Pre board Examination(Term -2) 2021-22

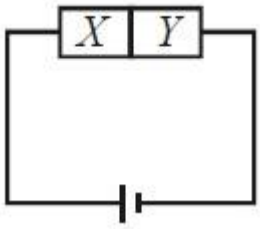
Class : XII ***No of Pages:4***

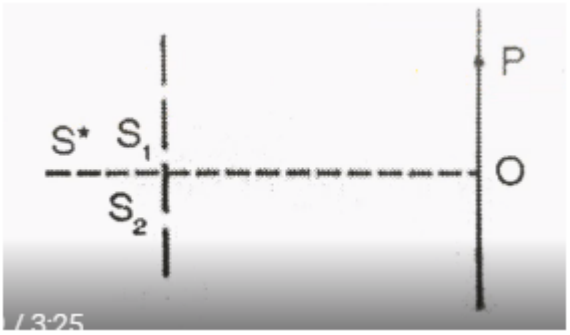
Time : 2Hrs ***Subject Code : 042*** ***M:M: 35***

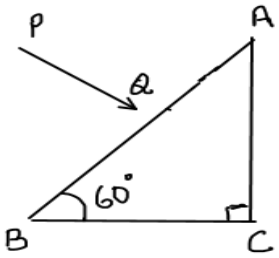
Physics Theory

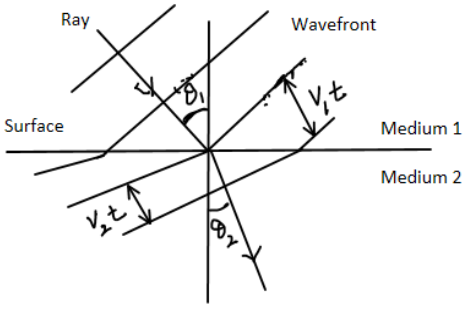
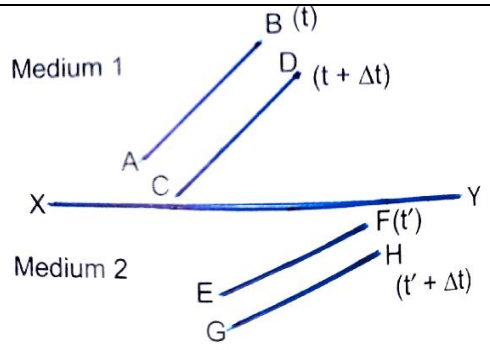
General Instructions:

(i) There are 12 questions in all. All questions are compulsory.
(ii) This question paper has three sections: Section A, Section B and Section C.
(iii) Section A contains three questions of two marks each, Section B contains eight questions of three marks Section C contains one case study-based question of five marks.
(iv) There is no overall choice. However, an internal choice has been provided in one question of two marks and two questions of three marks. You have to attempt only one of the choices in such questions.
(v) You may use log tables if necessary but use of calculator is not allowed.

	Section : A	
1	Two semiconductor materials X and Y in the given figure, are made by doping germanium crystal with indium and arsenic respectively. The two are joined end to end and connected to a battery as shown.  (i) Will the junction be forward biased or reverse biased ?Give reason (i) Sketch a V-I graph for this arrangement.	2
2	When an electron in hydrogen atom jumps from the third excited state to the ground state. how would the de Broglie wavelength associated with the electron change? OR When is Hα line in the emission spectrum of hydrogen atom obtained? Calculate the frequency of the photon emitted during this transition.	2
3	Draw V-I characteristics of a junction diode which converts solar energy into electrical energy. Write two important criteria for the selection of the material used for its fabrication?	2
	Section : B	
4	a) State Bohr's quantization condition for defining stationary orbits.	

	b) A photon emitted during the de – excitation of electron from a state n to the first excited state in a hydrogen atom, irradiates a metallic cathode of work function 2eV, in a photo cell, with a stopping potential of 0.55 V. Obtain the value of the quantum number of the state n.	3
5	Explain with a proper diagram how an ac signal can be converted into dc (pulsating)signal with output frequency as double than the input frequency using pn junction diode. Give its input and output waveforms.	3
6	What is the power output of $^{235}_{92}U$ reactor if it takes 30days to use up 2kg of fuel and if each fission gives 185MeV of usable energy?	3
7	The figure drawn here, shows a modified Young's double slit experimental set up in which $SS_2 - SS_1 = \lambda/4$,  (i) State the condition for constructive and destructive interference. (ii) Obtain the expression for fringe width. (iii) Locate position of the central fringe.	3
8 (a)	Draw a ray diagram of compound microscope for the final image formed at least distance of distinct vision?	3
(b)	The total magnification produced by a compound microscope is 20.The magnification produced by the eyepiece is 5.The microscope is focussed on a certain object.The distance between the objective and eyepiece is observed to be 14cm.If the least distance of distinct vision is 20cm calculate the focal length of the objective and the eyepiece.	
	OR	
(a)	Draw a ray diagram of Astronomical Telescope for the final image formed at infinity	
(b)	A telescope objective of focal length I m forms a real image of the moon 0.92cm in diameter. (i) Calculate the diameter of the moon taking its mean distance from the earth to be 38×10^4km	

	(ii)If the telescope uses an eyepiece of 5cm focal length, what would be the distance between the two lenses for the final image to be formed at infinity	
9 (i) (ii)	State two important features of Einstein's photoelectric equation. Radiation of frequency 10^{15}Hz is incident on two photosensitive surfaces P and Q. There is no photoemission from surface P. Photoemission occurs from Q but photoelectrons have zero kinetic energy. Explain these observation and find the value of work function for surface Q.	3
10	A ray PQ incident normally on the refracting face BA is refracted in the prism BAC made of material of refractive index 1.5 . Complete the path of ray through the prism. From which face will the ray emerge? Justify your answer.  	3
11 (i) (ii)	Why is the thin ozone layer on top of the stratosphere crucial for human survival? Identify to which part of electromagnetic spectrum does this radiation belong and write one important application of the radiation? Why are infrared waves referred to as heat waves? How are they produced ?What role do they play in maintaining the earth's warmth through the green house effect?	3
	<u>Section : C</u> *(Case study)*	
	Huygens principle allows us to determine the shape of the wave front at a later time τ . According to Huygens principle, each point of the wave front is the source of a secondary disturbance and the wavelets emanating from these points spread out in all directions with the speed of the wave. These wavelets emanating from the wave front are usually referred to as secondary wavelets .The common envelope (tangent) of these secondary wavelets in the forward direction gives the new wave front at that instant.	
a)	Which of the following phenomenon cannot be explained by Huygen's principle (i) Interference (ii) Diffraction (iii) Photoelectric effect (iv) polarization	1
b)	The energy of a wave travel in a direction _____ to the wavefront (i) parallel (ii) tangential (iii) lateral (iv) perpendicular	1

c)	According to Huygen's principle for the refraction of plane wavefront , which of the following are incorrect  (i) $\frac{v_1}{v_2} = \frac{\lambda_2}{\lambda_1}$ (ii) $\frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$ (iii) $\frac{sin\theta_1}{sin\theta_2} = \frac{\lambda_1}{\lambda_2}$ (iv) $\frac{sin\theta_1}{sin\theta_2} = \frac{v_1}{v_2}$	1
d)	Two plane wave fronts of light, one is incident on a thin convex lens and another on the refracting face of a thin prism. After refraction, the emerging wave fronts respectively become (i) plane wave front and plane wave front (ii) plane wave front and spherical wave front (iii) spherical wave front and plane wave front (iv) spherical wave front and spherical wave front	1
e)	 Let the phases of the light wave at C,D,E and F be Φ_C , Φ_D , Φ_E and Φ_F respectively and it is given that $\Phi_C \neq \Phi_E$ Choose the correct relation out of the following : (i) Φ_C cannot be equal to Φ_D (ii) Φ_D may be equal to Φ_F (iii) $(\Phi_E - \Phi_C) = (\Phi_F - \Phi_D)$ (iv) $(\Phi_E - \Phi_C)$ cannot be equal to $(\Phi_F - \Phi_D)$	1
