GCSE
Science

Hub school network – summer update

Booklet 3 – commentaries

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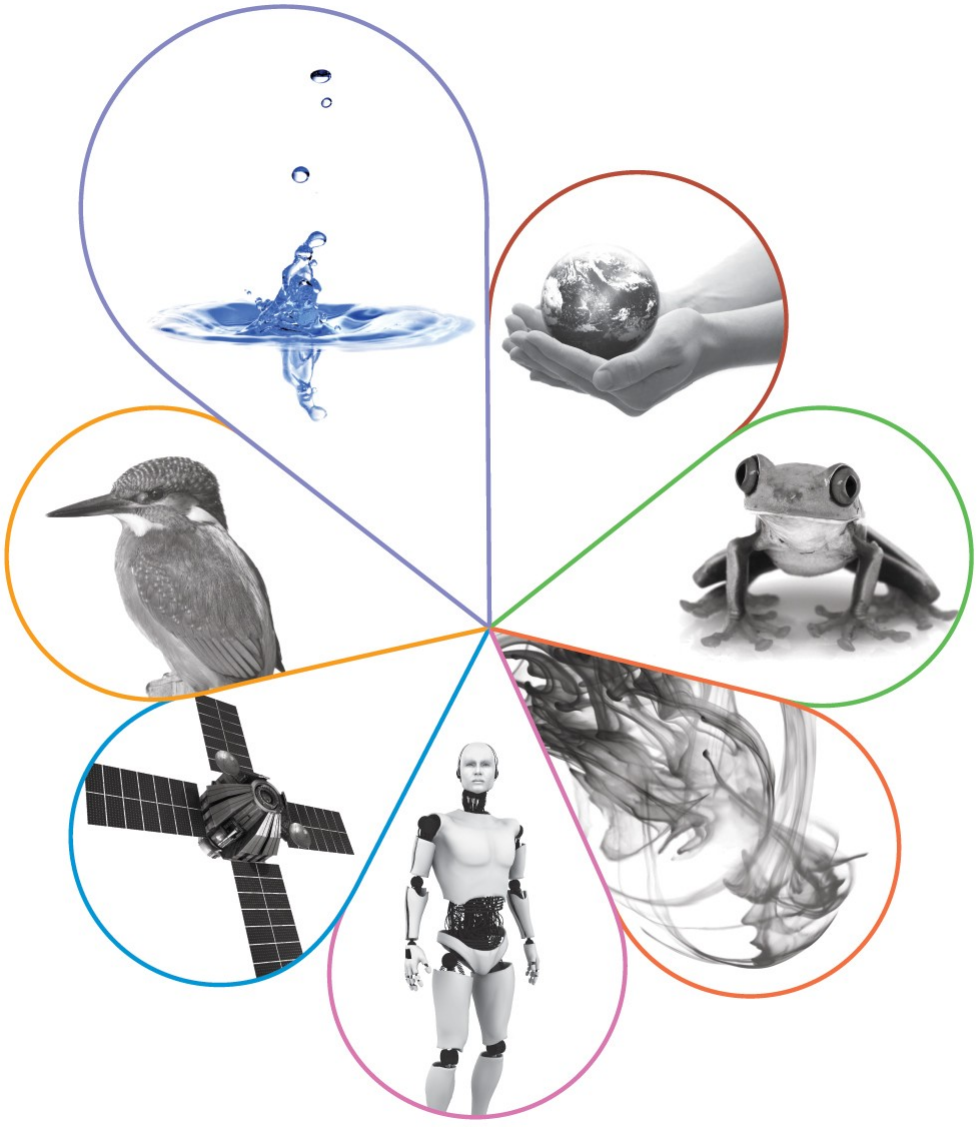

Contents

Commentaries

Example 1

This question is taken from Biology 2F, Question 8.4. It also assesses aspects of Working scientifically 1.1, 3.6 and 3.8.

Task

Students need to look at the diagram, and recognise which plants have not responded to the light (B and C). They then need to correlate the information in the diagram with the method (which should clue them in to the fact that the tip of the shoot in B and C have been treated in some way – either by covering or removing) to justify the given conclusion.

Aspect of AO3

Students are not making judgements and drawing conclusions, as the conclusion is given to them. They are also not developing or improving experimental procedures. This is an example of having to interpret the information given, which means it assesses their ability to interpret and evaluate.

Level of demand

This question is targeted at standard demand.
The diagram clearly shows the tips either covered or removed, reinforcing the written method. The shoots clearly either grow towards the light or grow straight up. Students are having to correlate and interpret the information that is given in different formats, which makes it more demanding than simply looking at one set of information simply stated (compare with Example X (**currently 5, but change**), which is a low demand example). Also, the question is open, with the simple instruction 'Give evidence from …' so students need to be looking for evidence and use their own words.

Possible adaptations to change demand

A low demand version of this question would give more scaffolding and may even be closed – perhaps multiple choice, or a 'complete the sentence' type question, or might say 'give two observations (or words to that effect) that support the conclusion', might ask for only one piece of evidence.
A high demand version might give two different conclusions and ask students to decide which one is more likely, using evidence from the diagram to justify their decision.

Example 2

Students should compare the patterns shown in the two simple line graphs and identify how they are similar and how they are different. In the question paper the two graphs are opposite each other on facing pages so they can do the comparison easily. They are prompted into a comparison by the instruction 'Give one similarity and one difference …' Students are being asked for a comparison and at this level may struggle with the command word, so the question is scaffolded and simply put, steering students to what is required.

Compare the demand with that of examples 3 and 4, where they are comparing the data but doing more than simply describing similarities and differences.

Example 3

This question assesses aspects of Working scientifically 3.5.
Students should study the patterns in the graph for both materials and identify similarities and differences. Having two sets of data on one graph, with a key that they need to interpret increases the level of demand from that shown in example 2. The question clearly asks students to compare and does not steer them towards similarities or differences, which opens it up and gives less scaffolding as to what is required. The mark scheme credits similarities and differences.

Example 4

The question assesses aspects of Working scientifically 3.5 and 3.6, and maths skill 4a.
This is a very high demand example, intended only for the most able, which occurs about two-thirds of the way through the Synergy HT paper (Synergy papers typically have eight or nine questions). Students need to interpret the data in the two graphs, which are more complicated than those in the previous examples. They then need to compare the data and use their interpretations to justify or refute the statement given. There is a lot of information that students need to process in order to evaluate the statement. This example shows how the complexity of the task ramps up with the level of demand, and more than one aspect of AO3 is being assessed here (including an aspect of 'making judgements and drawing conclusions'). The question and data is all on a double page spread, so students did not have to flip pages.

Example 5

The question also assesses aspects of Working scientifically 3.5.
Students should interpret the information given in the simple chromatogram to conclude which substances are present. The closed nature of the question keeps the demand low. Compare with the much more open question in example 7, which targets a higher level of demand.

Example 6

The question assesses an aspect of Working scientifically 3.5.
Students should interpret the information in the bottom row of the table that indicates light intensity increases with distance from the tree and the information about percentage cover of the different species with distance from the tree to conclude that the daisy is the correct species. Interpretation of tabular data can be more demanding than interpreting a graph or diagram, but the numbers in the table are all whole numbers, and clearly show the differences in light intensity and plant cover, so it is a relatively straightforward task.

Example 7

Uses the same chromatograph as example 5, but the question is much more open. It's actually targeted at standard to high demand, so students are still steered slightly towards what is required.

Example 8

This question assesses aspects of Working scientifically 2.3 and 2.7.
This question is based on a required practical activity, so students should be familiar with the basic experimental set-up. Students need to use the information given in the stem and in the diagram to identify which two of the options given are the errors. Compare this question with the more open, high-demand example 9.

Example 9

This question assesses aspects of Working scientifically 2.6 and 2.7.
It assesses the same skills as example 8, but the level of demand is higher as students are not given options to choose from. No clues or prompts are given. Also, as well as being asked to identify the errors, an extra aspect is brought in because they are being asked to identify the problem that each error would cause.

Interpret and evaluate

Example 10

This question assesses an aspect of Working scientifically 3.5.
Students should describe the pattern shown in the data in the table. The numbers are simple and the relationship clear and consistent. At higher levels of demand students are likely to be asked to do more with the information than simply describe the pattern, and the numbers may be less simple.

Example 11

This question assesses an aspect of Working scientifically 3.5.
Students should describe how the extension changes with the force applied.

Example 12

The question assesses an aspect of Working scientifically 3.5.
Students should understand what the patterns shown in the graph mean, to draw inferences about direct proportionality and positive correlation. The two lines on the graph are both straightforward to interpret, and clearly labelled; keeping the question closed by giving options also keeps the level of demand low.

Example 13

This question assesses aspects of Working scientifically 3.5 and 3.6.
Students have been given a conclusion (in the form of a decision made by a couple to choose one method of contraception over two others). They should interpret the information in the table to give reasons to justify this conclusion. The information given is simply stated and clearly laid out in a tabulated form so should be straightforward to interpret. Students are guided in the question to find three reasons in the data.

Example 14

The question assesses aspects of Working scientifically 1.4 and 1.5.
Students must interpret the information in the table to give advantages of one method of treatment. There is a range of advantages that would be credited, but at this level students are guided to give only two. This task involves comparing the two methods, but goes slightly further than just stating the differences and similarities.

Example 15

This question assesses an aspect of Working scientifically 3.5.
Students should describe the patterns shown by two different lines, across a number of specified time periods. The task is the same as that in example 11 (describe the pattern/trend in data shown in a graph). The data is more complex than in example 11, and there are two lines on the graph to interpret, which increases the level of demand. In order to keep it at standard demand, students are given words to use, which helps to clue them in to what is required.

Example 16

The question assesses aspects of maths skill 2c and Working scientifically 3.1 and 3.5.
Students need to compare the patterns shown in the table of data and identify ways in which they are different. The differences are less obvious in a table of numbers than if they were shown in a graph, which increases the level of demand. Compare with the task in example 2.

Example 17

Students should interpret the information for both methods, and then do some comparison to come up with ideas as to why the biosand unit is better than the SODIS. As the demand increases, more than one strand of AO3 is being assessed.

Example 18

The question assesses aspects of Working scientifically 3.3 and 3.4.
Determination of uncertainty is a skill that students may struggle with. The data in the table is simple and clearly laid out, and the calculation straightforward, which keeps the question at standard demand.

Example 19

This question assesses aspects of Working scientifically 3.3 and 3.4.
Compare the amount and complexity of the data given to interpret with that in example 18, and you will see how the level of demand has increased. Students need to choose the correct row from the table and analyse a wider range to calculate the uncertainty.

Make judgements and draw conclusions

Example 20

The question assesses an aspect of Working scientifically 3.5.
Students need to look at the pattern shown in the data, and make a suggestion as to where the value for X would fall. At this level of demand, the range that would be accepted was wide.

Example 21

The question assesses an aspect of Working scientifically 1.4.
Students need to use the data given in the table to make judgements on the suitability of fabrics for a purpose. Giving the options in a table keeps the task at low demand.

Example 22

The question also assesses an aspect of Working scientifically 3.5.
Students need to use the pattern shown in the graph and relate it to information given in the stem and their knowledge about potential difference in step-up and step-down transformers to explain the observation.

Example 23

The question assesses aspects of Working scientifically 3.5 and 3.6.
Like many questions targeting high demand, this does not just cover one aspect of AO3. It requires students to make a judgement about which hypothesis is correct, but in order to do this they need to understand the pattern the data should be showing to demonstrate direct proportionality, and be criticising the validity of the data – the anomalous result for example, that must be taken into account.

Example 24

The question assesses Working scientifically 3.5.
Students need to link the data in the table with their understanding of half-lives to state how the risks have changed over the given time period and explain why.

Example 25

This question assesses maths skills 1c and 4a, and aspects of Working scientifically 3.2, 3.3 and 3.5.
This task is the same as that in example 20 (making a prediction based on data), but is much more demanding than simply choosing a value between two other values. Students need to use the data in the graph to read the original value for the pressure, calculate what 25% of that value would be and then use that value to read off the time beyond which it is not safe for the diver to stay under water.

Develop and improve experimental procedures

Example 26

This question assesses aspects of Working scientifically 2.3, 2.6 and 2.7.
The question is based on a required practical (Chemistry RPA 4). Students were expected to adapt the method given in the stem of the question to devise a way of placing the unknown metal into the reactivity series that they had determined in a previous question. However, a number of alternative but equally valid methods were given by students, and the original mark scheme was adapted to allow full credit for these methods.

Example 27

This question assesses Working scientifically 2.2.
The question is based on a required practical (Biology RPA 8), and students should be familiar with the variables that need to be controlled in such an experiment, helping to keep the level of demand low. The closed nature of the question also helps to focus the students on what is required.

Example 28

This question assesses aspects of Working scientifically 2.3, 2.7 and 3.7.
It is based on a required practical (Trilogy RPA 5), so students should be familiar with the basic experimental set-up. The task (change a method to improve it) is the same as that in example 31, set at a lower level of demand.

Example 29

The question assesses aspects of Working scientifically 2.2, 2.7 and 3.7.
Students should bring in their understanding of controlling variables in order to adapt the incomplete method given to get the desired outcome of understanding whether the colour of the bag affects temperature increase.

Example 30

The question assesses aspects of Working scientifically 3.7.
Students need to use their understanding of transformers to suggest a reason for the anomalous result.

Example 31

This question assesses aspects of Working scientifically 2.5, 2.7 and 3.7.
Like example 28, the question is based on the photosynthesis required practical (Trilogy RPA 5), so students should be familiar with the basic experimental set-up. They need to use the understanding gained by doing the practical to answer the question.

Example 32

The question assesses aspects of Working scientifically 2.2, 2.3, 2.7, 3.1 and 3.5.
Students need to use their understanding of osmosis in section 4.1.3.2 and from Biology RPA 3 to be able to adapt the method given to do further investigation and determine the concentration of solution inside the eggs.

Example 33

The question assesses aspects of Working scientifically 2.2.
Students need to use their understanding of forces to suggest control variables for this

investigation, which is not necessarily going to be familiar as it's not covered in a required practical.

Example 34

This question also assesses aspects of Working scientifically 2.3, 2.7 and 3.7.
The question is based on the electrolysis required practical (Chemistry RPA 3), and students should use the understanding about measurement of volume of gases they gain through doing this practical to identify the error and suggest ways of correcting it. The task is initially similar to that in examples 5 and 7 (identifying and explaining sources of error) but goes further in that students need to then suggest how to modify the set-up to improve it.

Notes

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