Rewarding Learning

**General Certificate of Secondary Education
2012–2013**

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

WEDNESDAY 27 FEBRUARY 2013, MORNING

GSS31

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	

8422

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

(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
A	480	100
B	350	500
C	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]

8422   **3**   **[Turn over**

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?
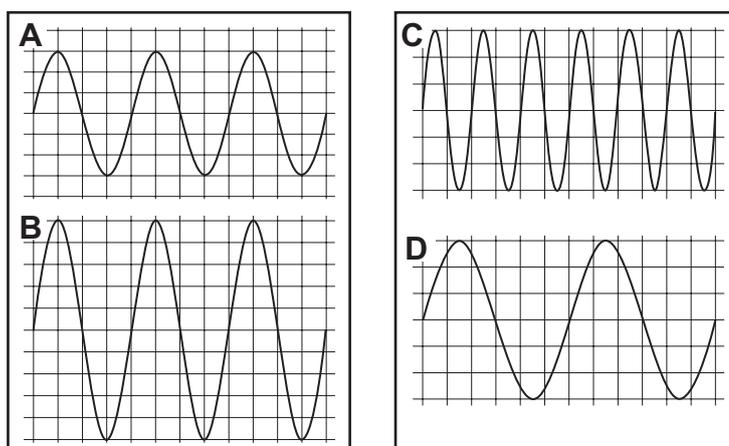
_____ [1]

(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

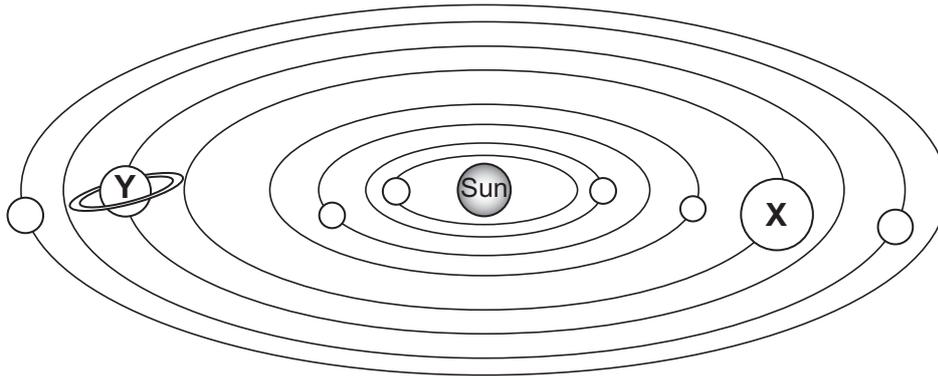Marks | Remark

(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]

5

[Turn over

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]

8422   **6**

(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:

weight = mass × 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.
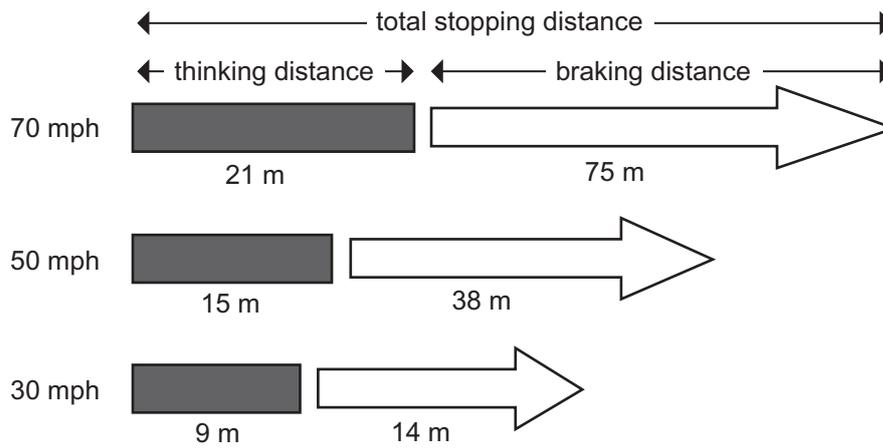
The planet's distance from the Sun ☐

The planet's size ☐

The number of moons the planet has ☐　　　[1]

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

total stopping distance

thinking distance ← → braking distance

70 mph

21 m   75 m

50 mph

15 m   38 m

30 mph

9 m   14 m

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

_____ m [1]

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

1. _____

_____

2. _____

_____ [2]

(b) Complete the table below to show what effect (if any) each condition may have on thinking and braking distance.

Choose from:

increased   **none**   **decreased**

Condition	Thinking distance	Braking distance
Wet road surface		
Worn tyres	none	increased
Driver after drinking alcohol		

[2]

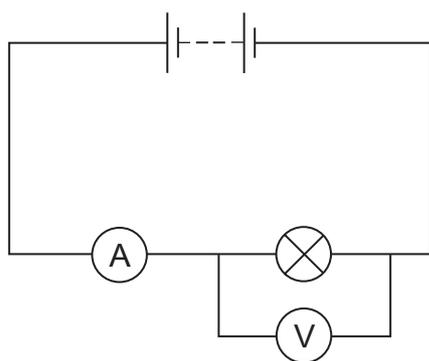**(c) (i)** Name the force that opposes motion.

_____ [1]

(ii) Name the unit of force.

_____ [1]

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]

8422

10

(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:

power = voltage × current
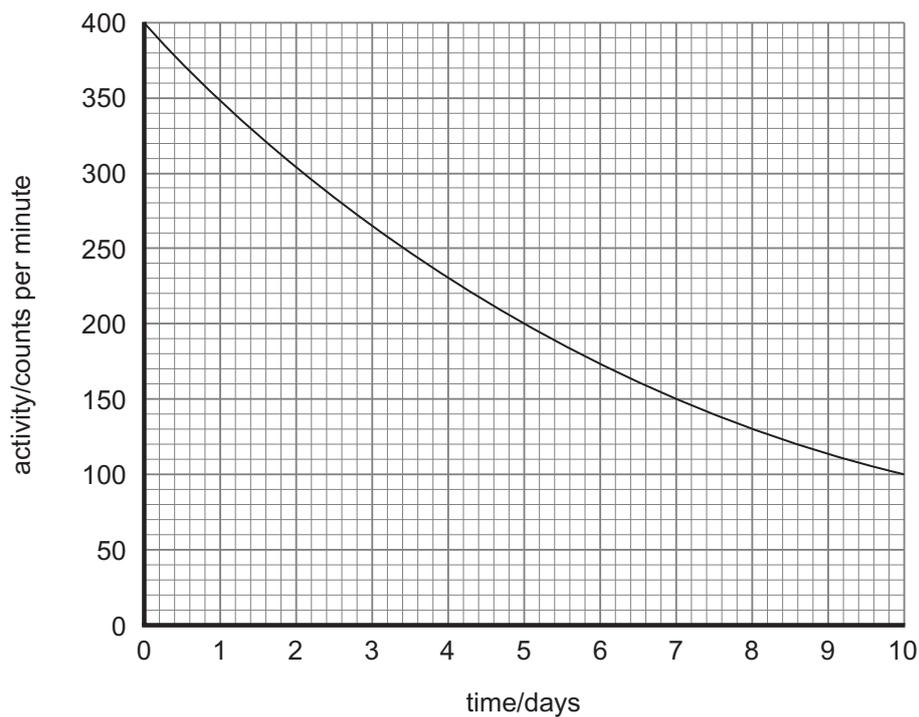
to calculate the power used when three batteries are connected to this bulb.

(Show your working out.)

Answer _____ W [2]

8422

11

[Turn over

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]

This isotope produces gamma radiation.

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

_____

_____

_____ [2]

13

[Turn over

7 The Northern Ireland government has recently announced that there will be an increase in the amount of electricity generated from sources other than fossil fuels.

Explain fully what fossil fuels are, how they are formed, and why the emphasis on developing alternative sources has increased in recent years.

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

[6]

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(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]

(ii) Use the equation to suggest how frequency will change when wavelength increases.

_____

_____ [1]

(d) (i) Microwaves are used in mobile phone communications. Suggest **one** other use of microwaves.

_____ [1]

(ii) Using the information provided and your knowledge, explain fully why microwaves are more likely than X-rays to affect the health of young people.

_____

_____

_____

_____ [2]

(iii) Name the medical condition associated with exposure to electromagnetic radiation.

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

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