

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

I declare this is my own work.

A-level PHYSICS

Paper 3 Section B Medical physics

Materials

For this paper you must have:

- a pencil and a ruler
- a scientific calculator
- a Data and Formulae Booklet
- a protractor.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- Show all your working.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 35.
- You are expected to use a scientific calculator where appropriate.
- A Data and Formulae Booklet is provided as a loose insert.

Time allowed: The total time for both sections of this paper is 2 hours. You are advised to spend approximately 50 minutes on this section.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
TOTAL	



Section BAnswer **all** questions in this section.**0 1**

An eye condition is corrected using a +4.0D lens.

0 1 . 1Which eye condition could be corrected by using this lens?
Tick (✓) **one** box.**[1 mark]**

astigmatism

hypermetropia

myopia

0 1 . 2Calculate the magnification produced by the +4.0D lens when viewing an object
75 cm from this lens.**[3 marks]**

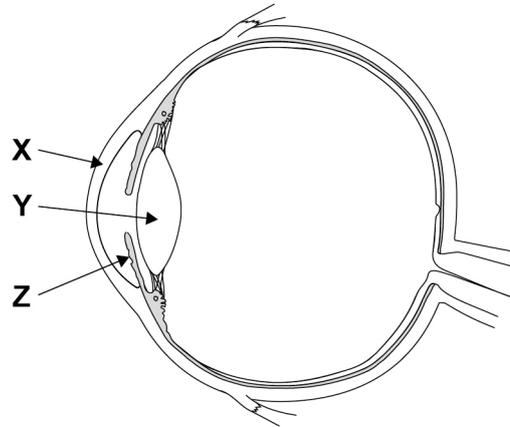
magnification = _____



0 1 . 3

Figure 1 shows a diagram of an eye.

Figure 1



State the name and primary optical function of X, Y and Z.

[4 marks]

Name of X _____

Primary optical function of X _____

Name of Y _____

Primary optical function of Y _____

Name of Z _____

Primary optical function of Z _____

8

Turn over ►



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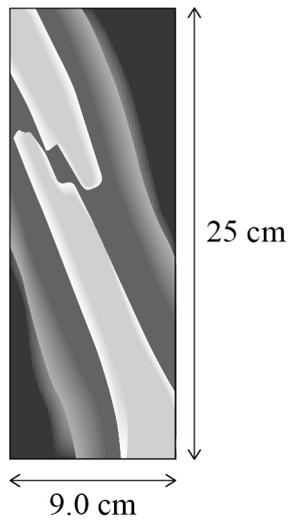
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outside the
box*

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ANSWER IN THE SPACES PROVIDED**



Figure 2 shows an X-ray of a broken bone.

Figure 2



mean diameter of bone = 0.040 m

intensity of incident X-rays = 0.013 W m^{-2}

exposure time of X-ray = 0.80 s

linear attenuation coefficient of bone = 58.3 m^{-1}



0 2 . 2 Calculate an estimate for the X-ray energy that is absorbed by the bone.

[5 marks]

energy absorbed = _____ J

0 2 . 3 State **two** reasons why the estimate of energy absorption in Question **02.2** may be greater than the actual value.

[2 marks]

1 _____

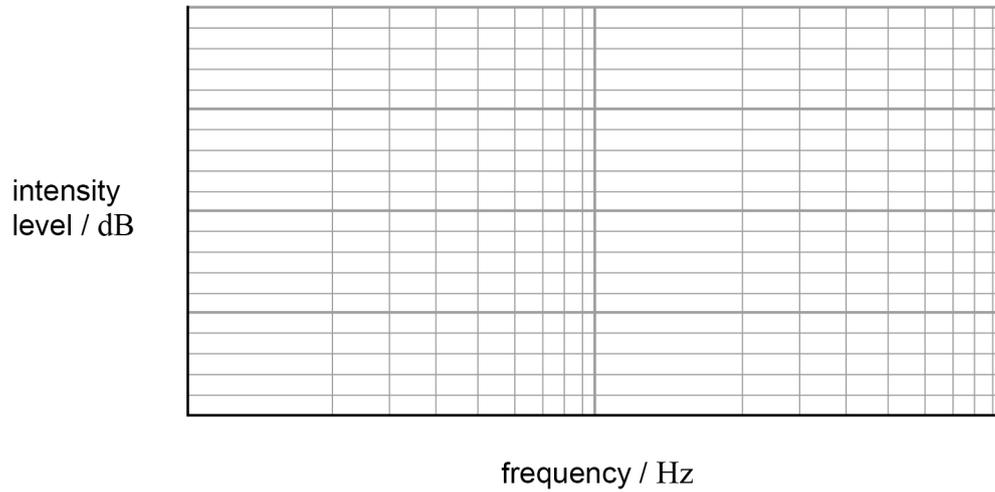
2 _____

Turn over ►



0 3 . 1

Sketch an equal loudness curve on **Figure 3** showing the normal response of a healthy ear.
Annotate the **frequency** axis with an appropriate scale.

[3 marks]**Figure 3**

0 3 . 2

Describe the procedure used to gather the data for an equal loudness curve.

[2 marks]



0 3 . 3

Calculate the intensity of a sound that produces an intensity level of 30 dB.

[2 marks]intensity = _____ W m^{-2}

7**Turn over for the next question****Turn over ►**

0 5 . 1

State the purpose of the magnetic field in a magnetic resonance scanner.

[1 mark]

0 5 . 2

Describe the role of the radio frequency pulses in a magnetic resonance scanner.

[2 marks]

3

END OF QUESTIONS



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ANSWER IN THE SPACES PROVIDED**



