# ST EDWARD'S
# OXFORD




Lower Sixth Entrance Assessment

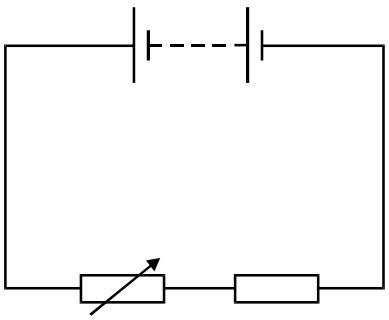
November 2013

Physics

1 hour

Candidate Name: …….

**1.** (a) The diagram shows a simple circuit. Add an ammeter and a voltmeter to the circuit to show how to measure the current through the fixed resistor and the voltage across it.

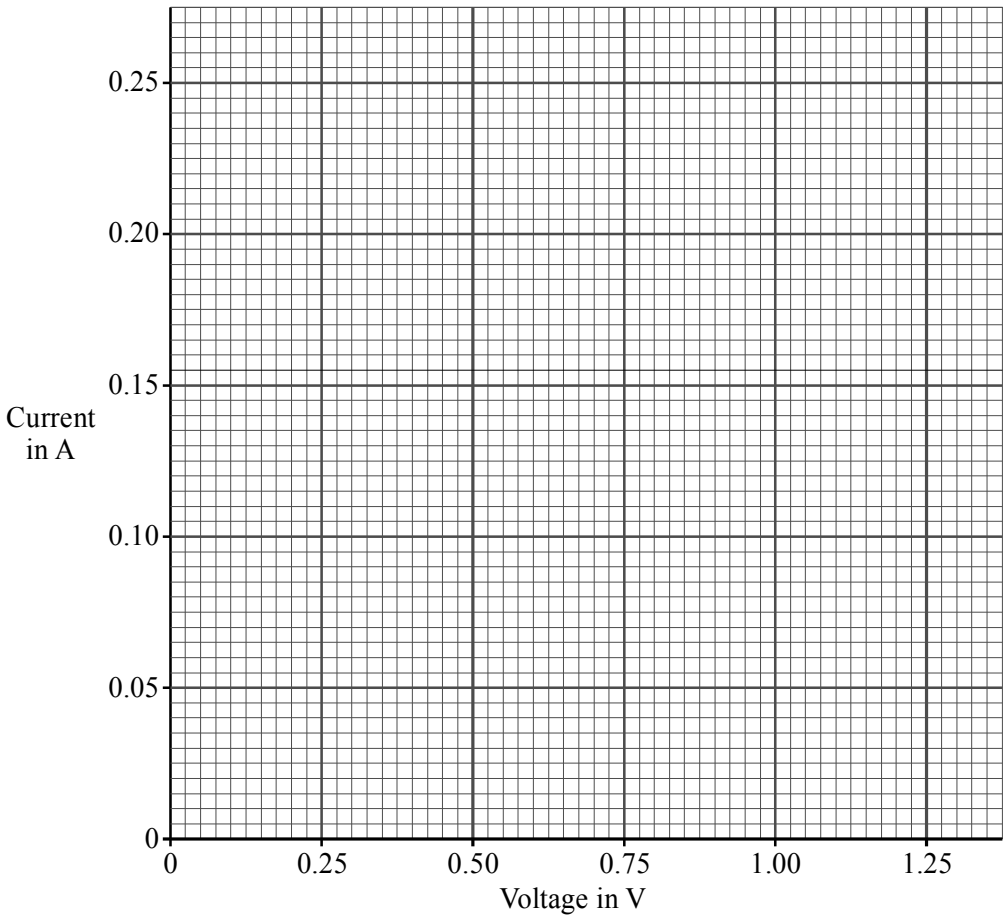


**(2)**

(b) An experiment using a circuit like the one above was set up. The following results were obtained when the resistance of the variable resistor was decreased.

(i) Draw a graph of the results below.

| **Voltage across fixed resistor in volts** | **Current in amps** |
|---|---|
| 0.50 | 0.10 |
| 0.75 | 0.15 |
| 1.00 | 0.20 |
| 1.25 | 0.25 |




**(2)**

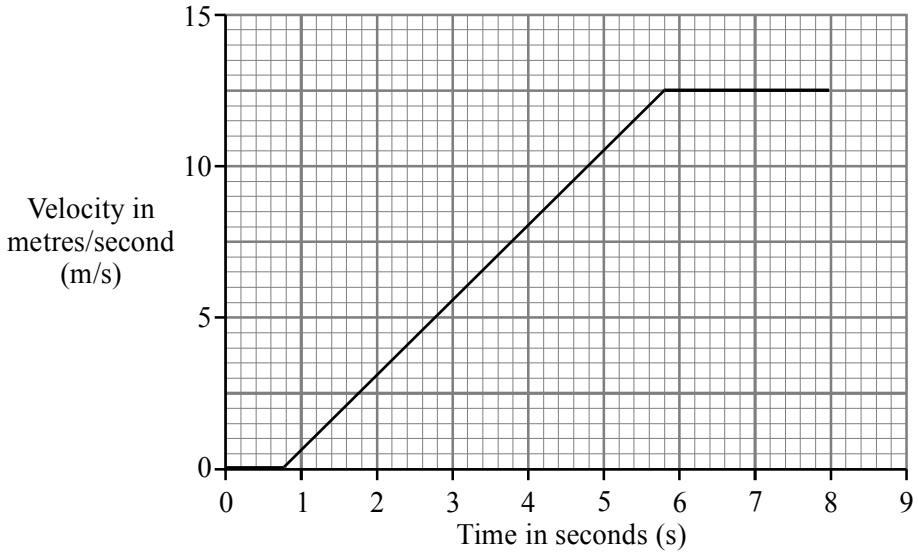
(ii) Use the graph to find the voltage when the current is 0.05 A.

Voltage =..... V

**(1)**

**(Total 5 marks)**

**2.** A car travelling along a straight road has to stop and wait at red traffic lights. The graph shows how the velocity of the car changes after the traffic lights turn green.




(a) Between the traffic lights changing to green and the car starting to move there is a time delay. This is called the reaction time. Write down **one** factor that could affect the driver's reaction time.

.....

**(1)**

(b) Calculate the distance the car travels while accelerating. Show clearly how you work out your answer.

.....

.....

Distance = .....metres

**(3)**

(c) Calculate the acceleration of the car. Show clearly how you work out your final answer and give the units.

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Acceleration = .....

**(4)**

(d) The mass of the car is 900 kg.

(i) Write down the equation that links acceleration, force and mass.

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**(1)**

(ii) Calculate the force used to accelerate the car. Show clearly how you work out your final answer.

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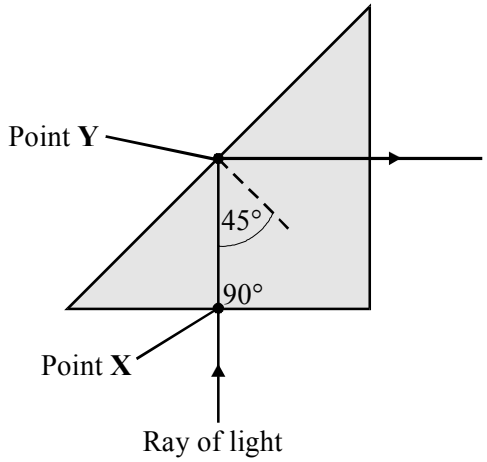
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Force = ..... newtons

**(2)**

**(Total 11 marks)**

**3.** The diagram shows a glass prism.




(i) Explain why refraction has **not** occurred at point **X**.

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**(1)**

(ii) (A) Give the full name for the process which has occurred at point **Y**.

.....

**(1)**

(B) Explain why this process has occurred.

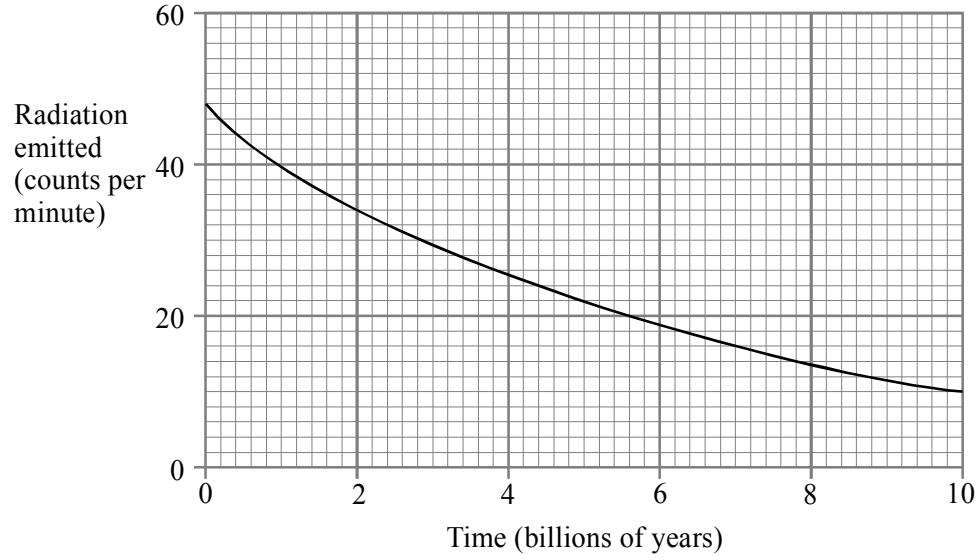
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**(2)**
**(Total 4 marks)**

**4.** The graph shows how the amount of radiation emitted by a sample of the radionuclide uranium 238 ($U^{238}$) changes as time passes.




(a) What is the half-life of uranium 238 ($U^{238}$)?
(You should show how you obtained your answer. You may do this on the graph if you wish.)

.....

.....

Answer .....

**(3)**

(b) What fraction (or percentage) of the uranium 238 ($U^{238}$) atoms will have decayed after 9 billion years?

.....

**(1)**

(c) Uranium 238 ($U^{238}$) decays through a long series of intermediate radionuclides to stable atoms of the isotope lead 206 (Pb).

A sample of igneous rock contains 3 atoms of uranium 238 ($U^{238}$) for every atom of lead 206 ($Pb^{206}$).

(i) The intermediate radionuclides are not important when estimating the age of the rock. Explain why.

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**(1)**

(ii) Estimate the age of the rock.
(You should explain how you obtained your answer.)

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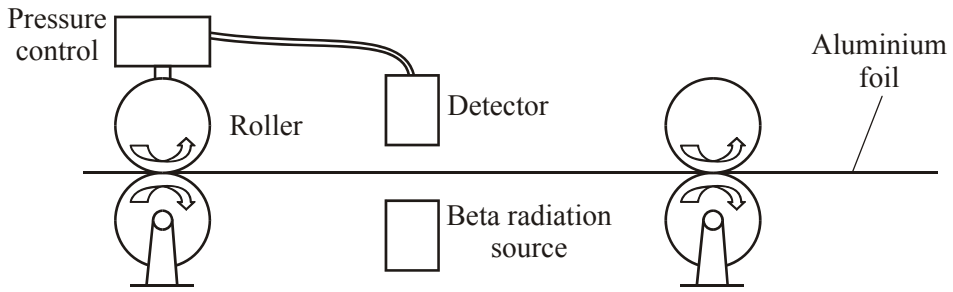
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Answer ..... billion years

**(3)**
**(Total 8 marks)**

**5.** The diagram shows how the thickness of aluminium foil is controlled. The thicker the aluminium foil, the more radiation it absorbs.




(a) The designers used a beta radiation source for this control system.

(i) Why would an alpha radiation source be unsuitable in this control system?

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.....

**(1)**

(ii) Why would a gamma radiation source be unsuitable in this control system?

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**(1)**

(b) The substance used in the beta radiation source is radioactive.

(i) Why are some atoms radioactive?

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**(1)**

(ii) Explain why radiation is dangerous to humans.

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**(2)**
**(Total 5 marks)**

**6.** A cyclist accelerates from a set of traffic lights.

The driving force of the back tyre on the ground is 250 N.

(a) How much work is done by this force when the cyclist travels 5 metres?
(Show your working.)

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Answer ..... joules (J)

**(2)**

(b) What happens to the energy transferred by this force?

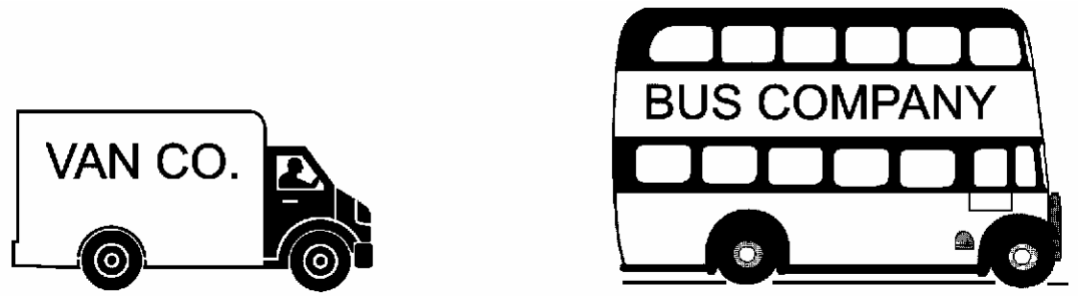
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**(2)**
**(Total 4 marks)**

**7.** **'SPEED KILLS' -** was the heading of an advertising campaign. The scientific reason for this is that energy is transferred from the vehicle to the person it knocks down.




(a) The bus and the van are travelling at the same speed. The bus is more likely to cause more harm to a person who is knocked down than the van would. Explain why.

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**(2)**

(b) A car and its passengers have a mass of 1200 kg. It is travelling at 12 m/s.

(i) Calculate the increase in kinetic energy when the car increases its speed to 18 m/s.

Show clearly how you work out your answer and give the unit.

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Increase in kinetic energy = .....

**(5)**

(ii) Explain why the increase in kinetic energy is much greater than the increase in speed.

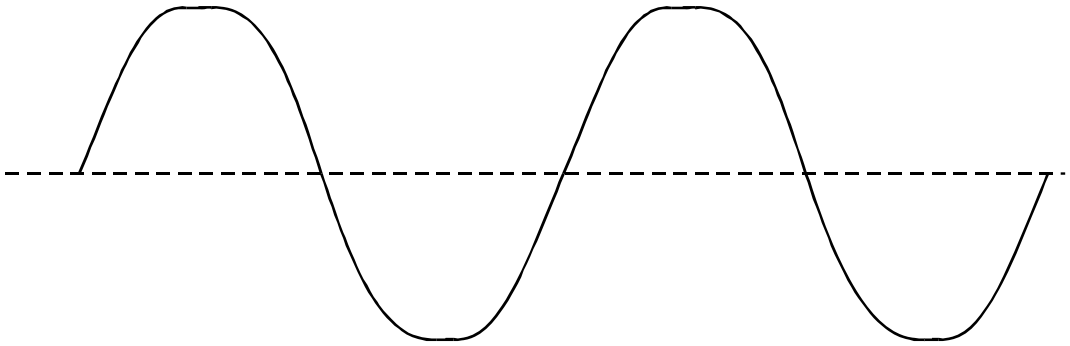
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**(1)**
**(Total 8 marks)**

**8.** The diagram represents part of an electromagnetic wave.



(a) Mark on the wave:

(i) a wavelength;

**(1)**

(ii) the amplitude of the wave.

**(1)**

(b) The frequency of a wave is the number of waves produced each second.

What are the units of frequency?

.....

**(1)**

(c) Complete the three missing names from the electromagnetic spectrum.

| | | | | | | |
|---|---|---|---|---|---|---|
| gamma rays | | ultraviolet | visible light | | | radio waves |

**(3)**

(d) What part of the electromagnetic spectrum:

(i) harms your skin unless it is protected by sun-screen creams;

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**(1)**

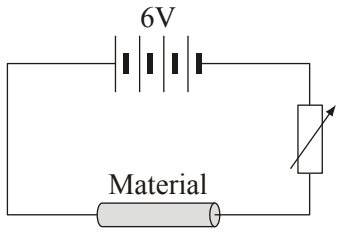
(ii) is used to destroy cancer cells?

.....

**(1)**

**(Total 8 marks)**

**9.** (a) The diagram shows the circuit used to investigate the resistance of a material. The diagram is incomplete; the ammeter and voltmeter are missing.




(i) Draw the symbols for the ammeter and voltmeter on the diagram in the correct places.

**(2)**

(ii) How can the current through the material be changed?

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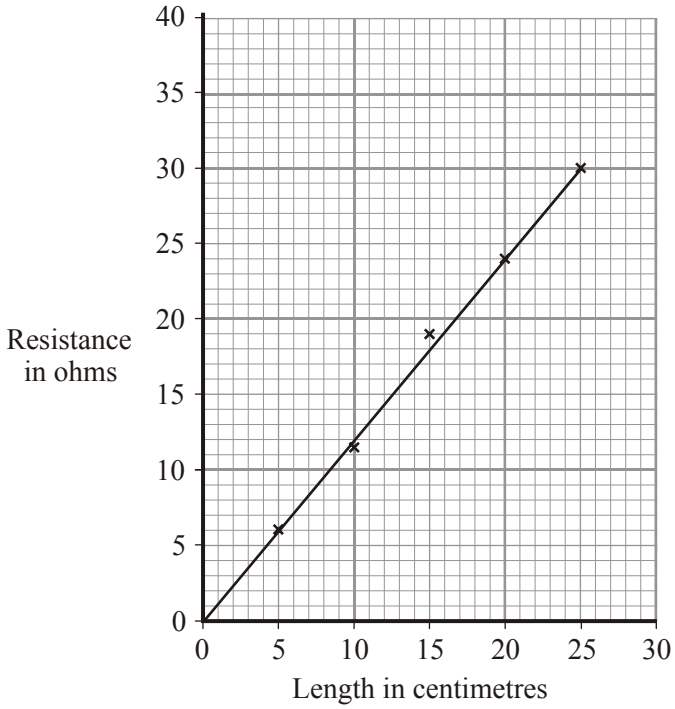
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**(1)**

(b) The material, called conducting putty, is rolled into cylinders of different lengths but with equal thicknesses.

**Graph 1** shows how the resistance changes with length.

**Graph 1**




(i) Why has the data been shown as a line graph rather than a bar chart?

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.....

**(1)**

(ii) The current through a 30 cm length of conducting putty was 0.15 A.

Use **Graph 1** to find the resistance of a 30 cm length of conducting putty.

Resistance = ..... ohms

**(1)**

(iii) Use your answer to (b)(ii) and the equation in the box to calculate the potential difference across a 30 cm length of conducting putty.

| potential difference = current × resistance |
|---|

Show clearly how you work out your answer.

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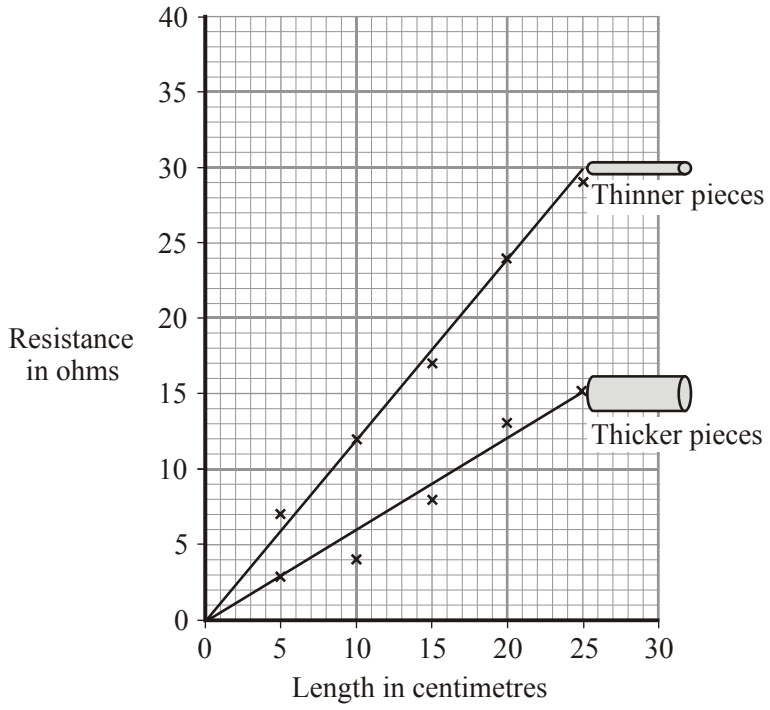
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Potential difference = ..... volts

**(2)**

(c) A second set of data was obtained using thicker pieces of conducting putty. Both sets of results are shown in **Graph 2.**

**Graph 2**



(i) What is the relationship between the resistance and the thickness of the conducting putty?

.....

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**(1)**

(ii) Name **one** error that may have reduced the accuracy of the results.

.....

**(1)**

(iii) How could the reliability of the data have been improved?

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**(1)**

**(Total 10 marks)**