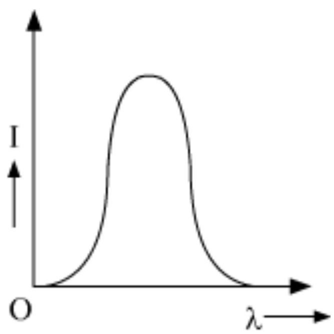
Dual Nature of Radiation and Matter

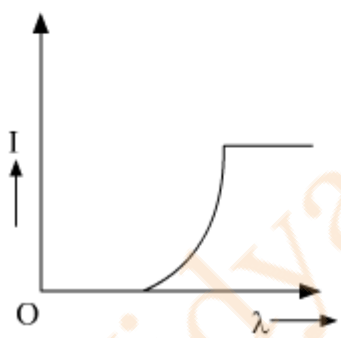
Q.No.1:
The anode voltage of photocell is kept fixed. The wavelength λ of the light falling of the cathode is gradually changed. The plate current I of the photocell varies as follows:

JEE 2013

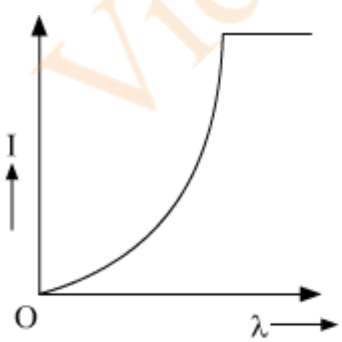
A.



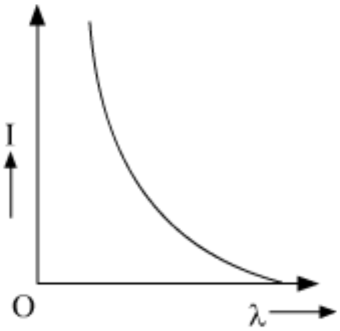
B.



C.



D.



Q.No.2: Match **List – I** (Fundamental Experiment) with **List – II** (its conclusion) and select the correct option from the choices given below the list :

	List – I		**List – II**
(A)	Franck-Hertz Experiment.	(i)	Particle nature of light
(B)	Photo-electric experiment.	(ii)	Discrete energy levels of atom
(C)	Davison-Germer Experiment	(iii)	Wave nature of electron
		(iv)	Structure of atom

JEE 2015

A. A – (i), B – (iv), C – (iii)
B. A – (ii), B – (iv), C – (iii)
C. A – (ii), B – (i), C – (iii)
D. A – (iv), B – (iii), C – (ii)

Q.No.3: Radiation of wavelength λ, is incident on a photocell. The fastest emitted electron has speed *v*. If the wavelength is changed to $\frac{3\lambda}{4}$, the speed of the fastest emitted electron will be: **JEE 2016**

A. $< v\left(\frac{4}{3}\right)^{\frac{1}{2}}$

B. $= v\left(\frac{4}{3}\right)^{\frac{1}{2}}$

C. $= v\left(\frac{3}{4}\right)^{\frac{1}{2}}$

D. $> v\left(\frac{3}{4}\right)^{\frac{1}{2}}$

Q.No.4: Arrange the following electromagnetic radiations per quantum in the

order of increasing energy :
A : Blue light
B : Yellow light
C : X-ray
D : Radiowave **JEE 2016**

A. A, B, D, C

B. C, A B, D

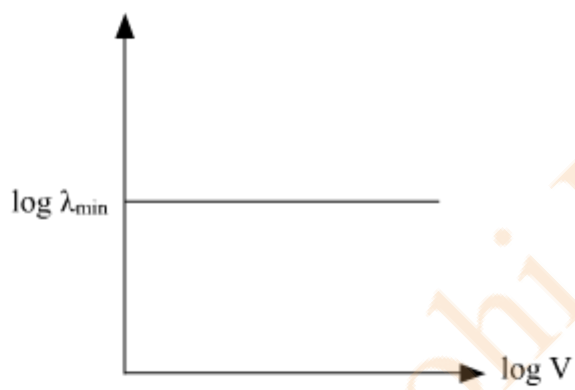
C. B, A, D, C

D. D, B, A, C

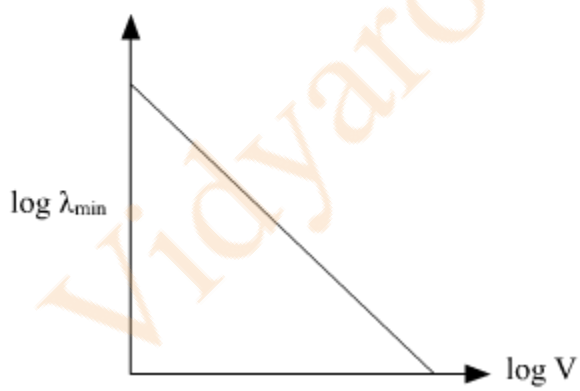
Q.No.5: An electron bean is acceleration by a potential difference *V* to hit a metallic target to produce X-rays. It produces continuous as well as characteristic X-rays. If λ_{min} is the smallest possible wavelength of X-ray in the spectrum, the variation of log λ_{min} with log V is correctly represented in:

JEE 2017

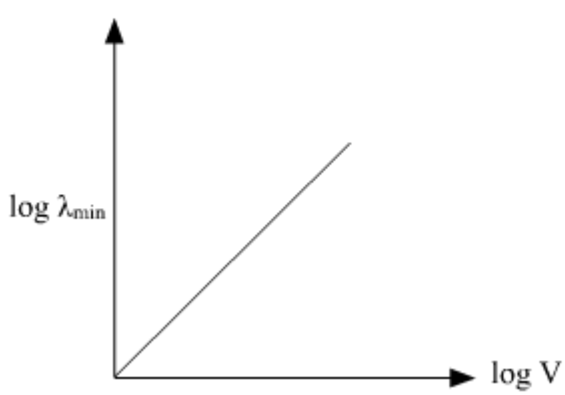
A.



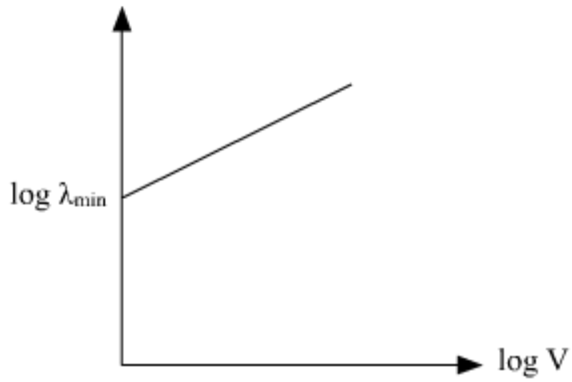
B.



C.

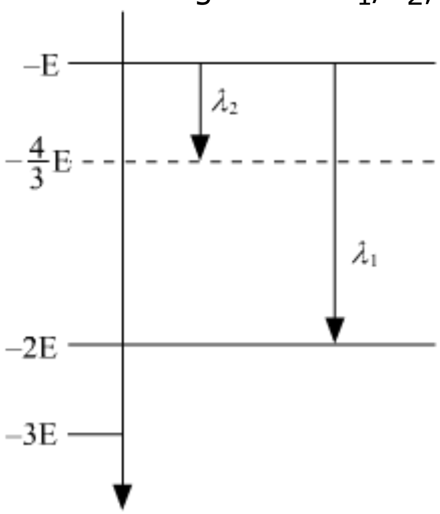


D.



Q.No.6: Some energy levels of a molecule are shown in the figure. The ratio of the wavelengths r = λ_1/λ_2, is given by:

JEE 2017



A. $\mathrm{r}=\frac{1}{3}$

B. $\mathrm{r}=\frac{4}{3}$

C. $\mathrm{r}=\frac{2}{3}$

D. $\mathrm{r}=\frac{4}{3}$

Q.No.7: Surface of certain metal is first illuminated with light of wavelength λ_1 = 350 nm and then, by light of wavelength λ_2 = 540 nm. It is found that the maximum speed of the photo electrons in the two cases differ by a factor of 2. The work function of the metal (in eV) is close to:
$\left(\text{Energy of photon} = \frac{1240}{\lambda(\text{in nm})}\text{eV}\right)$ **JEE 2019**

A. 1.8
B. 2.5
C. 5.6
D. 1.4

Q.No.8: The magnetic field associated with a light wave is given, at the origin, by $B = B_0 [\sin(3.14 \times 10^7)ct + \sin(6.28 \times 10^7)ct]$. If this light falls on a silver plate having a work function of 4.7 eV, what will be the maximum kinetic energy of the photo electrons?
($c = 3 \times 10^8$ ms^{-1}, $h = 6.6 \times 10^{-34}$ J-s) **JEE 2019**

A. 6.82 eV
B. 12.5 eV
C. 8.52 eV
D. 7.72 eV

Q.No.9: In an electron microscope, the resolution that can be achieved is of the order of the wavelength of electrons used. To resolve a width of 7.5×10^{-12} m, the minimum electron energy required is close to: **JEE 2019**

A. 500 keV
B. 100 keV
C. 1 keV
D. 25 keV

Q.No.10: A metal plate of area 1×10^{-4} m^2 is illuminated by a radiation of intensity 16 mW/m^2. The work function of the metal is 5 eV. The energy of the incident photons is 10 eV and only 10% of it produces photo electrons. The number of emitted photo electrons per second and their maximum energy, respectively, will be: [1 eV = 1.6×10^{-19} J] **JEE 2019**

A. 10^{14} and 10 eV
B. 10^{12} and 5 eV
C. 10^{11} and 5 eV