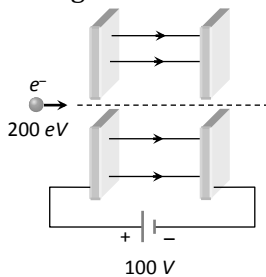


## Topic :- Dual nature of radiation and matter

- De-Broglie wavelength of a body of mass  $1\text{ kg}$  moving with velocity of  $2000\text{ m/s}$  is  
a)  $3.32 \times 10^{-27}\text{ \AA}$       b)  $1.5 \times 10^7\text{ \AA}$       c)  $0.55 \times 10^{-22}\text{ \AA}$       d) None of these
- If threshold wavelength for a certain metal is  $2000\text{ \AA}$ , then the work function of metal is  
a)  $6.2\text{ MeV}$       b)  $6.2\text{ keV}$       c)  $6.2\text{ J}$       d)  $6.2\text{ eV}$
- Four particles have same momentum. Which has maximum kinetic energy?  
a) Proton      b) Electron      c) Deuteron      d)  $\alpha$ -particle
- Cathode rays are  
a) Positive rays      b) Neutral rays      c) He rays      d) Electron waves
- A photon collides with a stationary hydrogen atom in ground state inelastically. Energy of the colliding photon is  $10.2\text{ eV}$ . After a time interval of the order of micro second another photon collides with same hydrogen atom inelastically with an energy of  $15\text{ eV}$ . What will be observed by the detector?  
a) 2 photons of energy  $10.2\text{ eV}$   
b) 2 photons of energy of  $1.4\text{ eV}$   
c) One photon of energy  $10.2\text{ eV}$  and an electron of energy  $1.4\text{ eV}$   
d) One photon of energy  $10.2\text{ eV}$  and another photon of  $1.4\text{ eV}$
- Which of the following statement about photon is incorrect?  
a) Photons exert no pressure      b) Momentum of photon is  $h\nu/c$   
c) Photon's rest mass is zero      d) Photon's energy is  $h\nu$
- A metal surface is illuminated by a light of given intensity and frequency to cause photoemission. If the intensity of illumination is reduced to one-fourth of its original value, then the maximum kinetic energy of the emitted photoelectrons would become  
a) Four times the original value      b) Twice the original value  
c)  $1/6$ th of the original value      d) unchanged

8.  $K_\alpha$  and  $K_\beta$  X-rays are emitted when there is a transition of electron between the levels  
 a)  $n=2$  to  $n=1$  and  $n=3$  to  $n=1$  respectively      b)  $n=2$  to  $n=1$  and  $n=3$  to  $n=2$  respectively  
 c)  $n=3$  to  $n=2$  and  $n=4$  to  $n=2$  respectively      d)  $n=3$  to  $n=2$  and  $n=4$  to  $n=3$  respectively
9. Dual nature of radiation is shown by  
 a) Diffraction and reflection      b) Refraction and diffraction  
 c) Photoelectric effect alone      d) Photoelectric effect and diffraction
10. The momentum of a photon is  $2 \times 10^{-16} \text{ gm-cm/sec}$ . Its energy is  
 a)  $0.61 \times 10^{-26} \text{ erg}$       b)  $2.0 \times 10^{-26} \text{ erg}$       c)  $6 \times 10^{-6} \text{ erg}$       d)  $6 \times 10^{-8} \text{ erg}$
11. A photon of wavelength  $6630 \text{ \AA}$  is incident on a totally reflecting surface. The momentum delivered by the photon is equal to  
 a)  $6.63 \times 10^{-27} \text{ kg-m/s}$       b)  $2 \times 10^{-27} \text{ kg-m/s}$       c)  $10^{-27} \text{ kg-m/s}$       d) None of these
12. A beam of light of wavelength  $\lambda$  and with illumination  $L$  falls on a clean surface of sodium. If  $N$  photoelectrons are emitted each with kinetic energy  $E$ , then  
 a)  $N \propto L$  and  $E \propto L$       b)  $N \propto L$  and  $E \propto \frac{1}{\lambda}$       c)  $N \propto \lambda$  and  $E \propto L$       d)  $N \propto \frac{1}{\lambda}$  and  $E \propto \frac{1}{L}$
13. An electron and a neutron can have same (1) kinetic energy, (2) momentum, or (3) speed. Which particle has a shorter de-Broglie wavelength?  
 a) Neutron, same, neutron      b) Neutron, electron, same  
 c) Electron, same, neutron      d) Electron, neutron, electron
14. A proton and an  $\alpha$ -particle are accelerated through the same potential difference. The ratio of their de-Broglie wavelength ( $\lambda_p/\lambda_\alpha$ ) is  
 a)  $1/2\sqrt{2}$       b) 1      c) 2      d)  $2\sqrt{2}$
15. A charged dust particle of radius  $5 \times 10^{-7} \text{ m}$  is located in a horizontal electric field having an intensity of  $6.28 \times 10^5 \text{ Vm}^{-1}$ . The surrounding medium in air with coefficient of viscosity  $\eta = 1.6 \times 10^{-15} \text{ Nsm}^{-2}$ . If this particle moves with a uniform horizontal speed of  $0.01 \text{ ms}^{-1}$ , the number of electrons on it will be  
 a) 20      b) 15      c) 25      d) 30
16. Two large parallel plates are connected with the terminal of  $100 \text{ v}$  power supply. These plates have a fine hole at the centre. An electron having energy  $200 \text{ eV}$  is so directed that it passes through the holes. When it comes out its de-Broglie wavelength is



- a)  $1.22 \text{ \AA}$       b)  $1.75 \text{ \AA}$       c)  $2 \text{ \AA}$       d) None of these

17. What will be the ratio of de-Broglie wavelengths of proton and  $\alpha$ -particle of same energy
- a) 2 :1                      b) 1 :2                      c) 4 :1                      d) 1 :4
18. Rest mass energy of an electron is  $0.51 \text{ MeV}$ . If this electron is moving with a velocity  $0.8 c$  (where  $c$  is velocity of light in vacuum), then kinetic energy of the electron should be
- a)  $0.28 \text{ MeV}$                       b)  $0.34 \text{ MeV}$                       c)  $0.39 \text{ MeV}$                       d)  $0.46 \text{ MeV}$
19. A photoelectric cell is illuminated by a point source of light 1 m away. When the source is shifted to 2 m then
- a) Each emitted electron carries half the initial energy  
b) Number of electrons emitted is a quarter of the initial number  
c) Each emitted electron carries one quarter of the initial energy  
d) Number of electrons emitted is half the initial number
20. An electromagnetic radiation has an energy of  $13.2 \text{ keV}$ . Then the radiation belongs to the region of
- a) Visible light                      b) Ultraviolet                      c) Infrared                      d) X-ray

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