OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL GCSE PHYSICS

(9203)

Paper 1 and Paper 2

Example responses with commentary

For teaching from September 2016 onwards
For GCSE exams in May/June 2018 onwards

This guide includes some examples of student responses to a selection of questions from the summer 2018 9203/1 and 9203/2 exams.

The question parts are reproduced, along with the final mark scheme, student responses and a commentary from the Lead Examiner on each of the students' answers.

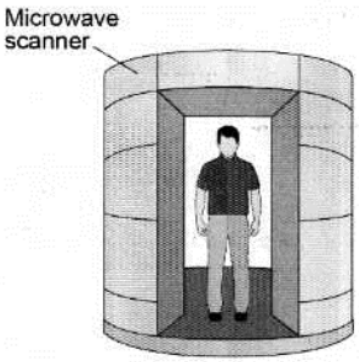
PAPER 1

QUESTION

05.3 AND 05.4

Figure 7 shows a passenger standing in a microwave scanner.

Figure 7



0 5 . 3 Explain why passengers are scanned with microwaves rather than X-rays.

[2 marks]

0 5 . 4 The microwaves used in the scanner have a wavelength of 16 mm.

speed of electromagnetic radiation = 3.0×10^8 m/s

Calculate the frequency of the microwaves used in the scanner.

Give your answer to **two** significant figures.

Use the Physics Equations Sheet.

[5 marks]

MARK SCHEME

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5.3	microwaves are not ionising so the risk to health is lower (than for X-rays)		1 1	AO2/AO3 3.3.2j 3.3.2m

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5.4		an answer of 1.9×10^{10} scores 5 marks		AO2 3.3.1h
	16mm = 0.016 m		1	
	$3.0 \times 10^{8} = f \times 0.016$	allow a correct substitution of an incorrectly/not converted value of wavelength.	1	
	$\frac{3.0 \times 10^{8}}{0.016} = f$		1	
	$f = 1.875 \times 10^{10}$ Hz		1	
	$f = 1.9 \times 10^{10}$ Hz		1	

STUDENT A

0 5 . 3 Explain why passengers are scanned with microwaves rather than X-rays.

[2 marks]

As microwaves are non-ionizing radiation it is much safer to expose microwave radiation to humans

EXAMINER COMMENTARY

The student has correctly stated that microwaves are non-ionising.
They have then gone on to state that this means that microwaves are much safer, therefore the student has clearly explained that the risk to health is lower than using X-rays.

2 marks out of a possible 2 awarded.

0 5 . 4 The microwaves used in the scanner have a wavelength of 16 mm.

speed of electromagnetic radiation = 3.0×10^8 m/s

Calculate the frequency of the microwaves used in the scanner.

Give your answer to **two** significant figures.

Use the Physics Equations Sheet.

[5 marks]

$V = f \times \lambda$

$3 \times 10^8 = f \times 16$

$\frac{3 \times 10^8}{16} = f$

Frequency = 19,000,000 Hz

EXAMINER COMMENTARY

The student has failed to recognise that the wavelength has been given in mm, and therefore should be converted into metres, so the student does not score the first mark. Despite this, the student has substituted the values into the wave equation, and correctly rearranged. Their subsequent answer is consistent with the substitution and rounded to two significant figures.
The student has made a single error at the start by not converting the unit for the wavelength, but can still be awarded all the remaining marks.

4 marks out of a possible 5 awarded.

STUDENT B

0 5 . 3 Explain why passengers are scanned with microwaves rather than X-rays.

[2 marks]

Because X-ray scanners are harmful & can cause cancer but microwave radiation is not because it has a lower frequency.

EXAMINER COMMENTARY

The student has correctly identified that X-rays are harmful and can cause cancer whereas microwaves do not, so scores the second mark for identifying the risk to health. There is no reference to ionisation though, so the student cannot be awarded the first mark.

1 mark out of a possible 2 awarded.

0 5 . 4 The microwaves used in the scanner have a wavelength of 16 mm.

speed of electromagnetic radiation = 3.0×10^8 m/s

Calculate the frequency of the microwaves used in the scanner.

Give your answer to **two** significant figures.

Use the Physics Equations Sheet.

[5 marks]

$3.0 \times 10^8 \div 16 = 18,750,000$

Frequency = 187,000,000 Hz

EXAMINER COMMENTARY

The student has not converted the 16 mm into 0.016 metres so does not score the first marking point. Although students should be encouraged to write down any equations they use for calculation questions, there are no marks for doing so. The student has rearranged, substituted and correctly calculated the frequency, using an unconverted value for wavelength. They have failed to round their answer to two significant figures, so are not awarded the final mark.

3 marks out of a possible 5 awarded.

STUDENT C

0 5 . 3 Explain why passengers are scanned with microwaves rather than X-rays.

[2 marks]

Because is harmful to the passengers body.

EXAMINER COMMENTARY

This student has made no attempt at an explanation. It is also not clear whether they are referring to microwaves or X-rays in their answer. Although they state 'it is harmful to the passenger's body' no credit can be given as the question asks about microwave scanner, so it cannot be assumed the student is referring to X-rays.

0 marks out of a possible 2 awarded.

0 5 . 4 The microwaves used in the scanner have a wavelength of 16 mm.

speed of electromagnetic radiation = 3.0×10^8 m/s

Calculate the frequency of the microwaves used in the scanner.

Give your answer to **two** significant figures.

Use the Physics Equations Sheet.

[5 marks]

$V = f \times \lambda$

$= 3.0 \times 10^8 \text{ m/s} \times 0.016 \text{ m}$

$= 4.8 \times 10^6$

Frequency = 4.8×10^6 Hz

EXAMINER COMMENTARY

Although the student has selected the correct equation from the *Physics Equations Sheet*, they have substituted incorrectly. They have attempted to work out the velocity and not the frequency as instructed in the question. The only credit the student can be given is for the correct conversion of 16mm to 0.016 m.

1 mark out of a possible 5 awarded.

QUESTION

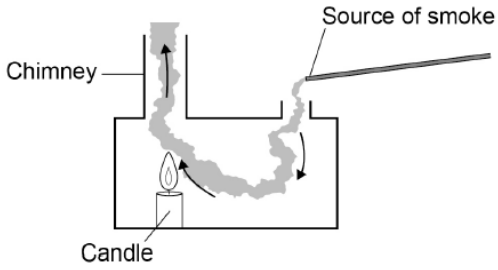
04.3

0 4 A student investigated energy transfers.

Figure 5 shows a candle underneath a chimney in a glass-fronted box.
A source of smoke was placed above a hole in the top of the box.

The smoke moves in the direction shown by the arrows.

Figure 5



0 4 . 3 Describe how the student could carry out an experiment to plot a cooling curve for stearic acid as it changes from liquid to solid.

[6 marks]

MARK SCHEME

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	**Level 3**: The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		5-6	AO1 3.5.2g
	Level 2: The design/plan would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.		3-4	AO1 3.5.2g
	Level 1: The design/plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1-2	AO1 3.5.2g
	No relevant content		0	
	Indicative content **setting up the investigation** • stearic acid is placed in a boiling tube and heated in a water bath • a thermometer is placed in the stearic acid to measure the temperature • the boiling tube is removed from the water bath • the boiling tube is placed in a test tube rack • a stop-clock is started to measure the time. **readings** • the temperature is recorded at regular intervals • readings should continue until after the stearic acid has solidified • readings should continue until the temperature of the solid stearic acid has started to fall. **graph** • a line graph should be plotted • time should be on the X-axis and temperature on the Y-axis			

STUDENT A

0 4 . 3 Describe how the student could carry out an experiment to plot a cooling curve for stearic acid as it changes from liquid to solid.

[6 marks]

The student can pour 10cm³ of stearic acid into a test tube, then place the test tube in a hot water bath at 80°C with a thermometer in the stearic acid. once the thermometer indicates the same temperature as the water bath, take the test tube out with a pair of tongs and use a stop watch to record the temperature indicated by the thermometer every 30 seconds until the temperature in the test tube returns to room temperature (when the temperature indicated by the thermometer goes no lower). the student should then plot their results on a temperature time graph.

EXAMINER COMMENTARY

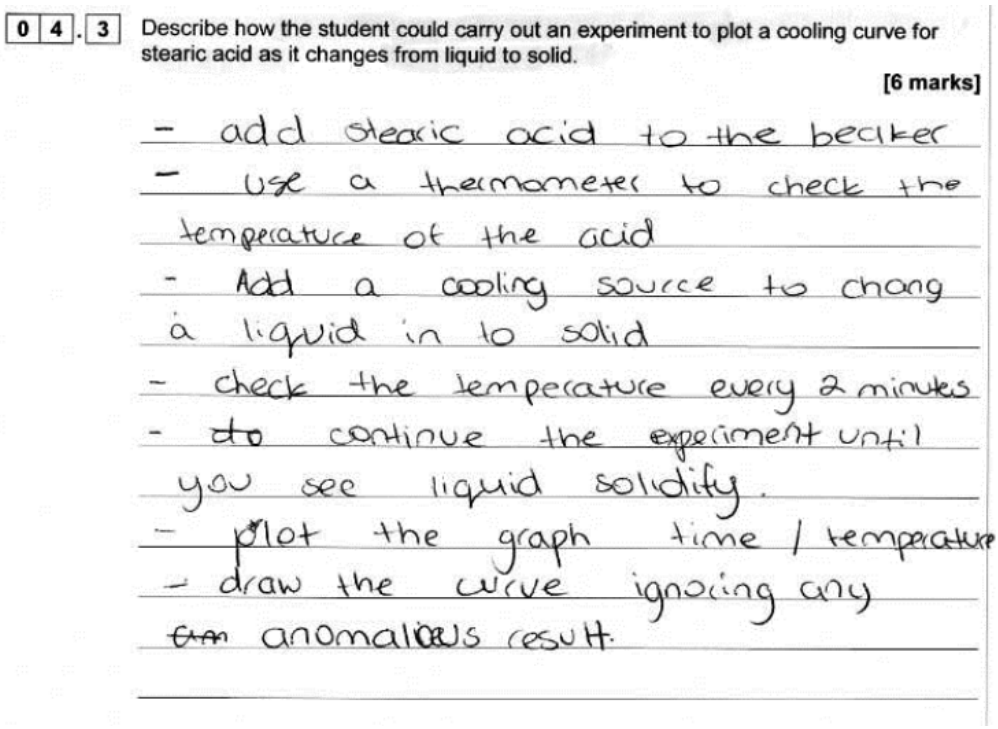
The method is clearly described and would lead to a valid outcome. The student would obtain results that would enable cooling curve to be plotted. There is sufficient detail in the answer for it to be a level 3 response. The student has included the temperature to which the stearic acid should be heated, and the time interval at which readings of temperature should be taken. The equipment that the student would need to use is also included. Whilst the answer is not perfect, it is sufficient to be at the top of level 3.

6 marks out of a possible 6 awarded.

STUDENT B

0 4 . 3 Describe how the student could carry out an experiment to plot a cooling curve for stearic acid as it changes from liquid to solid.

[6 marks]



EXAMINER COMMENTARY

The student has added stearic acid to a beaker rather than a test tube or boiling tube, heated in a water bath. It is not clear how the stearic is heated or allowed to cool. However, the student indicates the use of a thermometer to measure the temperature every two minutes, and to plot an appropriate graph. This is a weak level 2 response that lacks sufficient detail to be at the top of level 2.

3 marks out of a possible 6 awarded.

STUDENT C

0 4 . 3 Describe how the student could carry out an experiment to plot a cooling curve for stearic acid as it changes from liquid to solid.

[6 marks]

① : record temperature by using the thermometer and write the data down (the room temperature)
② using the watch / clock to measure the time.
③ Record the data of temperature ~~[illegible]~~ every 120 s (2 min).
④ Continue to decrease the temperature of the liquid ~~[illegible]~~ until the liquid transfer to the solid.
⑤ : After these steps, using the data which recorded of temperature and time to make a line chart of this experiment.

EXAMINER COMMENTARY

The student has suggested measuring the temperature at regular intervals to enable them to plot a temperature-time graph. There is no detail, and the method of heating and subsequent cooling is not described. This response achieves level 1.

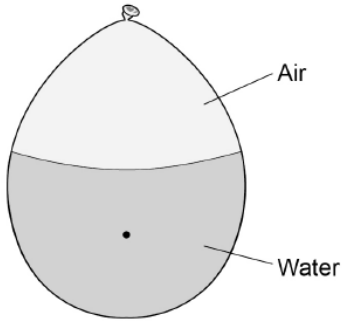
1 mark out of a possible 6 awarded.

QUESTION

01.5

0 1 **Figure 1** shows a water-balloon.

Figure 1



A child drops the water-balloon. Forces act on the water-balloon as it falls.

0 1 . 5 The water-balloon weighs 4.9 N.
gravitational field strength = 9.8 N/kg

Calculate the mass of the water-balloon.

Use the Physics Equations Sheet.

Give the unit.

[4 marks]

MARK SCHEME

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1.5	$4.9 = \text{mass} \times 9.8$ $\text{mass} = \frac{4.9}{9.8}$ mass = 0.50 kg / kilograms	an answer of 0.50 scores 3 marks	1 1 1 1	AO2 / AO1 3.1.1e

STUDENT A

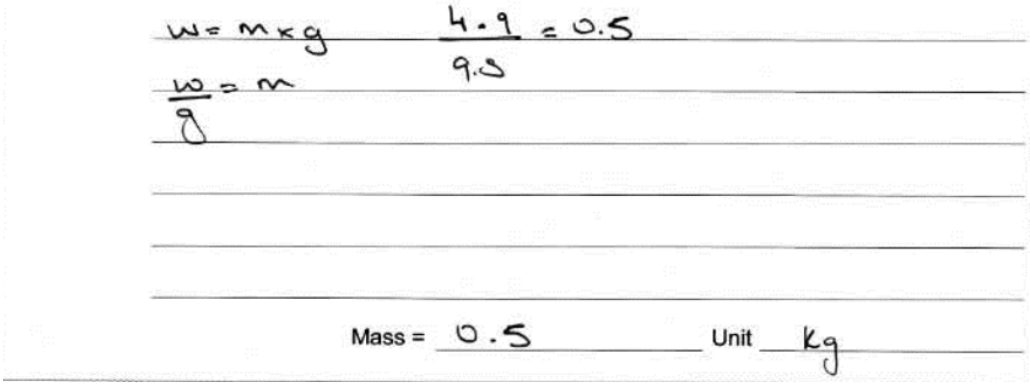
0 1 . 5 The water-balloon weighs 4.9 N.
gravitational field strength = 9.8 N/kg

Calculate the mass of the water-balloon.

Use the Physics Equations Sheet.

Give the unit.

[4 marks]

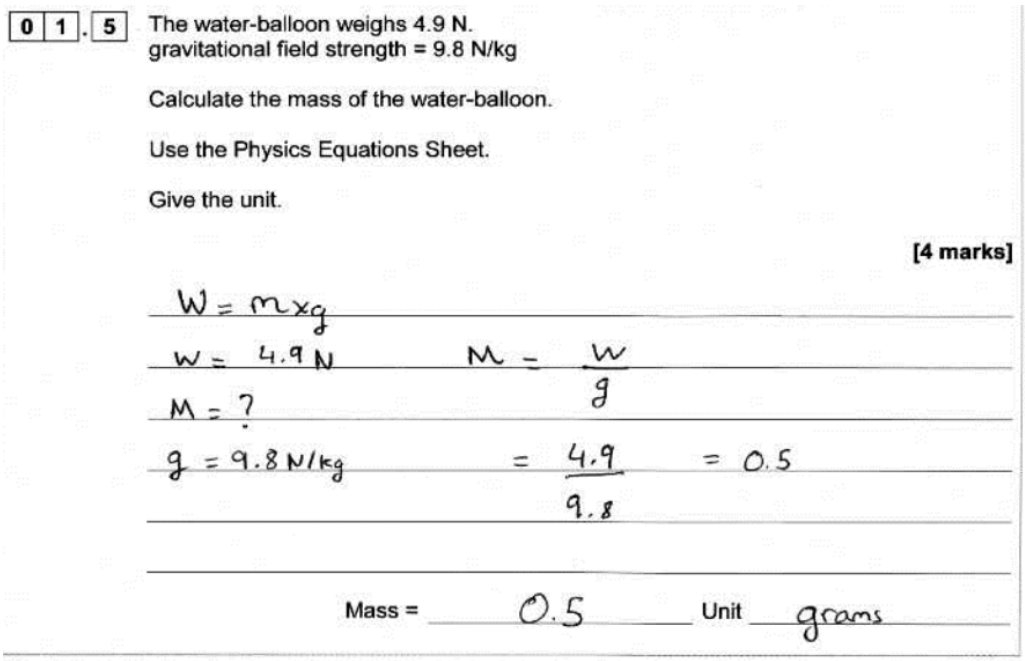


EXAMINER COMMENTARY

The student has used the correct equation, substituted and correctly rearranged. The student's response is well set out, and it is clear how they have arrived at their answer. They have also given the correct unit.

4 marks out of a possible 4 awarded.

STUDENT B



0 1 . 5 The water-balloon weighs 4.9 N.
gravitational field strength = 9.8 N/kg

Calculate the mass of the water-balloon.

Use the Physics Equations Sheet.

Give the unit.

[4 marks]

$W = m \times g$

$w = 4.9\ N$ $\quad M = \frac{w}{g}$

$M = ?$

$g = 9.8\ N/kg$ $\quad = \frac{4.9}{9.8} = 0.5$

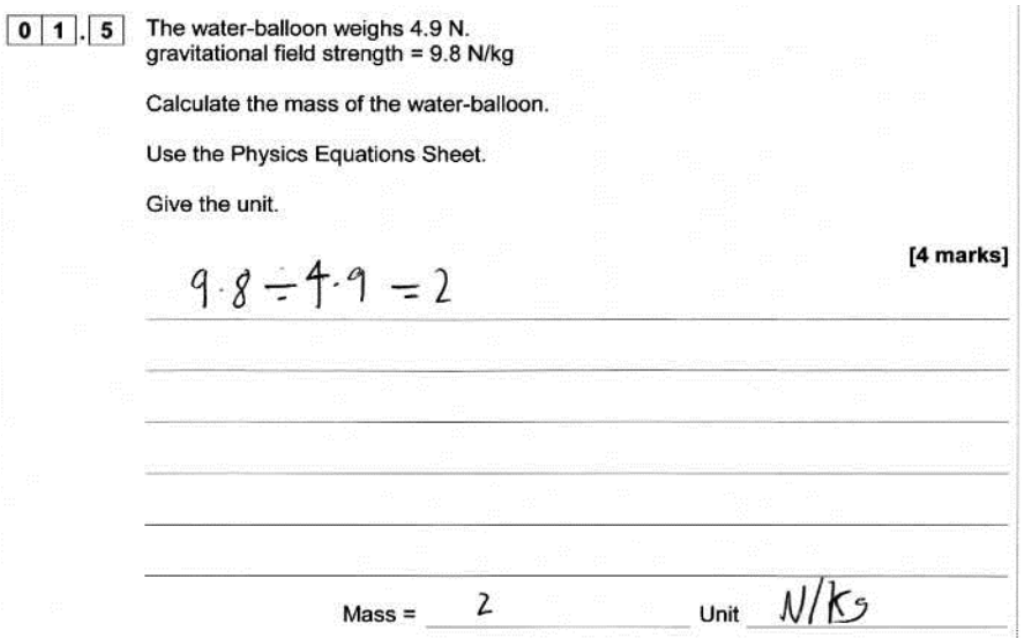
Mass = 0.5 Unit grams

EXAMINER COMMENTARY

The student has used the correct equation, substituted and correctly rearranged. The student's response is well set out, and it is clear how they have arrived at their answer. They have given the incorrect unit, so does not score the fourth mark.

3 marks out of a possible 4 awarded.

STUDENT C



0 1 . 5 The water-balloon weighs 4.9 N.
gravitational field strength = 9.8 N/kg

Calculate the mass of the water-balloon.

Use the Physics Equations Sheet.

Give the unit.

[4 marks]

9.8 ÷ 4.9 = 2

Mass = 2 Unit N/kg

EXAMINER COMMENTARY

There is no indication of which equation the student has used. One number has been divided by the other, but this has been done the wrong way round. The unit is also incorrect. The student gains no credit.

0 marks out of a possible 4 awarded.

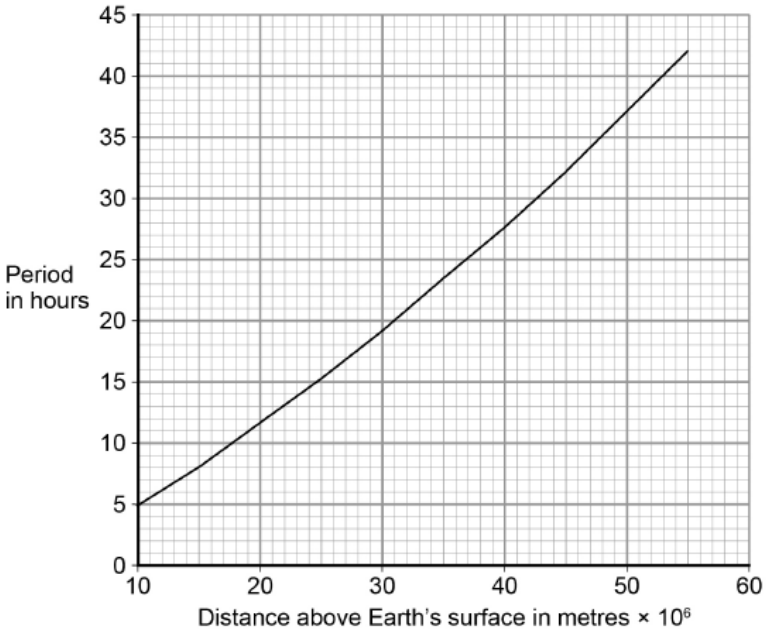
QUESTION

03.6

Stars can be observed using telescopes on satellites orbiting the Earth.

Figure 4 shows the period of satellites at different distances above the Earth's surface.

Figure 4



0 3 . 6 What distance above the Earth's surface is used for a satellite in a geostationary orbit?

Give a reason for your answer.

[2 marks]

Distance = _____ metres × 10^6

Reason _____

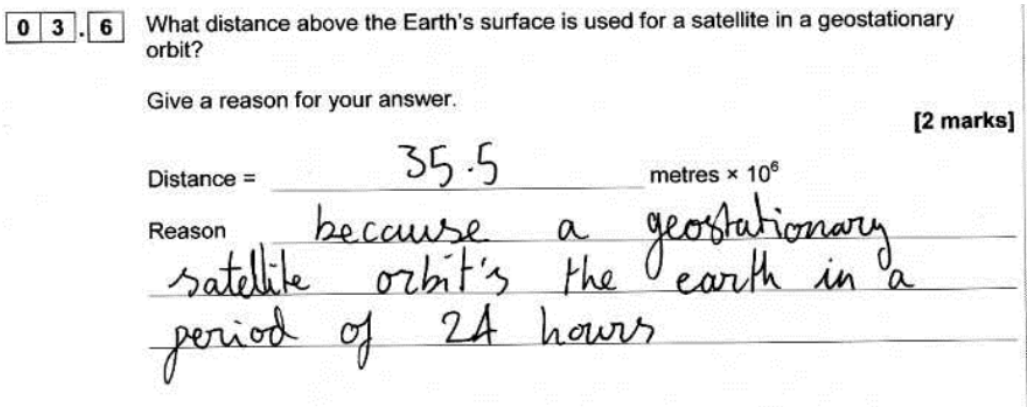
_____

_____

MARK SCHEME

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3.6	35.5	allow an answer between 35 and 36	1	AO3 3.8.2g
	so it has the same period as the Earth	allow so it takes 24 hours to orbit	1	

STUDENT A



0 3 . 6 What distance above the Earth's surface is used for a satellite in a geostationary orbit?

Give a reason for your answer.

[2 marks]

Distance = 35.5 metres × 10^6

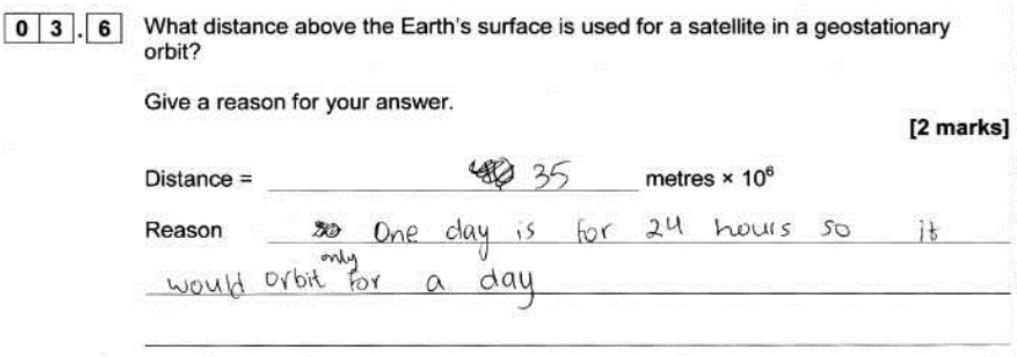
Reason because a geostationary satellite orbit's the earth in a period of 24 hours

EXAMINER COMMENTARY

The student has clearly indicated on the graph how they have determined the answer. The have read the correct value off the graph, and have written an excellent explanation of why that altitude is correct for a geostationary orbit.

2 marks out of a possible 2 awarded.

STUDENT B



0 3 . 6 What distance above the Earth's surface is used for a satellite in a geostationary orbit?

Give a reason for your answer.

[2 marks]

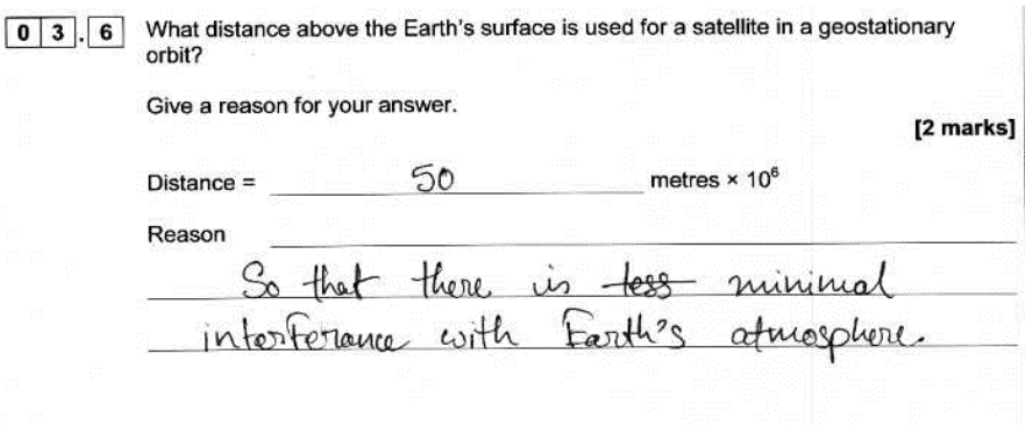
Distance = ~~48~~ 35 metres × 10^6

Reason ~~So~~ One day is for 24 hours so it would orbit only for a day

EXAMINER COMMENTARY

The answer for the distance is within the acceptable range. The explanation starts off well, but the student then gets confused and implies that the satellite would only orbit for one day. The answer in not sufficiently clear to be credited.
1 mark out of a possible 2 awarded.

STUDENT C



0 3 . 6 What distance above the Earth's surface is used for a satellite in a geostationary orbit?

Give a reason for your answer.

[2 marks]

Distance = 50 metres × 10^6

Reason

So that there is ~~less~~ minimal interferance with Earth's atmosphere.

EXAMINER COMMENTARY

The answer for the distance is not within the acceptable range so the first mark is not scored. The reason given for this value does not answer the question.

0 marks out of a possible 2 awarded.

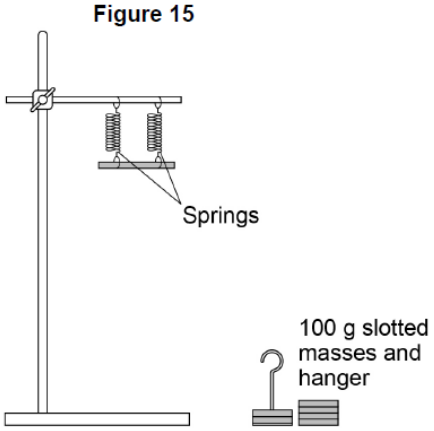
PAPER 2

QUESTION

05.6

0 5 . 6 **Figure 15** shows two springs, arranged in the same way as those in the door lock.

Figure 15



Plan an experiment to determine the spring constant of this arrangement of springs.

[6 marks]

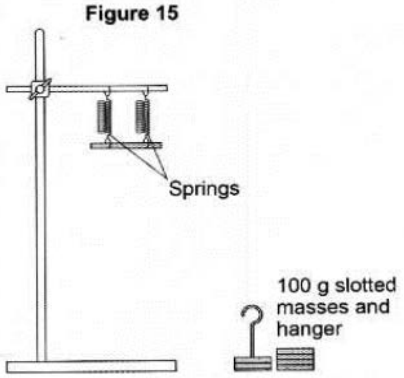
MARK SCHEME

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5.6	**Level 3:** The plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		5–6	AO4 3.1.1h
	Level 2: The plan would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.		3–4	
	Level 1: The plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1–2	
	No relevant content		0	
	Indicative content **measurements** • measure original length with a ruler • add a slotted mass • measure new length of spring • readings taken at eye level • calculate the extension by subtracting original length • calculate force applied • repeat with more masses • range 0 – 7 100g masses • suggests repeat readings • **analysis** • plot graph • line of best fit • how to obtain spring constant from the gradient			

STUDENT A

0 5 . 6 **Figure 15** shows two springs, arranged in the same way as those in the door lock.

Figure 15



Plan an experiment to determine the spring constant of this arrangement of springs.
[6 marks]

1) Measure the initial length of the springs using a ruler and use a pointer
2) Apply ~~500 one~~ 100g of Force ~~mass~~ onto the hanger and hang it on the springs
3) Record the length of the springs and calculate the difference between the initial length and the ~~co~~ recorded length
4) This will give you the extension length. To calculate spring constant, divide the force applied (100g) by the extension. ($k = \frac{F}{e}$)
5) Repeat steps 1-4 with different masses to ~~ensure~~ prove the spring constant is the same provided the limit of proportionality is not exceeded

EXAMINER COMMENTARY

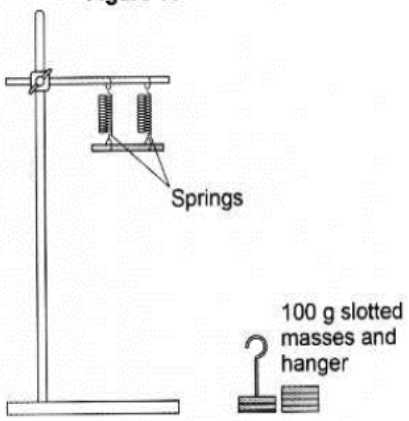
The student has written a clear explanation of the experimental procedure. The method leads to a valid outcome, which would allow the spring constant to be calculated. This is a clear level 3 response in which the student has identified all the stages. It is clear how the extension of the spring will be determined and the idea of varying the force is present. However, the student has got confused between mass and weight and incorrectly stated that 100g is a force. This does not prevent the student's answer from being in level 3, but for this reason the response is at the bottom of level 3.

5 marks awarded.

STUDENT B

0 5 . 6 **Figure 15** shows two springs, arranged in the same way as those in the door lock.

Figure 15



Plan an experiment to determine the spring constant of this arrangement of springs.
[6 marks]

The ruler would be placed against the springs by a clamp to measure the original size of spring then we will start hanging the masses one by one. After hanging the first 100g you will measure the length and extension of the springs then continue doing the same and adding masses until the springs cant extend any further and reached the maximum proportionality. Record the results in a graph and see if results are all directly proportional or if there is an anomalous result or random error.

EXAMINER COMMENTARY

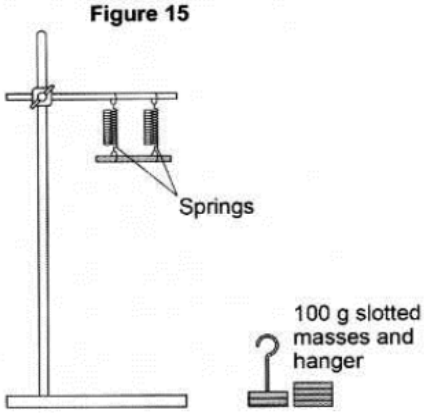
The method would not lead to a valid outcome. The student does mention measuring the original length of the spring, and also the extension of the spring when masses are added, but how the extension is determined is not clear. This is a level 2 response because the student has described a method that would produce results. The student suggests taking several measurements of extension for different masses. The student then goes on to say that a graph should be drawn, but does not give any detail, or correctly explain why the graph should be drawn. There is no mention of how the spring constant can be determined from the results. This response achieves level 2.

3 marks out of a possible 6 awarded.

STUDENT C

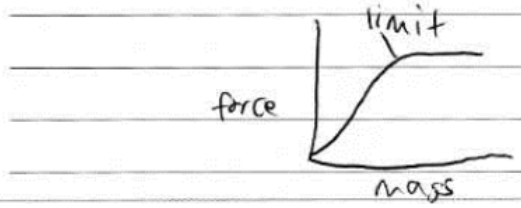
0 5 . 6 **Figure 15** shows two springs, arranged in the same way as those in the door lock.

Figure 15



Plan an experiment to determine the spring constant of this arrangement of springs.
[6 marks]

- first make sure the clamp is holding the springs tightly
- add the weights slowly to the spring
- put your hand bellow the weight to make sure it doesn't fall
- measure the extension
- when plotting the graph the mass is independant and the force is dependant
- the graph should look like this because it's proportional



EXAMINER COMMENTARY

This response is a level 1 response. The student has included some information about adding masses and measuring the extension. However, there is no detail about how these measurements should be made. The method would not lead to a valid outcome and there is no mention of spring constant. The graph the student has drawn of force against mass, is incorrect.

2 marks out of a possible 6 awarded.

QUESTION

06.1 AND 06.2

0 6 Bananas contain a radioactive isotope of potassium (K).

0 6 . 1 There are different isotopes of the element potassium.

What is meant by isotopes of an element?

[2 marks]

0 6 . 2 An isotope of potassium decays into argon (Ar) by emitting a beta particle (β).

$$^{40}_{19}\mathrm{K} \rightarrow {}^{40}_{20}\mathrm{Ar} + {}^{0}_{-1}\beta$$

Compare the numbers of protons and neutrons in the argon nucleus to those in the potassium nucleus.

[2 marks]

MARK SCHEME

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6.1	atoms with same number of protons but different numbers of neutrons	allow same atomic/proton number allow different mass number ignore reference to electrons	1 1	AO1 3.7.1f
6.2	argon has one more proton potassium has one more neutron	allow potassium has one fewer protons (than argon) allow argon has one fewer neutrons (than potassium)	1 1	AO2 3.7.2f

STUDENT A

0 6 Bananas contain a radioactive isotope of potassium (K).

0 6 . 1 There are different isotopes of the element potassium.

What is meant by isotopes of an element?

[2 marks]

- an isotope is the same element
- but with different neutrons but the same protons and electrons

EXAMINER COMMENTARY

The student has clearly stated that isotopes conation the same number of protons, but different number of neutron, the number of electron can be ignored.

2 marks out of a possible 2 awarded.

0 6 . 2 An isotope of potassium decays into argon (Ar) by emitting a beta particle (β).

$$^{40}_{19}K \rightarrow {}^{40}_{20}Ar + {}^{0}_{-1}\beta$$

Compare the numbers of protons and neutrons in the argon nucleus to those in the potassium nucleus.

[2 marks]

- for pottasium it contains 19 protons and 21 neutrons
- Argon contains 20 protons and neutrons

EXAMINER COMMENTARY

The student has correctly identified the number of protons and neutrons in argon and potassium, so their answer implies that argon has one more proton and one fewer neutron.

2 marks out of a possible 2 awarded.

STUDENT B

0 6 Bananas contain a radioactive isotope of potassium (K).

0 6 . 1 There are different isotopes of the element potassium.

What is meant by isotopes of an element?

[2 marks]

It is an element with a different number of neutrons.

EXAMINER COMMENTARY

The student gains one mark for 'different number of neutrons', but there is no mention of protons.

1 mark out of a possible 2 awarded.

0 6 . 2 An isotope of potassium decays into argon (Ar) by emitting a beta particle (β).

$$^{40}_{19}\mathrm{K} \rightarrow {}^{40}_{20}\mathrm{Ar} + {}^{0}_{-1}\beta$$

Compare the numbers of protons and neutrons in the argon nucleus to those in the potassium nucleus.

[2 marks]

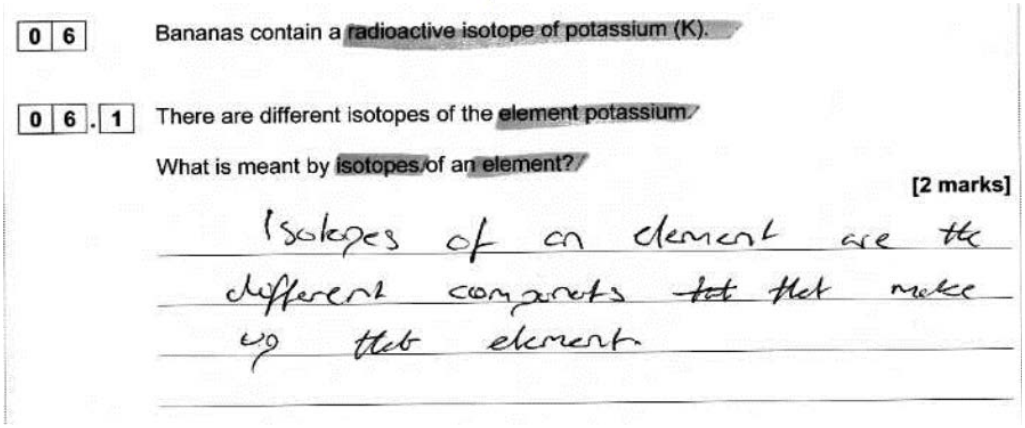
The number of neutrons will stay the same in Argon but the number of protons in the nucleus will increase.

EXAMINER COMMENTARY

The student's response indicates that they think potassium and argon have the same number of neutrons. They also suggest that argon has more protons, but this does not gain credit as the student does not identify that it has 1 more.

0 marks out of a possible 2 awarded.

STUDENT C



0 6 Bananas contain a radioactive isotope of potassium (K).

0 6 . 1 There are different isotopes of the element potassium.

What is meant by isotopes of an element?

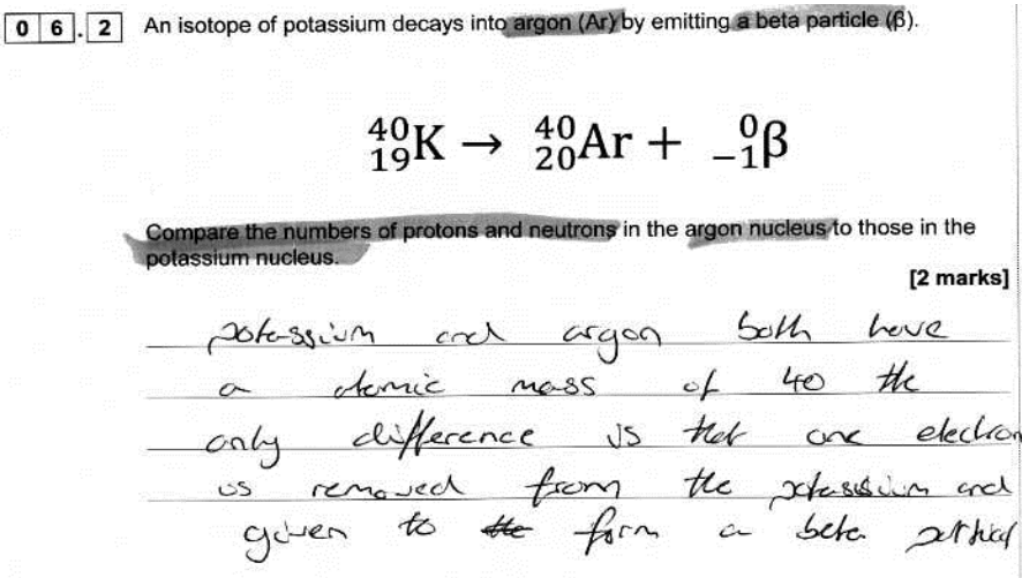
[2 marks]

Isotopes of an element are the different components that make up that element.

EXAMINER COMMENTARY

There is no mention of neutrons or protons, so no explanation of what is meant by the term isotope.

0 marks out of a possible 2 awarded.



0 6 . 2 An isotope of potassium decays into argon (Ar) by emitting a beta particle (β).

$$^{40}_{19}K \rightarrow {}^{40}_{20}Ar + {}^{0}_{-1}\beta$$

Compare the numbers of protons and neutrons in the argon nucleus to those in the potassium nucleus.

[2 marks]

potassium and argon both have a atomic mass of 40 the only difference is that one electron is removed from the potassium and given to the form a beta particle

EXAMINER COMMENTARY

The student correctly identifies the atomic mass of argon and potassium, but does not explain how the numbers of protons and neutrons are different. Reference to electrons in their answer is inappropriate.

0 mark out of a possible 2 awarded.

QUESTION

04

0 4 **Figure 9** shows a racing car and driver.

Figure 9

0 4 . 1 The car is moving at 80 m/s. The mass of the car is 750 kg.

Calculate the kinetic energy of the car.

Use the Physics Equations Sheet.

[2 marks]

0 4 . 2 The brakes were applied. The average braking force was 15 kN.

The car travelled 60 m while braking.

Calculate the work done by the braking force.

Use the Physics Equations Sheet.

[3 marks]

0 4 . 3 Determine the kinetic energy of the car immediately after braking.

[1 mark]

Kinetic energy = _____ J

MARK SCHEME

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4.1	$E_k = ½ \times 750 \times 80^2$ $E_k = 2\ 400\ 000$ (J)	an answer of 2 400 000 scores **2** marks allow 2.4×10^6	1 1	AO2 3.2.1e
4.2	15 000 W = 15 000 × 60 W = 900 000 (J)	an answer of 900 000 scores **3** marks allow a correct substitution of an incorrectly/not converted value of F allow 9.0×10^5 allow a correct calculation using an incorrectly/not converted value of F	1 1 1	2 AO2 1 AO1 3.2.1a
4.3	1 500 000 J	allow 1.5×10^6 allow their 4.1 – their 4.2	1	AO2 3.2.1b 3.1.5d

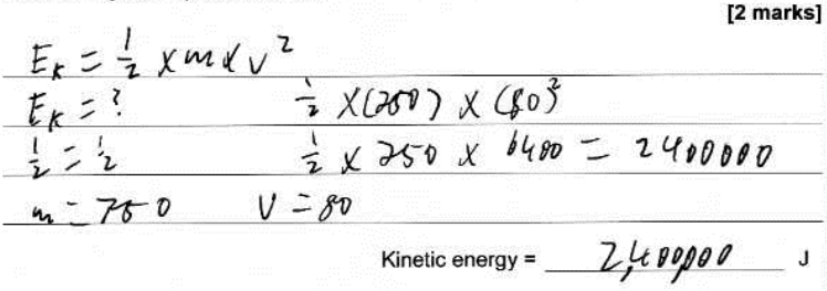
STUDENT A

0 4 . 1 The car is moving at 80 m/s. The mass of the car is 750 kg.

Calculate the kinetic energy of the car.

Use the Physics Equations Sheet.

[2 marks]



EXAMINER COMMENTARY

The student has used the correct equation, substituted and correctly calculated the kinetic energy. The student's response is well set out, and it is clear how they have arrived at their answer.

2 marks out of a possible 2 awarded.

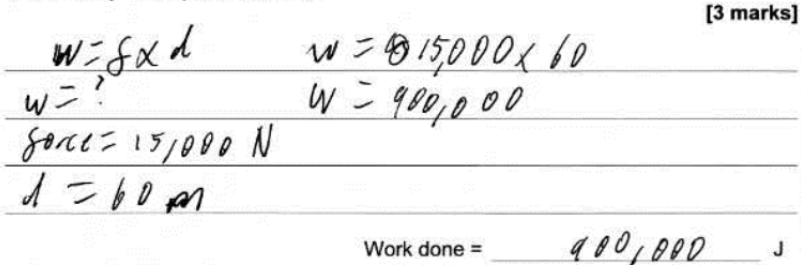
0 4 . 2 The brakes were applied. The average braking force was 15 kN.

The car travelled 60 m while braking.

Calculate the work done by the braking force.

Use the Physics Equations Sheet.

[3 marks]



EXAMINER COMMENTARY

The student has correctly converted the force from kN to N. They have then substituted and calculated correctly.

3 marks out of a possible 3 awarded.

0 4 . 3 Determine the kinetic energy of the car immediately after braking.

[1 mark]

2,400,000 − 900,000 = 1500000

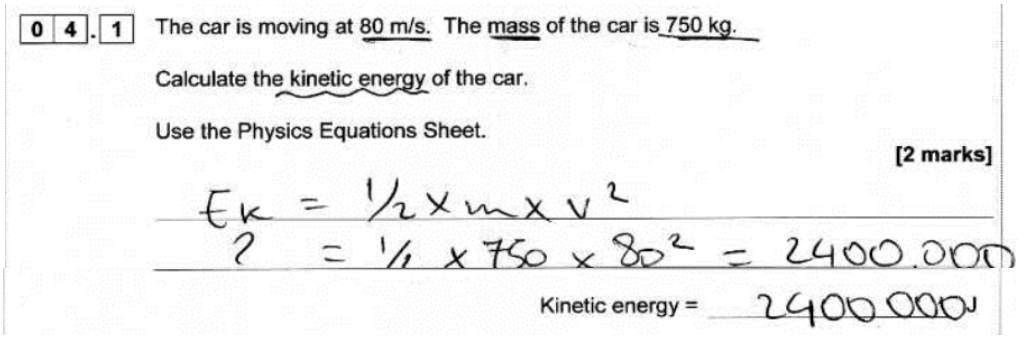
Kinetic energy = 4500000 J

EXAMINER COMMENTARY

The student has understood that the kinetic energy after braking is the difference between the kinetic energy before braking and the work done on the car during braking. They have subtracted correctly.

1 mark out of a possible 1 awarded.

STUDENT B



0 4 . 1 The car is moving at 80 m/s. The mass of the car is 750 kg.

Calculate the kinetic energy of the car.

Use the Physics Equations Sheet.

[2 marks]

$Ek = \frac{1}{2} \times m \times v^2$

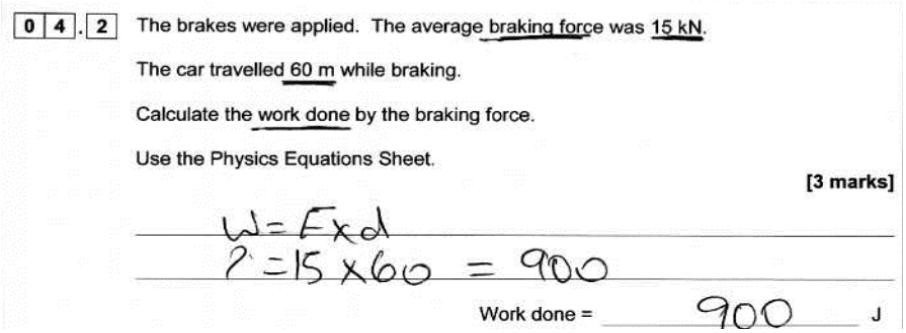
$? = \frac{1}{2} \times 750 \times 80^2 = 2400.000$

Kinetic energy = 2400000 J

EXAMINER COMMENTARY

The student has used the correct equation, substituted and correctly calculated the kinetic energy. The student's response is well set out, and it is clear how they have arrived at their answer.

2 marks awarded.



0 4 . 2 The brakes were applied. The average braking force was 15 kN.

The car travelled 60 m while braking.

Calculate the work done by the braking force.

Use the Physics Equations Sheet.

[3 marks]

$W = F \times d$

$? = 15 \times 60 = 900$

Work done = 900 J

EXAMINER COMMENTARY

The student has not converted the force from kN to N. However, they have then substituted and calculated correctly, so they are still awarded the second and third marks.

2 marks out of a possible 3 awarded.

0 4 . 3 Determine the kinetic energy of the car immediately after braking.

[1 mark]

2400 000 + 900 = 2399 100

Kinetic energy = 2399 100 J

EXAMINER COMMENTARY

The student has understood that the kinetic energy after braking is the difference between the kinetic energy before braking and the work done on the car during braking. They have subtracted their value from 04.2 from their value of 04.1 correctly so is awarded 1 mark.

1 mark awarded.

STUDENT C

0 4 . 1 The car is moving at 80 m/s. The mass of the car is 750 kg.

Calculate the kinetic energy of the car.

Use the Physics Equations Sheet.

[2 marks]

Kinetic energy = mass x velocity

= 750kg x 80m/s

= 60,000

Kinetic energy = 60,000 J

EXAMINER COMMENTARY

The student has used the incorrect formula to calculate the kinetic energy, so scores no marks.

0 marks awarded.

0 4 . 2 The brakes were applied. The average braking force was 15 kN.

The car travelled 60 m while braking.

Calculate the work done by the braking force.

Use the Physics Equations Sheet.

[3 marks]

Work done = force x distance moved.

W = f x d

= 15 x 60 = 900J

Work done = 900 J

EXAMINER COMMENTARY

The student has not converted the force from kN to N. However, they have then substituted and calculated correctly, so they are still awarded the second and third marks.

2 marks awarded.

0 4 . 3 Determine the kinetic energy of the car immediately after braking. [1 mark]

900

Kinetic energy = 6000 900 J

EXAMINER COMMENTARY

It is not clear how the student has arrived at their answer which is incorrect.

0 marks awarded.

QUESTION

01.2

0 1 Solar panels produce electricity from sunlight.

Figure 1

0 1 . 2 Using electricity from solar panels means less electricity is generated by burning fuels such as coal.

Explain why this is less harmful to the environment.

[2 marks]

MARK SCHEME

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1.2	using solar panels produces less CO_2 compared to burning fuels	allow any named polluting gas	1	AO1 3.2.3c
	CO_2 contributes to global warming	allow climate change allow acid rain with correctly named gas	1	

STUDENT A

0 1 . 2 Using electricity from solar panels means less electricity is generated by burning fuels such as coal.

Explain why this is less harmful to the environment.

[2 marks]

Burning fuels like coal releases carbon dioxide. Carbon dioxide is a greenhouse gas that contributes to global warming. Solar panels do not release any harmful gases so it is less harmful than burning fuels.

EXAMINER COMMENTARY

The student has stated that coal emits CO_2. They then state that solar panels do not release harmful gasses, so it is implied that solar panels do not emit CO_2. The student also explains that CO_2 is a greenhouse gas that contributes to global warming.

2 marks awarded.

STUDENT B

0 1 . 2 Using electricity from solar panels means less electricity is generated by burning fuels such as coal.

Explain why this is less harmful to the environment.

[2 marks]

No harmful gases are being released into the atmosphere and surroundings and doesn't lead to global warming.

EXAMINER COMMENTARY

The student does not name the gas. They do correctly explain that no harmful gases are released (by solar panels), so there is no contribution to global warming.

1 mark awarded.

STUDENT C

0 1 . 2 Using electricity from solar panels means less electricity is generated by burning fuels such as coal.

Explain why this is less harmful to the environment.

[2 marks]

Because using electricity from solar panels means there will be no ~~waste~~ waste product. Therefore no pollution is caused. And it doesn't pollute the atmosphere.

EXAMINER COMMENTARY

The student does mention that there are no waste products or pollution, but this is insufficient for either mark to be awarded.

0 marks awarded.

FURTHER GUIDANCE AND CONTACTS

You can contact the subject team directly at science@oxfordaqaexams.org.uk

Please note: We aim to respond to all email enquiries within two working days. Our UK office hours are Monday to Friday, 8am – 5pm local time.

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