# GCE
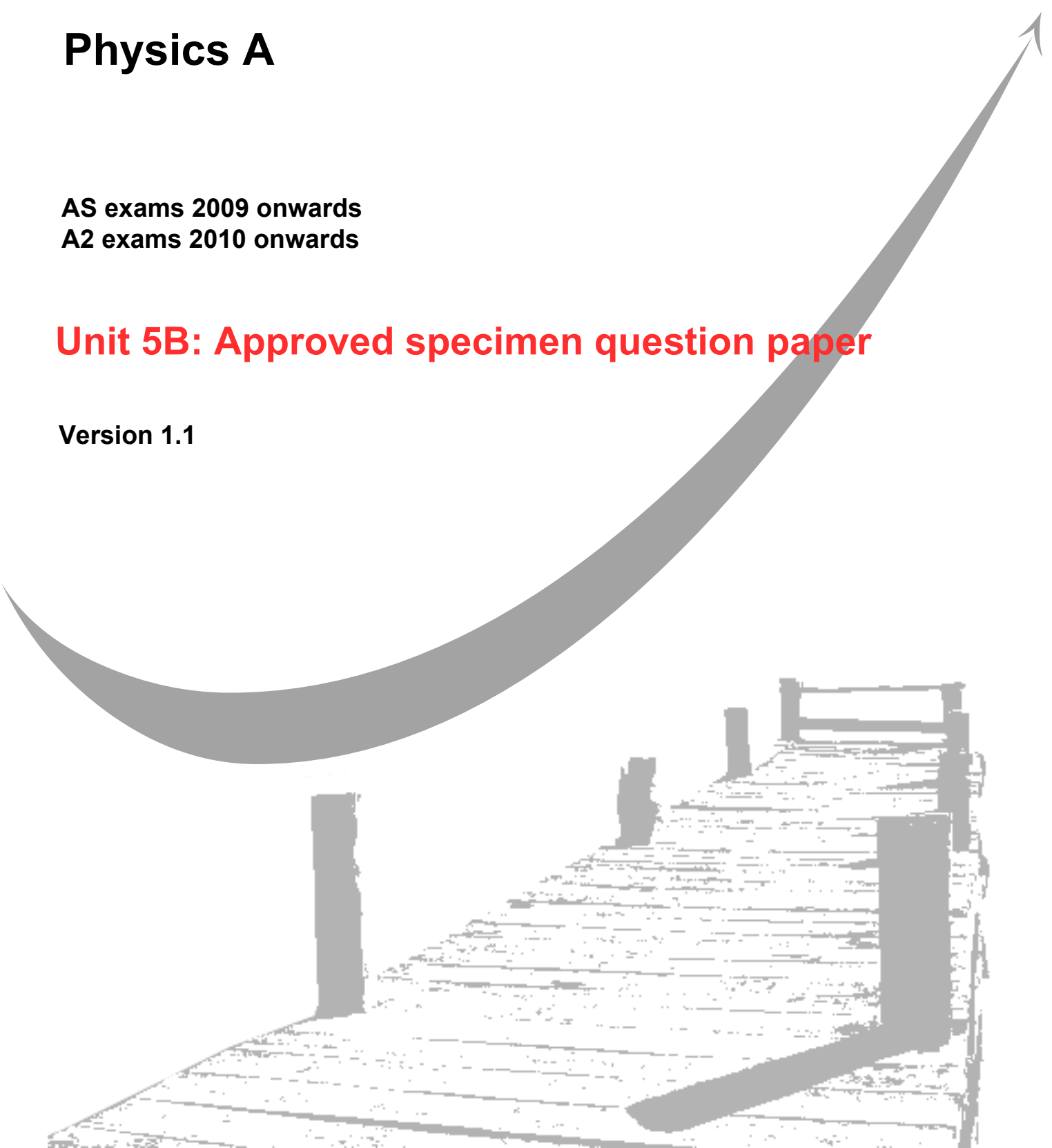**AS and A Level**

# Physics A

**AS exams 2009 onwards**
**A2 exams 2010 onwards**

## Unit 5B: Approved specimen question paper

**Version 1.1**

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General Certificate of Education
2010
Advanced Examination

**version 1.1**

**AQA**

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

**PHYSICS A**                                        **PHA5B**
**Unit 5B        Medical Physics**

**Section B**

SPECIMEN PAPER

Time allowed:  50 minutes

**Instructions**
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- A *Data and Formula Booklet* is provided as a loose insert.

**Information**
- The maximum mark for this paper is 35.
- The marks for the questions are shown in brackets.
- You are reminded of the need for good English and clear presentation
  in your answers.  You will be assessed on your quality of written
  communication where indicated in the question.

The maximum mark for this section is 35 marks.  You are advised to spend approximately 50 minutes on this section.

**1** The diagram represents a simplified version of a normal eye, with no sight defects, looking at a distant point object.

Complete the paths of the two rays.

eye lens

rays from
distant
point
object

optic
axis

fovea

cornea
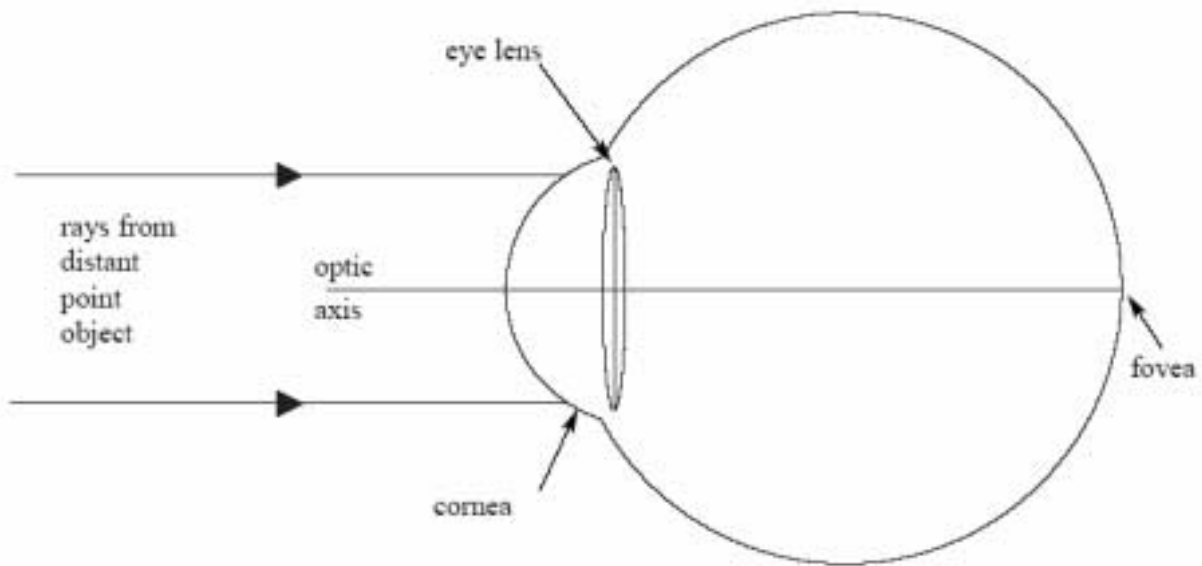
*(2 marks)*

(b) Describe the distribution of receptors over the retina.

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*(2 marks)*

(c)    (i)    State the purpose of the iris.

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       (ii)   Describe how this purpose is achieved when the eye is exposed to bright light.

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                                                                                                          *(2 marks)*

(d)    (i)    State what is meant by *accommodation*.

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       (ii)   Describe how accommodation is achieved.

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                                                                                                          *(2 marks)*
                                                                                                       **Total 8 marks**

**2**   Electrodes are attached to the chest of a healthy person and a normal ECG waveform is obtained.

(a)   State **two** ways of ensuring good electrical contact between the electrodes and the person.
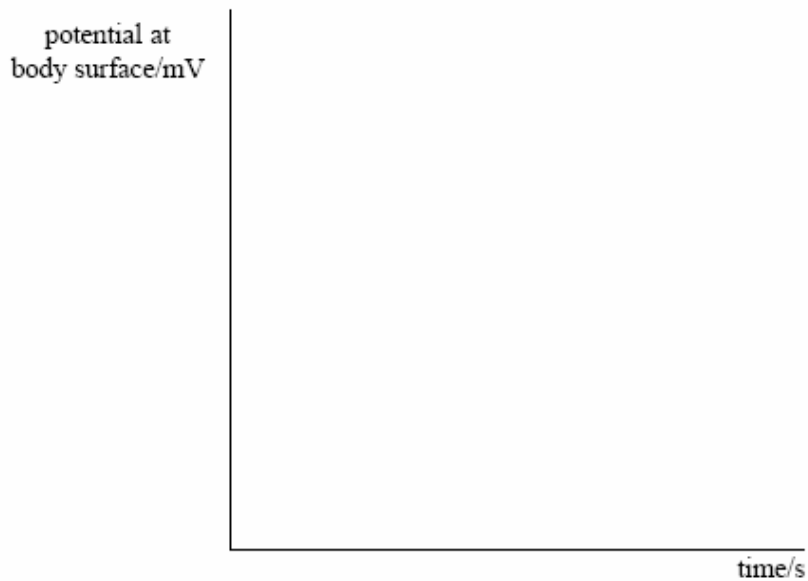
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*(2 marks)*

(b)   State **two** properties of the amplifier needed to amplify the signal from the electrodes.

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*(2 marks)*

(c)   Sketch, on the axes below, the waveform that you would expect to obtain. Label the axes with appropriate scales.

potential at
body surface/mV

time/s

Mark on the waveform where the following occur:

(i)   atrial depolarisation

(ii)   ventricular depolarisation

(iii)   ventricular repolarisation

*(5 marks)*
**Total 9 marks**

4

**3** (a) State the frequency of sound at which the normal ear is most sensitive.

...........................................................................................................................................

*(1 mark)*

(b) State the main features of hearing loss in terms of frequency response for

(i) age related hearing loss,

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.................................................................................................................................

(ii) noise related hearing loss.

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.................................................................................................................................

*(2 marks)*

(c) At the site of a machine in a factory, a sound meter was used to measure the sound level. The relative intensity level with the machine operating was 86 dB. The sound intensity reaching the meter when the machine was not operating was $7.0 \times 10^{-5}$ Wm$^{-2}$.
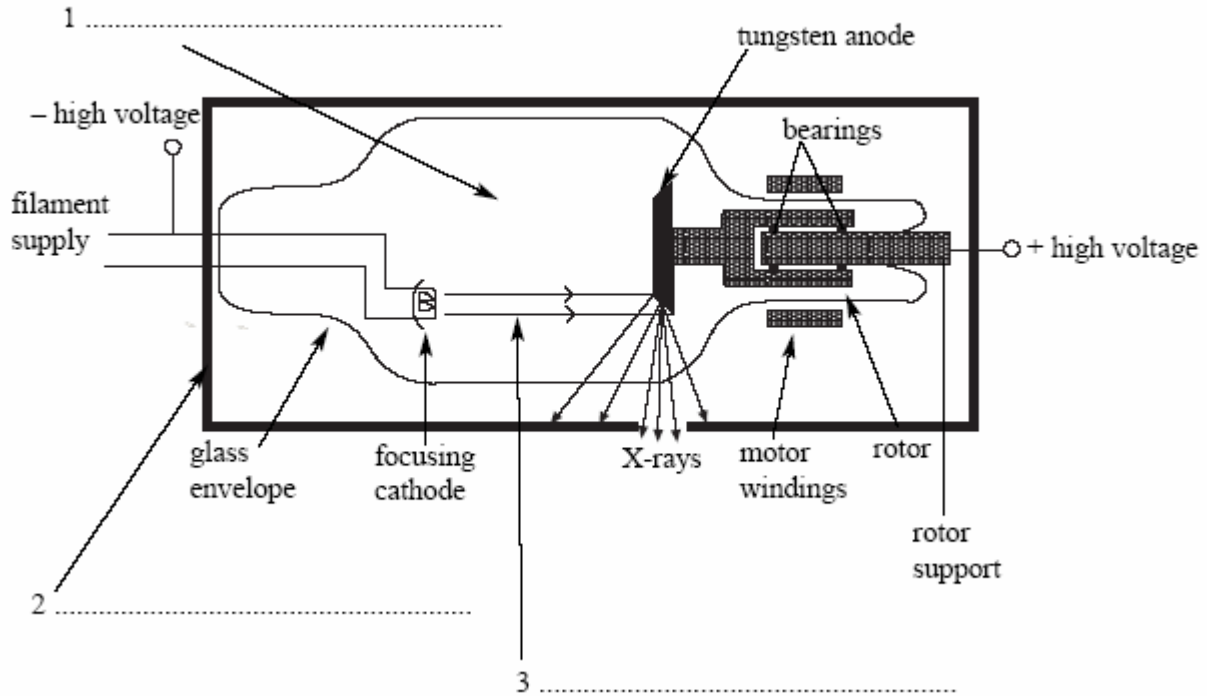
(i) Show that with the machine operating, the sound intensity reaching the meter was about $4 \times 10^{-4}$ Wm$^{-2}$.

(ii) Calculate the relative intensity level due to the machine alone.

Relative intensity level = ....................................

*(4 marks)*

**Total 7 marks**

**4** (a) The diagram shows a rotating-anode X-ray tube. Complete the labelling of the **three** numbered arrows in the diagram.

1 ..................................................

– high voltage

tungsten anode

filament supply

bearings

+ high voltage

glass envelope

focusing cathode

X-rays

motor windings

rotor

rotor support

2 ..................................................

3 ..................................................

*(3 marks)*

(b) Explain why the anode

(i) is rotated,

.............................................................................................................................

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(ii) has a bevelled edge.

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*(3 marks)*

(c) Define for a material,

(i) the linear attenuation coefficient, μ,

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(ii) the half thickness.

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*(2 marks)*

(d) A monochromatic X-ray beam of intensity 6.0 Wm$^{-2}$ is incident on an aluminium sheet of thickness 2.0 mm. For these X-rays, the half-value thickness of aluminium is 3.2 mm. Calculate the intensity of the transmitted beam.

Intensity = ....................................

*(3 marks)*
**Total 11 marks**