PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

ELECTRONS AND PROTONS

Example

1. If the electronic charge $e = 1.6 \times 10^{-19} C$ and the specific charge

e/m off electron is $1.76 \times 10^{11} C(kg)^{-1}$ then calculate the mass m of the electron.

A. $3.2 \times 10^{-31} kg$

B. $5.1 \times 10^{-31} kg$

C. $9.1 \times 10^{-31} kg$

D. $8.2 \times 10^{-31} kg$

Answer: C

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2. A charged oil drop fall with a terminal velocity V in the absence of elcectric field . An electric field E keep keep the oil drop stationary in it . When the drop acquire a charge 'q' it moves up with same velocity. Find the initial charge on the drop.

A. $q/2$

B. q

C. $3q/2$

D. $2q$

Answer: C

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3. The photoelectric work - function of potassium is 2.3 eV. If light having a wavelength of 2800Å falls on potassium, find

(a) the kinetic energy in electron volts of the most energetic electrons ejected.

(b) the stopping potential in volts.

A. 2.1 eV

B. 2.3 eV

C. 4.2 eV

D. 4.5 eV

Answer: A

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4. Photoelectric threshold of silver is $\lambda = 3800A$. Ultraviolet light of $\lambda = 2600A$ is incident of a silver surface. Calculate:

a. the value of work function in joule and in eV.

b. maximum kinetic energy of the emitted photoelectrons.

c. the maximum velocity of the photoelectrons.

(Mass of the electrons $= 9.11 \times 10^{-31}$).

A. $5.23 \times 10^{-19} J$

B. $6.5 \times 10^{-18} J$

C. $6.5 \times 10^{-19} J$

D. $5.5 \times 10^{-10} J$

Answer: A

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5. Light of wavelength 5000Å falls on a sensitive plate with photoelectric work function of $1.9eV$. The kinetic energy of the photoelectron emitted will be

A. 0.58 eV

B. 1.24 eV

C. 2.48 eV

D. 1.18 eV

Answer: A

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6. A radio transmitter operates at a frequency of $880kHz$ and a power of $10kW$. The number of photons emitted per second are

A. 10^{27}

B. 10^{28}

C. 10^{32}

D. 10^{30}

Answer: C

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7. Wavelength of a $1keV$ photon is $1.24 \times 10^{-9}m$. What is the frequency of $1MeV$ photon ?

A. $2.4 \times 10^{15} Hz$

B. $2.4 \times 10^{20} Hz$

C. $1.24 \times 10^{15} Hz$

D. $1.24 \times 10^{20} Hz$

Answer: B

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8. A lamp is placed at a distance of 16 cm, from a photocell and the current observed is 1 mA. If the distance from the lamp is reduced to 8 cm, the photocurrent now will be

A. 4 mA

B. 0.25 mA

C. 1 mA

D. 0.125 mA

Answer: A

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Exercise 1

1. Cathode rays are

A. streams of positive ions

B. streams of negatively charged particles

C. streams of nuclei

D. streams of neutrons

Answer: B

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2. Glow in discharge tube is due to

A. X-rays

B. positive rays

C. cathode rays

D. collision of gas ions

Answer: C

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3. Cathode rays are streams of fast moving regatively charged particles. Their speed range is (consider $c \approx 3 \times 10^8 ms^{-1}$)

A. 0.1 c to 0.2c

B. c

C. greater than c

D. around 10^{-5} c to 10^{-3}c

Answer: A

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4. Value of e/m (specific charge) of the cathode ray particles

A. depends on potential difference of cathode and anode

B. depends on nature of gas in the discharge tube

C. is independet of material of cathod eor gas in tube

D. depends on nature of metal used for cathode

Answer: C

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5. When electric field is applied between cathode annd anode, at pressure of about 0.001 mm of mercury in a discharge tube, following is observed.

A. There is no discharge in the tube

B. A zig-zag thin red spark runs from cathode to anode

C. whole of tube is filled with bright light

D. a fluorescent glow appeared on the glass opposite to cathode

Answer: D

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6. The colour of the positive column ina gas discharge tube depends on

A. natruue of gas in the discharge tube

B. potential difference between cathode and anode

C. natrue of material of cathode

D. nature of glass of the discharge tube

Answer: D

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7. In Millikan's oil drop experiment, a charged oil drop of mass $3.2 \times 10^{-14} kg$ is held stationary between two parallel plates 6mm apart by applying a potential difference of $1200V$ between them. How many excess

electrons does the oil drop carry? Take $g = 10ms^{-2}$

A. 7

B. 8

C. 9

D. 10

Answer: D

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8. The specific charge of a proton is $9.6 \times 10^7 \mathrm{C\,kg}^{-1}$.

The specific charge of an alpha particle will be

A. $9.6 \times 10^7 \mathrm{C} \quad kg^{-1}$

B. $19.2 \times 10^7 \mathrm{C} \quad kg^{-1}$

C. $4.8 \times 10^7 \quad \mathrm{C} \quad kg^{-1}$

D. $2.4 \times 10^7 \quad \mathrm{C} \quad kg^{-1}$.

Answer: C

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9. Positive rays are very identical to

A. α-rays

B. β-rays

C. γ-rays

D. none of these

Answer: A

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10. Few metals when irradiated with ultraviolet light emits

A. positively charged particles

B. gamma rays

C. negatively charged particles

D. neutral particles.

Answer: C

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11. Non-dependence of e/m oof the cathode ray particles on nature of the gas and metal of cathode suggested

A. wave nature of particles

B. photoemission of electrons

C. universality of the cathode ray particles

D. presence of positive charge in atom

Answer: C

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12. The velocity of electrons emitted from the electron gun can be increased by

A. increasing the filament current

B. decreasing the filament current

C. decreasing the potential difference between the anode and filament

D. increasing the potential difference between the anode and filament

Answer: D

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13. A beam of cathode rays is subjected to crossed electric (E) and magnetic fields (B). The fields are adjusted such that the beam is not deflected. The specific charge of the cathode rays is given by

A. $\frac{B^2}{2VE^2}$

B. $\frac{2VB^2}{E^2}$

C. $\frac{2VE^2}{B^2}$

D. $\frac{E^2}{2VB^2}$

Answer: D

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14. In the phenomenon of electric discharge through gases at low pressure , the coloured glow in the tube appears as a result of

A. excitation of electrons in the atoms

B. collision between the atoms of the gas

C. collisions between the charged particles emitted from

D. the cathode and the atoms of the gas

Answer: C

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15. Canal rays are

A. electrons

B. neutrons

C. positive ions

D. electromagnetic waves

Answer: C

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16. Cathode rays enter a magnetic field making oblique angle with the lines of magnetic induction. What will be the nature of the path followed?

A. Parabola

B. Helix

C. Circle

D. Straight line

Answer: B

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17. Millikan's oil drop experiment established that

A. electric chage depends on velocity

B. specific charge of electron is

$1.76 \times 10^{11} \mathrm{C} \quad kg^{-1}$

C. electron has wave nature

D. electric charge is quantised

Answer: D

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18. The photoelectric threshould wavelength for a metal surface is 6600 Å. The work function for this is

A. 0.87 eV

B. 1.87 eV

C. 18.7 eV

D. 0.18 eV

Answer: B

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19. Ligth of wavelength 4000Å is incident on a metal plate whose work function is $2eV$. What is maximum kinetic enegy of emitted photoelectron ?

A. 0.5 eV

B. 1.1 eV

C. 1.5 eV

D. 2.0 eV

Answer: B

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20. The frequency of incident light falling on a photosensitive metal plate is doubled, the K.E of the emitted photo-electrons is

A. double the earlier value

B. unchanged

C. more than doubled

D. less than doubled

Answer: C

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21. If the work function for a certain metal is 3.2×10^{-19} joule and it is illuminated with light of frequency $8 \times 10^{14} Hz$. The maximum

kinetic energy of the photo-electrons would be

$\left(h = 6.63 \times 10^{-34} Js\right)$

A. $2.1 \times 10^{-19} J$

B. $3.2 \times 10^{-19} J$

C. $5.3 \times 10^{-19} J$

D. $8.5 \times 10^{-19} J$

Answer: A

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22. Ultraviolet light of wavelength 300nn and intensity $1.0Wm^{-2}$ falls on the surface of a photosensitive material. If one per cent of the incident photons produce photoelectrons, then the number of photoelectrons emitted per second from an area of 1.0 cm^2 of the surface is nearly

A. $9.61 \times 10^{14}s^{-1}$

B. $4.12 \times 10^{13}s^{-1}$

C. $1.51 \times 10^{12}s^{-1}$

D. $2.13 \times 10^{11} s^{-1}$.

Answer: C

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23. Light of wavelength 4000 Å is incident on a sodium surface for which the threshold wavelength of photoelectrons is 5420 Å. The work function of sodium is

A. 0.57 eV

B. 1.14 eV

C. 2.29 eV

D. 4.58 eV

Answer: C

24. Photoelectric emission occurs only when the incident light has more than a certain minimum

A. wavelength

B. intensity

C. frequency

D. power

Answer: C

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25. A photosensitive metallic surface has work funtion hv_0. If photons of energy $2hv_0$ fall on this surface the electrons come out with a

maximum velocity of $4 \times 10^6 m/s$. When the photon energy is increases to $5hv_0$ then maximum velocity of photo electron will be

A. $12 \times 10^6 ms^{-1}$

B. $6 \times 10^6 ms^{-1}$

C. $3 \times 10^6 ms^{-1}$

D. $24 \times 10^6 ms^{-1}$

Answer: B

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26. Radiation two photons having energies twice and five times the work function of a metal are incident successively on the metal surface. The ratio of the maximum velocity of photoelectrons emitted in the two cases will be

A. $1:1$

B. $1:2$

C. $1:3$

D. $1:4$

Answer: B

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27. The work function for metals A, B and C are respectively $1.92eV, 2.0eV$ and $5eV$. According to Einstein's equation , the metals which will emit photoelectrons for a radiation of wavelength $4100Å$ are

A. A only

B. A and B

C. Both (a) and (b)

D. Neither (a) nor (b)

Answer: B

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28. Silver has a work function of 4.7 eV. When ultraviolet light of wavelength 100 nm is incident upon it, a potential of 7.7 V is required to stop the photo electrons from reaching the collector plate. How much

potential will be required to stop the photoelectrons when light of wavelength 200nm is incident upon silver?

A. 15.4 V

B. 2.35 V

C. 3.85 V

D. 1.5 V

Answer: D

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29. The maximum kinetic energy of emitted photoelectrons depends on the.....and nature of.....but is independent of..... .

A. potential

B. frequency

C. incident angle

D. pressure

Answer: B

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30. A photosensitive metallic surface has work funtion hv_0. If photons of energy $2hv_0$ fall on this surface the electrons come out with a maximum velocity of $4 \times 10^6 m/s$. When the photon energy is increases to $5hv_0$ then maximum velocity of photo electron will be

A. $2 \times 10^7 ms^{-1}$

B. $8 \times 10^6 ms^{-1}$

C. $2 \times 10^6 ms^{-1}$

D. $8 \times 10^5 ms^{-1}$

Answer: B

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

A. 1.07 eV

B. 2.68 eV

C. 3.7 eV

D. 4.81 eV

Answer: B

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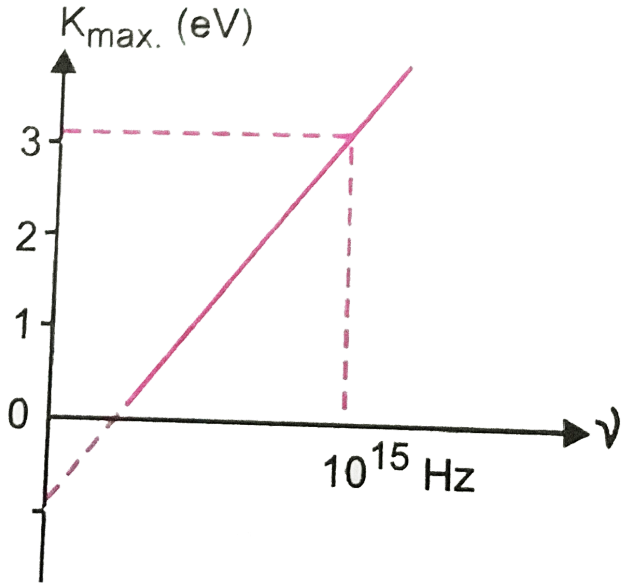
32. represents a graph of most energetic photoelectrons $K_{\max}$ (in eV) and frequency v for a metal used as cathode in photoelectrons experiment. The threshold frequency of light for the photoelectric emission from the metal

is



A. $4 \times 10^{14} Hz$

B. $3.5 \times 10^{14} Hz$

C. $2.0 \times 10^{14} Hz$

D. $2.7 \times 10^{-19} Hz$

Answer: D

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33. Find the difference of kinetic energies of photoelectrons emitted from a surface by light of wavelength 2500Å and 5000Å. $h = 6.62 \times 10^{-34} Js$.

A. 1.61 eV

B. 2.47 eV

C. 3.96 eV

D. $3.96 \times 10^{-19} eV$

Answer: B

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34. When ultraviolet light of wavelength 100 nm is incident upon silver plate, a potential of 7.7 V is required to stop the photoelectrons from reaching the collector plate. How much potential will be required to stop the

photoelectons when light of wavelength 200 nm is incident upon silver?

A. 1.5V

B. 3.85V

C. 2.35 V

D. 15.4V

Answer: A

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35. Light of wavelength λ strikes a photoelectric surface and electrons are ejected with kinetic energy K. If K is to be increased to exactly twice its original value, the wavelength must be changed to λ' such that

A. λ' is less than $\frac{\lambda}{2}$

B. λ' is greater than $\frac{\lambda}{2}$

C. λ' is greater than $\frac{\lambda}{2}$ but less than λ

D. λ' is exactly equal to $\frac{\lambda}{2}$.

Answer: C

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36. The energy of a photon corresponding to the visible light of maximum wavelenth is approximately

A. 1 eV

B. 1.6 eV

C. 3.2 eV

D. 7 eV

Answer: B

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37. When a centimeter thick surface is illuminated with light of wavelength λ, the stopping potential is V. When the same surface is illuminated by light of wavelength 2λ, the stopping potential is $\frac{V}{3}$. Threshold wavelength for the metallic surface is

A. $4\lambda/3$

B. 4λ

C. 6λ

D. $\lambda/3$

Answer: B

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38. The work function for Al, K and is 4.28 eV, 2.30 eV and 5.65 eV respectively. Their respective threshold frequencies would be

A. $Pt > Al > K$

B. $Al > Pt > K$

C. $K > Al > Pt$

D. $K + hv$

Answer: A

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39. When photons of energy hv fall on an aluminium plate (of work function E_0), photoelectrons of maximum kinetic energy K

are ejected . If the frequency of the radiation is doubled , the maximum kinetic energy of the ejected photoelectrons will be

A. $K + E_0$

B. $2K$

C. K

D. $K + hv$

Answer: D

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40. A photocell with a constannt potential differnce of V voolt across it, is illuminated by a point source from a distance of 25 cm. when the source is moved to a distance of 1 m, the electrons emitted by the photocell

A. carry 1/4th their previous energy

B. are 1/16th as numerous as before

C. are 1/4th as numerous as before

D. cary 1/4th theirr previous momentum

Answer: B

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41. In a photoemissive cell, with exciting wavelength λ, 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. $\frac{3K}{4}$

B. $\frac{4K}{3}$

C. less than $\frac{4K}{3}$

D. greater than $\frac{4K}{3}$

Answer: D

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42. In a photoemissive cell, with exciting wavelength λ, 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. $v\left(\frac{3}{4}\right)^{\frac{1}{2}}$

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

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

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

Answer: B

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43. The threshold frequency of the metal of the cathode in a photoelectric cell is $1 \times 10^{15} Hz$. When a certain beamm of light is incident on the cathode, it is found that a stopping potential 4.144 V is required to

reduce the current to zero. The frequency of the incident radiation is

A. $2.5 \times 10^{15} Hz$

B. $2 \times 10^{15} Hz$

C. $4.144 \times 10^{15} Hz$

D. $3 \times 10^{16} Hz$

Answer: B

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44. Calculate the energy of a photon with momentum $3.3 \times 10^{-13} kg - ms^{-1}$. (given, planck's constant to be $6.6 \times 10^{-34} J - s$)

A. $7.3 \times 10^{4} J$

B. $9.9 \times 10^{-5} J$

C. $1.3 \times 10^{5} J$

D. $8.1 \times 10^{3} J$

Answer: B

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45. The energy that should be added to an electron, to reduce its de-Broglie wavelengths from $10^{-10}m$ to 0.5×10^{-10} m wil be

A. four times the initial energy

B. thrice the initial energy

C. equal to the initial energy

D. twice the initial energy

Answer: B

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46. A parallel beam of light is incident normally on a plane surface absorbing 40% of the light and reflecting the rest. If the incident beamm carries 60 W of power, the force exerted by it on the surface is

A. $3.2 \times 10^{-8} N$

B. $3.2 \times 10^{-7} N$

C. $5.12 \times 10^{-7} N$

D. $5.12 \times 10^{-8} N$

Answer: B

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47. A particle of mass $1mg$ has the same wavelength as an electron moving with a velocity of $3 \times 10^6 ms^{-1}$. The velocity of the particle is

A. $3 \times 10^{-31} ms^{-1}$

B. $2.7 \times 10^{-21} ms^{-1}$

C. $2.7 \times 10^{-18} ms^{-1}$

D. $9 \times 10^{-2} ms^{-1}$

Answer: C

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48. Monochromatic light of frequency $6.0 \times 10^{14} Hz$ is produced by a laser. The power emitted is 2×10^{-3} w. The number of photons emitted, on the average, by the sources per second is

A. 5×10^{16}

B. 5×10^{16}

C. 5×10^{17}

D. 5×10^{14}

Answer: A

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49. Maxwell's equations of electromagnetism and hertz experiments on generation and detection of electromagnetic waves established the

A. particle nature of light

B. wave nature of particle

C. wave natue of light

D. matter wave hypothesis

Answer: C

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50. If 5% of the energy supplied to a bulb is irradiated as visible light, how many quanta are emitted per second by a 100 W lamp?

(Assume, wavelength of visible light as $5.6 \times 10^{-5} cm$)

A. 1.4×10^{19}

B. 3×10^{3}

C. 1.4×10^{-19}

D. 3×10^{4}

Answer: A

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Exercise 2

1. A tiny spherical oil drop carrying a net charge q is balanced in still air with a vertical uniform electric field of strength $\frac{81\pi}{7} \times 10^5 Vm^{-1}$. When the field is switched off, the drop is observed to fall with terminal velocity $2 \times 10^{-3} ms^{-1}$. Given $g = 9.8 ms^{-2}$, viscoisty of the air $= 1.8 \times 10^{-5} Nsm^{-2}$ and the denisty of oil $= 900 kgm^{-3}$, the magnitude of q is

A. $1.6 \times 10^{-19} C$

B. $3.2 \times 10^{-19} C$

C. $4.8 \times 10^{-19} C$

D. $8.0 \times 10^{-19} C$

Answer: D

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2. When a cathode ray tube is operated at 2912 V, the velocity of electrons is $3.2 \times 10^{7} ms^{-1}$. Find the velocity of cathode ray if the tube is operated at 5824V.

A. $2.4 \times 10^7 ms^{-1}$

B. $5.2 \times 10^7 ms^{-1}$

C. $4.525 \times 10^7 ms^{-1}$

D. $2.4 \times 10^6 ms^{-1}$

Answer: C

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3. In a cathode ray oscillograph, the focusing of beam on the screen is achieved by

A. convex lenses

B. magnetic field

C. electric potential

D. all of these

Answer: C

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4. if e/m of electron is $1.76 \times 10^{11} C(kg)^{-1}$ andn stopping potential is 0.71 V, then the maximum velocity of the photoelectron is

A. $150kms^{-1}$

B. $200kms^{-1}$

C. $500kms^{-1}$

D. $250kms^{-1}$

Answer: C

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5. The voltage applied to an electron microscope to produce electrons of wavelength $0.50Å$ is

A. 602 V

B. 50 V

C. 138 V

D. 812 V

Answer: A

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6. A radiotransmitter operates at a frequency 1000 kHz and a powerr of 66 kW. Find the number of photons emitted per second

A. 10^{27}

B. 10^{28}

C. 10^{29}

D. 10^{30}

Answer: C

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7. When a surface 1 cm thick is illuminated with light of wavelength λ, the stopping potential is V_0, but when the same surface is illuminated

by light of wavelength 3λ, the stopping potential is $\frac{V_0}{6}$. Find the threshold wavelength for metallic surface.

A. 4λ

B. 5λ

C. 3λ

D. 2λ

Answer: B

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8. In a photoelectric effect measurement, the stoppingg potential for a given metal is found to be V_0 volt, when radiation of wavelength λ_0 is used. If radiation of wavelength $2\lambda_0$ is used with the same metal, then the stopping potential (in V) will be

A. $\frac{V_0}{2}$

B. $2V_0$

C. $V_0 + \frac{hc}{2e\lambda_0}$

D. $V_0 - \frac{hc}{2e\lambda_0}$

Answer: D

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9. The work function of a substance is 4.0 eV. The longest wavelength of light that can cause photoelectron emission from this substance is approximately:

A. 540 nm

B. 400 nm

C. 310 nm

D. 220 nm

Answer: C

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10. The act of photoelectric effect taking place with a certain photosensitive metal depends upon

(i) frequency annd

(ii) intensity of the incident radiation.

A. both (i) and (ii) are correct

B. only (i) is correct

C. only (ii) is correct

D. neigher (i) nor (ii) is correct.

Answer: B

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11. A point source of light is used in a photoelectric effect. If the source is removed farther from the emitted metal, the stopping potential

A. will increases

B. will decreases

C. will remain constant

D. will either increase or decrease

Answer: C

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12. If the frequency of light in a photoelectric experiment is doubled the stopping potential will

A. be doubled

B. halved

C. become more than double

D. become less than double

Answer: C

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13. The cathode of a photoelectric cell is changed such that the work function changes from $(W_1 \rightarrow W_2(W_2 > W_1)$. If the current

before and after change are I_1 and I_2, all other conditions remaining unchanged , then (assuming $hv > W_2$)

A. $l_1 = l_2$

B. $l_1 < l_2$

C. $l_1 > l_2$

D. $\frac{W_1}{W_2} = \frac{l_1}{l_2}$

Answer: A

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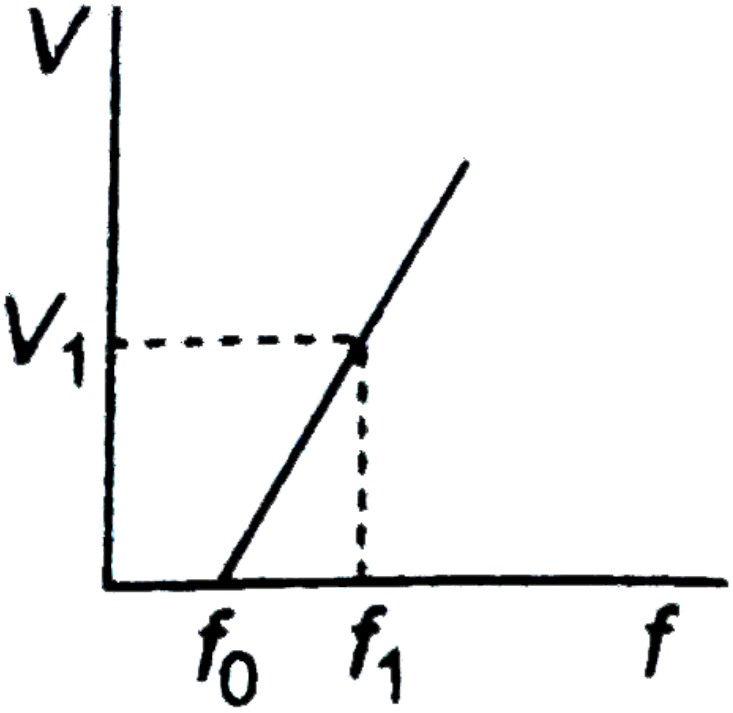
14. In a photoelectric experiment, the potential difference V that must be maintained between the illuminated surface and the collector so as just to prevennt any electron from reaching the collector is determined for different frequencies f of the incident illumination. the graph obtained is shown in the figure. the maximum kinetic energy of the electrons

emitted at frequency f_1 is



A. hf_2

B. $\dfrac{V_1}{(f_1 - f_0)}$

C. $h(f_1 - f_0)$

D. $eV_1(f_1 - f_0)$

Answer: C

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15. what should be the velocity of an electron so that its momentum becomes equal to that of a photon of wavelength 5200Å

A. $700ms^{-1}$

B. $1000ms^{-1}$

C. $1400ms^{-1}$

D. $2800ms^{-1}$

Answer: C

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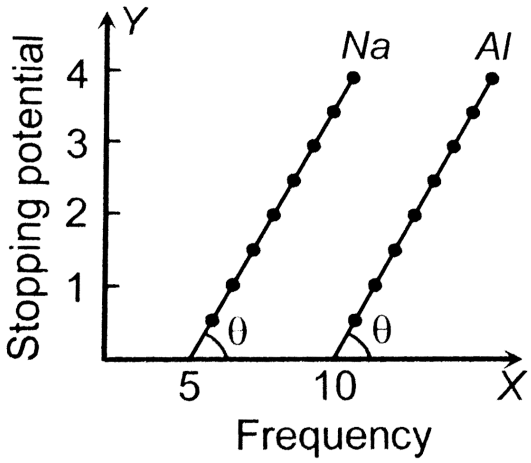
16. From the figure describing photoelectric effect we may infer correctly that



A. Na and Al bothh have the same threshold frequency

B. maximum kinetic energy for both the metals depend linearly on the frequency

C. the stopping potential are different for Na annd Al for the samme change in

frequency

D. Al is a better photo sensitive material than Na

Answer: B

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17. Cathode rays enter a magnetic field makin oblique angle withh the lines off magnetic induction. What will be the nature of the path followed?

A. Parabola

B. Helix

C. Circle

D. straight line

Answer: B

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18. The work function for aluminium is 4.125 eV. The cut-off wavelength for photoelectric effect for aluminium will be

A. 420 nm

B. 350 nm

C. 300 nm

D. 200 nm

Answer: C

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19. According to Einstein's photoelectric equation, the plot of the maximum kinetic energy of the emitted photoelectrons from a

metal versus frequency of the incident radiation gives a straight line whose slope

A. depends on the intensity of the incident radiation

B. depends on the nature of the metal and also on the intensity of incident radiation

C. is same for all metals and independent of the intensity of the incident radiation

D. depends on the nature of the metal

Answer: C

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20. Photon and electron are given same energy $\left(10^{-20} J\right)$. Wavelength associated with photon and electron are λ_{ph} and λ_{el} then correct statement will be

A. $\lambda_p > \lambda_e$

B. $\lambda_p < \lambda_e$

C. $\lambda_p = \lambda_e$

D. $\frac{\lambda_e}{\lambda_p} = c$

Answer: A

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21. Match column I (fundamental experiment) with column II (its conclusion) and select the correct optionn from the choices given below:

	Column I	Column II
A.	Franck-Hertz experiment	1. Particle nature of light
B.	Photoelectric experiment	2. Discrete energy levels of atom
C.	Davisson-Germer experiment	3. Wave nature of electron
		4. Structure of atom

A. $A-1, B-4, C-3$

B. $A-2, B-4, C-3$

C. $A-2, B-1, C-3$

D. $A-2, B-1, C-4$

Answer: C

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22. When a certain metallic surface is illuminated with monochromatic light of wavelength λ, the stopping potential for

photo electric current is $6v_0$. When the same surface si illuminated with light of wavelength 2λ, the stopping potential is $2v_0$. The threshold wavelength of this surface for photoelectric effect is -

A. 6λ

B. 4λ

C. $\frac{\lambda}{4}$

D. $\frac{\lambda}{6}$

Answer: B

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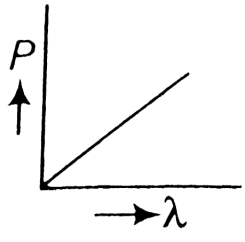
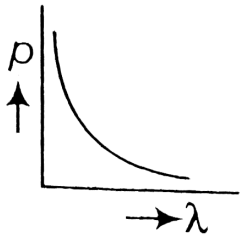
23. Which of the following figure represents the variation of particle momentum and the associated de - Broglie wavelength ?

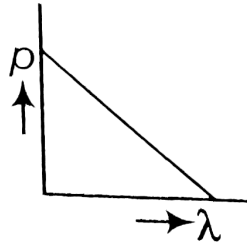
A.



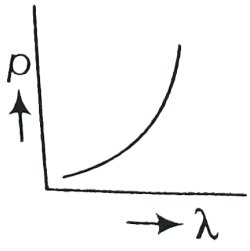
B.



C.



D.



Answer: B

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24. Threshold wavelength for lithium metal is 6250 Å. For photo emission, the wavelength of

the incidennt light must be

A. exactly equal to 6250 Å

B. more than 6250 Å

C. equal to or more than 6250 Å

D. equal to or less than 6250 Å

Answer: D

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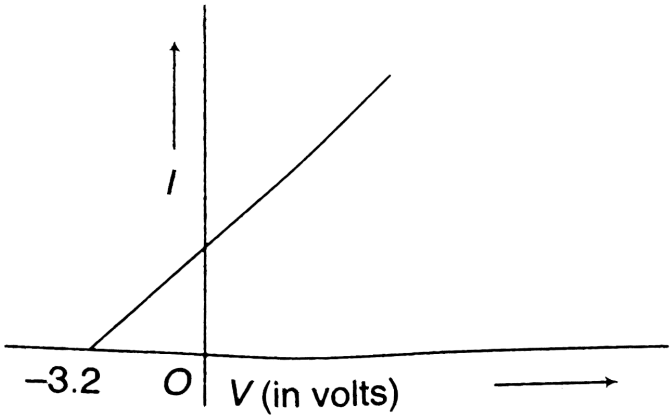
25. In a photoelectric experiment the relation between applied potential difference between cathode and anode V and the photoelectric current cathode and anode V and the photoelectric current I and was found to be shown in graph below. If planck's constant $h = 6.6 \times 10^{-34}$Js, the frequency of incident radiation would e nearly (in s^{-1})



A. 0.436×10^{18}

B. 0.436×10^{17}

C. 0.775×10^{15}

D. 0.775×10^{16}

Answer: C

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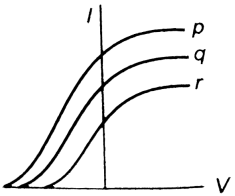
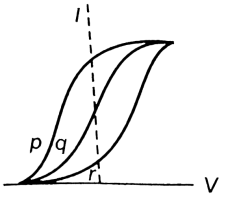
26. Photoelectric effect experiments are performed using three different metal plates p, q and$r$ having work function

$\phi_p = 2.0eV, \phi_e = 2.5eV$ and $\phi_r = 3.0eV$ respectively A light beam containing wavelength of $550nm, 450nm$ and $350nm$ with equal intensities illuminates each of the plates . The correct $I - V$ graph for the experiment is [Take hc = 1240 eV nm]

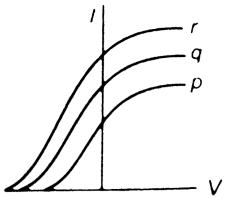
A.



B.



C.



D. none of these

Answer: D

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27. Light of two different frequencies whose photons have energies 1eV and 2.5 eV respectively illuminate a metallic surface whose work function is 0.5 eV successively. Ratio of maximum kinetic energy of emitted electrons will be:

A. $1:2$

B. $1:5$

C. $1:1$

D. $1:4$

Answer: A

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28. Light of intensity $10^{-5}Wm^{-2}$ falls on a sodium photocell of surface area $2cm^2$. Assuming that the top 5 layers of sodium

absorb the incident energy, estimate the time required for photoelectric emission in the wave picture of radiation. The work function of the metal is given to be about 2eV. What is the implication of your answer? effective atomic area $= 10^{-20} m^2$.

A. $10\frac{1}{2}s$

B. $\frac{1}{2}s$

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

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

Answer: D

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29. Work function for caesium metal is 2.14 eV. Let a beam of light of frequency $6 \times 10^{14} Hz$ incident over the metal surface.

Now, match the following columns and choose the correct option from code given.

	Column I	Column II	
A.	Maximum KE of emitted photoelectrons (in eV)	1.	332.3
B.	Minimum KE of emitted photoelectrons (in eV)	2.	345
C.	Stopping potential of material (in mV) is	3.	0.345
D.	Maximum speed of the emitted photoelectrons (in kms^{-1})	4.	0

A. A-4,B-3,C-2,D-1

B. A-3,B-4,C-2,D-1

C. A-3,B-1,C-4,D-2

D. A-2,B-1,C-4,D-3

Answer: B

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Mht Cet Corner

1. Light of wavelength A which is less than threshold wavelength is incident on a

photosensitive material. If incident wavelength is decreased so that emitted photoelectrons are moving with same velocity, then stopping potential will

A. increase

B. decrease

C. be zero

D. become exactly half

Answer: A

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2. When light of wavelength λ is incident on photosensitive surface, the stopping potential is V. When light of wavelength 3λ is incident on same surface, the stopping potential is $\frac{V}{6}$ Thereshould wave length for the surface is

A. 2λ

B. 3λ

C. 4λ

D. 5λ

Answer: D

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3. The de-Broglie wavelength λ

A. is proportional to mass

B. is proportional to impulse

C. is inversely proportional to impulse

D. does not depend on impulse

Answer: C

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4. For photoelectric emission from certain metal the cut - off frequency is v. If radiation of frequency $2v$ incident on the metal plate , the maximum possible velocity of the emitted electron will be (m is the electron mass).

A. $\sqrt{\frac{hv}{(2m)}}$

B. $\sqrt{\frac{hv}{m}}$

C. $\sqrt{\frac{2hv}{m}}$

D. $2\sqrt{\frac{hv}{m}}$

Answer: C

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5. The wavelength λ_e of ann electron and λ_p of a photon of same energy E are related by

A. $\lambda_p \propto \lambda_e^2$

B. $\lambda_p \propto \lambda_e$

C. $\lambda_p \propto \sqrt{\lambda_e}$

D. $\lambda_p \propto \frac{1}{\sqrt{\lambda_e}}$

Answer: A

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6. The ratio of moment of an electron and an α-particle which are accelerated from rest by a potential difference of $100V$ is

A. 1

B. $\sqrt{\frac{2m_e}{m_\alpha}}$

C. $\sqrt{\frac{m_e}{m_\alpha}}$

D. $\sqrt{\frac{m_e}{2m_\alpha}}$

Answer: D

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7. When the kinetic energy of an electron is increased , the wavelength of the associated wave will

A. increase

B. decrease

C. wavelength does not depends upon kinetic energy

D. none of these

Answer: B

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8. The dimensions of Planck's constant is the same as the product of

A. force and time

B. force, displacement and time

C. force and distance

D. time and displacement

Answer: B

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

A. double the earlier value

B. halff

C. four times

D. no change

Answer: D

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10. Which of the following is not the property of the photons ?

A. Momentum

B. Energy

C. charge

D. velocity

Answer: C

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11. The momentum of a photon of energy $1MeV$ "in"kgm/s will be

A. 0.33×10^{6}

B. 7×10^{-24}

C. 10^{-22}

D. 5×10^{-22}

Answer: D

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12. As the intensity of incident light increases

A. photocurrent increases

B. photocurrennt decreases

C. kinetic energy of emitted photoelectrons increases

D. kinetic energy of emitted photoelectrons decreases

Answer: A

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13. A photoelectric cell is illuminated by a point source of light $1m$ away . When the source is shifted to $2m$ then

A. each emitted electron carries half the initial energy

B. numer 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

Answer: B

14. A red bulb and violet bulb of equal power emits n_R and n_v number of photons in a given time, then

A. $n_R = n_V$

B. $n_R > n_V$

C. $n_R < n_V$

D. $n_R \geq n_V$

Answer: B

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15. An electron is accelerated from rest to potential V. the final velocity of electron is

A. $\sqrt{\frac{eV}{2M}}$

B. $\sqrt{\frac{4eV}{m}}$

C. $\sqrt{\frac{eV}{m}}$

D. $\sqrt{\frac{2eV}{m}}$

Answer: D

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16. The dual nature of light is exhibited by

A. diffraction and photoelectric effect

B. photoelectric effect

C. refractionn and interference

D. diffraction and reflection

Answer: A

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17. Energy of photon whose frequency is $10^{12} MHz$, will be

A. $4.14 \times 10^3 keV$

B. $4.14 \times 10^2 eV$

C. $4.14 \times 10^3 MeV$

D. $4.14 \times 10^3 eV$

Answer: D

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18. Number of electrons emitted by a surface exposed to light is directly proportional to

A. wavelength of light

B. frequency of light

C. intensity of incident light

D. velocity of light

Answer: C

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19. The $\frac{e}{m}$ value of electron is

A. $9.76 \times 10^{11} C(kg)^{-1}$

B. $6.6 \times 10^{27} C(kg)^{-1}$

C. $3.52 \times 10^{11} C(kg)^{-1}$

D. $1.76 \times 10^{11} C(kg)^{-1}$

Answer: D

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