Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | Candidate Number

Physics

Unit P3: Applications of Physics

Foundation Tier

Monday 23 June 2014 – Morning
Time: 1 hour

Paper Reference
5PH3F/01

You must have:
Calculator, ruler

Total Marks

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.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 4 3 4 2 3 A 0 1 2 4

PEARSON

FORMULAE

You may find the following formulae useful.

power of lens = $\dfrac{1}{\text{focal length}}$

current = number of particles per second × charge on each particle $\quad I = Nq$

frequency = $\dfrac{1}{\text{time period}}$ $\quad f = \dfrac{1}{T}$

The relationship between temperature and volume for a gas $\quad V_1 = \dfrac{V_2 T_1}{T_2}$

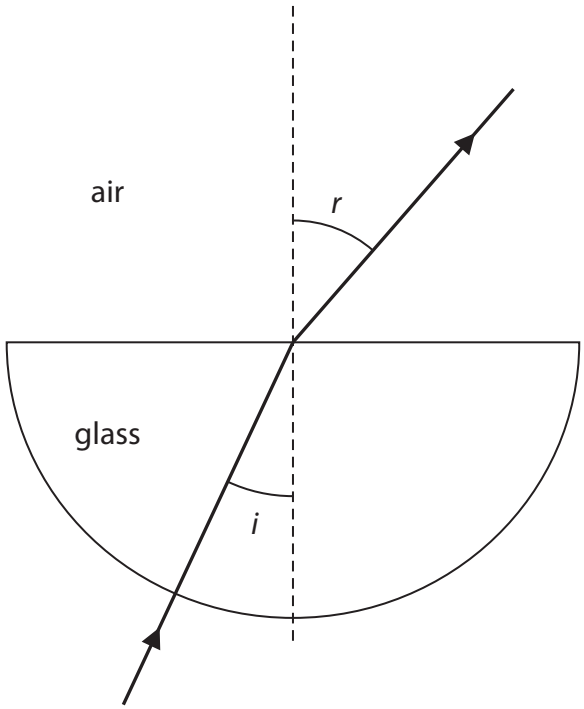
The relationship between volume and pressure for a gas $\quad V_1 P_1 = V_2 P_2$

Answer ALL questions

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Light

1 A student investigates the way light passes through glass.
The diagram shows the path of a ray of light through the glass.



(a) State the scientific name for the dotted line in the diagram.

(1)

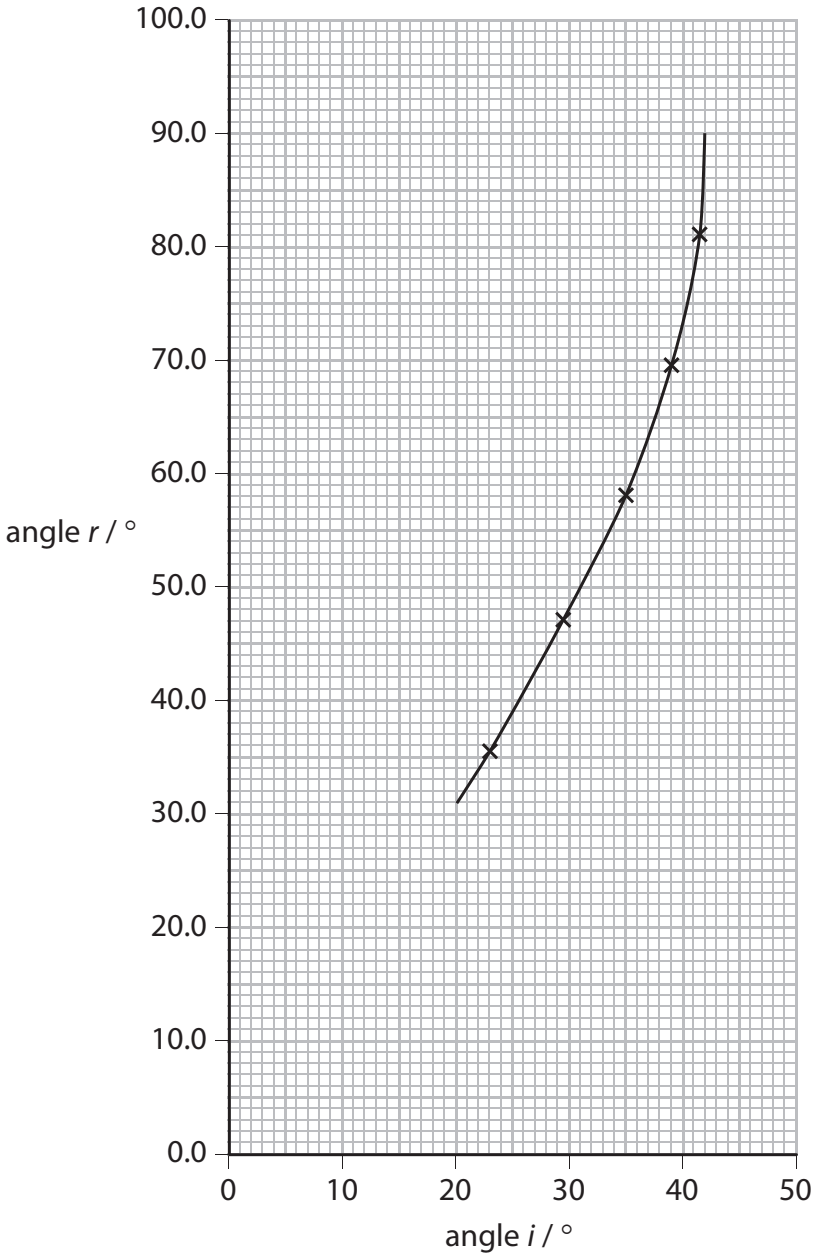
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(b) The student measures several values of angle *i* and angle *r*.
She plots some of her results on the graph.
The table shows results that she has not plotted.

angle *i*	angle *r*
0°	0°
6°	9°

(i) Plot these results on the graph.

(2)



(ii) Continue the line on the graph through the results you have plotted.

(1)

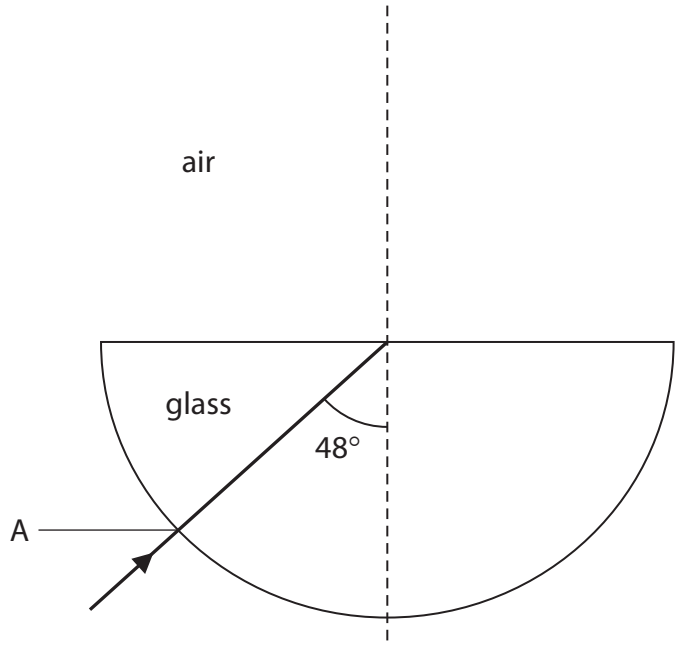
(iii) Write down the value of angle *i* when angle *r* = 90°.

(1)

angle *i* = ... °

(c) (i) Complete the diagram to show what happens to the ray of light when angle *i* is 48°.

(2)



(ii) State why the ray of light does not change direction when it enters the glass at A.

(1)

.....

.....

(Total for Question 1 = 8 marks)

Gases

2 (a) Complete the sentence by putting a cross (☒) in the box next to your answer.

Kinetic theory describes gases as particles that

(1)

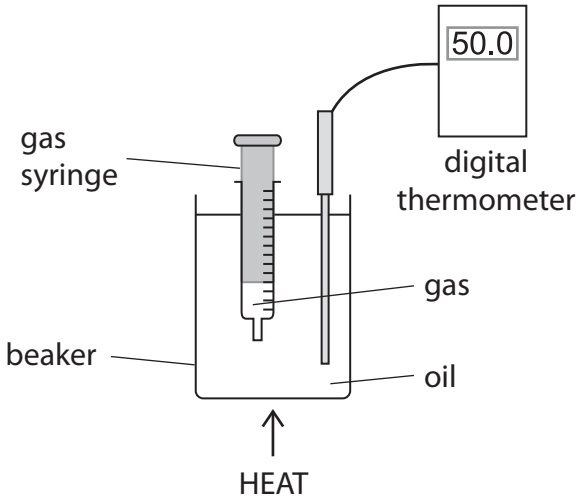
☒ **A** only vibrate

☒ **B** do not move at absolute zero

☒ **C** only move at high temperatures

☒ **D** only move at low temperatures

(b) The apparatus shown in the diagram is used to investigate how the volume of a gas changes with temperature when its pressure is constant.



(i) Explain how the particles in the gas exert a pressure on the syringe.

(2)

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.....

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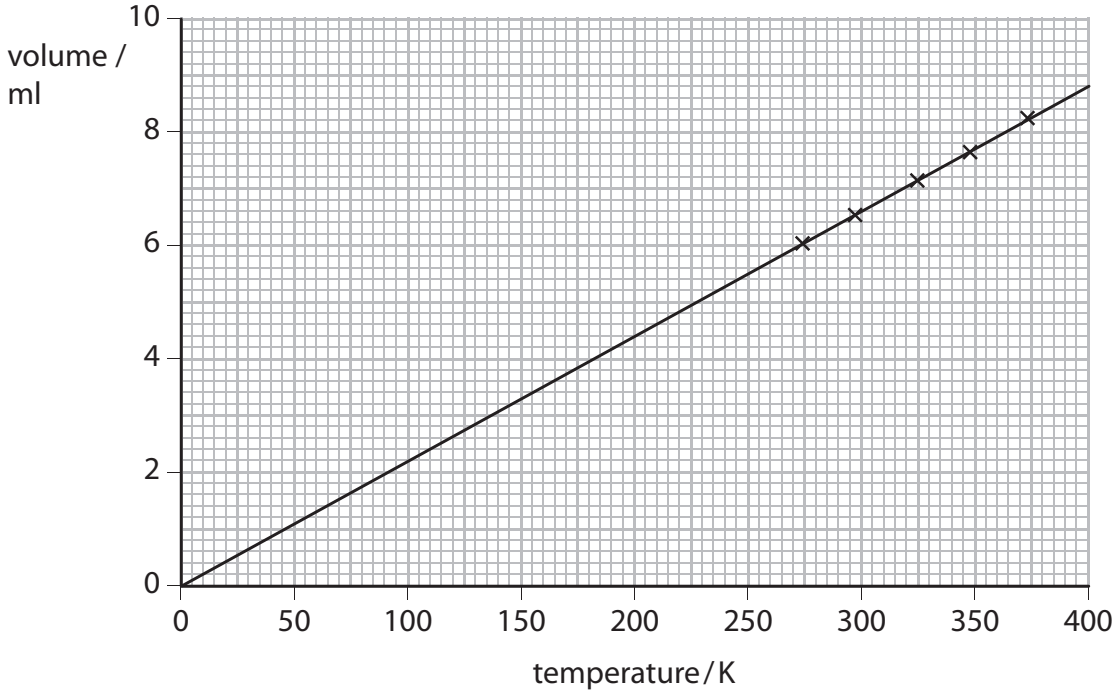
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(ii) The results from the investigation are given in the table.
Fill in the gap in the table.

(1)

volume / ml	temperature / °C	temperature / K
6.0	0.0	273
6.5	25	298
7.1	50	
7.6	75	348
8.2	100	373

(iii) The volume of the gas is plotted against the temperature in Kelvin and a line of best fit is drawn.



Describe what this line of best fit shows about how the volume of the gas varies with temperature.

(2)

.....

.....

.....

.....

(c) When the temperature of the gas is 298 K, the volume of the gas in the syringe is 6.5 ml.

Calculate the volume of gas when its temperature is increased to 450 K.

Use the equation $V_2 = \frac{V_1 T_2}{T_1}$

(2)

volume of gas = ... ml

(Total for Question 2 = 8 marks)

Lenses

3 Diagram 1 shows an eye.

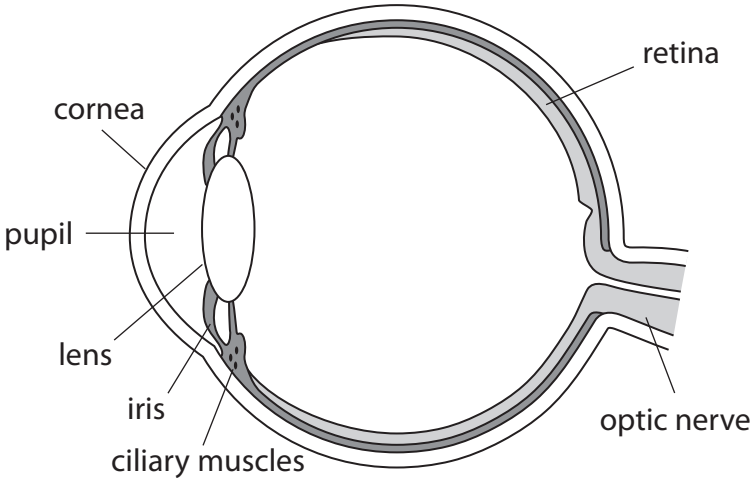


Diagram 1

(a) (i) Use words from the labels on diagram 1 to complete the sentence.

The parts of the eye which focus light are the

(2)

..... and the .....

(ii) Lenses of different powers are shown in diagram 2.



Diagram 2

Explain which lens has the greater power.

(2)

.....

.....

.....

.....

(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The unit for the power of a lens is the

(1)

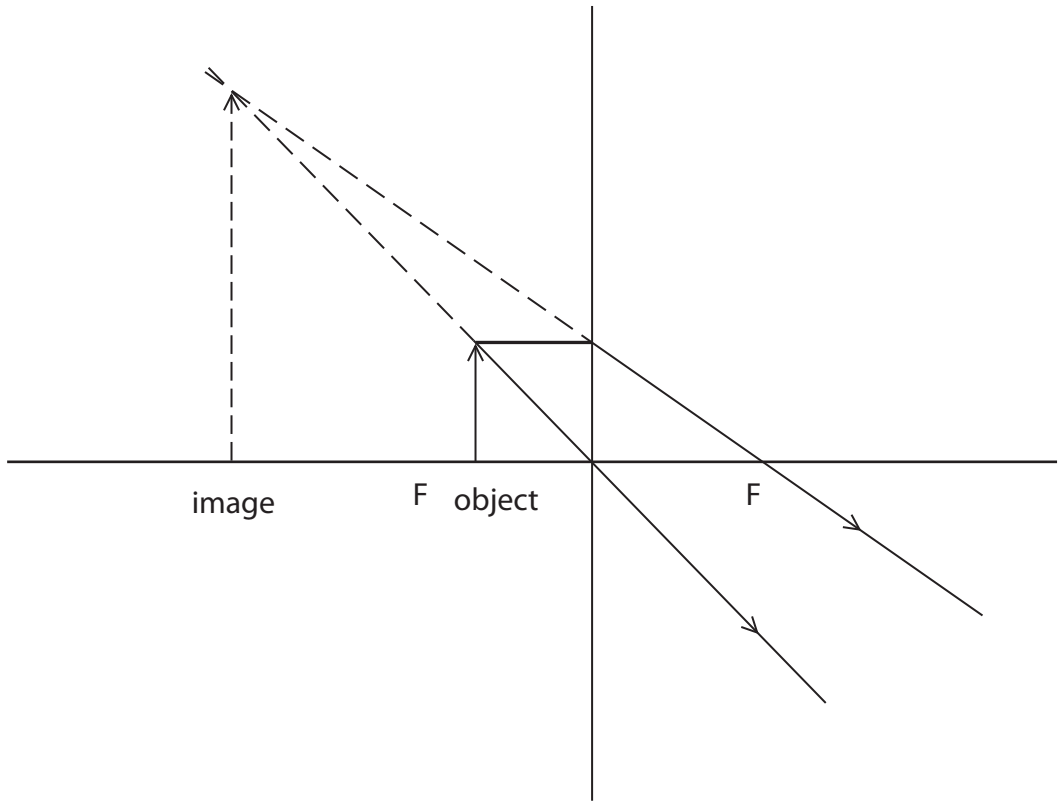
☒ **A** decibel

☒ **B** dioptre

☒ **C** metre

☒ **D** watt

(b) The ray diagram shows the image of an object formed by a converging lens when it is used as a magnifying glass.



(i) The object has a height of 4 cm.
Estimate the height of the image.

(2)

height of image = ... cm

(ii) Which of these describes the image formed by this converging lens when it is used as a magnifying glass?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** inverted, real

☒ **B** right way up, real

☒ **C** inverted, virtual

☒ **D** right way up, virtual

(c) Explain why a converging lens is used for the treatment of long sight.

You may draw a diagram to help with your answer.

(2)

.....

.....

.....

.....

(Total for Question 3 = 10 marks)

Radioactive sources

4 (a) Cobalt-60 is a radioactive substance.
A nucleus of cobalt-60 contains 27 protons and 33 neutrons.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The number of electrons in a neutral atom of cobalt-60 is

(1)

☒ **A** 87

☒ **B** 60

☒ **C** 33

☒ **D** 27

(ii) Cobalt-60 decays by emitting gamma radiation.

Explain what happens to the mass of a cobalt-60 atom when a gamma ray is emitted.

(2)

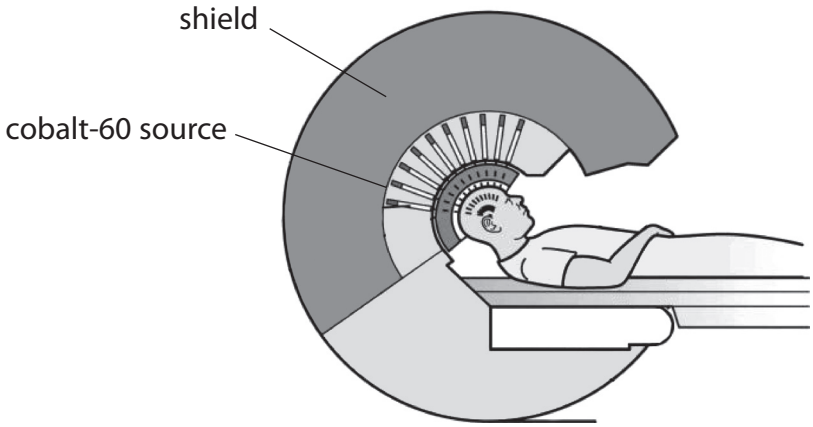
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(b) Gamma radiation from cobalt-60 can be used to destroy tumours.
The diagram shows how gamma radiation is used to destroy a brain tumour.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Gamma radiation is used because

(1)

☒ **A** gamma can penetrate further than alpha or beta

☒ **B** gamma is more ionising than alpha or beta

☒ **C** gamma is always safer than alpha or beta

☒ **D** gamma has a shorter half-life than alpha or beta

(ii) Describe what the shield is used for.

(2)

.....

.....

.....

.....

(iii) Suggest **two** advantages that this kind of treatment has over other forms of treatment for tumours.

(2)

1 .....

.....

2 .....

.....

(iv) Explain why several beams of gamma radiation are used instead of just one.

(2)

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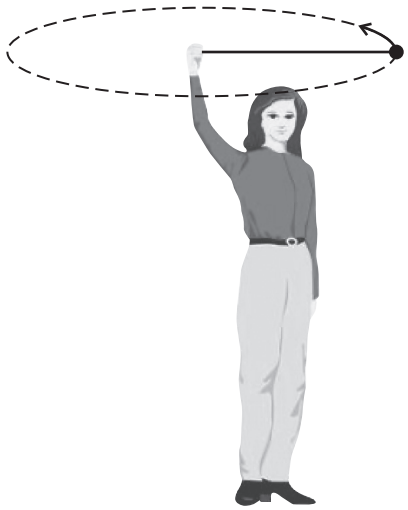
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(Total for Question 4 = 10 marks)

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Circular motion

5 (a) The diagram shows a girl swinging a rubber ball in a horizontal circle above her head.



(i) In which direction does the resultant force act on the ball?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** away from the centre of the circle

☒ **B** in the direction of the arrow on the diagram

☒ **C** in the opposite direction to the arrow on the diagram

☒ **D** towards the centre of the circle

(ii) State the name of the resultant force acting on the ball.

(1)

.....

(iii) Suggest what would happen to the ball as the girl gets tired.

(2)

.....

.....

.....

.....

(iv) The girl lets go of the string and the ball hits a wall.

The collision is not elastic.

Explain what happens to both momentum and kinetic energy when the ball hits the wall.

(2)

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.....

.....

*(b) Describe a cyclotron and how charged particles move inside it.

You may draw a labelled diagram to help with your answer.

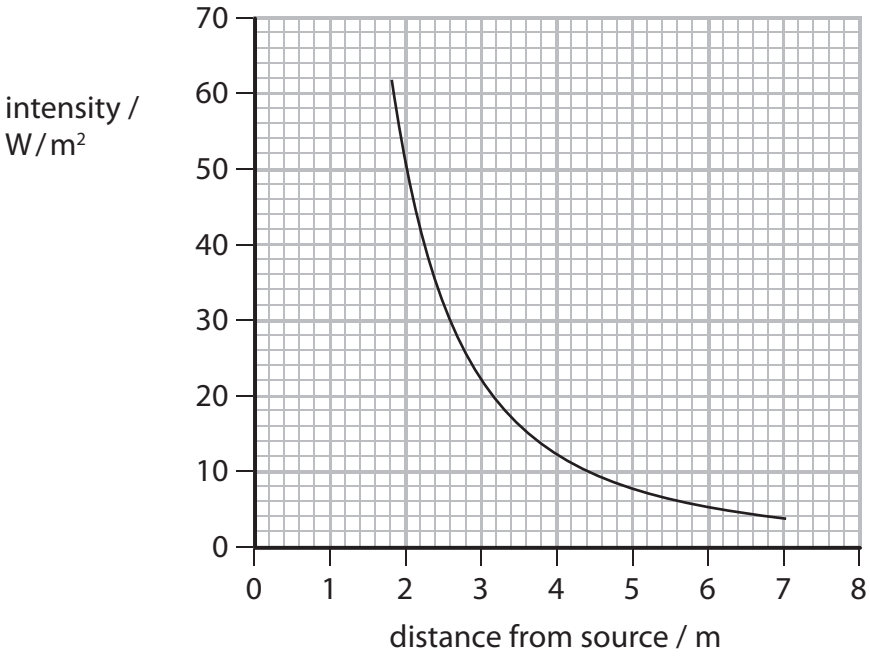
(6)

(Total for Question 5 = 12 marks)

X-rays

6 X-rays are electromagnetic radiation.

(a) The graph shows how the intensity of electromagnetic radiation changes with distance from the source.



(i) State the intensity when the distance from the source is 2 m.

(1)

intensity = ... W / m²

(ii) The equation linking the intensity of this radiation to the distance from the source is

$$\text{intensity} = \frac{200}{(\text{distance})^2}$$

Calculate the intensity when the distance is 0.9 m.

(3)

intensity = ... W/m^2

(b) X-rays have many uses.

Which of the following uses X-rays?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** CAT scan

☒ **B** endoscope

☒ **C** pulse oximeter

☒ **D** ultrasound scan

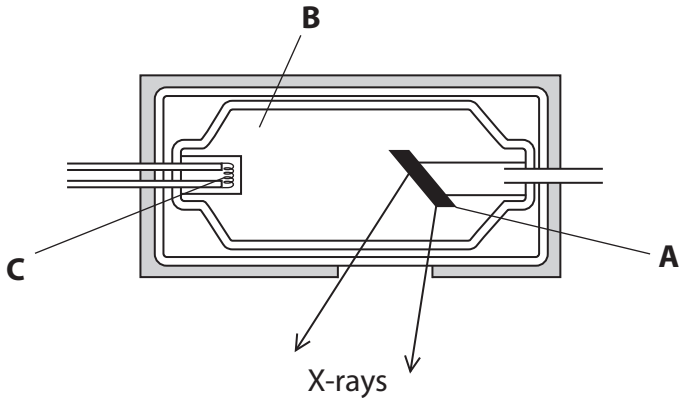
(c) State one harmful effect of X-rays.

(1)

.....

.....

*(d) The diagram shows an X-ray tube.



Describe how X-rays are produced in this type of tube.

You may refer to the letters on the diagram in your answer.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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