ST EDWARD'S
OXFORD

16+ ENTRANCE EXAMINATION

For entry in
September 2015

PHYSICS

Time: 1 hour

Candidates Name: ……

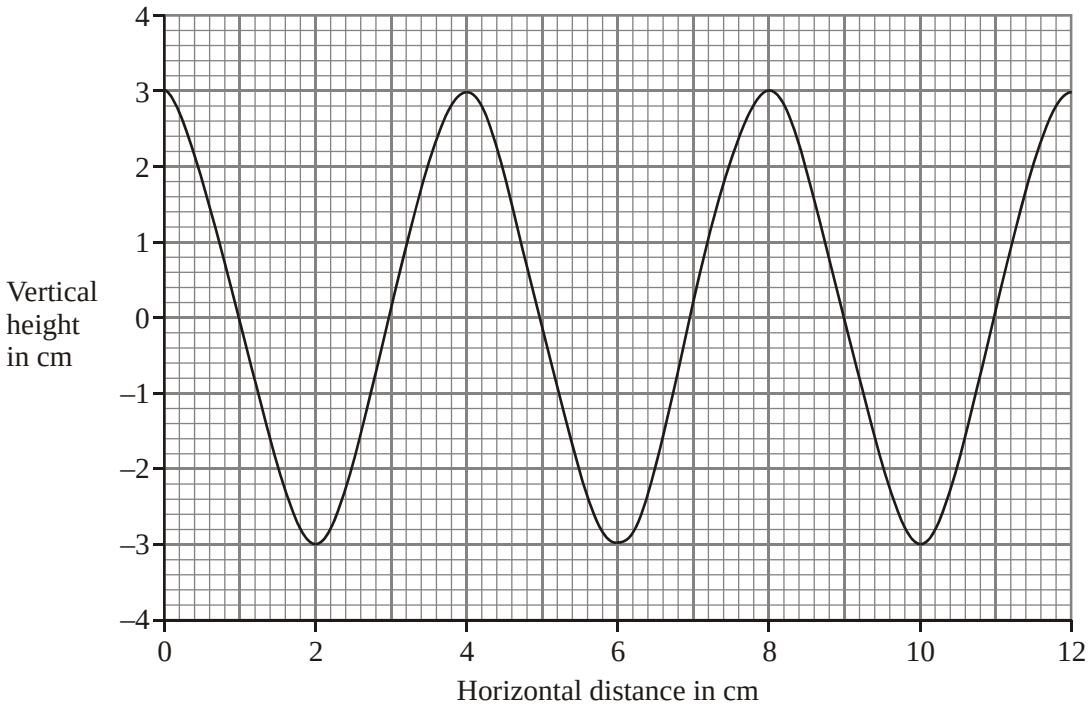
Instructions to Candidates

- Use of a calculator is permitted
- Write your answers clearly and legibly

For internal use only:

Question	Marks
1	/5
2	/4
3	/12
4	/4
5	/8
6	/9
7	/7
8	/8
9	/10
TOTAL	/67

1. The diagram shows a water wave drawn to scale.



(a) What is the wavelength of this water wave? ..... cm

(1)

(b) What is the amplitude? ..... cm

(1)

(c) Twelve waves pass an observer in four seconds.

What is the frequency of the waves? Show clearly how you work out your answer and give the unit.

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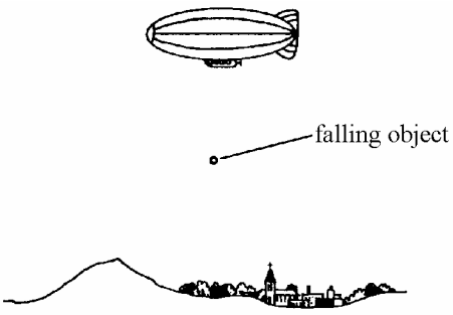
.....

Frequency = ...

(3)

(Total 5 marks)

2. A small object falls out of a balloon.



Choose words from the list to complete the sentences below.

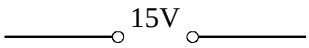
friction	**gravity**	**air pressure**
accelerates	**falls at a steady speed**	**slows down**

- The weight of an object is the force of ..... which acts on it.
- When you drop something, first of all it ..... .
- The faster it falls, the bigger the force of ..... which acts on it.
- Eventually the object ..... .

(Total 4 marks)

3. A student investigates how the current flowing through a filament lamp changes with the voltage across it.
She is given a filament lamp and connecting wires.
She decides to use a 15V power supply, a variable resistor, an ammeter, a voltmeter and a switch.

(a) Complete the circuit diagram to show how she should set up the circuit.

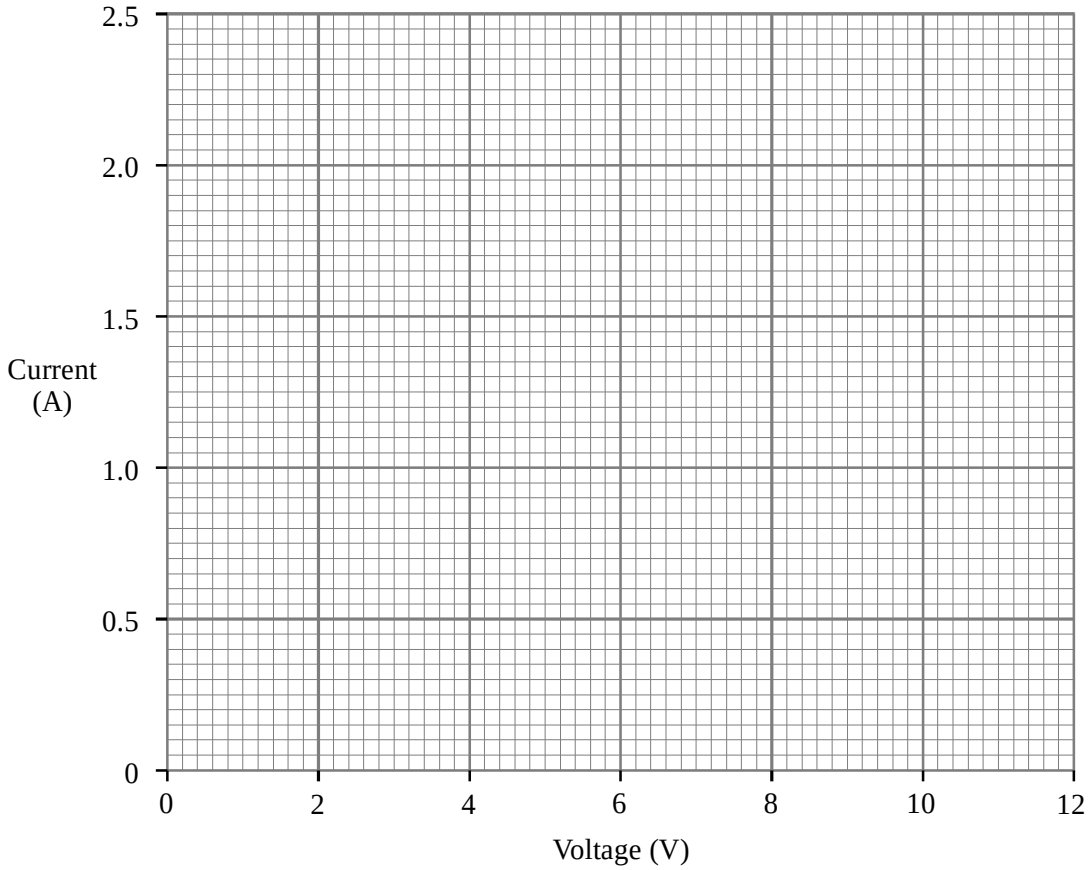


(4)

(b) The student obtains the following results.

VOLTAGE (V)	0.0	3.0	5.0	7.0	9.0	11.0
CURRENT (A)	0.0	1.0	1.4	1.7	1.9	2.1

(i) Plot a graph of current against voltage.



(3)

(ii) Use your graph to find the current when the voltage is 10V.

Current ..... A

(1)

(iii) Use your answer to (ii) to calculate the resistance of the lamp when the voltage is 10V.

.....

.....

.....

Resistance ..... Ω

(2)

(c) (i) What happens to the resistance of the lamp as the current through it increases?

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(ii) Explain your answer.

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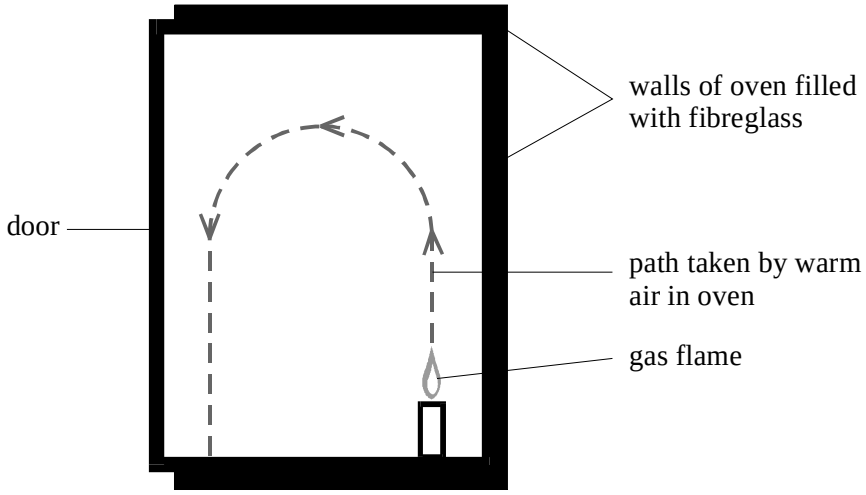
.....

(2)
(Total 12 marks)

4. The diagram shows a section through a gas oven.



Use words from the list to complete the sentences.

conduction **convection** **insulation** **radiation** **resistance**

The outside of the door gets hot because energy is transferred through

the door by .....

Energy is transferred from the gas flame to the rest of the oven by the movement of air.

This type of energy transfer is called .....

The walls of the oven are packed with fibreglass to reduce energy transfer. Energy transfer

is reduced because fibreglass provides good .....

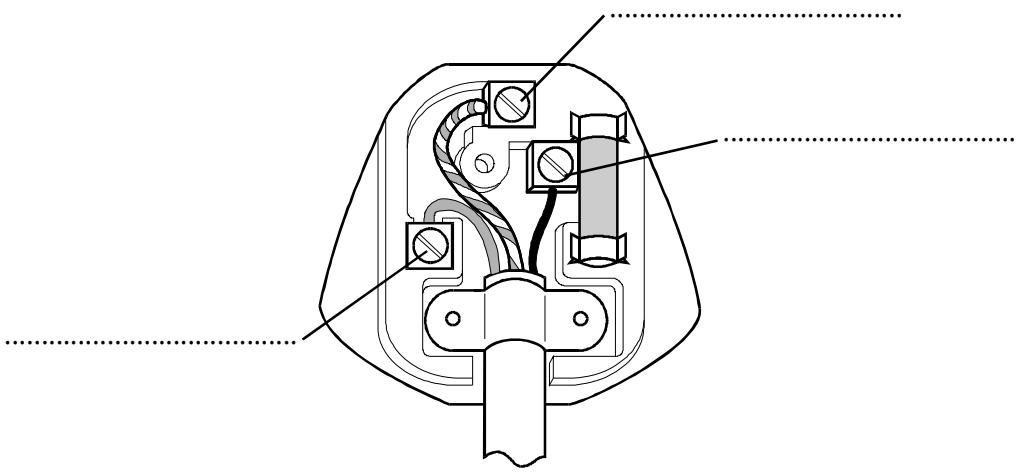
The outside of the cooker is white and shiny.

This reduces energy transfer by .....

(Total 4 marks)

5. The diagram shows the inside of a mains plug.

(a) Label the earth, live and neutral pins.



(3)

(b) (i) Explain how the earth wire and the fuse protect a person from an electric shock when there is a short circuit to the metal case of an appliance.

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(4)

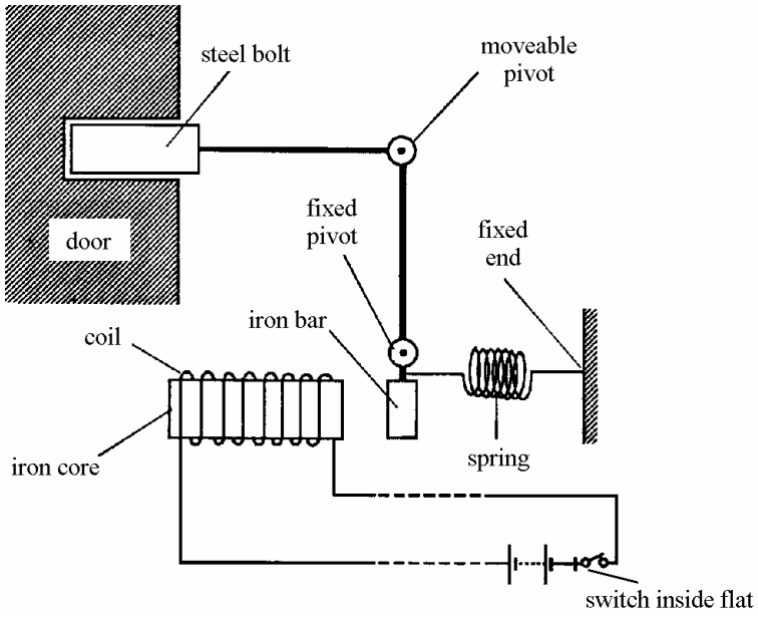
(ii) What is the most appropriate size fuse rating for a fuse in a television?

Circle the correct answer.

3 A 5 A 13 A

(1)
(Total 8 marks)

6. The diagram below shows a door lock which can be opened from a flat inside a building.



(a) Explain how the door is unlocked when the switch is closed.

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.....

.....

(4)

(b) State **two** changes which would increase the strength of the electromagnet.

1 .....

2 .....

(2)

(c) Why is the spring needed in the lock?

.....

.....

(1)

(d) The connections to the coil were accidentally reversed. Would the lock still work?

.....

Explain your answer.

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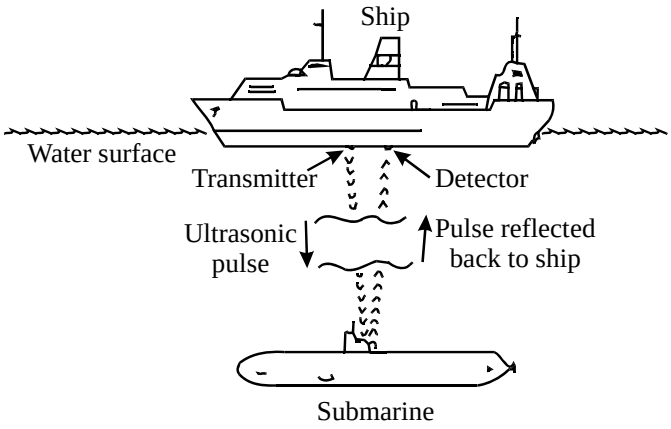
(2)
(Total 9 marks)

7. Echo sounders are used at sea to locate underwater objects, such as submarines.
The diagram below shows how an echo sounder works.



(i) What are ultrasonic waves?

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(ii) The pulse travels from the transmitter to the submarine and back to the detector. The time taken is 0.1 s.

Calculate the distance between the submarine and the ship.

.....

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.....

.....

Distance ..... m

(iii) State **one** other use for ultrasonic waves.

.....

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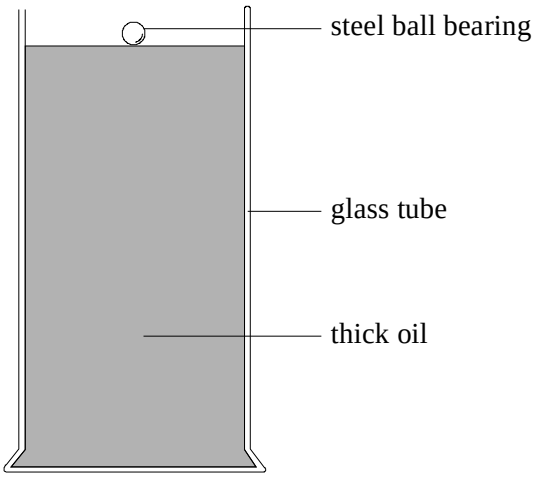
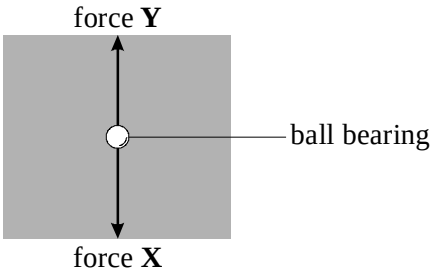
(Total 7 marks)

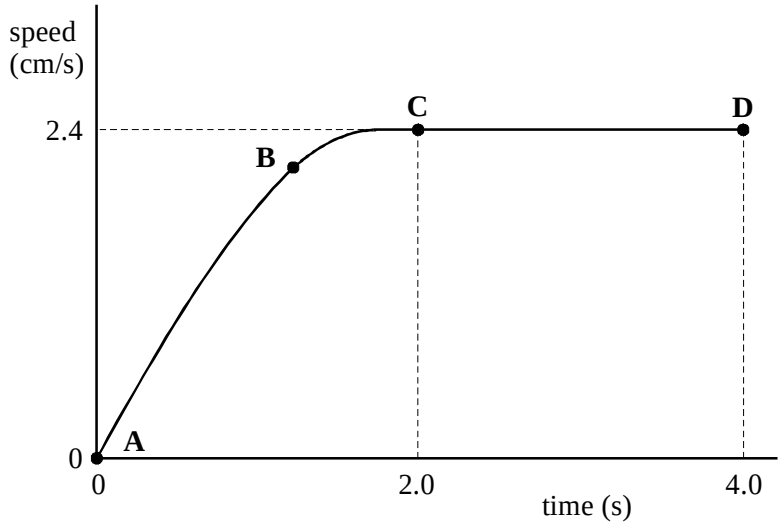
8. A student carries out an experiment with a steel ball bearing and a tube of thick oil.
The diagram shows the apparatus used.
The student releases the ball bearing and it falls through the oil.



The forces X and Y act on the ball bearing as it falls through the oil.
This is shown on the diagram.



The graph shows how the speed of the ball bearing changes as it falls through the oil.



(a) (i) What is happening to the speed of the ball bearing between points **A** and **B**?

.....

.....

(1)

Explain, in terms of forces **X** and **Y**, why this happens .....

.....

.....

.....

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(1)

(ii) What is happening to the speed of the ball bearing between points **C** and **D**?

.....

.....

(1)

Explain, in terms of forces **X** and **Y**, why this happens .....

.....

.....

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(3)

(b) Use the graph to help you to calculate the distance travelled by the ball bearing between points **C** and **D**.

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Distance .....

(2)

(Total 8 marks)

9. Gamma rays are part of the electromagnetic spectrum. They can be useful to us.

(a) Explain how the properties of gamma rays make them useful to us.

.....

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(2)

(b) Gamma rays can also be very dangerous.

Explain why gamma rays can cause damage to human beings.

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.....

(2)

(c) Give **one** difference between gamma rays and microwaves.

.....

(2)

(d) Microwaves travel at 300 000 000 m/s

(i) What speed do gamma rays travel at?

Answer ..... m/s

(1)

(ii) If the microwaves have a wavelength of 0.1 metres, calculate their frequency.

(Show your working.)

.....

.....

.....

Answer .....

(3)

(Total 10 marks)

This is the end of the paper.