

Please write clearly in block capitals.

Centre number

--	--	--	--	--

Candidate number

--	--	--	--

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	
TOTAL	



J U N 2 2 7 4 0 8 3 B B 0 1

1B/M/Jun22/E9

7408/3BB

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

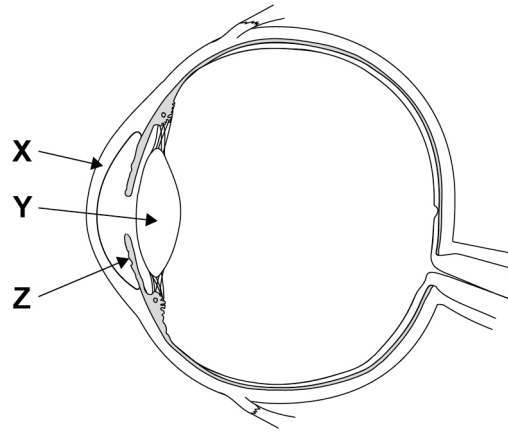
magnification = _____



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** _____

Name of **Y** _____Primary optical function of **Y** _____

Name of **Z** _____Primary optical function of **Z** _____

Turn over ►



There are no questions printed on this page

*Do not write
outside the
box*

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Find Personal Tutor from www.wisesprout.co.uk

找名校导师，用小草线上辅导（微信小程序同名）



An X-ray image is to be made of a broken bone.
The image can be formed on

- photographic film
- a flat panel (FTP) detector or
- an intensifying screen using fluoroscopic image intensification.

State and explain which one of these detection methods should be used in this situation.

Go on to discuss why the other two methods are less suitable.

[4 marks]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Question 2 continues on the next page

Find Personal Tutor from www.wisesprout.co.uk

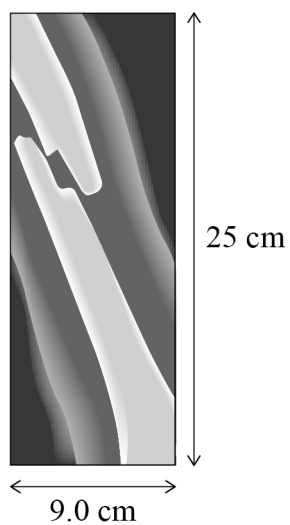
找名校导师，用小草线上辅导（微信小程序同名）

Turn over ►



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 _____

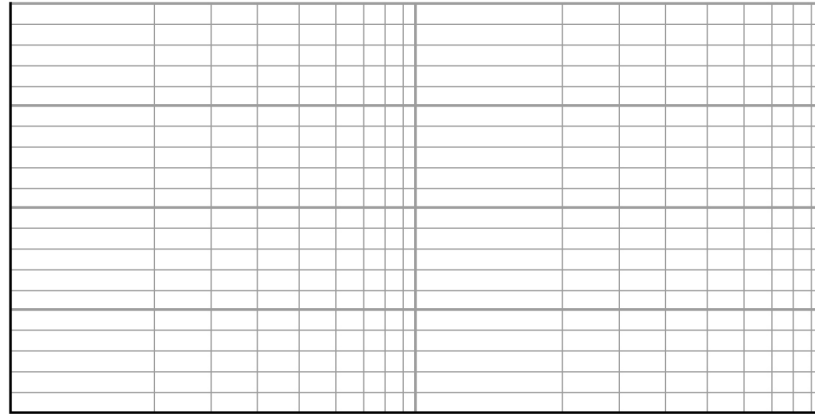
2 _____

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 3intensity
level / dB

frequency / Hz

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 ►



Three types of scan are available to investigate the condition:

- Calcium kidney stones contain no water and appear similar to bone in each of the scans.

Discuss the advantages and disadvantages of each option.
In your answer you should

- refer to the relevant quality of the image obtained from each scan
- identify other factors that should be considered
- justify the type of scan you would recommend.

[6 marks]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Do not write
outside the
box

Find Personal Tutor from www.wisesprout.co.uk

找名校导师，用小草线上辅导（微信小程序同名）

6

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]

END OF QUESTIONS

There are no questions printed on this page

*Do not write
outside the
box*

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Find Personal Tutor from www.wisesprout.co.uk

找名校导师，用小草线上辅导（微信小程序同名）



[illegible]

Question number	Additional page, if required. Write the question numbers in the left-hand margin.
	Copyright information For confidentiality purposes, all acknowledgements of third-party copyright material are published in a separate booklet. This booklet is published after each live examination series and is available for free download from www.aqa.org.uk. Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team. Copyright © 2022 AQA and its licensors. All rights reserved.

