ASSESSMENT and QUALIFICATIONS ALLIANCE

# Mark scheme June 2003

# GCE

## Physics A

**Unit PHA6/W**

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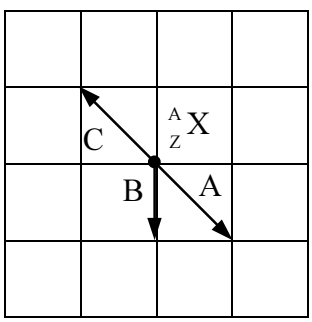
# Units 5 - 9 : Section A

**1**

(a)(i)




correct arrows: A ✓
B ✓
C ✓

(a)(ii) $e^{-1} + {}^{A}_{Z}X \rightarrow {}^{A}_{Z-1}Y + \nu_e$ ✓ (*4*)

(b)(i) $((4.18 - 1.33) \times 10^{-13}) = 2.85 \times 10^{-13}$ (J) ✓

(b)(ii) $1.33 \times 10^{-13}$ (J)
$0.30 \times 10^{-13}$ (J) for 3 correct values ✓
$1.63 \times 10^{-13}$ (J)

(b)(iii) (use of $\Delta E = hf$ gives) $f\left(= \frac{1.63 \times 10^{-13}}{6.63 \times 10^{-34}}\right) = 2.46 \times 10^{20}$ Hz ✓

(allow C.E. from (b)(ii) if largest value taken) (*3*)

(c)(i) (✓ for each precaution <u>with</u> reason to $_{max}2$)

handle with (long) (30 cm) tweezers
because the radiation intensity decreases with distance

store in a lead box (immediately) when not in use
to avoid unnecessary exposure to radiation

[or any sensible precaution with reason]

(b)(ii) γ rays are more penetrating and are therefore more hazardous
(to the internal organs of the body)

$\beta^-$ particles are more hazardous because they are more ionising ✓
( ✓ for any argued case for either radiation) <u>(*3*)</u>

<u>(*10*)</u>

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# Unit 6 : Section B

**2**

(a) diagram to show: rays refracted inwards at cornea ✓
rays refracted inwards at lens ✓
rays focused at optic axis on retina ✓ $_{max}(2)$

(b) only cones at fovea ✓
moving away from fovea, more rods, less cones ✓ (*2*)

(c)(i) to control the intensity of light reaching retina ✓

(c)(ii) forms a small pupil ✓ (*2*)

(d)(i) accommodation: ability of the eye/lens to (change and) focus on different object distances ✓
[adjustment of the eye/lens to form a clearly focused image on the retina]

(d)(ii) changing the shape of the lens
[or using the cillary muscles] ✓ (*2*)

(*8*)

**3**

(a) axes: time/ms, action potential/mV ✓
time scale from 1 → 5 (approx) ✓
action potential scale + 20 → −80 or +30 → −70 ✓ (*3*)

(b) $Na^+$ ions move into cell ✓
pd rises (from −70 to 0) (or +30), called depolarisation ✓
$K^+$ ions move out of nerve ✓
pd returns/falls to −70/resting potential, called repolarisation ✓
$Na^+$ moving from 0 to +30 called reverse polarisation ✓
to restore starting equilibrium of ions, the Na/K pump operates ✓ $_{max}(3)$

(*6*)

**4**

(a) A ear drum or tympanic membrane ✓
transfers vibration of sound waves into mechanical oscillations ✓

B ossicles ✓
system of levers to multiply the force ✓
[or system of levers to link outer and inner ear]

C cochlea ✓
converts pressure wave in fluid into electrical signal ✓ (*6*)

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(b) (use of *intensity level* = $10 \log \frac{I}{I_0}$ gives) $42 = 10 \log \frac{I}{1.0 \times 10^{-12}}$ ✓

$I = 1.6 \times 10^{-8}$ W m$^{-2}$ ✓ *(2)*

*(8)*

**5**

(a)(i) method 1: increasing pd across the tube ✓
method 2: increasing tube current or increasing filament temperature ✓

(a)(ii) method 1: will increase the maximum photon energy ✓
method 2: will not change the maximum photon energy ✓ $_{max}$*(3)*

(b) reduces intensity of low energy photons ✓
hardly changes intensity of high energy photons ✓
need high energy for picture
[or low energy no good for picture] ✓
reducing low energy reduces dose received by patient ✓ $_{max}$*(3)*

*(6)*

Quality of Written Communication (Q1(c)(i) and Q3(b)) ✓✓ *(2)*

*(2)*

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