



Centre Number

71

Candidate Number

General Certificate of Secondary Education  
2012–2013

## Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]



WEDNESDAY 27 FEBRUARY 2013, 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 eight** 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.

For Examiner's  
use only

Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	

Total  
Marks



1 The picture shows a television, an energy changing device.



© Ton Kinsbergen / Science Photo Library

(a) Complete the following sentences.

Choose from:

**light**      **heat**      **chemical**      **sound**      **electrical**

The energy input into the television is \_\_\_\_\_ energy.

The useful energy output from the screen is \_\_\_\_\_ energy.

Some energy is wasted in the form of \_\_\_\_\_ energy. [3]

(b) The table below shows the energy input and output figures for three televisions. However, one value has been recorded incorrectly.

Television	Energy input/J	Useful energy output/J
<b>A</b>	480	100
<b>B</b>	350	500
<b>C</b>	600	400

Which set of figures **A**, **B** or **C** is incorrect?

Explain your answer.

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

Examiner Only	
Marks	Remark

(c) An energy efficient television saves £12 per year in running costs compared to a less efficient model. However, it costs £60 more to buy.

Calculate how many years it takes to save the extra £60.

(Show your working out.)

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

Examiner Only	
Marks	Remark

2 (a) Given below are some sound wave frequencies.

200 Hz

20 Hz

2000 Hz

30 kHz

2 kHz

(i) Which frequency is the lowest humans can hear?

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

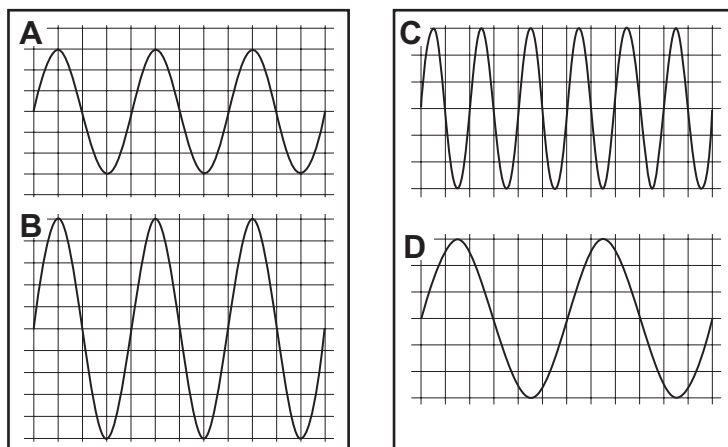
(ii) Which **two** frequencies are the same?

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

(iii) Which frequency is in the ultrasound range?

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

(b) The diagrams below represent sound waves taken over the same time.



Which wave **A**, **B**, **C** or **D** has:

(i) the longest wavelength? \_\_\_\_\_ [1]

(ii) the biggest amplitude? \_\_\_\_\_ [1]

Examiner Only	
Marks	Remark

(c) (i) Complete the following sentence.

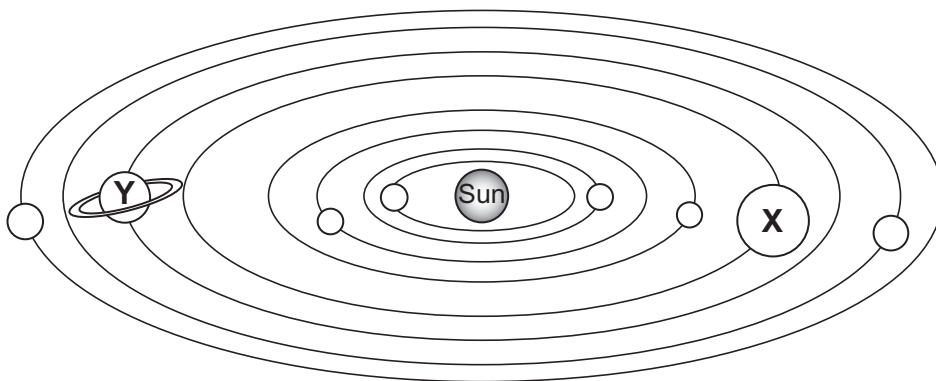
Sound is an example of a longitudinal wave whereas light is an example of a \_\_\_\_\_ wave. [1]

(ii) What do waves carry from one place to another?

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

Examiner Only	
Marks	Remark

3 (a) The diagram below shows the Sun and its eight planets.



(i) Name the planets labelled X and Y.

X is \_\_\_\_\_

Y is \_\_\_\_\_

[2]

(ii) What name is given to this model of the Solar System?

Circle the correct answer.

concentric      geocentric      heliocentric      [1]

(iii) What name is given to the old model used by the ancient Greeks?

Circle the correct answer.

concentric      geocentric      heliocentric      [1]

(iv) What is the main difference between the two models?

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

Examiner Only	
Marks	Remark

(b) The table below gives the strength of gravity on four planets.

Planet	Strength of gravity N/kg
A	9
B	10
C	4
D	26

(i) On which planet **A**, **B**, **C** or **D** would your weight be the lowest?

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

(ii) Use the equation:

$$\text{weight} = \text{mass} \times \text{gravity}$$

to calculate the weight of a person with a mass of 60 kg on planet **A**.

(Show your working out.)

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

(iii) What does the strength of a planet's gravity depend on?

Tick (✓) the correct answer.

The planet's distance from the Sun

The planet's size

The number of moons the planet has

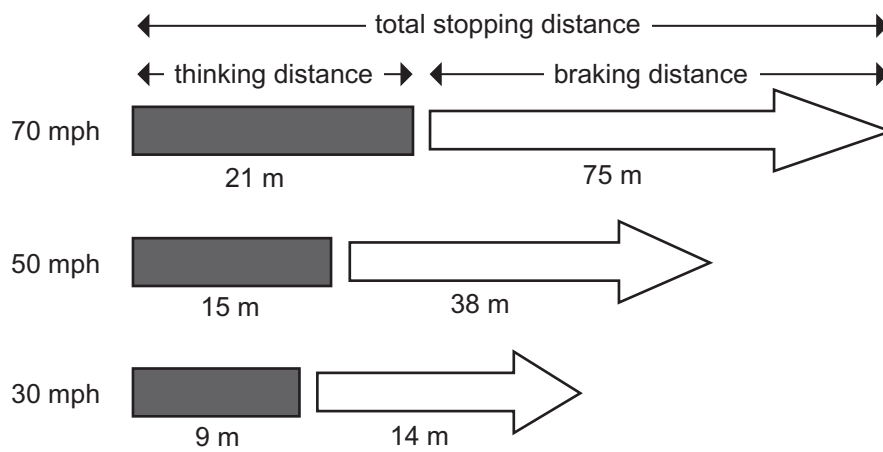
[1]

Examiner Only

Marks

Remark

- 4 (a) The diagram below shows the total stopping distances for cars travelling at different speeds.



- (i) Calculate the total stopping distance at 70 mph.

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

- (ii) From the diagram state **two** effects of increasing speed.

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

\_\_\_\_\_

2. \_\_\_\_\_

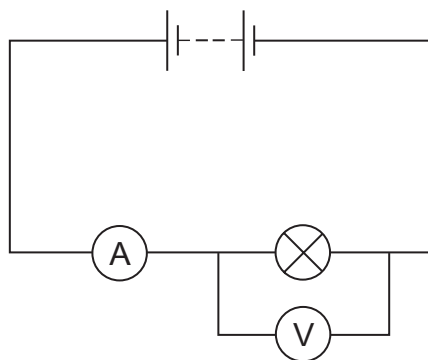
\_\_\_\_\_ [2]

Examiner Only	
Marks	Remark





- 5 (a) Pupils set up the circuit below to investigate the effect of adding extra batteries.



The pupils' results are shown in the table below.

Number of batteries	Voltage/V	Current/A
1	1.5	0.10
2	3.0	0.19
3	4.5	0.30
4	6.0	0.41
5	7.5	0.50

- (i) Name the meter shown in the diagram that measures current.

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

- (ii) State **two** trends shown by these results.

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

\_\_\_\_\_

2. \_\_\_\_\_

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

Examiner Only

Marks Remark

- (b) The pupils then used a light meter to measure how the brightness of a bulb was affected by the number of batteries.

The results are shown below.

Number of batteries	Bulb brightness/lux
1	14
2	22
3	35
4	35
5	35

- (i) Explain the advantage of using only three batteries with this bulb.

\_\_\_\_\_

\_\_\_\_\_

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

- (ii) Use the table opposite and the equation:

$$\text{power} = \text{voltage} \times \text{current}$$

to calculate the power used when three batteries are connected to this bulb.

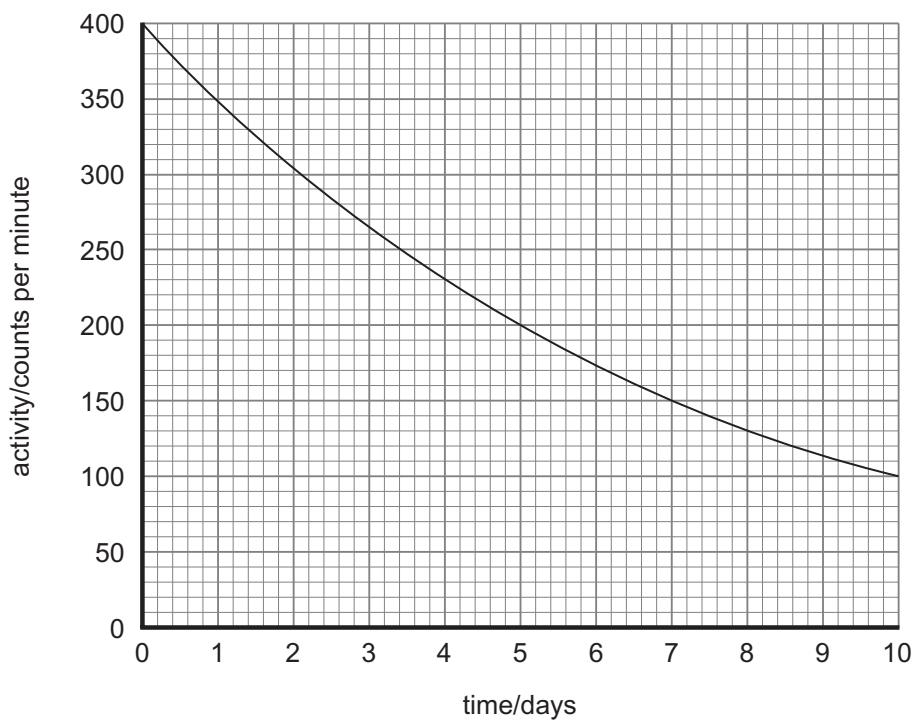
(Show your working out.)

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

Examiner Only

Marks Remark

- 6 (a) The graph below shows how the activity of a radioactive isotope varies with time.



- (i) What is the activity at 7 days?

\_\_\_\_\_ counts per minute [1]

- (ii) Describe the trend shown by this graph.

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

- (iii) Use the graph to give the half-life of this isotope.

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

- (b) Explain fully why some nuclei are radioactive.

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

Examiner Only	
Marks	Remark

This isotope produces gamma radiation.

(c) Explain fully why gamma radiation can be used to treat cancer within the body.

---

---

---

[2]

Examiner Only	
Marks	Remark



**BLANK PAGE**  
**(Questions continue overleaf)**

- 8 The table below gives information on the different types of wave in the electromagnetic spectrum.

Type	Wavelength/m	Energy/ arbitrary units
Gamma	0.00000000001	300 000
X-rays	0.0000000001	3000
	0.00000001	30
Visible light	0.0000005	6
	0.00001	0.3
Microwaves	0.03	0.001
Radio waves	1000	0.00003

- (a) State the relationship between wavelength and energy in the table above.

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

- (b) Complete the table by correctly naming the other **two** types of electromagnetic radiation. [2]

- (c) All these waves travel at the same speed (300 000 000 m/s).

- (i) Use the equation:

$$\text{frequency} = \frac{\text{speed}}{\text{wavelength}}$$

to calculate the frequency of radio waves.

(Show your working out.)

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

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.