

Write your name here

Surname	Other names
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**Pearson Edexcel
Level 3 GCE**

Centre Number

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Candidate Number

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Physics

Advanced Subsidiary Paper 1: Core Physics I

Sample Assessment Materials for first teaching September 2015
Time: 1 hour 30 minutes

Paper Reference
8PH0/01

You may need the Formulae Sheet, a calculator, protractor and a ruler.

Total Marks

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Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions in Sections A and B.
- Answer the questions in the spaces provided – *there may be more space than you need.*

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- You may use a scientific calculator.
- In questions marked with an *, marks will be awarded for your ability to structure your answer logically, showing how the points that you make are related or how they follow on from each other where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- You are advised to show your working in calculations including units where appropriate.

Turn over ►

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SECTION A**Answer ALL questions.**

All multiple choice questions must be answered with a cross \boxtimes in the box for the correct answer from A to D. If you change your mind about an answer, put a line through the box \boxtimes and then mark your new answer with a cross \boxtimes .

1 Which of the following is a correct statement?

- A charge is a base quantity
- B velocity is a base quantity
- C mass is a derived quantity
- D resistance is a derived quantity

(Total for Question 1 = 1 mark)

2 Which of the following is an equivalent unit to the newton?

- A kg m s^{-1}
- B kg m s^{-2}
- C $\text{kg m}^{-1} \text{s}^{-2}$
- D $\text{kg m}^2 \text{s}^{-2}$

(Total for Question 2 = 1 mark)

3 Which of the following is a scalar quantity?

- A displacement
- B force
- C weight
- D work

(Total for Question 3 = 1 mark)

4 Which of the following quantities has the same units as the area beneath an acceleration-time graph?

- A acceleration
- B force
- C momentum
- D velocity

(Total for Question 4 = 1 mark)

5 An object is acted on by a vertical force of 25 N and a horizontal force of 34 N.

The angle to the horizontal of the resultant force is given by

- A $\cos^{-1}(25/34)$
- B $\sin^{-1}(34/25)$
- C $\tan^{-1}(25/34)$
- D $\tan^{-1}(34/25)$

(Total for Question 5 = 1 mark)

6 Which of the following statements about the forces in a Newton's Third Law pair is **not** correct?

The forces

- A act along the same line.
- B act on the same body.
- C are equal in magnitude.
- D are of the same type.

(Total for Question 6 = 1 mark)

7 A potential difference is applied to a wire.

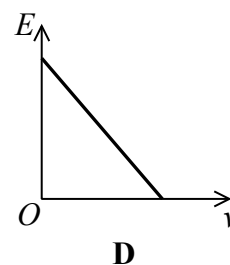
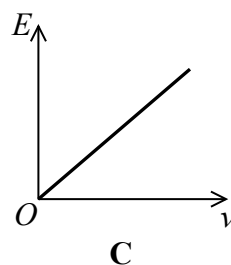
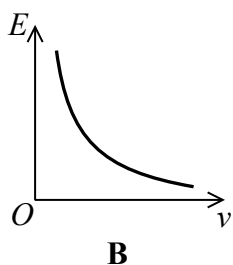
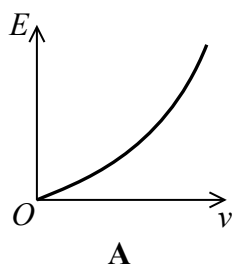
The current in the wire

- A depends only on the potential difference applied.
- B depends only on the resistance of the wire.
- C depends on both the potential difference and the resistance of the wire.
- D does not depend on the potential difference or the resistance of the wire.

(Total for Question 7 = 1 mark)

8 A ball is dropped from a student's hand and falls to the ground.

Which graph correctly shows the variation of kinetic energy E with velocity v for the ball?



- A
- B
- C
- D

(Total for Question 8 = 1 mark)

9 An electric motor takes 45.0 s to lift a mass of 800 kg through a vertical height of 14.0 m. The potential difference across the motor is 230 V and the current is 13.0 A.

Calculate the efficiency of the motor.

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Efficiency =

(Total for Question 9 = 3 marks)

10 The photograph shows cars travelling on a straight section of a motorway.

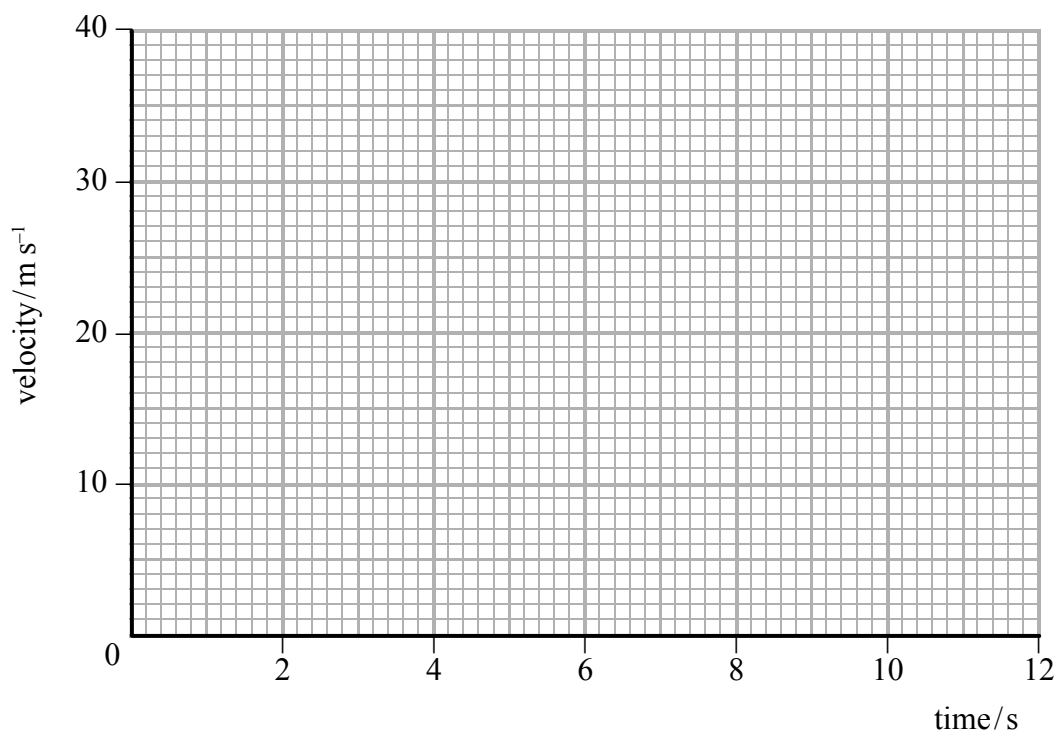
The maximum speed limit on a motorway in the U.K. is 31 m s^{-1} .



(source: <http://tracksideviews.com/tag/motorway/>)

- (a) A car is travelling along the motorway at 31 m s^{-1} . The driver sees stationary traffic 180 m ahead. After 0.6 s the driver reacts by applying a constant braking force that stops the car in 10 s.
- (i) Draw a velocity-time graph of the car's motion, from the instant the driver sees the stationary traffic until the car stops.

(1)



(ii) Analyse the data to determine whether the car stops without colliding with the stationary traffic.

(2)

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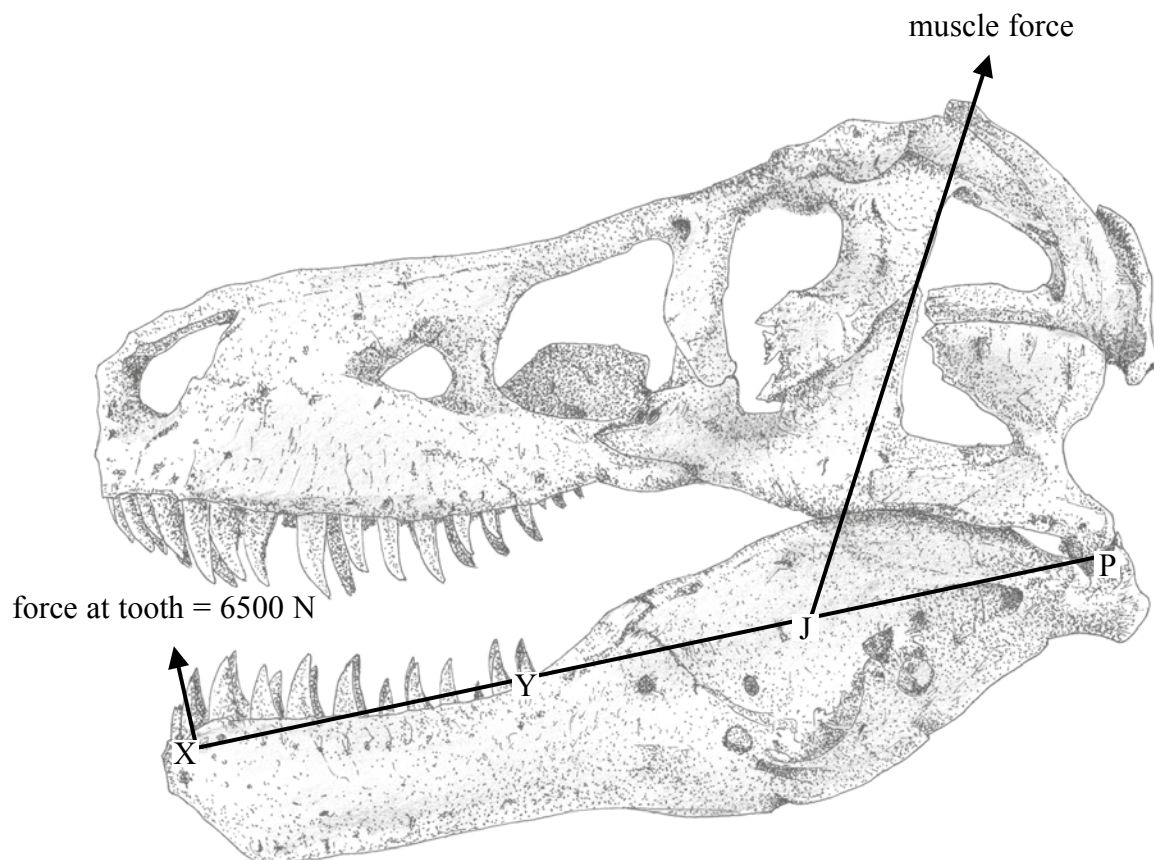
TURN OVER FOR QUESTION 10(b)



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TURN OVER FOR QUESTION 11

- 11 Extinct animals can be studied by using their fossils. 70-million-year-old fossils from the *Tyrannosaurus rex* and *Triceratops* dinosaurs show that a *Triceratops* was sometimes eaten by a *Tyrannosaurus rex*.

The diagram shows a *Tyrannosaurus rex* skull.



© Markwitton.com

On the diagram, the position of the main biting muscle is indicated by the line labelled 'muscle force'. The muscle is connected to the jaw at point J. This produces a moment about point P where the jaw is hinged. Teeth marks found in fossilised *Triceratops* bones show that the force exerted by a tooth at the front of the jaw X could reach 6500 N.

The skull is drawn to a scale of 1 to 10. The force arrows are **not** drawn to scale.

(a) Take measurements from the diagram to determine the size of the muscle force when the force exerted by the tooth at X is 6500 N.

(5)

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Muscle force =

(b) The length of a tooth from another dinosaur is approximately 10 cm.

Scientist A measures this length with a metre rule, and scientist B measures this length with callipers.

Scientist B claims that his measurement will produce a more accurate value for the length of the tooth.

Comment on the claim made by scientist B.

(3)

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(Total for Question 11 = 8 marks)

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12 A potential difference is applied across the metal filament of a light bulb and charge flows.

(a) By referring to the mean drift velocity of the electrons, explain what happens to the current in the metal filament if the potential difference is unchanged and the temperature of the metal increases.

(3)

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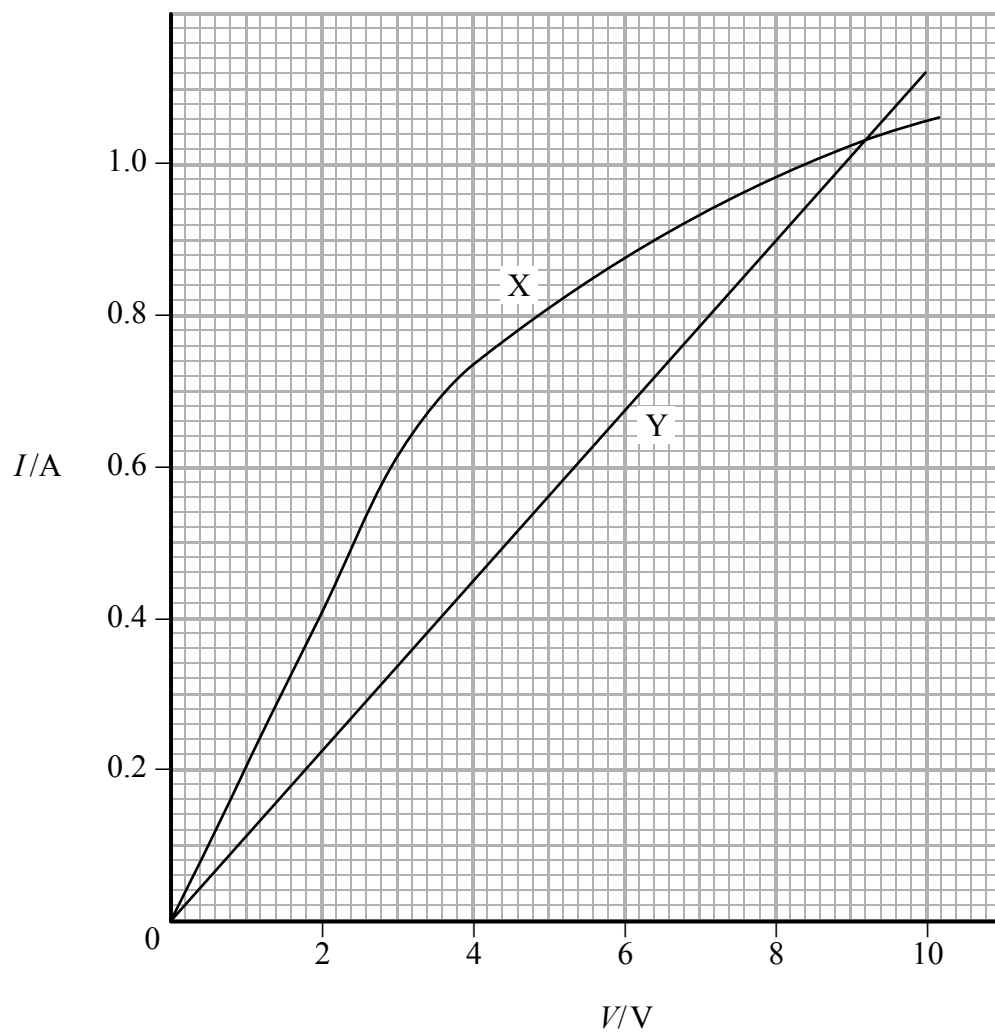
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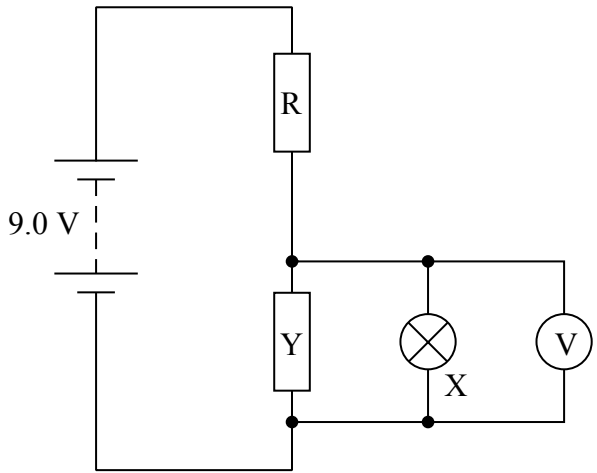
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(b) The graph shows the variation of current I with potential difference V for two electrical components X and Y.

X is a filament bulb and Y is a fixed resistor.



A potential divider circuit consisting of components X and Y is connected to a 9.0 V supply in series with a fixed resistor R as shown. The supply has a negligible internal resistance.



The reading on the voltmeter is 3.0 V.

- (i) Determine the current in the fixed resistor R. (2)

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Current in the fixed resistor R =

- (ii) Component X is removed from the circuit.
Explain, without further calculation, how this would change the voltmeter reading. (3)

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(Total for Question 12 = 8 marks)

13 A laboratory technician found a reel of resistance wire, without a label.

- (a) In order to determine the type of wire on the reel she recorded the following measurements.

Length of wire $l = 70.7 \text{ cm} \pm 0.2 \text{ cm}$

Diameter of wire $d = 1.82 \text{ mm} \pm 0.02 \text{ mm}$

Potential difference across wire $V = 1.50 \text{ V}$

Current through wire $I = 4.11 \text{ A}$

The uncertainty in the measurements of V and I is negligible.

Calculate the resistivity of the wire.

(3)

Resistivity =

- (b) The technician used the internet to find values for the resistivity of the different wires available in the laboratory. She recorded these values in a table.

Wire	Resistivity / $\times 10^{-8} \Omega\text{m}$
Constantan	49.0
Nichrome	125
Kanthal	139

Use the uncertainties in the measurements to explain whether the technician could conclude which type of wire was on the reel.

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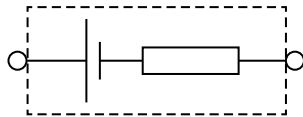
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(Total for Question 13 = 7 marks)

14 A student is asked to determine the e.m.f. and internal resistance of a cell using standard laboratory apparatus and a graphical method.

(a) The diagram below shows a cell with internal resistance. Add to the diagram to show the circuit she could use.

(2)



(b) Explain how she should determine the e.m.f. and internal resistance of the cell. Your answer should include a sketch of the graph.

(5)

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(Total for Question 14 = 7 marks)

15 The photograph shows a small plastic container, its lid and some pellets of frozen carbon dioxide, known as dry ice. When at room temperature the dry ice gradually changes state directly from solid to gas.



Dry ice is placed in the container and the lid is put on. The container is turned upside down and placed on the floor. After a few minutes the pressure of the gas causes the container to fly into the air, leaving the lid and some dry ice behind.

A student investigated the motion of the container.

- (a) The student obtained measurements of the maximum height reached by the container for a particular initial mass of dry ice. The student determined that the maximum height was 2.5 m.

Calculate the initial speed of the container.

(2)

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Initial speed =

- (b) The student investigated how the maximum horizontal distance travelled by the container varies with launch angle.

Calculate the maximum horizontal distance the container would travel if launched at an initial speed of 6.5 m s^{-1} at an angle of 20° to the vertical.

(5)

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Maximum horizontal distance =

(c) The student added dry ice to the container again and placed it on its side on the floor. When the lid was forced off, the container moved forward at a speed of 5.5 m s^{-1} and the lid moved backwards. The pellets of dry ice remained in their original position.

mass of container = 4.3 g

mass of lid = 1.6 g

(i) Calculate the initial speed of the lid.

(3)

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Initial speed of lid =

(ii) Explain why the dry ice remained at the original position.

(2)

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(Total for Question 15 = 12 marks)

TOTAL FOR SECTION A = 60 MARKS

SECTION B**Answer ALL questions.**

- 16** Fibre optic cables are made from strands of optically pure glass as thin as a human hair. Although they are used in a wide range of applications, they are particularly important in communication systems.

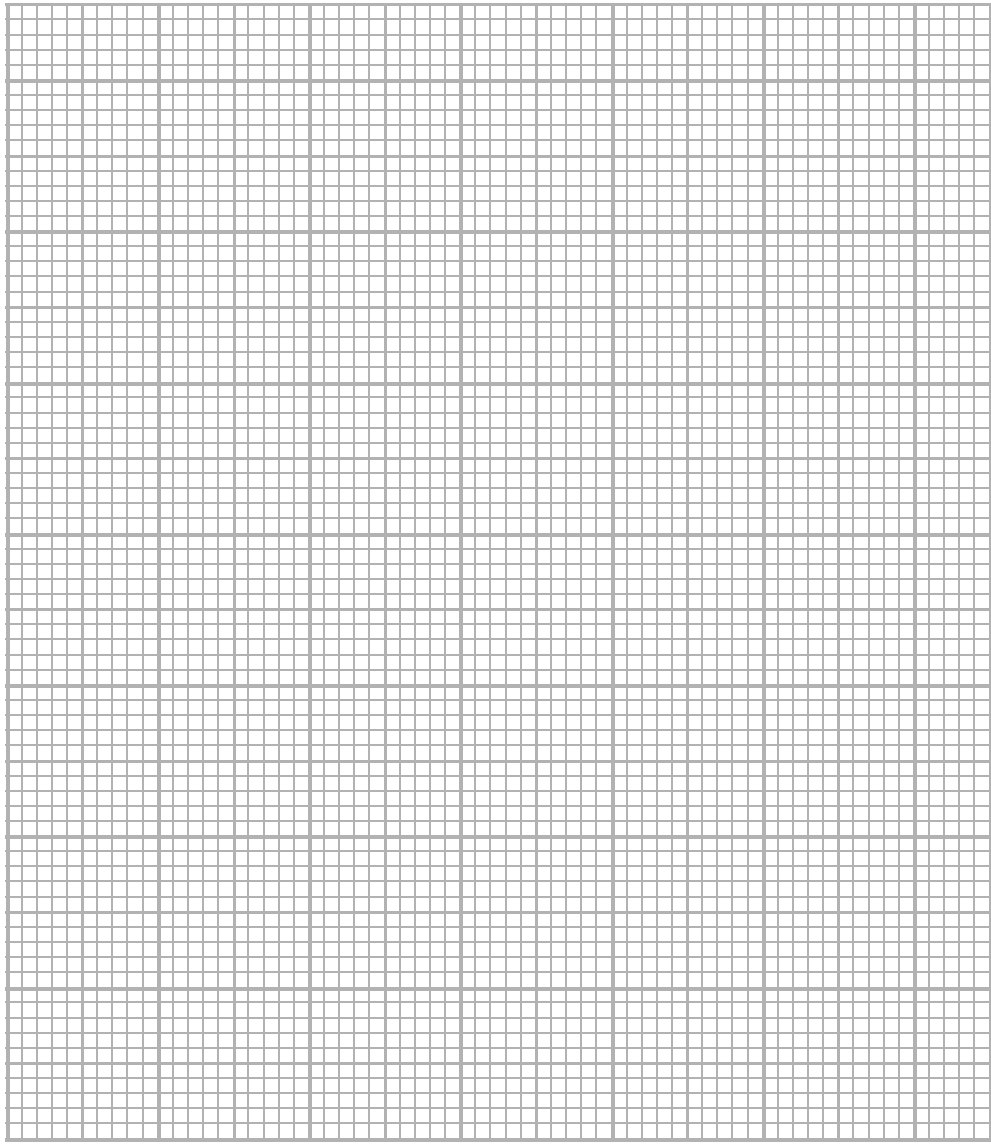
Bending an optical fibre can cause the fibre to break.

- (a) The table shows data collected when the optical fibre is bent. Theory suggests that the strain in the fibre is inversely proportional to the bending radius.

Radius/mm	% strain
2	3.15
3	2.10
7	0.90
9	0.70
10	0.65

- (i) Use the data to draw a graph to determine whether the suggested relationship is correct.

(4)



(ii) The fibre can fail under repeated strains in excess of 2.4%.

Use your graph to estimate the smallest bending radius that the fibre should be subjected to.

(2)

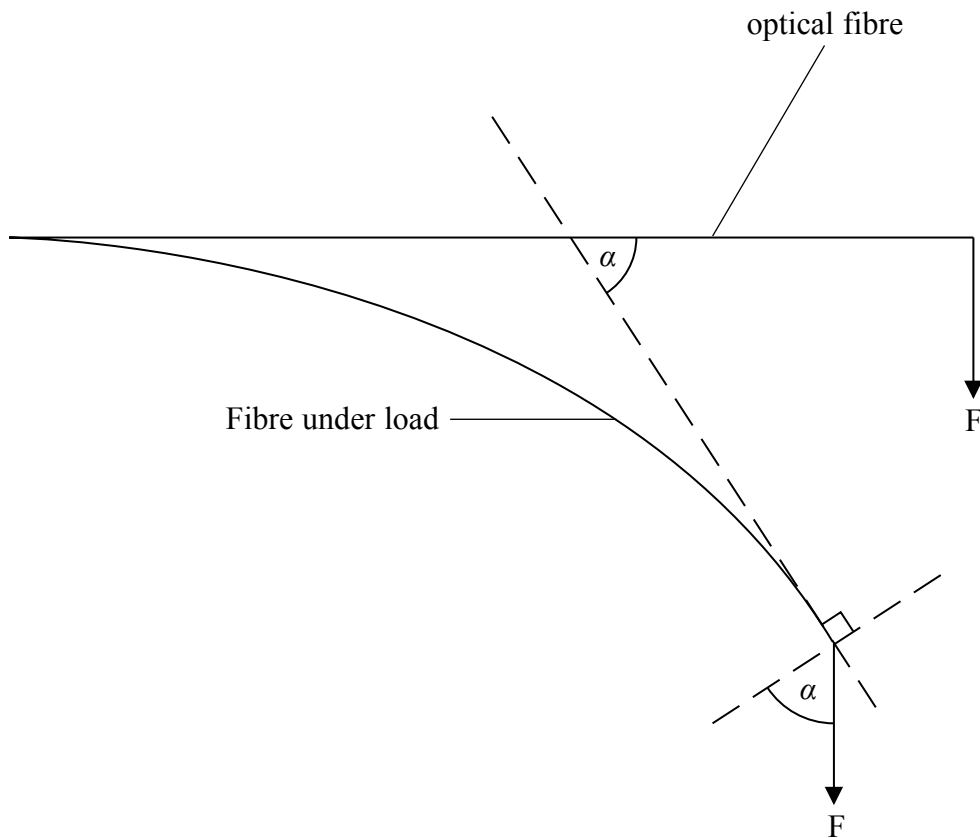
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(b) The diagram shows an optical fibre. A small force F is applied to the end of the optical fibre causing it to bend through an angle α .



Explain why the stress parallel to the surface of the fibre increases as the fibre bends.

(4)

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(Total for Question 16 = 10 marks)

17 An 8 W, 230 V energy-efficient light bulb is used as a reading lamp.

(a) Calculate the number of electrons passing a point in the reading lamp circuit in one hour.

(4)

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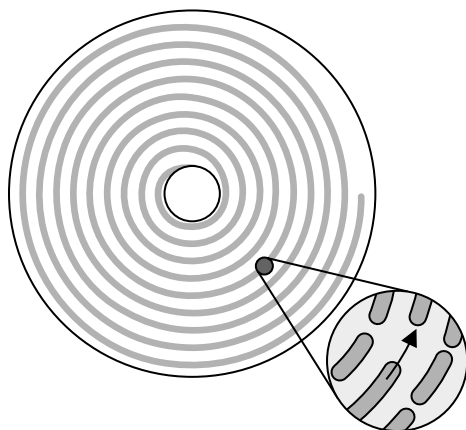
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*(b) The light from the lamp is reflected from the surface of a CD, which consists of a spiral track of elongated bumps.



CD surface showing spiral track of bumps with a smooth reflective surface in between.

(Source: <http://gantisreerajiv.blogspot.co.uk/2012/04/you-cant-imagine-world-if-there-are.html>.)

A physics student notices that although the light from the lamp is white, different colours are seen in the reflected light. He suggests that the colours are produced when diffraction occurs at the surface of the CD.

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