23.12.17

MARKING SCHEME-PHYSICS-PRACTICE TEST-03

Q/N	EXPECTED ANSWER/ VALUE POINTS	MARKS
1.	Diverging	1
2.	$\phi = \frac{-2Q}{\varepsilon_0}$	1
3.	Any device which converts energy from one form to another is called a transducer.	1
4.	The brightness of the bulb remains unchanged because the reactance of inductor is zero in a d.c. circuit.	1
5.	The mobility of a charge carrier is the drift velocity acquired by it in a unit electric field. S.I. unit: $m^2V^{-1}S^{-1}$	1/2 1/2
6.	(a) The energy (E) of a photon of wavelength (λ) is given by $E = \frac{hc}{\lambda} = \frac{6\cdot626\times10^{-34}\times3\times10^{8}}{275\times10^{-9}}$ J $= \frac{6\cdot626\times10^{-34}\times3\times10^{8}}{275\times10^{-9}\times1\cdot6\times10^{-19}}$ eV $= \mathbf{4\cdot5\ eV}$ From fig. this transition corresponds to B since for transition B. $E = 0-(-4\cdot5\text{ eV}) = \mathbf{4\cdot5\ eV}$ **(b) Energy of Photon Emitted,** $E = \frac{hc}{\lambda} \propto \frac{1}{\lambda}$ For minimum wavelength of emission, the energy is minimum. This transition A corresponds to emission of radiation of maximum wavelength.	1 1
7.	Davisson-Germer experiment establishes the existence of matter waves of electrons. The K.E. gained by a charged particle when accelerated through a potential difference of V volts is given by $\frac{1}{2}mv^2 = qV$ $m^2v^2 = 2mqV$ $p = \sqrt{2mqV}$ $de-broglie$ wavelength $= \lambda = \frac{h}{p} = \frac{h}{\sqrt{2mqV}}$ for the same potential difference V, $\frac{\lambda_{\alpha\text{-particle}}}{\lambda_{\text{proton}}} = \sqrt{\frac{m_p q_p}{m_\alpha q_\alpha}} = \sqrt{\frac{m_p q_p}{4m_p 2q_p}} = \frac{1}{2\sqrt{2}}$	1 1
8.	(i) emf=1.4 V (ii) r=5 Ω	1 1
9.	Intrinsic semiconductor Energy band diagram n-type semiconductor Energy band diagram	½ ½ ½ ½
10.	$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$ Now for concave mirror, f<0 and for an object on the left, u<0 $\therefore 2f < u < f$ or $\frac{1}{2f} > \frac{1}{u} > \frac{1}{f} \Rightarrow -\frac{1}{2f} < -\frac{1}{u} < -\frac{1}{f}$ $\Rightarrow \frac{1}{f} - \frac{1}{2f} < \frac{1}{f} - \frac{1}{u} < \frac{1}{f} - \frac{1}{f}$ $\therefore \frac{1}{2f} < \frac{1}{v} < 0$ This implies that v<0, so that image is formed on left. Also the above inequality implies 2f>v $\lvert 2f \rvert < \lvert v \rvert$ OR For numerical	½ ½ ½ ½ 2

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11.	a. Balance point will shift twoeards the end B b. No effect c. Balance point is not found on wire	1 1 1
12.	Deduction of the expression for the electrostatic energy stored in a capacitor Explanation of how the (i) energy stored and (ii) the electric field inside the capacitor be affected when it is completely filled with a dielectric constant 'K'?	2 ½ ½
13.	Defination of the term 'mutual inductance' expression for mutual inductance	1 2
14.	In magnitude $\tau = mB\sin\theta$ Here $\boldsymbol{\tau}$ is restoring torque and θ is the angle between **m** and **B**. Therefore, in equilibrium $\mathcal{I}\frac{d^2\theta}{dt^2} = -mB\sin\theta$ Negative sign with $mB\sin\theta$ implies that restoring torque is in opposition to deflecting torque. For small values of θ in radians, we approximate $\sin\theta \approx \theta$ and get $\mathcal{I}\frac{d^2\theta}{dt^2} \approx -mB\theta$ or, $\frac{d^2\theta}{dt^2} = -\frac{mB}{\mathcal{I}}\theta$ This represents a simple harmonic motion. The square of the angular frequency is $\omega^2 = mB/\mathcal{I}$ and the time period is. $T = 2\pi\sqrt{\frac{\mathcal{I}}{mB}}$	½ ½ 1 1
15.	a. wavelength of the wave b. amplitude of the oscillating magnetic field c. Proof that the average energy density of the E field equals the average energy density of the B field.	1 1 1
16.	Tracing the path of the ray Expression for refractive index of the glass prism. Plot a graph between angle of incidence and angle of deviation.	1 1 1
17.	Defination of magnifying power Write its expression. Numerical	½ ½ 2
18.	Einstein's photoelectric equation two characteristics properties of photons on which this equation is based. three observed features	1 1/2+1/2 1
19.	(a) Deduction of the expression (b) expression of the β^+ decay of $^{22}_{11}Na$ basic nuclear process underlying this decay.	2 ½ ½
20.	Space wave propagation Numerical	1 2
21.	circuit diagram and the name of three basic processes Draw the I-V characteristics two important criteria OR fabricatetion and working. three important advantages of LEDs over conventional incandescent lamps.	1 1 1 1+1 1
22.	Truth Table Logic peration Logic Sysmbol	1 1 1

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23.	Principle Explanation Two qualities of Sunita	1 1 1+1
24.	Statement of Gauss's law Deduction of the expression for the electric field due to a uniformly charged thin spherical shell at points (i) inside and (ii) (ii) outside the shell. graph showing variation of electric field as a function of r>R and r<R. OR Defination of electric dipole moment Is it a scalar or a vector? Expression for the electric field of a dipole at a point on the equatorial plane of the dipole. Equipotential surfaces due to an electric dipole. Locate the points where the potential due to the dipole is zero.	1 For fig-1 1 1 1 1 1 2 1
25.	Expression for the impedance of a series LCR circuit connected to an ac supply of variable frequency Graph showing variation of current with the frequency of the applied voltage Explanation of how the phenomenon of resonance in the circuit can be used in the tuning mechanism of a radio or a TV set. OR labelled diagram underlying principle and working of a step-up transformer. two sources of energy loss in a transformer. Explanation	3 1 1 1 1+1 1 1
26.	Condition for Constructive interference -1 Condition for destructive interference -1 variation of the resultant intensity in the interference pattern against position 'x' on the screen-2 Difference -1 OR a) For Fig-1 For demonstration-1 b) For fig-1 For proof of Brewster law -2	