

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

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.

### 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.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
<b>TOTAL</b>	



**Section B**Answer **all** questions in this section.**0 1**

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

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

astigmatism

hypermetropia

myopia

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

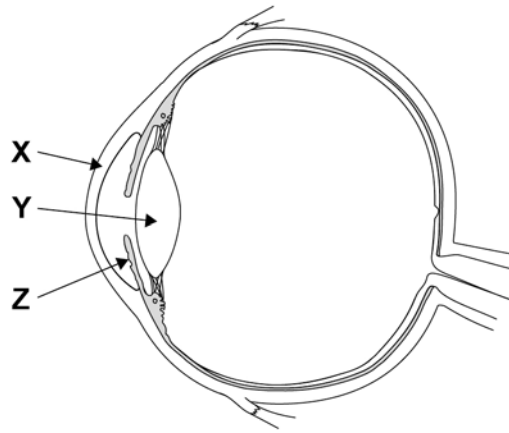
magnification = \_\_\_\_\_



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 \_\_\_\_\_

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Name of Y \_\_\_\_\_

Primary optical function of Y \_\_\_\_\_

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Name of Z \_\_\_\_\_

Primary optical function of Z \_\_\_\_\_

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8

Turn over ►



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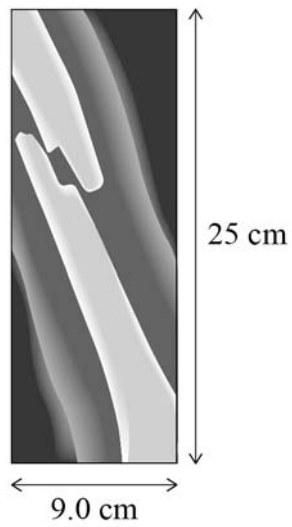
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ANSWER IN THE SPACES PROVIDED**





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

**Figure 2**



mean diameter of bone = 0.040 m

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

exposure time of X-ray = 0.80 s

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



**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 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

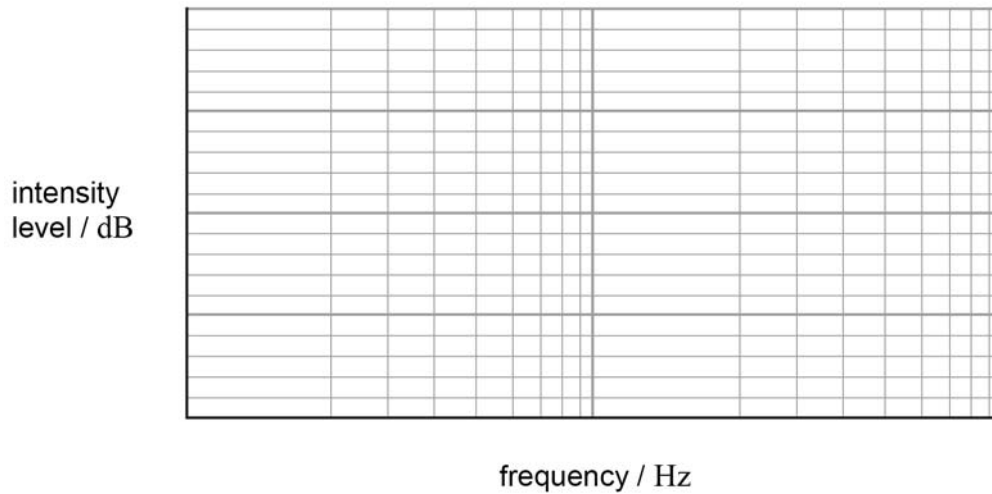
11

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]**

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0 3 . 3

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

**[2 marks]**intensity = \_\_\_\_\_  $\text{W m}^{-2}$ 

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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]**

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0 5 . 2

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

**[2 marks]**

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**3****END OF QUESTIONS**

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ANSWER IN THE SPACES PROVIDED**







