Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017–2018

Science: Single Award

Unit 3 (Physics)
Higher Tier

ML

[GSS32]

FRIDAY 23 FEBRUARY 2018, MORNING

TIME

1 hour 15 minutes, plus your additional time allowance.

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.

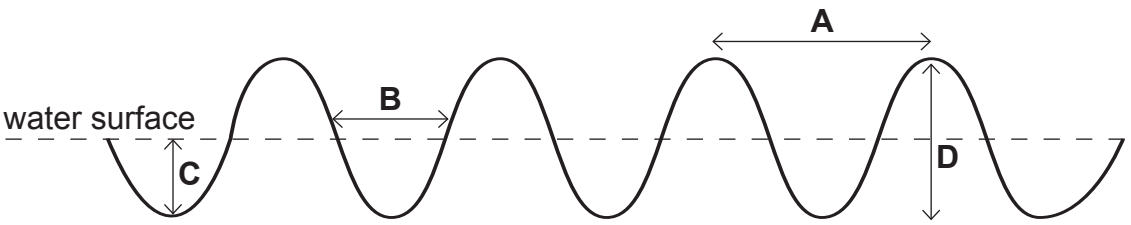
INFORMATION FOR CANDIDATES

The total mark for this paper is 75.
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 Questions **4(a)** and **7(a)**.

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

Examiner Only	
Marks	Remark

1 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]

(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:

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

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.

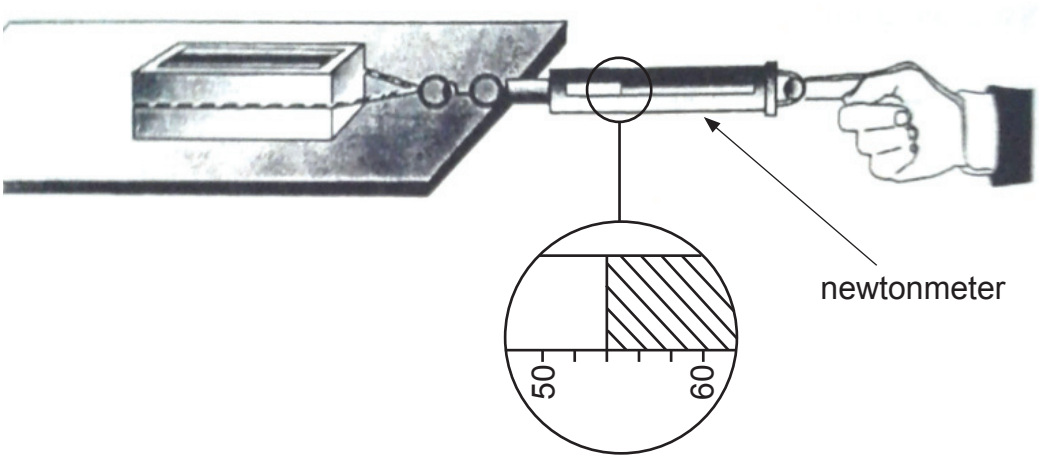
Answer _____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

2 **(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]

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

(iii) Use this information to describe fully the effect of speed and road conditions on safe distances.

_____

_____

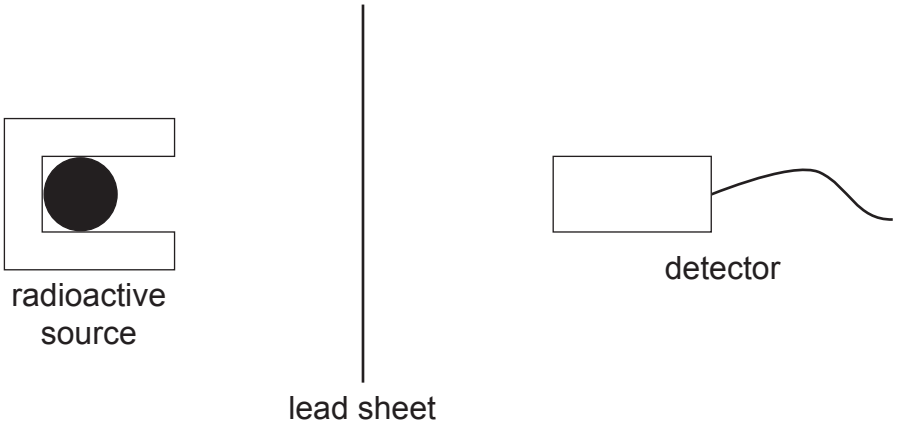
_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

3 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.

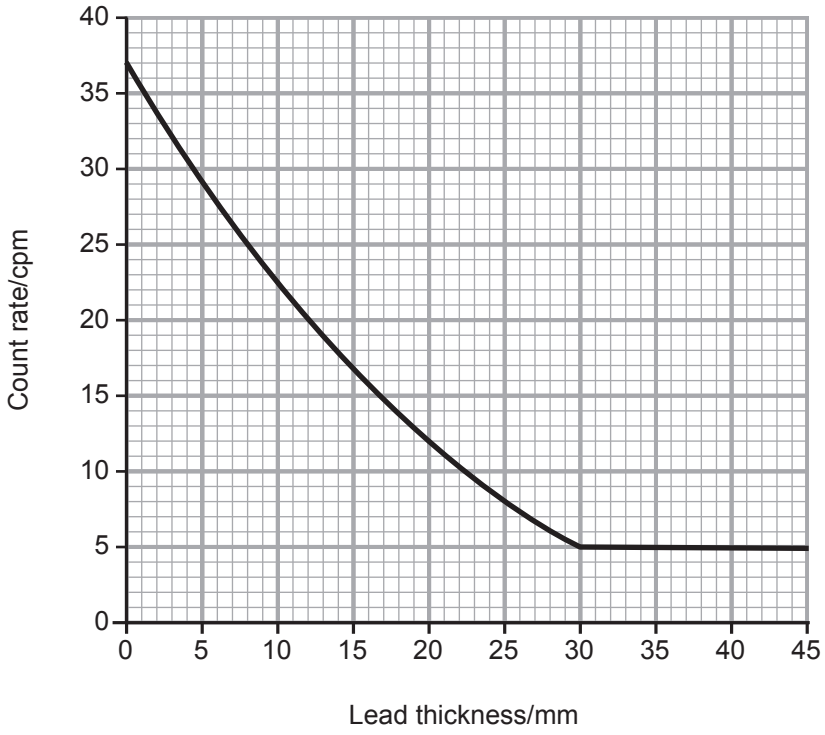
_____ and _____ [1]

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

_____

_____ [1]

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



Source: Principal Examiner

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

_____

_____

_____ [2]

(ii) Give **two** ways this investigation should have been carried out to make it a fair test.

1. _____

_____

2. _____

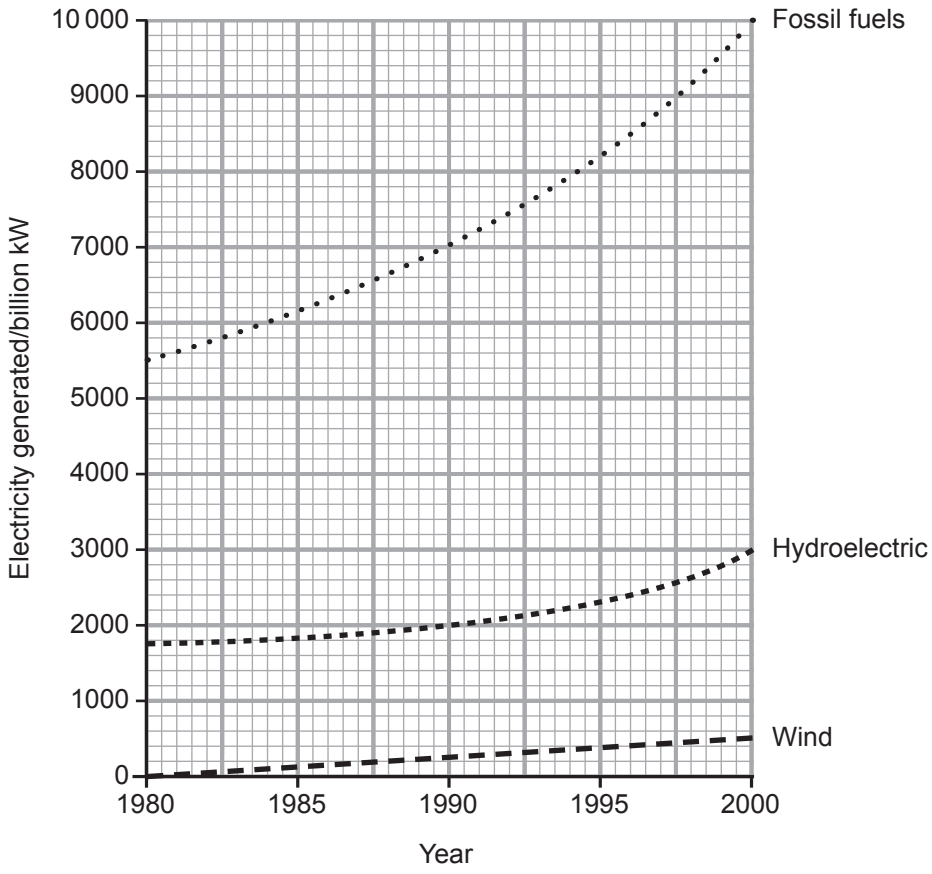
_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

4 **(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

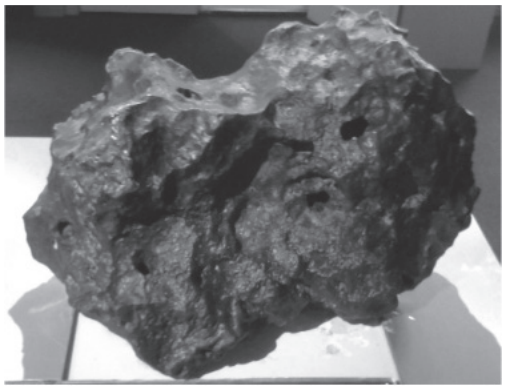
[6]

(b) In a power station, electricity is produced when a turbine drives a generator. Describe fully how electricity is made in the **generator**.

[2]

Examiner Only	
Marks	Remark

5 **(a)** The photograph below shows the remains of one of the largest asteroids ever to have hit Earth. On impact it made a hole in the ground that was 1 km wide.



Source: Principal Examiner

(i) What name is given to a hole in the ground made by an asteroid hitting the Earth?

_____ [1]

(ii) Describe and explain the effects that the impact of this asteroid could have had on living things.

_____

_____

_____

_____

_____ [3]

(iii) Suggest one reason why we should **not** be overly concerned about an asteroid hitting the Earth.

_____

_____ [1]

The table below gives some information about five planets in a solar system.

Planet	Average distance from star/km ($\times 10^8$)	Average surface temperature/°C	Time to orbit/ years
A	1.50	22	1.00
B	3.75	–23	1.88
C	7.80	–80	11.86
D	14.00	–175	45.06
E	29.00	–210	84.01

(b) Describe fully the effects of increasing distance from the star.

_____

_____ [1]

(c) The Sun is our closest star. Describe fully the formation of a star.

_____

_____

_____

_____

_____ [3]

Examiner Only

Marks	Remark

(d) Our galaxy is so large that a beam of light travelling at 3×10^8 m/s would take 1×10^5 years to travel from one side to the other.
There are 3.2×10^7 seconds in one year.

Use this information and the equation:

distance = speed × time

to calculate the distance from one side of our galaxy to the other.

Show your working out.

Answer _____ m [3]

Examiner Only	
Marks	Remark

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(Questions continue overleaf)

Examiner Only	
Marks	Remark

6 **(a)** The photograph below shows a hairdryer which is double insulated.

© Creative_Outlet / iStock / Thinkstock

Plugs on electrical appliances usually have three wires. This hairdryer plug only has two wires.

(i) Name the wire which is **not** needed in this hairdryer.

_____ [1]

(ii) Explain fully how double insulation protects the user from an electric shock.

_____

_____

_____ [2]

(b) This hairdryer uses 1200 W and is connected to the 230 V mains supply.

(i) Use the equation:

power = voltage × current

to calculate the current that flows through this hairdryer.

Show your working out.

Answer _____ A [2]

(ii) What size of fuse should be used in the plug of this hairdryer?

Choose from:

1 A **3 A** **5 A** **13 A** **30 A**

Answer _____ [1]

(c) Describe and explain the difference between conventional current flow and how current actually flows.

_____

_____

_____

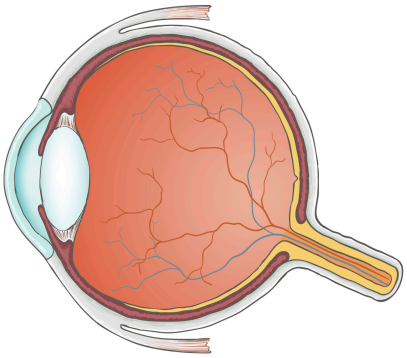
_____

_____ [3]

Examiner Only

Marks	Remark

7 The diagram below represents a human eye.



© Trifonenko / iStock / Thinkstock

(a) Name and describe how the parts of the eye produce perfect vision.

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

[6]

Examiner Only	
Marks	Remark

(b) Short sight is a common eye defect. Explain fully the cause of short sight and how it is corrected.

Examiner Only

Marks	Remark

_____

_____

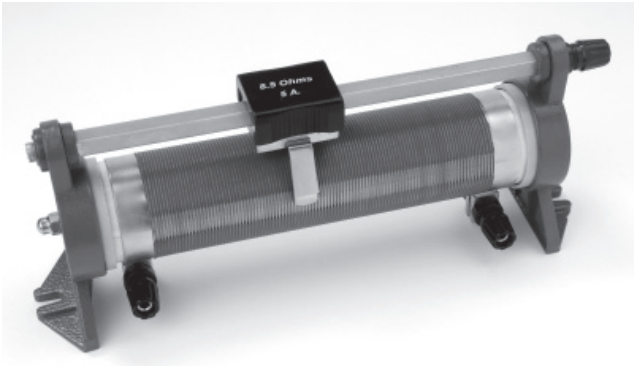
_____

_____

_____ [3]

Examiner Only	
Marks	Remark

8 **(a)** The photograph below shows a variable resistor.



© Trevor Clifford Photography / Science Photo Library

(i) Describe fully how a variable resistor is used to change the resistance and current in a circuit.

_____

_____

_____

_____

_____ [3]

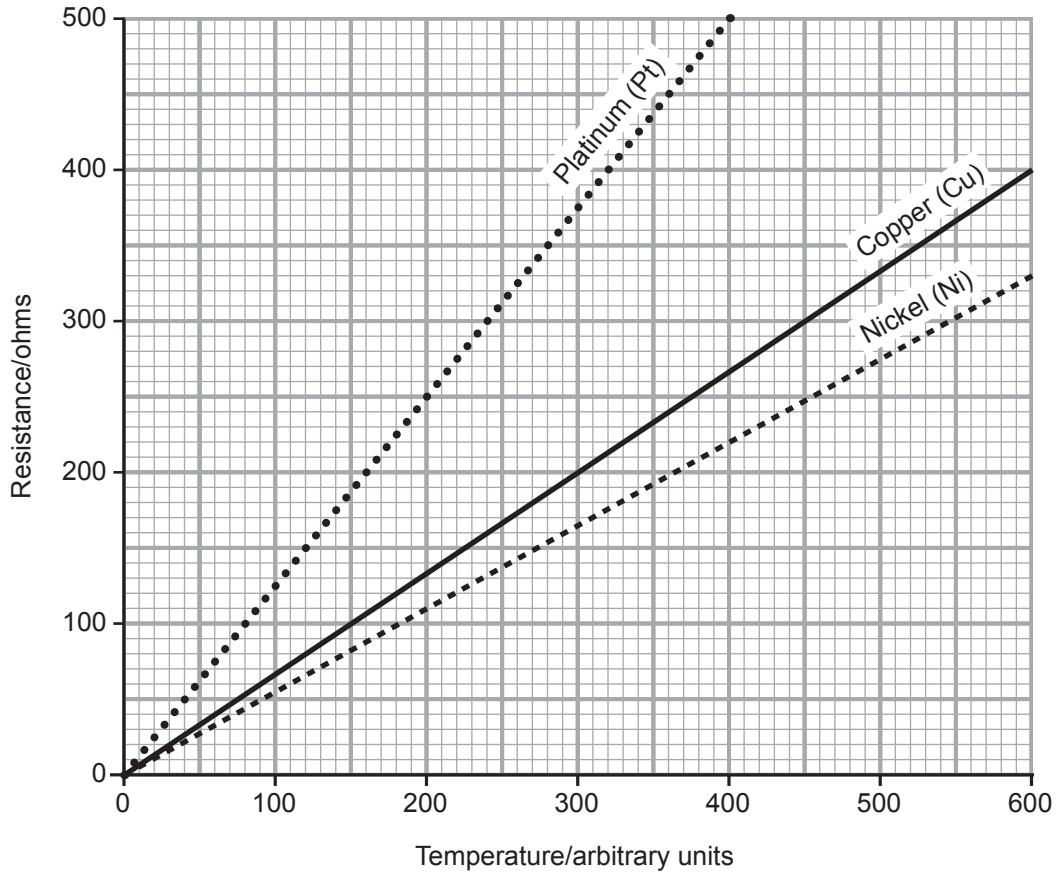
(ii) State **one** use of a variable resistor.

_____ [1]

(b) The graph below shows the effect of temperature on the resistance of three metals.

Examiner Only

Marks	Remark



(i) State the conclusions that can be made from the information shown in the graph.

_____

_____

_____

_____ [2]

(ii) Temperature, length and type of metal all have an effect on resistance. Give **one** other factor that affects resistance and describe its effect.

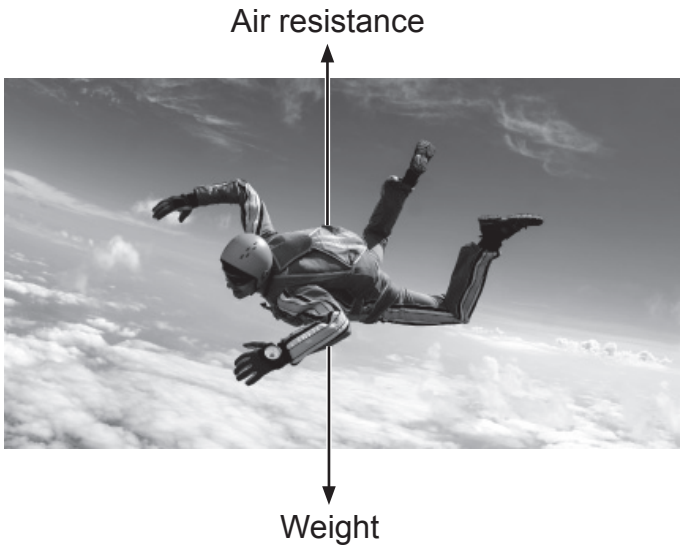
_____

_____

_____ [2]

Examiner Only	
Marks	Remark

9 **(a)** The photograph below shows a skydiver falling through the air.



The table below shows how the speed of the falling skydiver affects the forces acting on him.

Speed/mph	Air resistance/N	Weight/N
20	35	750
40	150	750
60	310	750
80	540	750
100	750	750

(i) Describe the effect, if any, that speed has on the forces acting on the skydiver.

_____

_____

_____ [2]

(ii) Calculate the resultant force at 60 mph and state its effect.

Resultant force _____ N

Effect _____

_____ [2]

(iii) Describe and explain the motion of the skydiver at 100 mph.

_____

_____

_____ [2]

(b) Using the equation below and your knowledge, explain fully how a parachute reduces the force of impact when a skydiver hits the ground.

momentum = mass × velocity

_____

_____

_____

_____

_____ [2]

Examiner Only

Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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