ST EDWARD'S

OXFORD

16+ ENTRANCE EXAMINATION

For entry in September 2017

Physics

(Use of a calculator is permitted)

Time: 1 hour

Candidate First Name: ……

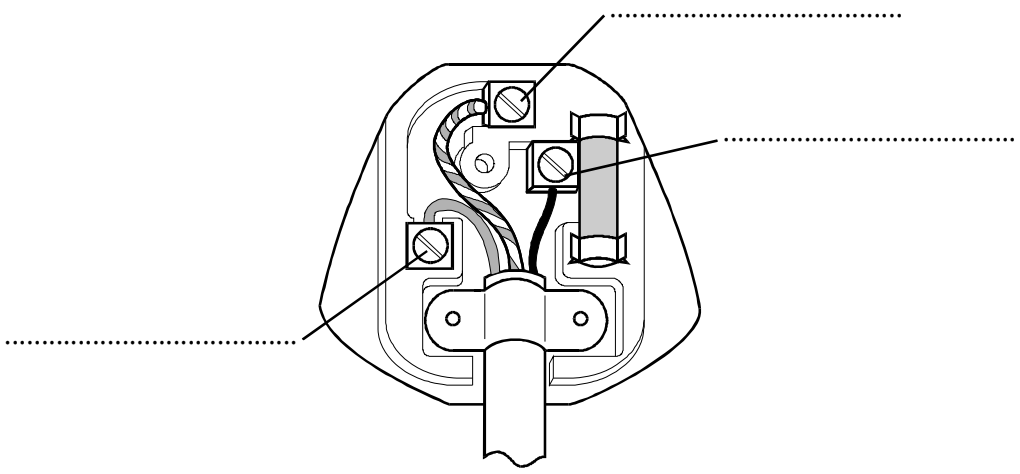
Candidate Surname: ……

For Internal Use by St Edward's School:

Question Number:	Marks Allocated:
1	/8
2	/8
3	/3
4	/5
5	/10
6	/4
7	/4
8	/9
9	/5
10	/4
TOTAL:	/60
GRADE:	

1. 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?

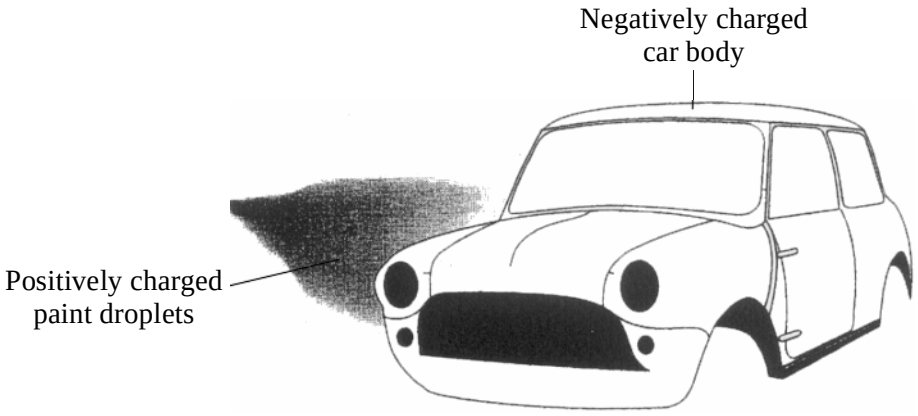
Circle the correct answer.

3 A 5 A 13 A

(1)

(Total 8 marks)

2. (a) One method of painting a car uses electrostatics. A paint spray produces paint droplets, all of which are given a positive charge. The car body is given a negative charge.



(i) Explain why it is important to give all of the paint droplets a positive charge.

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(2)

(ii) Explain why it is important to give the car body a negative charge.

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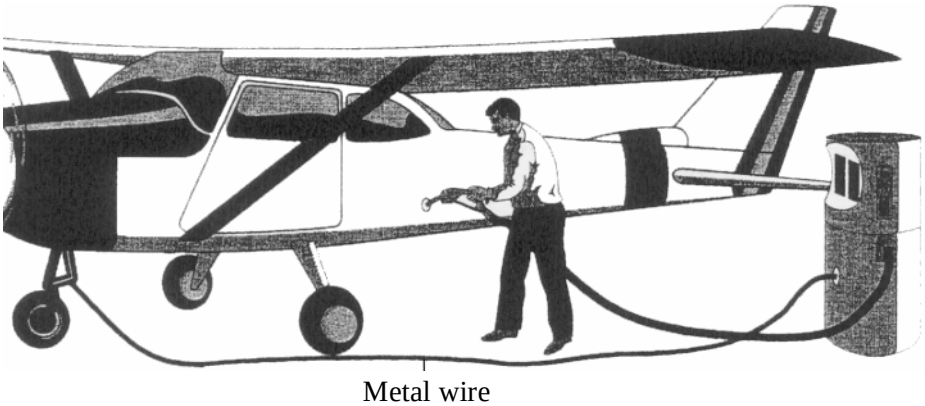
(2)

(b) The picture shows a light aircraft being refuelled after a flight.



Explain why it is important that, before refuelling starts, the aircraft is first connected to the fuel pump by a metal wire.

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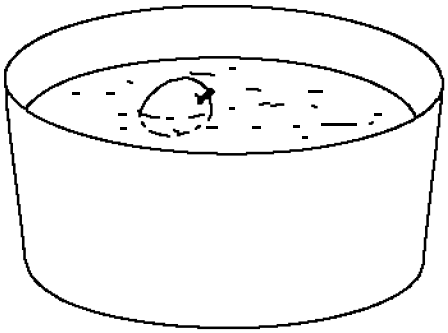
(4)
(Total 8 marks)

3.



In a science lesson, some children float an apple on some water.

One of the children says:

“The apple is not moving. That means that there cannot be any forces acting on it.”

Do you agree?

Explain your answer as fully as you can.

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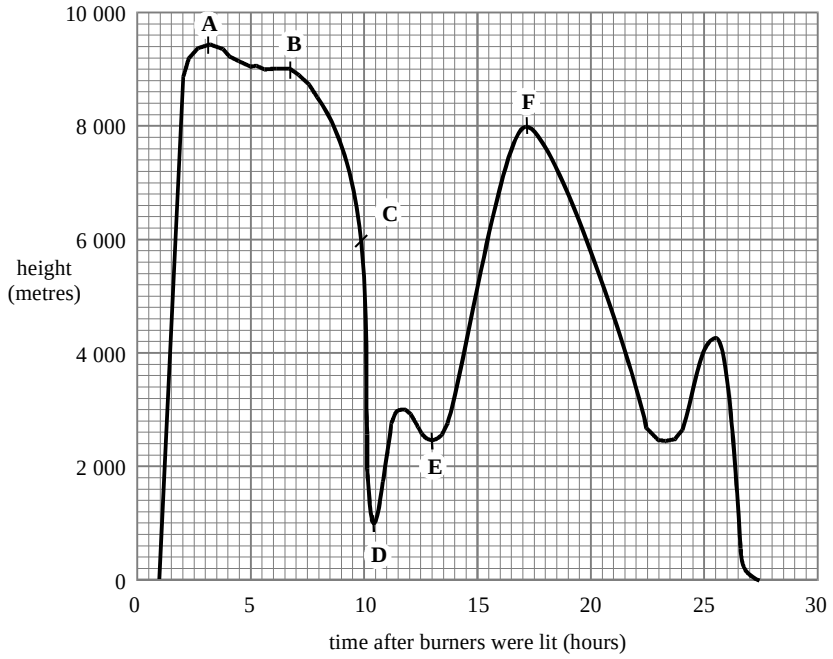
(Total 3 marks)

4. A hot air balloon called Global Challenger was used to try to break the record for travelling round the world.
The graph shows how the height of the balloon changed during the flight.



The balloon took off from Marrakesh one hour after the burners were lit and climbed rapidly.

(a) Use the graph to find:

(i) the maximum height reached.

Maximum height ..... metres.

(ii) the total time of the flight.

Total time ..... hours.

(2)

(b) Several important moments during the flight are labelled on the graph with the letters **A**, **B**, **C**, **D**, **E** and **F**.
At which of these moments did the following happen?

(i) The balloon began a slow controlled descent to 2500 metres. .....

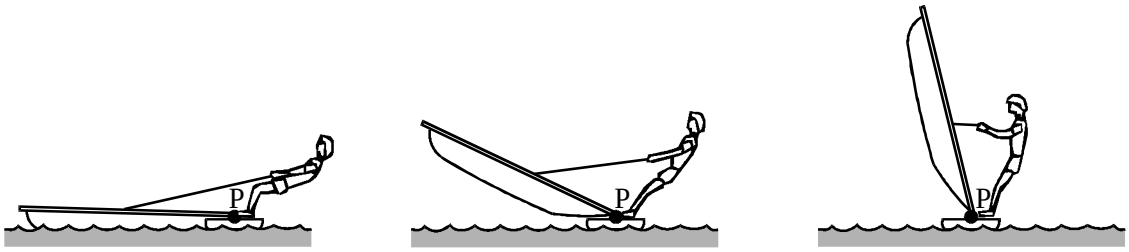
(ii) The crew threw out all the cargo on board in order to stop a very rapid descent. .....

(iii) The balloon started to descend from 9000 metres. .....

(3)

(Total 5 marks)

5. (a) The diagrams show a windsurfer pulling up the sail of a sailboard. The mast pivots at point P.



A **B** **C**

In which position, **A**, **B** or **C** must the windsurfer pull with the largest force? Give a reason for your answer.

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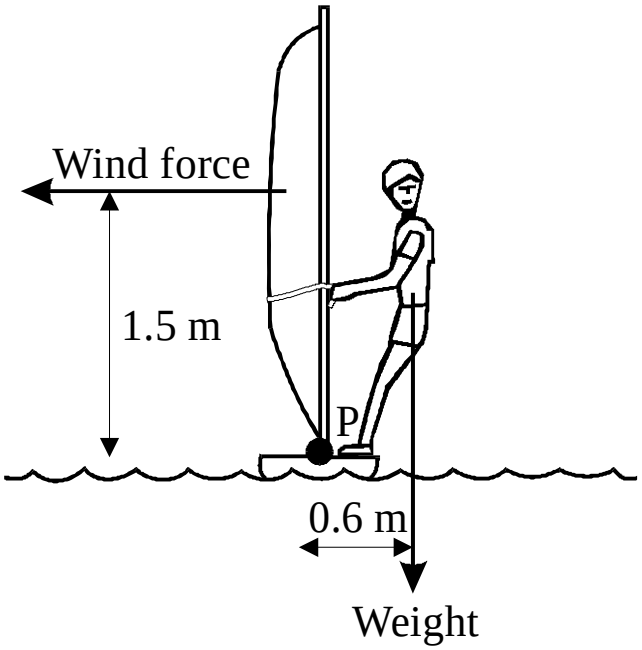
(2)

(b) Once the mast is upright, the windsurfer and the sailboard are *in equilibrium.*



(i) What does *in equilibrium* mean?

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(1)

(ii) The weight of the windsurfer is 700 newtons. Use the equation below to calculate

the moment exerted by the windsurfer on the sailboard. Show clearly how you work out your answer.

moment = force × perpendicular distance from pivot

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Moment = ... Nm

(2)

(iii) Use the relationship below to calculate the horizontal force of the wind on the sail. Show clearly how you work out your answer.

total clockwise moment = total anticlockwise moment

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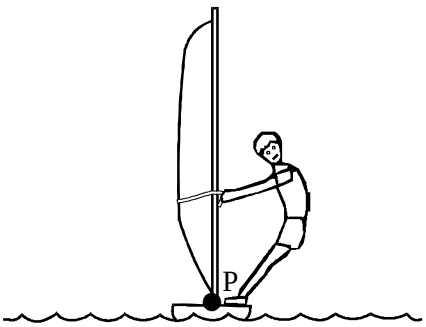
Force = ... N

(2)

(c) As the wind speed increases the windsurfer leans further out from the sailboard.



This position allows the windsurfer and sailboard to stay in equilibrium. Explain why.

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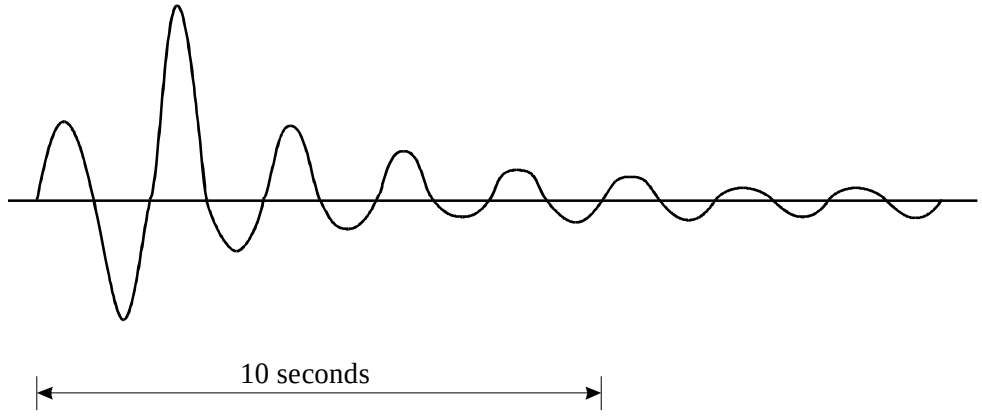
(3)

(Total 10 marks)

6. The vibration caused by a P wave travelling at 7.6 km/s has been recorded on a seismic chart.



(i) How many waves are produced in one second?

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(1)

(ii) Write down the equation which links frequency, wavelength and wave speed.

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(1)

(iii) Calculate the wavelength of the P wave. Show clearly how you work out your answer and give the unit.

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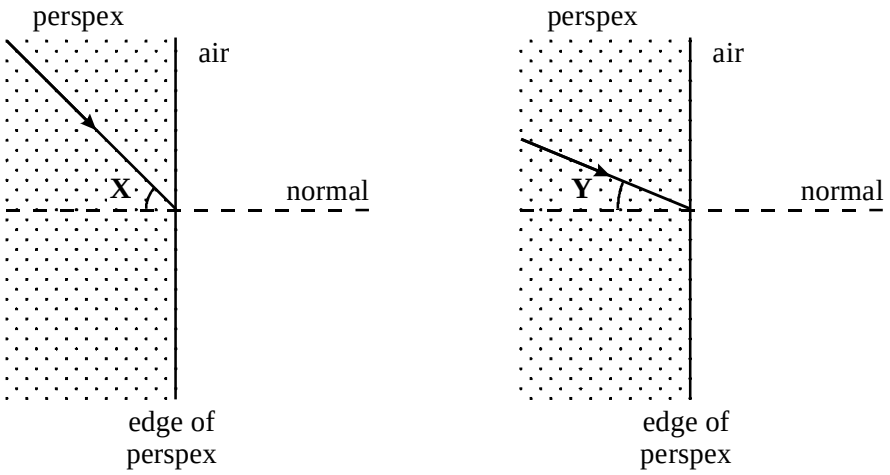
Wavelength = ...

(2)

(Total 4 marks)

7. (a) The diagrams show rays of light. They are travelling inside perspex and striking its edge.



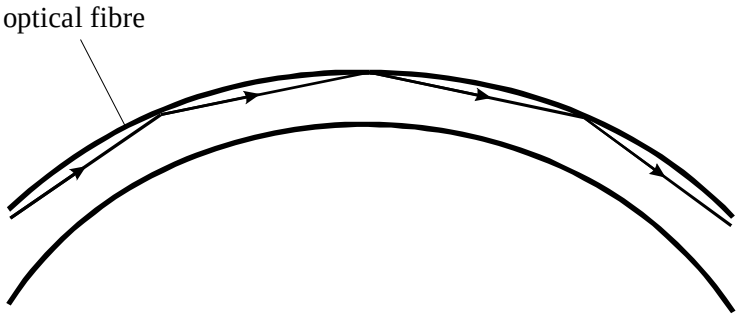
(i) Angle **X** is bigger than the critical angle for perspex. Complete the path of the ray as it leaves the edge of the perspex.

(1)

(ii) Angle **Y** is smaller than the critical angle for perspex. Complete the path of the ray as it leaves the edge of the perspex.

(1)

(b) The diagram shows a ray of light passing through an optical fibre.



Explain why the ray of light stays in the optical fibre.

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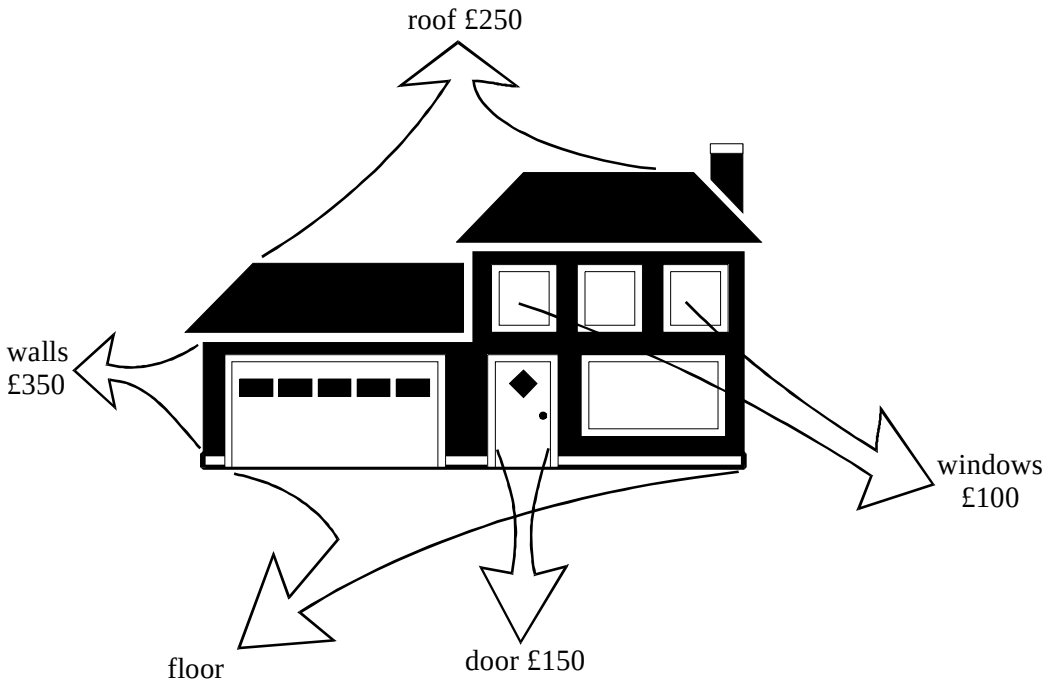
(2)

(Total 4 marks)

8. The diagram below shows a house which has **not** been insulated. The cost of the energy lost from different parts of the house during one year is shown on the diagram.



(a) The total cost of the energy lost during one year is £1000.

(i) What is the cost of the energy lost through the floor?

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(2)

(ii) Suggest one way of reducing this loss.

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(1)

(b) The table below shows how some parts of the house may be insulated to reduce energy losses. The cost of each method of insulation is also given.

WHERE LOST	COST OF ENERGY LOST PER YEAR (£)	METOD OF INSULATION	COST OF INSULATION (£)
roof	250	fibre-glass in loft	300
walls	350	foam filled cavity	800
windows	100	double glazing	4500
doors	150	draught proofing	5

(i) Which method of insulation would you install first? Explain why.

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(3)

(ii) Which method of insulation would you install last? Explain why.

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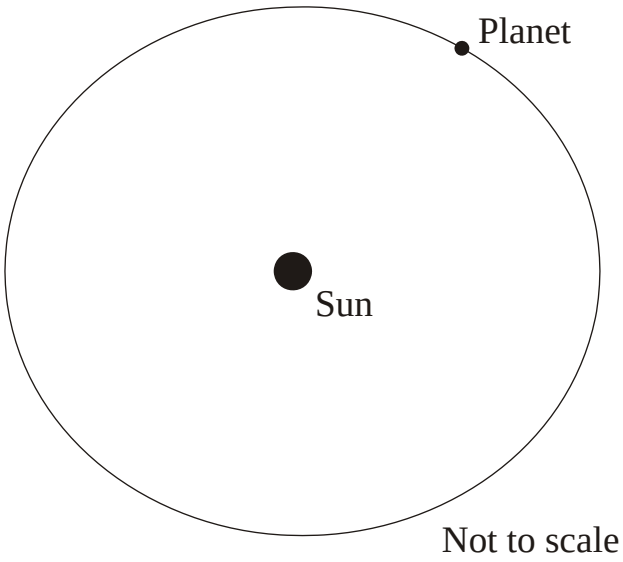
(3)

(Total 9 marks)

9. (a) The diagram shows the orbit of a planet in the Solar System. The orbit is in the shape of a slightly squashed circle.



(i) What is the name of this orbit shape?

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(1)

(ii) Complete the sentence.

The Sun is at one .....of this shape.

(1)

(iii) What provides the centripetal force which allows the planet to maintain its nearly circular orbit?

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(1)

(iv) What is the relationship between the time it takes each planet in the Solar System to complete its orbit and the planet's average distance from the Sun?

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(1)

(b) Scientists have detected an object orbiting the Sun at a distance of about 17 billion kilometres. Some scientists think that the object, named Sedna, should be classified as a planet. However, some other scientists disagree.

What do you think scientists should do?

Put a tick (✓) in the box next to your answer.

Scientists should decide by voting. ☐

Scientists should wait until they have more evidence. ☐

Give a reason for your answer.

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(1)

(Total 5 marks)

10. (a) A radioactive isotope has a half-life of 10 minutes.
At the start of an experiment, the activity of a sample of this isotope was 800 counts per second after allowing for background radiation.

Calculate how long it would be before the activity fell from 800 counts per second to 200 counts per second.

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Time ..... min.

(2)

(b) A physicist investigates a solid radioactive material. It emits alpha particles, beta particles and gamma rays.
The physicist does not touch the material.

Explain why the alpha particles are less dangerous than the beta particles and gamma rays.

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(2)

(Total 4 marks)