Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic : 5_Waves

Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Mark Schemes

Q1

Question Number	Answer	Mark
(a)	Lowest / minimum frequency (of light / photons incident on a metal) that will cause electrons to be emitted (from surface) **Or** the frequency of (light / photons) that will cause electrons to be emitted (from the surface of a metal) with zero kinetic energy (1) (accept only just emitted)	1
(b)	Conversion of eV to J (1) Use of $E = hf$ (1) $f = 5.5 \times 10^{14}$ Hz (1) Example of calculation $\varphi = (2.28 \text{ eV} \times 1.6 \times 10^{-19} \text{ C})$ $= 3.65 \times 10^{-19}$ J $f = 3.65 \times 10^{-19}$ J / 6.63×10^{-34} J s = 5.50×10^{14} Hz	3
	Total for Question	4

Q2.

Question Number	Answer	Mark
(a)	Change in direction of wave (accept ray or any named wave) (do not accept bend) (1) (Due to) change in (optical) density / speed / medium (1)	2
Question Number	Answer	Mark
(b)	There is no change in direction for the light (passing between the water and the gel) **Or** There is no refraction (as the light passes between the water and the gel) (accept … within the beaker) (1) The light must have the same/similar wave speed in the water and gel (1) (accept same/similar density for water and gel)	2

Q3

Question Number	Acceptable answers	Additional guidance	Mark
(a)	the lowest frequency (of incident radiation) that will cause the emission of (photo)electrons (from the surface)		**(1)**

Question Number	Acceptable answers		Additional guidance	Mark
(b)	• use of ½ m v_{max}^2	(1)	Example of calculation: E = 6.63 × 10^{-34} J s × 8.9 × 10^{14} Hz = 5.9 × 10^{-19} J ½ m v_{max}^2 = ½ × 9.11 × 10^{-31} kg × (6.7 × 10^5 m s^{-1})^2 = 2.045 × 10^{-19} J φ = 5.9 × 10^{-19} J − 2.045 × 10^{-19} J = 3.8 × 10^{-19} J = 1.8 × 10^{-19} J ÷ 1.6 × 10^{-19} C = 2.4 eV	**(4)**
	• use of $\varphi = hf$ − max ke	(1)		
	• divides energy in joule by 1.6 × 10^{-19} C	(1)		
	• φ = 2.4 eV	(1)		

Q4

Question Number	Answer		Mark
(a)	Idea of two or more waves meeting Displacement is sum of individual displacements	(1) (1)	2

Question Number	Answer		Mark
(b) (i)	(QWC – Work must be clear and organised in a logical manner using technical wording where appropriate – e.g. if the term 'superimpose' is used this mark is not awarded)		
	When in phase constructive interference/superposition occurs **Or** when path difference is $n\lambda$ constructive interference/superposition occurs	**(1)**	
	When in antiphase destructive interference/superposition occurs **Or** when path difference is $(n + ½) \lambda$ destructive interference/superposition occurs	**(1)**	
	Light band forms when in phase **Or** path difference is $n\lambda$ **Or** constructive **Or** Dark band forms when in antiphase **Or** path difference is $(n + ½) \lambda$ **Or** destructive	**(1)**	**3**
(b) (ii)	Oscillations of light from the two filters are perpendicular to each other	**(1)**	
	So there are no opposite components to cancel each other out **Or** so the waves do not interact/interfere	**(1)**	
	So zero <u>amplitude</u> not possible	**(1)**	
	OR (If the candidate assumes that it is a source of polarised light) One filter is parallel to the plane of polarisation of the light source, so light is transmitted but the other one absorbs light	**(1)**	
	So light now only reaches the screen from one filter, so there is no interference	**(1)**	
	So zero <u>amplitude</u> not possible	**(1)**	**3**