

New
Specification

Rewarding Learning

General Certificate of Secondary Education
2017–2018

Centre Number

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Candidate Number

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Single Award Science Physics

Unit 3
Foundation Tier

[GSA31]



FRIDAY 23 FEBRUARY 2018, 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

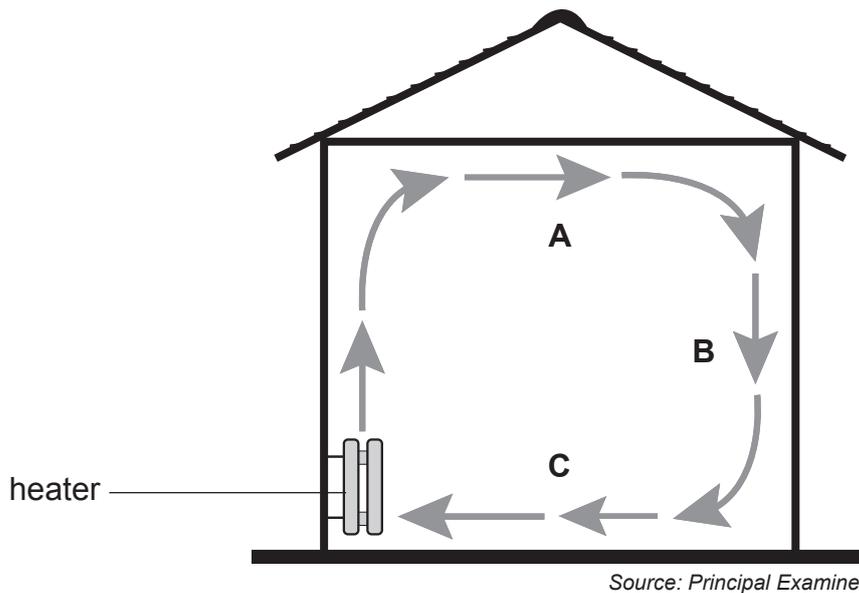
The total mark for this paper is 60.

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 **9(a)**.

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

- 1 (a) The diagram below shows a room being heated. The arrows show the movement of air.



- (i) Name the method of heat transfer shown in this diagram.

Choose from:

convection

radiation

conduction

Answer _____ [1]

- (ii) Complete the sentence below.

Choose from:

falls

heavier

rises

lighter

The air above the heater gets warm and _____

because it is _____ than cold air. [2]

- (iii) Where in the room (A, B or C) is the air temperature lowest?

Answer _____ [1]

Examiner Only

Marks Remark

(b) Name the method by which heat travels through metals.

Choose from:

convection

radiation

conduction

Answer _____ [1]

The photograph below shows a saucepan being heated on a gas cooker.



© Martyn F. Chillmaid / Science Photo Library

(c) Name a suitable material for the handle of the saucepan. Explain your answer.

_____ [2]

Examiner Only	
Marks	Remark

2 (a) The photograph below shows an aeroplane taking off.



© Vladimir_Timofeev / iStock / Thinkstock

Complete the following sentences about the aeroplane taking off.

Choose from:

nuclear kinetic light potential strain

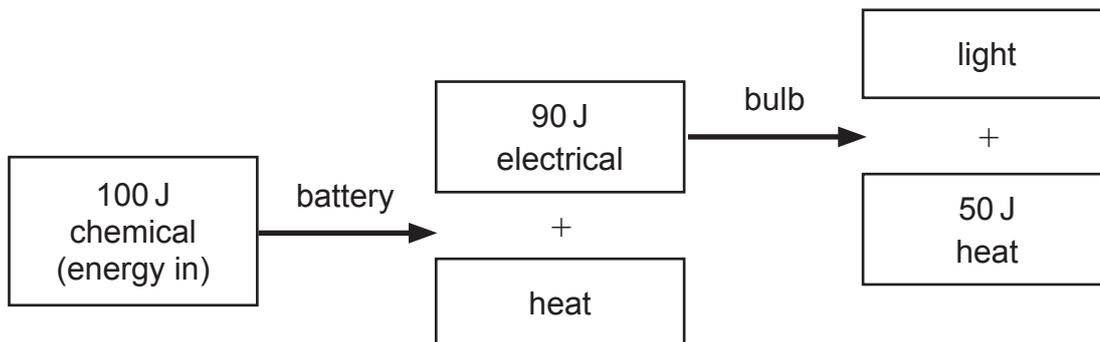
As the aeroplane speeds along the runway, the chemical energy in its fuel is changed into _____ energy.

The aeroplane will then take off changing this energy into gravitational _____ energy as it climbs higher.

[2]

Examiner Only	
Marks	Remark

- (b) The diagram below shows how 100 J of chemical energy in a battery is changed into useful light energy in a torch.



- (i) Calculate how much heat energy is produced by the battery.

Answer _____ J [1]

- (ii) Calculate how much light energy is produced by the bulb.

Answer _____ J [1]

- (iii) Use the equation:

$$\text{efficiency} = \frac{\text{useful energy out (light)}}{\text{total energy in}}$$

to calculate the efficiency of this torch.

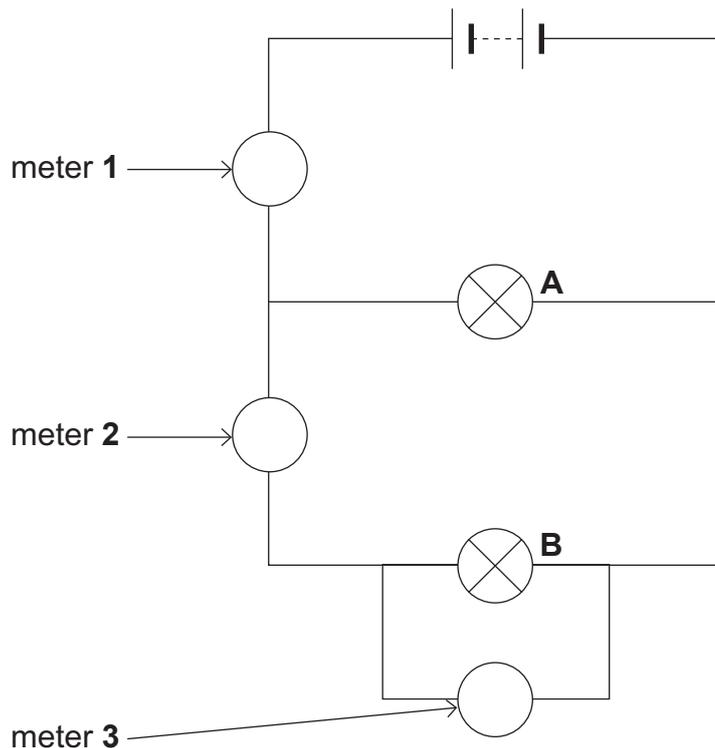
(Show your working out.)

Answer _____ [2]

Examiner Only

Marks Remark

- 3 (a) The diagram below shows two identical bulbs **A** and **B** in an electrical circuit with three meters.



Source: Principal Examiner

- (i) Complete the following sentences.

Meter **2** measures current and is called an _____.

It is connected in _____ with bulb **B**. [2]

- (ii) Meter **1** also measures current and shows a reading of 2 A.
What will be the reading on meter **2**?

Circle the correct answer.

2 A **4 A** **1 A** **3 A** [1]

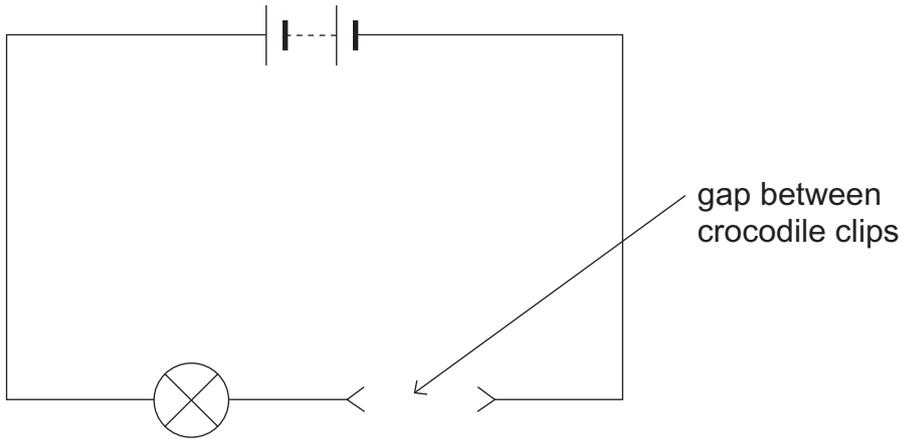
- (iii) Meter **3** shows a reading of 4 V. What voltage is produced by the battery?

Circle the correct answer.

2 V **4 V** **1 V** **3 V** [1]

Examiner Only	
Marks	Remark

(b) The diagram below shows a simple test circuit.



Source: Principal Examiner

(i) Describe fully how this circuit can be used to find if a material is an electrical conductor.

[2]

(ii) Complete the table below by placing the following materials in the correct column.

iron

paper

copper

wood

Conductor	Insulator

[2]

Examiner Only	
Marks	Remark

4 The table below gives information about five electric kettles.

Kettle	Time to boil water/s	Power/kW	Cost to buy/£	Cost to run per year/£
A	90	0.8	18	14.0
B	70	1.0	14	13.5
C	55	1.2	14	13.0
D	44	1.5	25	13.0
E	40	2.0	25	15.5

Use information from the table and your knowledge to answer the following questions.

(a) Which kettle (**A**, **B**, **C**, **D** or **E**) will boil water the fastest?

Answer _____ [1]

(b) When finding the time that each kettle takes to boil water, state **one** thing that had to be done to get valid results (fair test).

 _____ [1]

(c) A cafe needs to buy a new kettle every year. Which kettle (**A**, **B**, **C**, **D** or **E**) would be the best value for money? Explain your answer.

 _____ [2]

Examiner Only

Marks Remark

(d) The kettle will be connected to the mains using a 3-pin plug.

(i) Complete the table below about the wires in a 3-pin plug.

Name	Colour
earth	green/yellow
	blue
live	

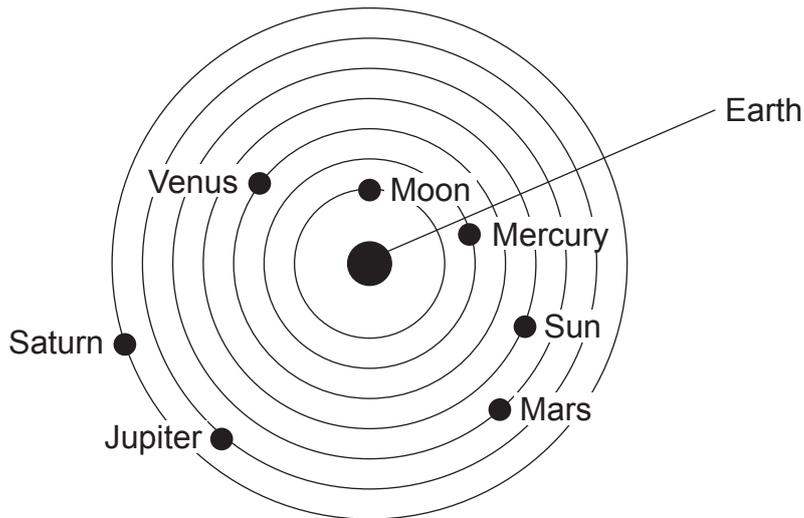
[2]

(ii) Name the wire that will **not** be needed if the kettle is double insulated.

Answer _____ [1]

Examiner Only	
Marks	Remark

5 The diagram below shows a previous model of the Solar System.



Source: Principal Examiner

(a) State **two** differences between this model and the modern day model of the Solar System.

1. _____

 2. _____

- [2]

(b) The table below gives information about the first five planets in our Solar System.

Planet	Distance from Sun/ million km	Average surface temperature/ °C	Time for one orbit/ years	Orbital speed/ million km/ year
Mercury	58	350	0.2	1560
Venus	108	480	0.6	1100
Earth	150	22	1.0	945
Mars	778	-23	1.9	754
Jupiter	1429	-150	12.0	413

Examiner Only	
Marks	Remark

Use information from the table to answer parts (i) and (ii) below.

- (i) Complete the following sentence.

As the time for one orbit _____, the
orbital speed _____ [1]

- (ii) Calculate the number of orbits that Mercury makes around the Sun when the Earth completes **one** orbit.

Answer _____ [1]

- (iii) Apart from a star and planets, name **one** other object found in our Solar System.

_____ [1]

- (c) The table below gives information about an astronaut as he travels from the Earth to the Moon.

	Mass/ kg	Gravity/ N/kg	Weight/ N
Earth	80	10	
Space		0	0
Moon	80	1.7	136

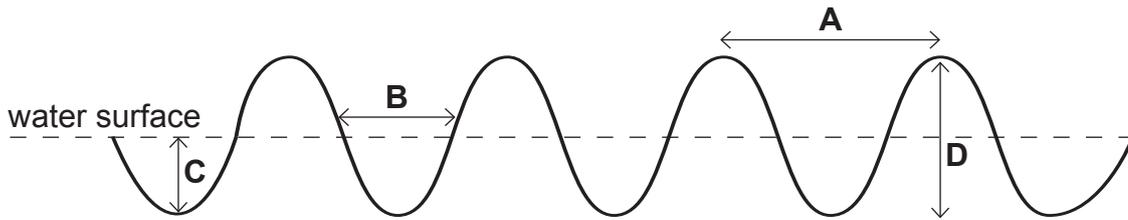
Use the equation:

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

to complete the table. [2]

Examiner Only	
Marks	Remark

6 The diagram below represents a water wave.



Source: Principal Examiner

(a) Which letter (A, B, C or D) represents:

(i) the amplitude?

Answer _____ [1]

(ii) the wavelength?

Answer _____ [1]

(b) Water waves are transverse waves.

(i) Which statement below describes how the particles vibrate in a transverse wave?

Circle the correct answer.

in the same direction as wave travel

at right angles to wave travel

in the opposite direction to wave travel

[1]

(ii) Transverse waves are one type of wave. Name the other type.

_____ [1]

Examiner Only

Marks Remark

- (c) The table below shows how the speed of sound changes with air temperature.

Air temperature/°C	Speed of sound/ m/s
-1	330.0
10	336.9
21	343.6
33	350.3
45	358.0

- (i) Describe the trend shown by this information.

_____ [1]

- (ii) Use the equation:

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

to calculate the frequency of a sound wave that has a wavelength of 0.02 m travelling through air which has a temperature of -1°C .

(Show your working out.)

Answer _____ [2]

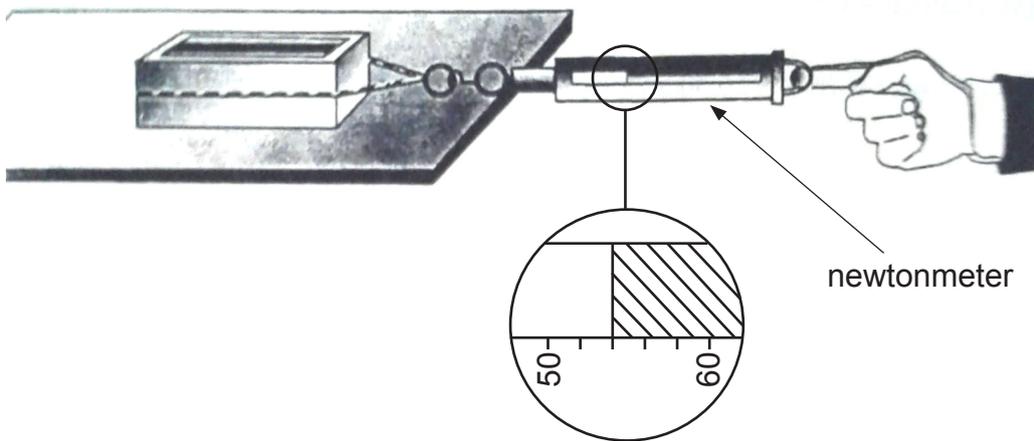
- (iii) State the unit of frequency.

Answer _____ [1]

Examiner Only

Marks Remark

- 7 (a) The diagram below shows a newtonmeter being used to pull a brick across a flat table.



Source: CCEA Artwork

- (i) What size of force is shown on the newtonmeter?

Answer _____ N [1]

- (ii) As the brick moves across the surface of the table a force is produced which opposes motion. Name this force.

_____ [1]

- (iii) Suggest **one** way that the size of this force could be reduced.

 _____ [1]

Examiner Only

Marks Remark

(b) The table below gives the recommended safe distance between vehicles moving at different speeds, in order to avoid an accident.

Speed/ mph	Safe distance for good road conditions/metres	Safe distance for poor road conditions/metres
25	34	42
35	51	61
45	61	73
55	73	
65	89	105
75	102	120

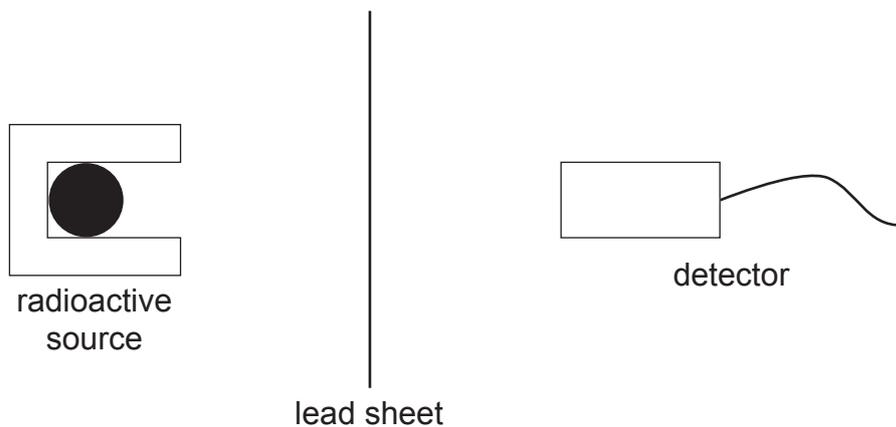
(i) Complete the table by suggesting a value for the safe distance at 55 mph. [1]

(ii) Suggest **one** example of poor road conditions.

_____ [1]

Examiner Only	
Marks	Remark

- 8 The diagram below shows the apparatus used to investigate how the thickness of lead affects the amount of radiation that can pass through to reach the detector.



Source: Principal Examiner

- (a) There are three types of radiation. However, gamma is the only type suitable for this investigation.

- (i) Name the other **two** types of radiation.

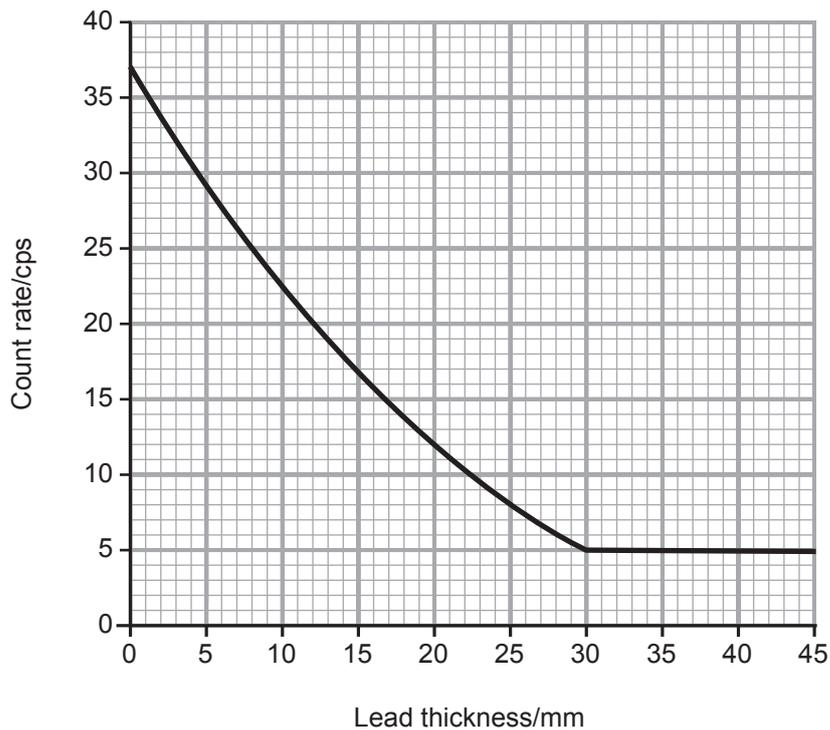
_____ and _____ [1]

- (ii) Explain why these types of radiation are **not** suitable for this investigation.

_____ [1]

Examiner Only	
Marks	Remark

(b) The graph below shows the results of this investigation.



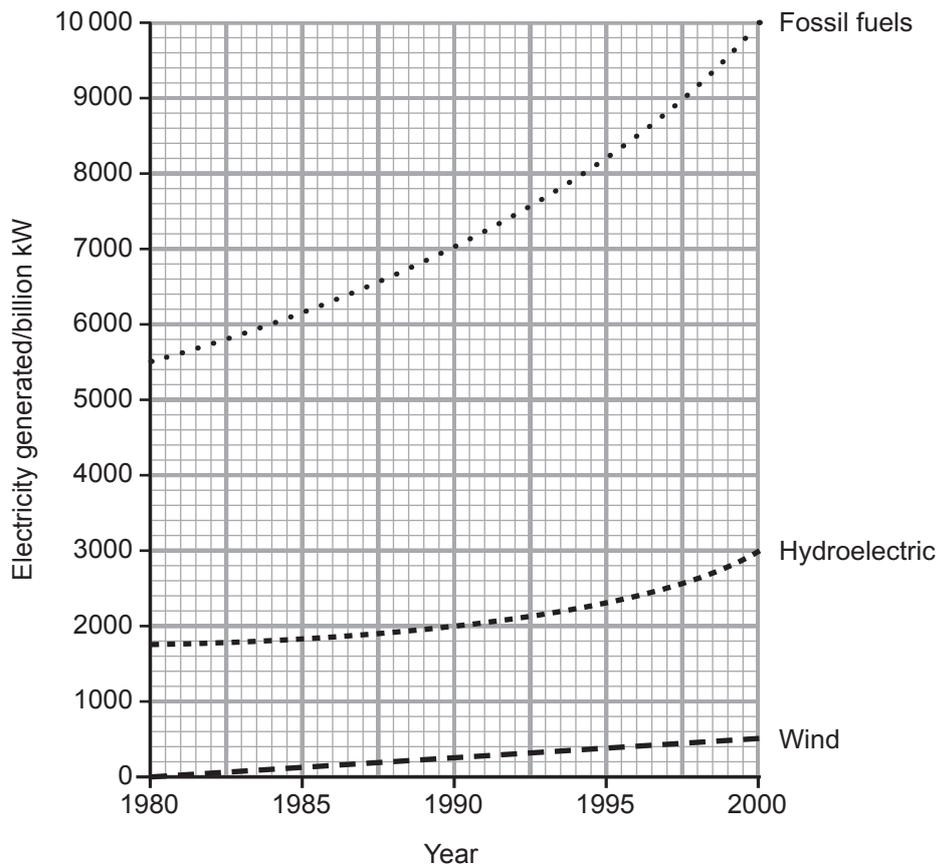
Source: Principal Examiner

Describe fully the conclusion that can be made from these results.

[2]

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Marks	Remark

- 9 (a) The graph below shows how much electricity was generated worldwide from three different energy sources over 20 years.



Source: Principal Examiner

Compare the use of renewable and non-renewable energy sources during this 20-year period.

Your answer should include:

- the names of the renewable and non-renewable sources shown;
- the definition of a renewable energy source;
- one environmental disadvantage of each source.

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

Examiner Only	
Marks	Remark

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