



# PHYSICS

## BOOKS - DISHA PHYSICS (HINGLISH)

### DUAL NATURE OF MATTER AND RADIATION

#### Physics

1. Energy of a  $\alpha$  — particle, having de broglie wavelength of  $0.004 \overset{\circ}{\text{A}}$  is approximately.

A. 1275eV

B. 1200 KeV

C. 1200 MeV

D. 1200 GeV

**Answer:**



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2. Velocity of a proton is  $c/20$ . Associated de-Broglie wavelength is (Take

$$h = 6.626 \times 10^{-34} J - s)$$

A.  $2.64 \times 10^{-24} mm$

B.  $2.64 \times 10^{-24} cm$

C.  $2.64 \times 10^{-14} \text{\AA}$

D.  $2.64 \times 10^{-14} m$

**Answer:**



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**3.** One electron & one proton is accelerated by equal potential. Ratio of their de-Broglie wavelength is-

A.  $\sqrt{\frac{m_p}{m_e}}$

B.  $\frac{m_e}{m_p}$

C.  $\frac{m_p}{m_e}$

D. 1

**Answer:**



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4. de-Broglie wavelength of an electron is  $10\overset{\circ}{\text{\AA}}$   
then velocity will be-

A.  $7.2 \times 10^7 m / s$

B.  $7.2 \times 10^6 m / s$

C.  $7.2 \times 10^5 m / s$

D.  $7.2 \times 10^4 m / s$

**Answer:**



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5. One electron & one proton have equal energies then ratio of associated de-Broglie wavelength will be-

A.  $1 : (1836)^2$

B.  $\sqrt{1836} : 1$

C.  $1836 : 1$

D.  $(1836)^2 : 1$

**Answer:**



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6. A proton and deuteron are accelerated by same potential difference. Find the ratio of their de-Broglie wavelengths.

A.  $\frac{1}{\sqrt{2}}$

B.  $\sqrt{\frac{2}{2}}$

C.  $\frac{1}{2}$

D.  $\frac{2}{1}$

**Answer:**



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7. In photoelectric effect if the intensity of light is doubled then maximum kinetic energy of photoelectrons will become

A. Double

B. Half

C. Four time

D. No change

**Answer:**



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**8.** Name the phenomenon which shows the quantum nature of electromagnetic radiation.



A. Huygen wave theory

B. Photoelectric effect

C. Maxwell electromagnetic theory

D. de-Broglie theory

**Answer:**



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9. From rest an electron is accelerated between two such points which has potential

20 & 40 volts respectively. Associated de-Broglie wavelength of electron is-

A.  $0.75\text{\AA}$

B.  $7.5\text{\AA}$

C.  $2.75\text{\AA}$

D.  $2.75m$

**Answer:**



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10. An electron microscope uses 40 KeV electrons. Find its resolving limit on the assumption that it is equal to the wavelength of the electrons-

A.  $0.61 \text{ \AA}$

B.  $0.6 \text{ \AA}$

C.  $0.06 \text{ \AA}$

D.  $0.061 \text{ \AA}$

**Answer:**



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11. A hydrogen atom moving at a speed  $v$  absorbs a photon of wavelength 122 nm and stops. The value of  $v$  is (mass of hydrogen atom  $= 1.67 \times 10^{-27}$  kg)

A. 3.5m/s

B. 32.5m/s

C. 3.05m/s

D. 3.25m/s

**Answer:**



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**12.** The de-Broglie wavelength of an electron is  $0.2\overset{\circ}{\text{A}}$ . Calculate the potential difference (approximate) required to retard it to rest-

A.  $3.76 \times 10^{-3}V$

B.  $3.76 \times 10^3V$

C.  $3.76 \times 10^3eV$

D.  $376.5V$

**Answer:**



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**13.** A photon and an electron have equal energy  $E$ .  $\lambda_{\text{photon}} / \lambda_{\text{electron}}$  is proportional to

A.  $\sqrt{E}$

B.  $\frac{1}{\sqrt{E}}$

C.  $\frac{1}{E}$

D. Does not depend upon  $E$ .

**Answer:**



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**14.** In a photoemissive cell, with exciting wavelength  $\lambda$ , the faster electron has speed  $v$ . If the exciting wavelength is changed to  $3\lambda/4$ , the speed of the fastest electron will be

A.  $v(3/4)^{1/2}$

B.  $v(4/3)^{1/2}$

C. Less than  $v(4/3)^{1/2}$

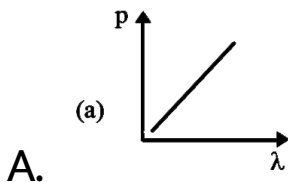
D. Greater than  $v(4/3)^{1/2}$

**Answer:**



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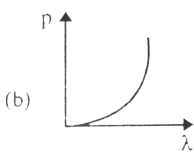
**15.** Which of the following figure represents the variation of particle momentum and the associated de - Broglie wavelength ?



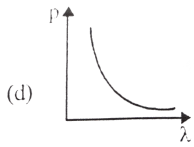
B. 



C.



D.



**Answer:**



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**16.** The work function for the surface of aluminium is 4.2 eV. What will be the wavelength of that incident light for which the

stopping potential will be zero.

$$(h = 6.6 \times 10^{-34} J - se = 1.6 \times 10^{-19} C)$$

A.  $2496 \overset{\circ}{A}$

B.  $2946 \times 10^{-7} m$

C.  $2649 \overset{\circ}{A}$

D.  $2946 \overset{\circ}{A}$

**Answer:**



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17. Slope of  $V_0 - \nu$  curve is-

(where  $V_0 =$  Stopping potential and  $\nu$ =frequency)

A.  $e$

B.  $\frac{h}{e}$

C.  $\phi_0$

D.  $h$

**Answer:**



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**18.** An AIR station is broadcasting the waves of wavelength  $300\text{metres}$ . If the radiating power of the transmitter is  $10\text{kW}$ , then the number of photons radiated per second is

A.  $1.5 \times 10^{35}$

B.  $1.5 \times 10^{31}$

C.  $1.5 \times 10^{29}$

D.  $1.5 \times 10^{33}$

**Answer:**



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**19.** A metal surface of work function  $1.07\text{eV}$  is irradiated with light of wavelength  $332\text{nm}$ . The retarding potential required to stop the escape of photo - electrons is

A.  $3.74\text{V}$

B.  $2.67\text{V}$

C.  $1.0\text{V}$

D.  $4.81\text{V}$

**Answer:**

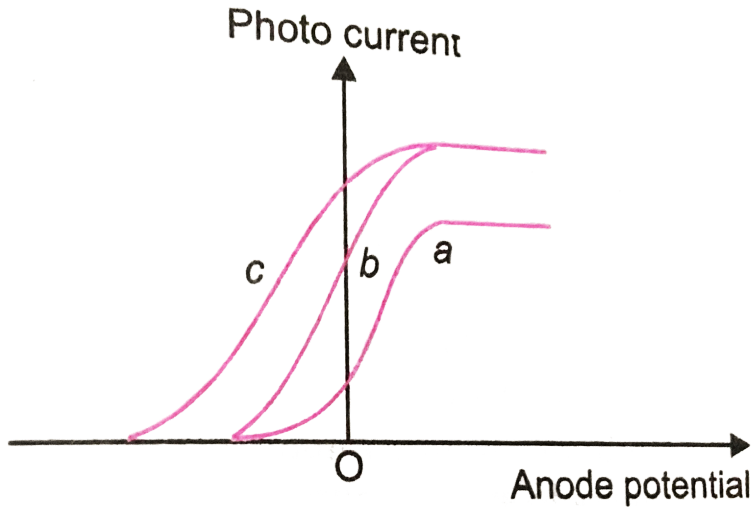


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20. The fig. shows the variation of photon current with anode potential for a photo-sensitive surface for three different radiation.

Let  $I_a$ ,  $I_b$  and  $I_c$  be the intensities and  $f_a$ ,  $f_b$  and  $f_c$  be the frequency for the curves

a,b and c respectively.



A.  $f_a = f_b$  and  $f_a \neq I_b$

B.  $f_a = f_c$  and  $I_a = I_c$

C.  $f_a = f_b$  and  $I_a = I_b$

D.  $f_a = f_b$  and  $I_a = I_c$

**Answer:**



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**21.** An electromagnetic radiation of frequency  $3 \times 10^{15}$  cycles per second falls on a photo electric surface whose work functions is 4.0eV. Find out the maximum velocity of the photo electrons emitted by the surface.

A.  $13.4 \times 10^{-19} m / s$

B.  $19.8 \times 10^{-19} m / s$

C.  $1.73 \times 10^6 m / s$



D. None

**Answer:**



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**22.** Ultraviolet light of wavelength 280 nm is used in an experiment on photo electric effect with lithium ( $\phi = 2.5eV$ ) cathode.

(1) The maximum kinetic energy is 1.9eV

(2) The stopping potential is 1.9V

(3) The maximum kinetic energy is 4.4 V

(4) The stopping potential is 4.4. eV

A. 1,2 and 3 are correct

B. 1 and 2 are correct

C. 2 and 4 are correct

D. 1 and 3 are correct

**Answer:**



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23. The separation between Bragg's planes in a crystal is  $10\text{\AA}$ . Then the wavelength of those X-rays which can be diffracted by this crystal is-

(1)  $5\text{\AA}$  (2)  $10\text{\AA}$

(3)  $20\text{\AA}$  (4)  $25\text{\AA}$

A. 1,2 and 3 are correct

B. 2 and 2 are correct

C. 3 and 4 are correct

D. 2 and 3 are correct

**Answer:**



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**24.** Electrons are accelerated in television tubes through potential difference of about 10 KV.

(1) The lowest wavelength of the emitted X-rays is  $12.4\overset{\circ}{\text{\AA}}$ .

(2) The lowest wavelength of the emitted X-rays is  $1.24\overset{\circ}{\text{\AA}}$

(3) The highest frequency of the emitted X-rays is  $2.4 \times 10^8 \text{ Hz}$

(4) The higher frequency of the emitted X-rays is  $2.4 \times 10^{18} \text{ Hz}$

A. 1,2 and 3 are correct

B. 3 and 2 are correct

C. 4 and 4 are correct

D. 3 and 3 are correct

**Answer:**



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**25.** A physicist wishes to eject electrons by shining light on a metal surface. The light source emits light of wavelength of 450 nm. The table lists the only available metals and their work functions.

Metal	$W_0(eV)$
Barium	2.5
Lithium	2.3
tantalum	4.2
Tungsten	4.5

Which metal(s) can be used to produce electrons by the photoelectric effect from given source of light?

- A. Barium only
- B. Barium or lithium
- C. Lithium, tantalum or tungsten
- D. Tungsten or tantalum

**Answer:**



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**26.** A physicist wishes to eject electrons by shining light on a metal surface. The light source emits light of wavelength of 450 nm.

The table lists the only available metals and their work functions.

Metal	$W_0(eV)$
Barium	2.5
Lithium	2.3
tantalum	4.2
Tungsten	4.5

Which option correctly identifies the metal that will produce the most energetic electrons and their energies?

A. Lithium, 0.45 eV

B. Tungsten, 1.75 eV

C. Lithium, 2.30eV



D. Tungsten, 2.75 eV

**Answer:**



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27. A physicist wishes to eject electrons by shining light on a metal surface. The light source emits light of wavelength of 450 nm. The table lists the only available metals and their work functions.

Metal	$W_0(eV)$
Barium	2.5
Lithium	2.3
tantalum	4.2
Tungsten	4.5

Suppose photoelectric experiment is done separately with these metals with light of wavelength 450 nm. The maximum magnitude of stopping potential amongst all the metals. is-

A. 2.75 volt

B. 4.5 volt

C. 0.45 volt

D. 0.25 volt

**Answer:**



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**28.** Assertion : Mass of moving photon varies inversely as the wavelength .

Reason : Energy of the particle

$$= Mass \times (Speed of light)^2$$

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True: Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is False, Statement-2 is True.

D. Statement-1 is True, Statement-2 is False.

**Answer:**



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**29.** Assertion : Photosensitivity of a metal is high if its work function is small.

Reason : Work function  $= hf_0$  where  $f_0$  is the threshold frequency.

A. Statement-1 is True, Statement,

Statement-2 is True, Statement-2 is a

correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True:

Statement-2 is NOT a correct explanation  
for Statement-1.

C. Statement-1 is False, Statement-2 is  
True.

D. Statement-1 is True, Statement-2 is False.

**Answer:**



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**30. Assertion :** The de - Broglie wavelength of a molecule varies inversely as the square root of temperature.

**Reason :** The root mean square velocity of the molecule depends on the temperature.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True: Statement-2 is NOT a correct explanation

for Statement-1.

C. Statement-1 is False, Statement-2 is True.

D. Statement-1 is True, Statement-2 is False.

**Answer:**



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