Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic: Waves

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Name of the Student:_____
Max. Marks : 15 Marks **Time : 15 Minutes**

Mark Schemes

Q1.

(a) $q\bar{q}$ ✔

1

(b) Total energy = 2keV + 2 × 511 keV = 1024 keV ✔

= $1024 \times 1.6 \times 10^{-19} = 1.64 \times 10^{-13}$J ✔

Energy of each photon = $1.64 \times 10^{-13}/2 = 8.19 \times 10^{-14}$ (J) ✔

First mark for calculating the total energy in keV.
Second mark is for converting correctly into joules.
Third mark is for dividing by two so ecf for incorrect conversion into joules. Student must show at least 3sf.

3

(c) $$\lambda = \frac{hc}{E} = \frac{6.63 \times 10^{-34} \times 3 \times 10^{8}}{8.19 \times 10^{-14}}$$ ✔

= 2.43×10^{-12} (m) ✔

First mark for the correctly rearranged equation or correct values substituted into equation.
Correct answer only scores 2 marks, ecf from 1 ***(b)***

2

(d) E_k= 2 keV = $2000 \times 1.6 \times 10^{-19}$ J = 3.2×10^{-16}J ✔

$$v = \sqrt{\frac{2E_k}{m}} = \sqrt{\frac{2 \times 3.2 \times 10^{-16}}{9.11 \times 10^{-31}}}$$ ✔

= 2.65×10^{7}(m s^{-1}) ✔

First mark for converting KE into joules.
Second mark for rearranging equation correctly or substituting correct values into equation.
Third mark for correct answer, must be to at least 3sf.

3

(e) $$\lambda = \frac{h}{mv} = \frac{6.63 \times 10^{-34}}{9.11 \times 10^{-31} \times 2.65 \times 10^{7}}$$ ✔

= 2.75×10^{-11}(m) ✔

First mark for rearranging equation correctly or substituting correct values into equation.

Second mark for correct answer.

2

(f) Recognition that separation is 1.5×10^{-10} m and compared to 0.28×10^{-10} (ecf)✔

wavelength is about 5 times less than gap width✔

$\sin\theta = \frac{\lambda}{d} = 0.2 \rightarrow \theta \sim 11^{\circ}$ ✔

yes (diffraction would be observable)✔

Or words to that effect

4

[15]