in each part of the mark scheme.

For some question parts, we have at the end of the mark scheme, “if no other mark awarded, allow...”. This is referred to as a compensation mark in these notes.

Calculations

A calculation of 3 marks or more, with a correct answer on the answer line, with no working, should not be marked but should be escalated with the message ‘no working’.

A 2-mark calculation without working can be awarded 2 marks and does not need to be escalated

A correct answer, with working should still be checked for the working being correct. A correct answer with incorrect working is not creditworthy.

- 01.1** The mark is awarded for a bar plotted at 21%. We are marking only the horizontal line. The line **MUST** be drawn below 22 and above 20. It cannot touch or cross the lines at 22 and 20.
- The question asks for a bar chart. Sides are required on the bar but they can be ignored if they extend above 22. The width of the bar and the size of the gaps in between, can be ignored. Lines drawn without a ruler are acceptable as long as they remain within tolerance.
- Please note: If, when marking 01.1 you see anything else written on the graph that relates to another question, you must mark 01.1 and then escalate the response using the 'orange triangle' and stating which question it relates to by checking the whole script first.
- 01.5** We are looking for 9 and 5. am and pm are not required. If am and pm are the wrong way round, the mark cannot be awarded.
- 01.6** The response must be linked to either traffic or transport. We are looking for the idea of more vehicles/ cars/buses/lorries on the road. Therefore, travel unqualified is insufficient as you can travel to work without using a motor vehicle.
- Travel to work
 - Rush hour
 - It's when most people are travelling.
- These answers do not gain any credit as there is no indication that people are using their cars or buses.
- More rush hour traffic will gain credit.
- 02.1** 'Photosynthesis' is the only correct answer.
- 02.3 + 4** Sulfur oxide is not creditworthy. An incorrectly named gas here in 02.3 can still gain credit for a correctly named problem that it causes in 02.4.
- Responses which give 2 effects of acid rain can be awarded only 1 mark. Vague responses such as 'toxic', 'poisonous', 'air pollution', 'harmful to nature', 'dangerous to breathe in', 'effects on the earth's atmosphere' are not creditworthy.
- 'Breathing problems' is an acceptable alternative to 'respiratory problems'. Irritates (eyes and) lungs' and 'lung disease' are also creditworthy.
- Incorrectly named gases in 02.3 can gain credit here: 'Sulfur oxide' is treated in the same way as 'sulfur dioxide', and 'carbon dioxide' can be awarded 1 mark for 'global warming/greenhouse effect'. Their responses in 02.4 can only gain credit if they are associated with their named gas in 02.3.
- For three or more responses, the list principle applies, as always deduct 1 mark for each incorrect response.
- 02.5** Credit is given for explicit statements on 3 of the 4 fuel sources. An acceptable alternative to 'renewable fuels increase' is 'more renewables'
- 03.1** Check carefully that responses are 'hydrogen chloride' and not 'hydrogen chlorine' which is not creditworthy. 'Hydrochloric' alone is not creditworthy.

03.3 For responses which give the equilibrium symbol, we would like to see the correct symbol since it is given in the question stem. Written descriptions are acceptable, for example 'the arrows between NH_4Cl and NH_3 ' and 'two way arrows' are creditworthy, but '2 little arrows' or 'arrowheads' which do not indicate the forward and reverse directions are insufficient. However, the '2 little arrows/arrowheads of the symbol' would be acceptable since they are referring to the symbol given in the equation.

03.4 'Exothermic' is the only creditworthy response.

03.7 Acceptable alternatives to 'increases rate of reaction' are 'speeds up the reaction', and 'smaller reaction time'. 'Increases frequency of collisions' is not creditworthy. References to the catalyst such as 'it is not used up' are not creditworthy, since this question is about reducing costs.

03.8 'Formulation' is the only creditworthy response.

04.3 + 4 All the points on the graph need to be checked and a tolerance of $\pm \frac{1}{2}$ a small square is permitted.

The line of best fit should ideally be a smooth curve going through all the points, or at least touching them. Lines which are "hairy" or "double" are not creditworthy, neither are straight lines or "dot to dot".

The part of the line of best fit that extends beyond 0.1 and 0.6 should not be included in your assessment of the line of best fit.

A bar chart is not an acceptable alternative to a line graph.

This question is marked viewed with 04.3, as the answer must be a reading at 0.7 mol/dm^3 from an extrapolation of their graph. The value must be read from the graph and a tolerance of $\pm \frac{1}{2}$ a small square applied.

If there is no extrapolation, credit can only be given for an answer of 7 s.

04.5 This question forms part of the conclusion for the experiment, so we are looking for the idea that as the concentration increases the time taken decreases. Gets smaller / reduces / lowers / falls / is less are all acceptable alternatives for this.

However, "less" on its own is insufficient to gain credit.

04.6 The students are given the equation for the calculation.

MP1 is gained when the correct values are substituted into it.

MP2 is awarded for a correctly rounded answer to at least 2 sig figs. Units can be ignored.

0.036 = 2 marks 0.0363 = 2 marks

Any additional working after 0.725/20 negates MP1. They cannot gain MP2 either because marks cannot be awarded for an answer derived from this incorrect working. A correct answer without any working will gain 2 marks

04.8 This is a 3 mark calculation. If an answer of 63.1 is given without any working then, the answer must be escalated by pressing the orange triangle button. Select "Other" as the option and type "Correct answer no working" as the reason.

However, an answer of 63.133333..... without any working, will gain 2 marks but doesn't need to be escalated.

MP1 is awarded for correctly substituting the values into the equation.

MP2 is given for the answer.

MP3 To award this mark, there must be evidence of working in order to check that the answer is correctly given to 3 sig figs.

This mark can also be awarded for an answer, correctly rounded to 3 sig figs, from an incorrect calculation which uses the values in the question.

05.1 We are looking for C₃H₈

The numbers must be discernibly smaller than or below the top of the letters

05.2 propane is the only acceptable answer

05.3 alkane/s is the only acceptable answer

05.5 We are looking for 'boiling point' increases and would ideally expect to see them include 'boiling point' in their answer

- However, 'they' increase is accepted as this is taken to refer to the boiling points
- 'it' increases is not enough to gain the mark as this is taken to refer to the hydrocarbons and not to the boiling points
- 'Increases' alone does not gain the mark
- The converse is not allowed as it does not answer the question

Suitable alternatives to increase include get higher / go up / go up and up

05.6 We are looking for **one** condition used to crack hydrocarbons

- Heat/hot as alternatives to high temperature are insufficient, but we would accept 'extremely' high temperature.

Compressed is not a suitable alternative to high pressure

05.7 We are looking for **2** and will accept multiples.

Look for changes to formulae as these will negate the mark

05.8 We are looking for **one** reason why hydrocarbons are cracked

- 'Hydrocarbons' is a suitable alternative to 'molecules' throughout but products is not
- References to smaller/shorter on their own are not acceptable alternatives to make smaller **molecules**

To create **different** fuels is acceptable but not to make 'fossil' fuels

05.9 The question is about the advantages of **wood**, and we are therefore looking for answers which refer to wood and not plastic.

- 'it' is assumed to refer to wood
- 'fossil fuels' and 'non-renewable fuels' are acceptable as alternatives to coal/oil for MP2

Answers such as 'it's greener' are too vague.

06.1 Mark the question as a whole. So, we can accept errors on problem lines and vice versa.

We would accept water for solvent.

MP1 students who have gained credit for the error 'the start line should be drawn in pencil' should not get a problem mark for 'because the pencil line will not dissolve'. It does not answer the question.

For MP2 and MP4 acceptable alternatives to mix and dissolve are: run, bleed, go into, leach, contaminate, merge, blend.

Smear / spread / smudge / leak are insufficient for this mark.

For MP2 acceptable alternatives to move up are: spread up / travel up / go up.

Climb up / spread are insufficient.

For MP3 acceptable alternatives to the start line are: dots / spots / colours / pigments / dyes / inks.

Vague comments such as: the start line is too low / there is too much solvent / the start line is unclear / it would interfere with the results are insufficient.

For MP4 an alternative answer would be so the colours would not move up / travel up / spread up the paper.

For a problem mark to be awarded, there has to be an attempt at an error mark, even if it has not been achieved.

06.2 Mark the question as a whole. So, two conclusions could be found on one line. But the whole question must be read in case of wrong answers.

Brown is not a pure substance is insufficient.

06.4 If a candidate writes the correct answer with no working, do not mark but escalate.

If a candidate writes a wrong answer with no working, 0 marks and do not escalate.

MP1 and/or MP2 and the correct answer = 3 marks

If a candidate completes two different methods and does not put an answer on the answer line, this is a list and 0 marks, even if one of the answers is correct.

If a candidate completes two different methods, one of which gives an incorrect answer, and puts the correct answer on the answer line, this is telling us which method they are choosing, and they would get the marks.

0.18 = 2 marks (MP1 and MP2)

0.24

07.1 This question should be marked holistically.

Firstly, determine the correct level and then the mark within the level based on amount of correct detail given.

To access level 1, the level descriptor states that **relevant features** are identified and **differences noted**.

For the **relevant features**, we are looking for simple statements that don't necessarily include any scientific link. The most common examples are **filtering** and/or **sterilising** with no subsequent explanation. For example, "Ground water is sterilised". Note that cleaning/sanitising etc are insufficient as alternatives to sterilising. However, filtering is an acceptable alternative to screening in waste water.

For **differences stated** we are looking for **simple** comparisons such as the ones stated at the top of the indicative content table or an **unclear comparison**. An **unclear** comparison/difference could be implied by making a scientific statement about 1 of the methods only. For example, "ground water is filtered" without saying anything about the filtering/screening of waste water.

In summary, to access level 1 we require:

- at least 1 relevant feature
- **and/or** a simple or unclear comparison.

Typically, 1 of these would gain 1 mark, 2 would gain 2 marks etc but please remember that this question must be marked holistically rather than by points.

To access level 2, the level descriptor states that **Scientifically relevant features** are identified, the ways in which they are **similar/different is made clear** and (where appropriate) the **magnitude of the similarity/difference is noted**.

For **Scientifically relevant features** we are looking for further detail/links on filtering and/or sterilising and/or details regarding sedimentation, effluent and sludge. Examples of acceptable scientifically relevant statements can be seen on the mark scheme. For example "Waste water is sterilised (Relevant – level 1) so that the bacterial are killed (Scientifically relevant). They do this using chlorine (Another Scientifically relevant point).

For **The ways in which they are similar/different is made clear**, we are looking for a simple statement such as those at the top of the mark scheme (weak so potentially low level 2) and/or a **good/clear** comparison using a connective word. For example, "Both waste and ground water are filtered", "Wastewater goes through sedimentation but ground water doesn't" or "Sludge is produced in waste water but not in ground water". etc.

In this particular question, the magnitude of similarities and difference is not appropriate, so we **do not** require statements regarding this.

In summary, a level 2 response will typically contain:

- at least 1 **simple** (a weaker response) **or good/clear** comparison with a connective (a stronger response)
- **and** at least 1 **Scientifically relevant feature** for at least 1 of waters
- **plus** relevant (or scientifically relevant) features for both.

The more detail, the more marks.

Therefore, a weak level 2 response could be:

- "Wastewater is filtered (relevant) to remove large particles such as sand (scientifically relevant). Ground water is filtered (relevant). Making potable water from ground water takes less time than making it from wastewater (simple comparison).

This response contains the bare essentials of a level 2 response

A stronger level 2 response could be

- “Wastewater is filtered (relevant) to remove large particles such as sand (scientifically relevant). Wastewater is also filtered (relevant or possible weak comparison). It then goes through sedimentation as well (sci relevant). Both the waters are sterilised (clear comparison and relevant) in order to kill the bacteria (sci relevant). They use UV light to do this (sci relevant). But making potable water from ground water takes less time (simple comparison)”.

This response has at least 1 clear comparison, relevant and scientifically relevant features for both waters.

As it is difficult to annotate directly onto the scripts, it may be helpful to have a grid available to keep track of the creditworthy points.

Eg

Weak/unclear comparison	Clear comparison	Waste relevant	Waste Sci relevant	Ground relevant	Ground Sci relevant

Please note that as their responses are to be marked holistically, an answer that mentions all the scientific processes/features involved in each of the waters can still be awarded up to 6 marks even without a comparison due to high level of Scientific content.

Ignore references to desalination (e.g., boiling, distillation) and reverse osmosis. They are not creditworthy as they do not relate to the waste and ground water.

07.3 When marking a calculation, always start at the answer line and work backwards, looking for creditworthy responses.

Incorrect rounding should only be penalised in the last step of each method.

For example

If candidates use method 2, they should leave the values in the calculator.

However, if they incorrectly round 6.67 to 6.6 and then go onto multiply 6.6 by 2.4, they will get the answer 15.84 (or 15.8 rounded). This would gain 3 marks.

Or if they incorrectly rounded 6.66666 recurring to 6.6 then multiply this by 2.4, their answer will be 15.984 - also 3 marks.

Please note that the correct answer of 16 on its own, with no working should not be marked and should be escalated. But any other answer on its own, including those gained though incorrect rounding as mentioned above, should be marked wrong. For example, 15.84 with no working = 0.

NB. Some pupils are approaching this in a different way, but if their maths is correct credit should be given. The most common example seen is they divide by 3 to get a mass for 50 cm^3 . They then multiply the mass by 2 to scale the volume up to 100 cm^3 . Finally, they multiply by 10 to get the mass for 1000 cm^3 . This is an alternative but correct method and should be credited accordingly