PHYSICS CBSE -07(SOLUTION)

Full Marks : 70

Pass Marks : 21 **Time : Three ho**

Q.No.	Option/Ans/Key point	weightage	Marks
SECTION: A			
1.	C	1	1
2.	D	1	1
3.	C	1	1
4.	C	1	1
5.	D	1	1
6.	D	1	1
7.	A	1	1
8.	B	1	1
9.	C	1	1
10.	C	1	1
11.	C	1	1
12.	B	1	1
13.	A	1	1
14.	C	1	1
15.	D	1	1
16.	C	1	1

	SECTION: B		
17.	$\emptyset_{net} = \frac{q_{net\ enclosed}}{\epsilon_0}$ $q_{A\ enclosed} = 2q \quad \emptyset_A = \frac{2q}{\epsilon_0}$ $q_{B\ enclosed} = q \quad \emptyset_B = \frac{q}{\epsilon_0}$ $q_{C\ enclosed} = 0 \quad \emptyset_C = 0$ $q_{D\ enclosed} = -q \quad \emptyset_D = \frac{-q}{\epsilon_0}$ D < C < B < A.	½ ½ ½ ½	2

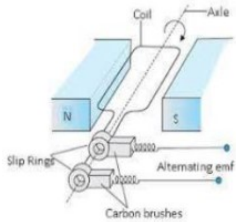
18.	A diamond cutter uses a large angle of incidence to ensure that the light entering the diamond is totally reflected from its face.	1+1	2
19.	$\frac{1}{f} = \frac{(\mu-1)}{R}$ $\frac{1}{0.3} = \frac{(1.5-1)}{R}$ $\frac{1}{0.3} = \frac{0.5}{R}$ ➔ R = 0.15 m (OR) Magnification when image formed at infinity $m_{\propto} = \frac{f_o}{f_e}$ $= \frac{20}{5} = 4$ $m_D = \frac{f_o}{f_e}\left[1 + \frac{D}{f_e}\right]$ $= \frac{20}{5}\left[1 + \frac{25}{5}\right]$ $= 24$	½ ½ ½+½ ½ ½ ½ ½	2 2
20.	Energy of photon $E_{ph} = \frac{hc}{\lambda e} eV.$ $E_{ph} = \frac{(6.624\times10^{-34})(3\times10^{8})}{(412.5\times10^{-9})(1.6\times10^{-19})}$ $E_{ph} = 3.00eV$ As sodium and Potassium are having work function less than energy of photon. These two metals exhibit photoelectric effect.	½ ½ ½ ½	2
21.	Differences two points Diagrams	½ + ½ ½+½	2

	SECTION - C		
22.	(i) $\sigma = \frac{q}{4\pi R^2}$ $q = \sigma 4\pi R^2$ $q = 80 \times 10^{-6} \times 4 \times (3.14) \times (1.2)^2$ $q = 1.45\ mC$ (ii) $\emptyset = \frac{q}{\epsilon_0}$ $\emptyset = \frac{1.45\times10^{-3}}{8.85\times10^{-12}}$ $\emptyset = 16.38 \times 10^{7} \frac{N}{m^2.C}$	½ ½ ½ ½ ½ ½	3
23.	Derivation Charge flowing through the given cross-section is equal to area under the curve of current (I) versus time (t). $q = \left(\frac{1}{2}\times 5 \times 5\right) + (5 \times 5)$ q = 12.5 + 25 = 37.5 C.	2 ½ ½	3

24.	(a) Principle. (b) Two reasons. (c) Definitions of voltage sensitivity and current sensitivity. (OR) $F = \frac{\mu_0 i_1 i_2 l}{2\pi r}$ $F = \frac{2\times10^{-7}\times10\times5\times20\times10^{-2}}{5\times10^{-2}}$ $F = 4 \times 10^{-5} N$	1 ½+½ ½+½ 1 1 1	3 3
25.	Let *ON* be at some point *x*. The emf induced in the loop $e = -\frac{d\phi}{dt}$ $e = -\frac{d(Blx)}{dt}$ $e = -Blv$ $e = 0.5 \times 0.2 \times 10 = 1V$ Current in the arm, $I = \frac{e}{R}$ $I = \frac{1}{5} = 0.2$ A	1 1 1	3
26.	(i) Microwaves are suitable for RADAR systems that are used in aircraft navigation. These rays are produced by special vacuum tubes, namely klystrons and magnetrons diodes. (ii) Infrared rays are used to treat muscular strain. These rays are produced by hot bodies and molecules. (iii) X-rays are used as a diagnostic tool in medicine. These rays are produced, when high energy electrons are stopped suddenly on a metal of high atomic number. (OR)	1 1 1 1 1	3

	(i) γ-rays are used for the treatment of certain forms of cancer. Its frequency range is **3 X 10^{19} Hz to 5 X 10^{22} Hz.** (ii) The thin ozone layer on top of stratosphere absorbs most of the harmful ultraviolet rays coming from the sun towards the earth. They include UVA, UVB and UVC radiations, which can destroy the life system on the earth. Hence, this layer is crucial for human survival. (iii) An electromagnetic wave transports linear momentum as it travels through space. If an electromagnetic wave transfers a total energy U to a totally absorbing surface in time t, then total linear momentum delivered to the at surface. This means, the momentum range of EM waves is **10^{-19} to 10^{-41}**. Thus, the amount of momentum transferred by the EM waves incident on the surface is very small	1	3
27.	Energy difference = energy emitted by photon = -1.51 – (-3.4) = 1.89 eV = 1.89 × 1.6 × 10^{-19} J $\lambda = \frac{hc}{E_2 - E_1}$ $= \frac{6.624\times10^{-34}\times3\times10^{8}}{1.89\times1.6\times10^{-19}}$ = 6548A^0. This wavelength belongs to Balmer series of hydrogen spectrum.	1 1 1	3
28.	Using the given data $\Delta m = [m(^{238}_{92}U) - m(^{234}_{90}Th) - m(^{2}_{4}He)]$ Energy released $Q = \Delta mc^2$ $Q = [m(^{238}_{92}U) - m(^{234}_{90}Th) - m(^{2}_{4}He)]c^2$ $Q = [238.05079amu - 234.043630amu - 4.002600amu]c^2$ $Q = [0.00456amu]c^2$ $Q = \left[\!\left[0.00456 \times \frac{931MeV}{c^2}\right]\!\right] c^2$ $Q = 4.25\ MeV$	1 1 1	3
	SECTION - D		
29.	a.Conditions for sustained interference b. I = I_0 $Cos^2\Phi/2$ $Cos^2\Phi/2$ = ½ Cos Φ/2 = 1/√2 Φ/2 = π/4 Φ = π/2 (2n+1) Δx = λ/2π (Φ) = (λ/2π) x (π/2)(2n+1) = λ/4 (2n+1) c. Ratio = 1:1 β = λ D/ d Taking the ratio new fringe width is half the first one = 0.2cm	1 1 2	4

30.	a. This is because the energy gap for Ge (E=0.7 eV) is smaller than the energy gap for Si (E=1.1 eV). b. Reverse Bias, figure c. if the reverse bias decreases the width of the depletion region decreases OR c.Drift and Diffusion.	1 1 2	4
	SECTION - E		
31.	(a) $W=q\times dV=2\times e\times 1$ $=3.2\times 10-19$ J (b) Zero .Work done in moving a charge in a closed path is zero. (c) (i) Since the battery remains connected, the potential difference remains constant, hence E also remain unchanged (ii)Capacitance becomes K times (iii).Charge becomes K times since capacitance becomes K times. (OR) (a) (i) $\Phi_1= Q/\varepsilon_0$ and $\Phi_2= 3Q/\varepsilon_0$ so, $\Phi_1:\Phi_2$ =1:3 (ii) $\Phi_1=\int E.dS=Q/\varepsilon_0$. On introducing medium of dielectric constant L inside the sphere S1,the electric field becomes K times Now the new flux $\Phi1'=Q/K\varepsilon_0$ On solving K=5 . So new flux $\Phi1'=Q/5\varepsilon_0$ (b) Derivation of electric field intensity	**1** **1** **1** **1** **1** 1 2 2	5 5
32.	(i) E_P= 2200 V, n_P= 3000, n_S= ?, E_S= 220 V $E_S/E_P = n_S/n_P$ So n_S= 3000 ×1/10 = 300 (ii) A step up transformer converts a low voltage into high voltage, it does not violate principle of conservation of energy as the increase in voltage is at the cost of current. When voltage increases the current decreases. (iii) Energy loss in a transformer: (a)Eddy current loss: Alternating magnetic flux induces eddy currents in the iron core, which leads to energy loss in the form of heat. It can be minimized by using laminated core. (b) Hysteresis loss: AC carries the core to the process of magnetization and demagnetization. Work is done in each of these cycles resulting into loss of energy. (OR) (i) Consider a coil consisting of N turns of insulated copper wire rotated in a uniform magnetic field B. Let the angle between magnetic field and area vector at any point of time be θ. The coil is rotated with angular velocity ω. ϕ= NBA cos θ θ= ωt So, ϕ= NBA cos ωt	2 1 1 1 1 1 1	5 5

	$E = -d\phi/dt$ $= -NBA\omega(-\sin\omega t)$ $= ANB\omega \sin\omega t$ $E=0$ when $\omega t=0$ $E=$ max when $\omega t=\pi/2$ $E_{max} = NBA\omega = E_0$ $E_{in} = E_0 \sin\omega t$ (ii) $A= 200\ cm^2 = 200 \times 10^{-4}\ m^2$, $N=20$, $\omega= 50$ rad/s , $B= 3\times10^{-2}$ T $E_0= NBA\omega= 20\times 3\times10^{-2}\times 200 \times10^{-4}\times 50 = 0.6$ V  	2	
33.	Huygens principle Definition Ray diagram derivation (OR) Two points Ray diagram derivation	1 1 1.5 1.5 2 1.5 1.5	