



General Certificate of Secondary Education  
2013–2014

## Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]



WEDNESDAY 26 FEBRUARY 2014, MORNING

### TIME

1 hour.

### INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.  
Answer **all nine** questions.

### INFORMATION FOR CANDIDATES

The total mark for this paper is 60.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question 7.

Centre Number

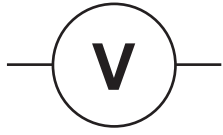
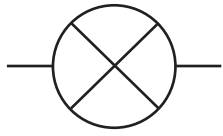

71

Candidate Number

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	

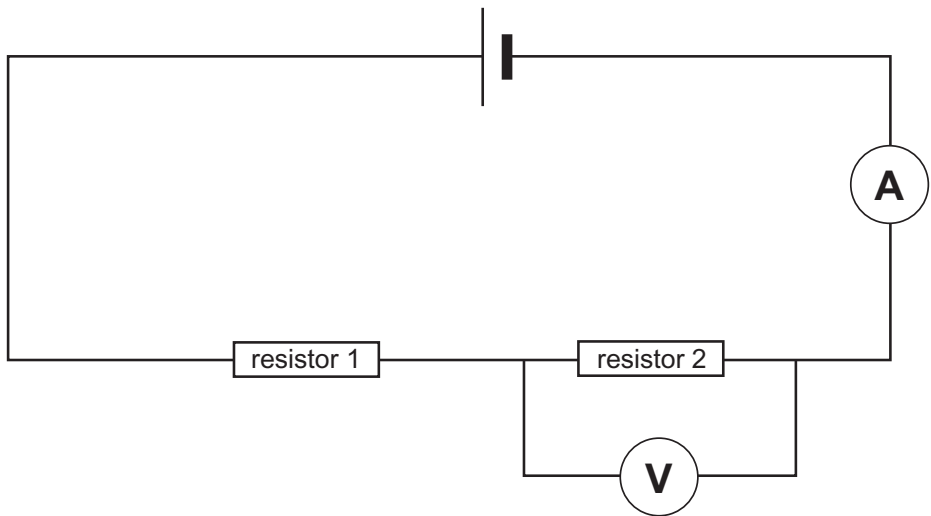
Total  
Marks

1 (a) Below are some electrical symbols. Using lines, match each symbol with its correct description.

Symbol	Description
	cell
	voltmeter
	bulb

[2]

(b) The diagram below was set up to measure the resistance of a resistor.



(i) Complete the following sentence.

Choose from:

**series**

**short**

**parallel**

In the diagram above the resistors are connected

in a \_\_\_\_\_ circuit.

[1]

Examiner Only	
Marks	Remark

- (ii) The voltmeter had a reading of 2 V and the ammeter had a reading of 4 A.

Use the equation:

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

to calculate the resistance of resistor 2.  
(Show your working out.)

Answer \_\_\_\_\_ [2]

- (iii) Name the unit of resistance.

Choose from:

volt

watt

amp

ohm

Answer \_\_\_\_\_ [1]

Examiner Only

Marks Remark

2 (a) The diagram below gives stopping distances for a car travelling at different speeds on a **dry** road.

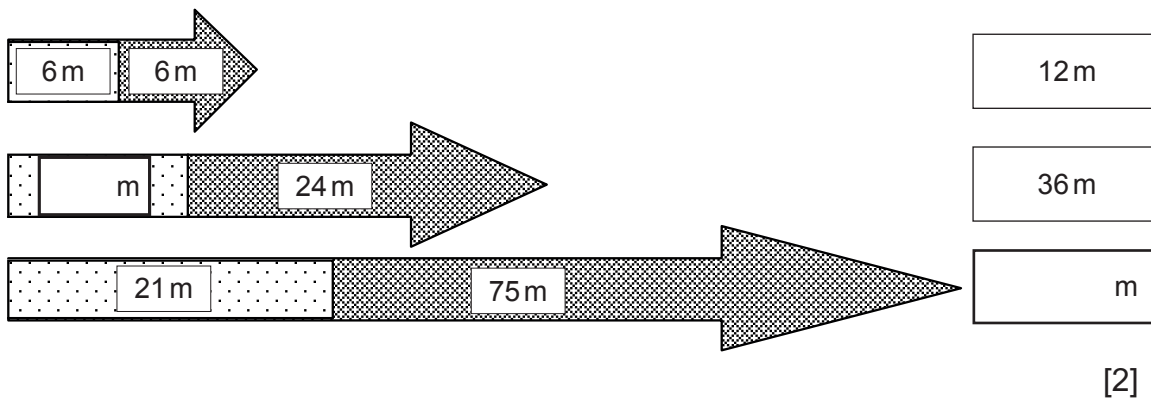
(i) Use the equation:

**thinking distance + braking distance = stopping distance**



to complete the diagram below.

Two answer boxes need completed.



(ii) If the road was **wet**, what effect, if any, would this have on the:

braking distance?

\_\_\_\_\_

thinking distance?

\_\_\_\_\_

stopping distance?

\_\_\_\_\_ [3]

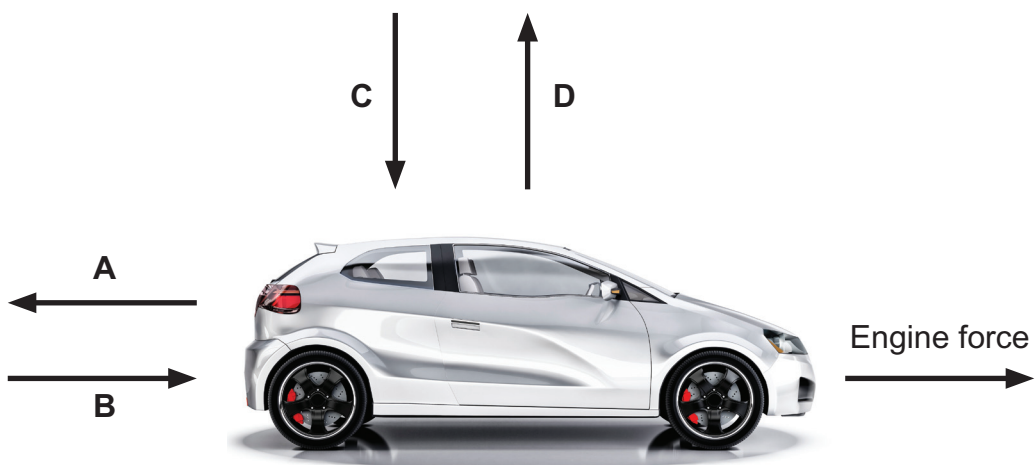
(b) The table below shows the stopping distance for different depths of tyre tread.

Tread depth/mm	Stopping distance/m
8.0 (new tyre)	25.9
3.0 (part worn)	31.7
1.6 (legal limit)	39.5

Use the information to state how stopping distance changes as tread depth decreases.

\_\_\_\_\_ [1]

(c) The diagram below shows a car moving to the right.



© tridland/iStock/Thinkstock

Which arrow **A**, **B**, **C** or **D** shows the direction of the force of friction?

Answer \_\_\_\_\_ [1]

Examiner Only	
Marks	Remark

- 3 A group of students investigated how energy drinks affect reaction times. The same student carried out the test for each drink.

The results are shown in the table below.

Drink	Reaction time before taking drink/ms	Reaction time after taking drink/ms
Water	315	316
Energy drink A	321	298
Energy drink B	318	288

- (a) (i) Using the information, describe the effect of energy drinks on reaction times.

\_\_\_\_\_  
\_\_\_\_\_ [1]

- (ii) Compare the effect of energy drink A and energy drink B on reaction times.

\_\_\_\_\_  
\_\_\_\_\_ [1]

- (b) Suggest why reaction times before and after drinking water were measured.

\_\_\_\_\_  
\_\_\_\_\_ [1]

- (c) Why was the same student used for each test?

\_\_\_\_\_  
\_\_\_\_\_ [1]

- (d) State how the reliability of the investigation could be improved.

\_\_\_\_\_ [1]

Examiner Only

Marks Remark

4 The photograph below shows a speaker which produces sound waves.



© Gustoimages/Science Photo Library

(a) Complete the following sentence.

Choose from:

**reflections**                      **vibrations**                      **energy**                      **pictures**

All sound waves are caused by \_\_\_\_\_ and they carry \_\_\_\_\_ from one place to another. [2]

(b) Suggest which feature of a sound wave increases as the volume of the sound gets louder.

Circle the correct answer.

**frequency**                      **amplitude**                      **wavelength** [1]

Examiner Only	
Marks	Remark

(c) The table below shows the percentage of sound reflected at different frequencies for different materials.

Examiner Only	
Marks	Remark

**Percentage of sound reflected at different frequencies**

Material	250 Hz	500 Hz	1 kHz	2 kHz
<b>Brick</b>	98	97	96	95
<b>Carpet</b>	76	43	31	29
<b>Curtain</b>	65	42	30	28
<b>Glass</b>	75	82	88	93

(i) Which material reflects most sound over a range of frequencies?

\_\_\_\_\_ [1]

(ii) A concert hall needs to reduce echoes to improve sound quality. Use the information and your knowledge to suggest which material should be used. Explain your answer.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [3]



(d) (i) The table below shows the electromagnetic spectrum. Complete the table using the words given below.

**infrared**

**microwaves**

**ultraviolet**

gamma rays	X-rays		visible light			radio waves
------------	--------	--	---------------	--	--	-------------

[2]

(ii) State **one** feature these waves have in common.

\_\_\_\_\_ [1]

(iii) State **one** feature that is different for each of these waves.

\_\_\_\_\_ [1]

(e) Electromagnetic waves can be used in communications. Using lines, match each wave with how it is used.

**Wave**

**Use**

infrared

television aerial

optical fibre

microwave

satellite

[2]

Examiner Only	
Marks	Remark

- 5 Pilots are exposed to higher levels of radiation because they spend long periods of time at high altitudes (heights).



© Victor De Schwanberg/Science Photo Library

The table below shows the amount of radiation (dose) received by pilots travelling to different destinations from Belfast.

Destination	Flight time/hrs	Amount of radiation/ mSv
Paris	1.75	8.34
New York	7.7	50.00
Sharm El Sheikh	6.2	24.18
Manchester	1.0	1.82

- (i) State the trend shown by this data.

\_\_\_\_\_ [1]

- (ii) Background radiation causes this increase in dose. Suggest **one** possible source of radiation which could affect the pilots at this height.

\_\_\_\_\_ [1]

Examiner Only

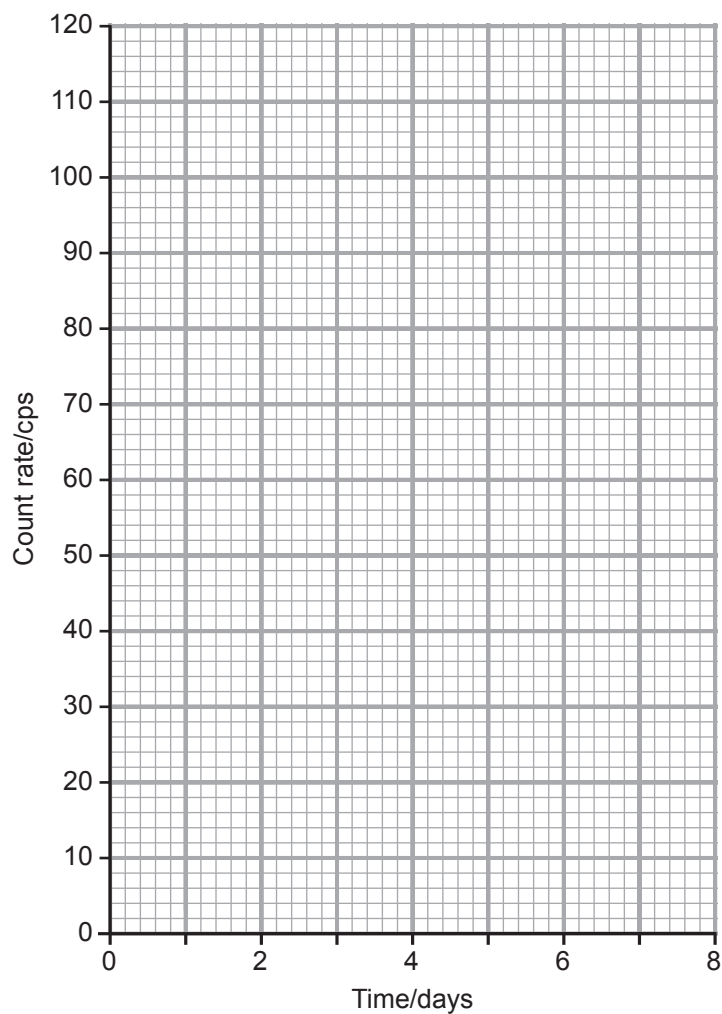
Marks Remark



6 (a) The table below shows the count rate of a radioactive isotope.

Time/days	Count rate/ cps
0	120
2	76
4	48
6	30
8	19

(i) Plot these points on the axes below and draw a curve of best fit.



[3]

Examiner Only	
Marks	Remark

(ii) Use the graph to find the half-life of the radioactive isotope.

Answer \_\_\_\_\_ days [1]

(b) Radioactive phosphorus has a half-life of 20 days. What fraction of the original mass of phosphorus will be left after 40 days?

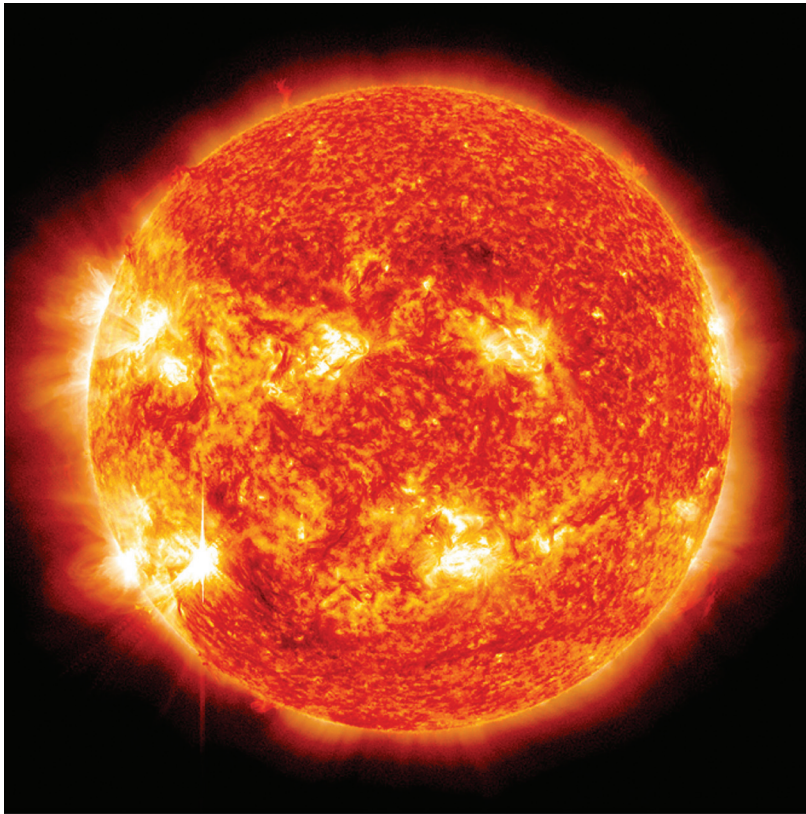
Answer \_\_\_\_\_ [1]

Examiner Only	
Marks	Remark

7 The photograph below shows the Sun, our closest star.

**Examiner Only**

**Marks Remark**



© NASA/SDO

Describe fully the formation of the Sun, naming the gases and forces involved.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

---

---

---

---

---

---

---

---

---

---

---

---

[6]

8 (a) The table below shows information on generating electrical power.

	Tidal	Coal	Wind	
			Onshore	Offshore
Power output/ MW	12	1600	24	94
Life expectancy/ years	15	30	20	20
Annual operating costs per kW/£	56	24	24	57
Generating costs per kWh/p	6.63	3.33	5.35	7.19

(i) The government want to replace fossil fuel power stations with alternative sources.  
Use the information to explain fully why this might not be the best option.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [3]

(ii) Give **two** reasons why more alternative energy sources are being introduced.

1. \_\_\_\_\_

2. \_\_\_\_\_ [2]

(b) Explain fully the formation of fossil fuels from dead plants and animals.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

Examiner Only	
Marks	Remark

(c) Given below are some of the processes involved in producing electricity using a coal fired power station.

<b>A</b>	The coal produces heat	The boiler produces steam	The steam turns the blades of the turbine to make electricity directly
<b>B</b>	The coal produces heat	The heat turns the blades of the turbine	The turbine turns the generator which produces electricity
<b>C</b>	The boiler produces steam	The steam turns the blades of the turbine	The turbine turns the generator which produces electricity
<b>D</b>	The turbine heats the boiler	The boiler produces steam	The steam turns the generator which produces electricity

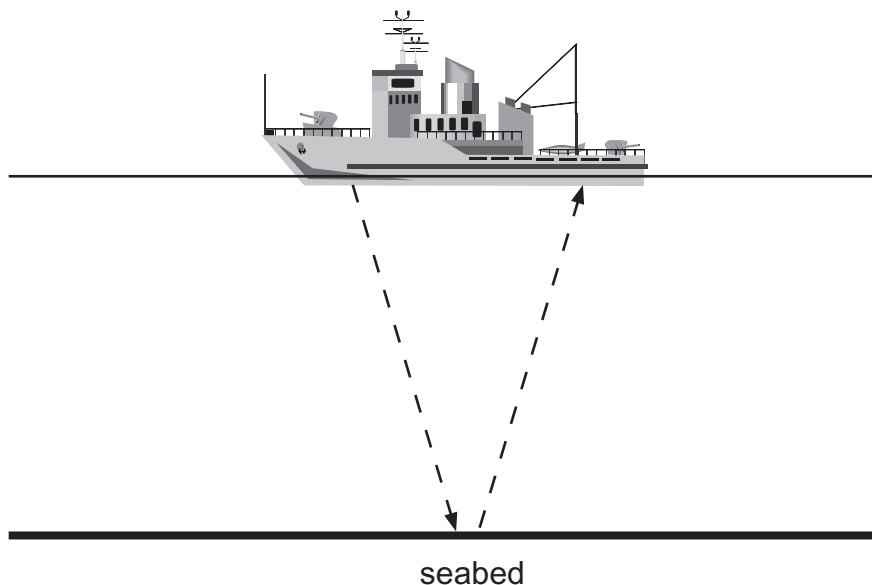
Which letter **A**, **B**, **C** or **D** gives the correct order of processes?

Answer \_\_\_\_\_ [1]

Examiner Only	
Marks	Remark



- 9 Ultrasound can be used to measure the depth of the sea as shown in the diagram below.



Ultrasound travels at 1500 m/s in water.

- (a) The ship sends out an ultrasound pulse and the echo returns 6 seconds later.

Use the equation:

$$\text{distance} = \text{speed} \times \text{time}$$

to calculate the depth of the water.  
(Show your working out.)

Answer \_\_\_\_\_ m [3]

- (b) How will the captain of the ship know if a shoal of fish swims under the ship?

\_\_\_\_\_  
\_\_\_\_\_ [1]

---

**THIS IS THE END OF THE QUESTION PAPER**

---

Examiner Only	
Marks	Remark





Permission to reproduce all copyright material has been applied for.  
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA  
will be happy to rectify any omissions of acknowledgement in future if notified.