INDIAN SCHOOL MUSCAT

FIRST PRE-BOARD EXAMINATION

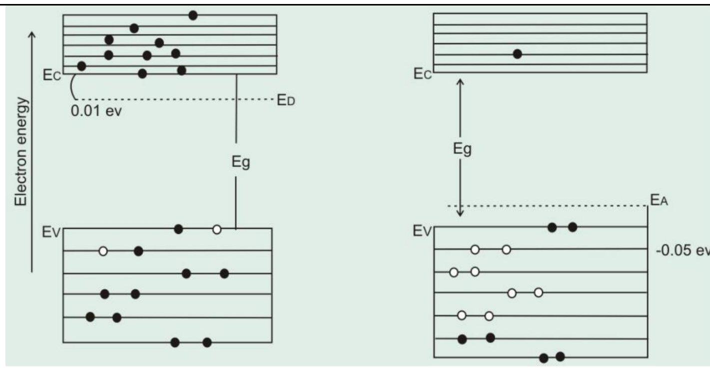
SET C

JANUARY 2021

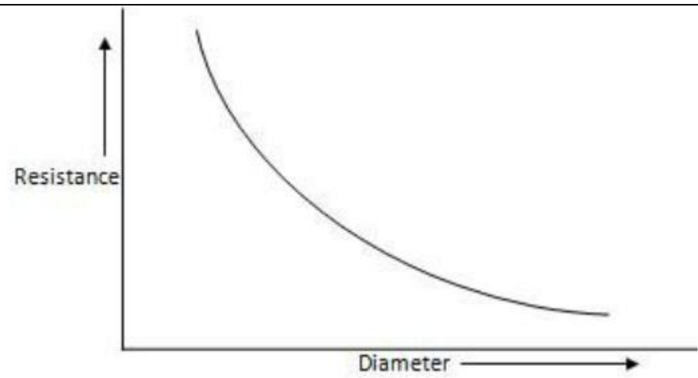
CLASS XII

Marking Scheme – SUBJECT [THEORY]

Q.NO.	Answers	Marks (with split up)
1.	Depletion region widens under reverse bias.	
2.	Irms=0.35A(formula ½ mark) OR No change	½+ ½ 1
3.	Balmer Series	1
4.	1:1 OR poles	1 OR 1
5.	The sign of the potential energy difference of a small negative charge will be positive. This is because negative charge moves a point at a lower potential energy to a point at a higher potential energy.	1
6.	$\vec{P} = \chi\vec{E}$	1
7.	Concave lens	1
8.	Infrared waves are produced by hot bodies and molecules, so are referred to as heat waves. **OR** $5x10^{14}$ Hz, visible region.	1 OR ½ + ½
9.	6V OR (1,3) and (2,4)	1 ½+ ½
10.	UV (ii) IR	½+ ½
11.	a	
12.	a	
13.	a	1
14.	d	1
15.	1. (b) Diffraction fringes become narrower and crowded 2. (b) should be of the order of wavelength. 3. (b) sharper and brighter 4. (a)Diffraction of sound 5. (a)interfere constructively at the centre of the shadow -	1 mark each (Any 4)
16.	1. C The drift speed decreases on moving from A to B 2. C $i/2$ 3. C does not change	1 mark each (Any

	4. A 16:1 5. B 6.25×10^{18}	4)
17.	Focal length will be doubled. Power will be halved. If the student has applied len's maker's formula, reward ½ mark	1 1
18.	Any two advantages of a light emitting diode over conventional incandescent lamps. OR any two differences between intrinsic and extrinsic semiconductors.	1+1 1+1
19.	 n-type p-type	1+1
20.	Derivation $U=Q^2/2C$ Energy density of the capacitor is the energy stored in a capacitor per unit volume. OR Derivation $\iota=pE\sin\theta$ with diagram The electric dipole will attain stable equilibrium when the dipolemoment is in the direction of the electric field	1 ½ ½ 1 ½ ½
21.	(a) A toroid is a solenoid bent into the form of a closed ring. The magnetic field lines of solenoid are straight lines parallel to the axis inside the solenoid. (b) Inside a given solenoid the magnetic field may be made strong by (i) passing large current and (ii) using laminated coil of soft iron.	1 1
22.	(i) At the given place total earth's magnetic field B is along the vertical direction. Therefore, the horizontal component of earth's magnetic field $B_H = B\cos 90^\circ = 0$. (ii) Angle of dip at that place=angle between the axis of needle with the horizontal line in magnetic meridian=90∘. OR Here, $H = B$ and $\delta = 60^\circ$. From $H = R\cos\delta$ $B = R\cos 60^\circ = R/2 \therefore R = 2B$ At equator, $\delta = 0$ $\therefore H = R\cos 0^\circ = 2B\cos 0^\circ = 2B$	1 1 1 1
23.	(i) Capacitive reactance increases, impedance increases and so current decreases, brightness of the bulb reduces.	½+ ½

	(ii) When frequency decreases Capacitive reactance increases, impedance increases and so current decreases, brightness of the bulb reduces.	½+ ½
24.	(a) Gamma rays (ii) X-rays (ii)to protect the eyes from large amount of UV radiations produced by welding arcs.	½ + ½ 1
25.	labelled ray diagram showing the image formation by a compound microscope.	1+1
26.	(i)getting the equation $\lambda = \frac{h}{\sqrt{2meV}}$ (ii) $v_0 = \frac{\phi_0}{h} = \frac{2.14eV}{6.63 \times 10^{-34} Js}$ $= \frac{2.14 \times 1.6 \times 10^{-19} J}{6.63 \times 10^{-34} Js} = 5.16 \times 10^{14} Hz$ OR Einstein's Photoelectric equation, $h\nu = \phi_0 + k_{max}$ (i) For a given photosensitive material and frequency of incident radiation (above the threshold frequency), the photoelectric current is directly proportional to the intensity of incident light. (ii) For a given photosensitive material and frequency of incident radiation, saturation current is found to be proportional to the intensity of incident radiation whereas the stopping potential is independent of its intensity. Or any other two Energy of one photon $= h\nu$ $= (6.6 \times 10^{-34}) \times (6.0 \times 10^{14})$ Number of photons emitted per sec $= \frac{\text{Power}}{\text{Energy of one photon}}$ $n = \frac{2 \times 10^{-3}}{(6.6 \times 10^{-34}) \times (6.0 \times 10^{14})}$ $\therefore n = 5 \times 10^{15}$	2 ½+ ½ ½ ½ ½ ½ ½ ½
27.	(i) Principle of working of potentiometer $\frac{E_1}{E_2} = \frac{l_1}{l_2}$ $E_2 = \frac{63}{35} \times 1.25 = 2.25$ emf of the second cell is 2.25V.	1 ½ ½

	 OR (i) Principle of working of metre bridge (ii) $$\frac{X}{Y}=\frac{l_1}{100-l_1}$$ $$X=12.5\times\frac{39.5}{100-39.5}=8.2$$ resistance of resistor X is 8.2Ω. (iii) The connection between resistors in a Wheatstone or metre bridge is made of thick copper strips to minimize the resistance of connection, which is not taken into consideration in the formula.	1 1 ½ ½ 1
28.	(i)Neutrons produced during fission get slowed if they collide with a nucleus of the same mass. As ordinary water contains hydrogen atoms (of mass nearly that of neutrons), so it can be used as a moderator. But it absorbs neutrons at a fast rate. (ii)	1

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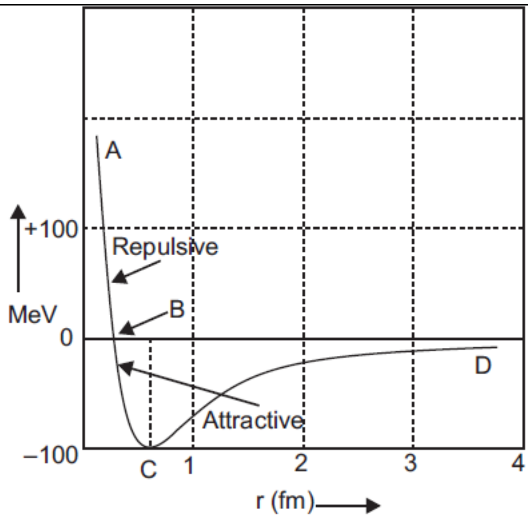

(i) If the distance $r0 > 0.8$ fm, the nuclear force is attractive.
(ii) If the distance between the nucleons $r < 0.8$ fm. The nuclear force is repulsive
OR
(a) Control rod or cadmium rod. (b) liquid Na
(b)
$R = R_0 A^{1/3}$
$\therefore \quad \text{Density } \rho = \dfrac{mA}{\frac{4}{3}\pi\left(R_0 A^{1/3}\right)^3}$
$= \dfrac{m}{\frac{4}{3}\pi R_0^3}$
Hence ρ is independent of A.
c)
$\dfrac{R_1}{R_2} = \left(\dfrac{A_1}{A_2}\right)^{1/3} = \left(\dfrac{8}{125}\right)^{1/3} = \dfrac{2}{5}$
</td>
<td>½+ ½ labelling

½
½

½ + ½

1

1</td>
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<td>29.</td>
<td>Obtaining the expression $2\pi r = nh/mv$
$n_i = 4$ to $n_f = 3, 2, 1$
$n_i = 3$ to $n_f = 2, 1$
$n_i = 2$ to $n_f = 1$
6 transitions</td>
<td>1 ½
½
½
½</td>
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<td>30.</td>
<td>(i) schematic diagram of a step-up transformer.</td>
<td>1</td>
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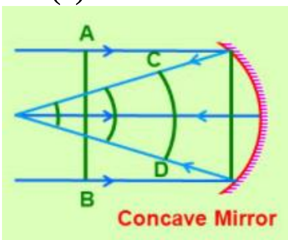
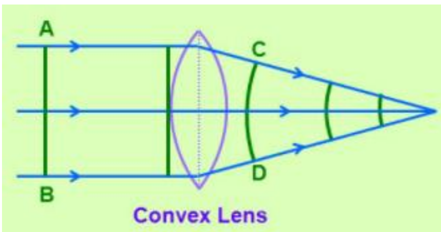
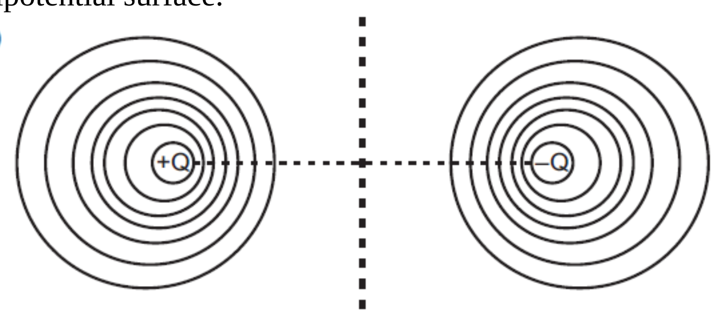
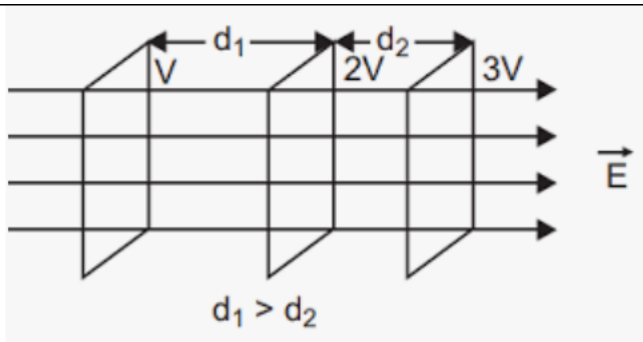
	(ii) Definition of mutual induction (iii)Expression for the secondary to primary voltage in terms of the number of turns in the two coils. $V_s/V_p = N_s/N_p$	1 1
31.	(a) Definition of wavefront   diagram showing the propagation of a plane wavefront from denser to a rarer medium verifying Snell's law of refraction. OR (a) Obtaining the conditions for obtaining constructive and destructive interference fringes at a point on the screen. (b) Draw the intensity distribution for (i) the fringes produced in interference and (ii) the diffraction bands produced due to single slit.	1 1 1 1 1 1 ½ +1 ½ 1+1
32.	(*a*) A surface around a point charge (or group of charges) with a constant value of potential at all points on the surface is called an equipotential surface. If the electric field is not normal to the equipotential surface, then to move a charge *q* against the direction of the component of the field, some work would have to be done. But this work done is in contradiction to the definition of an equipotential surface. If there is no potential difference, there is no work done. Hence, electric field is directed normally to the equipotential surface. (*b*)  $dr = -\frac{dV}{\|E\|}$ As the value of *E* decreases, it results increase in the separation of equipotential surfaces from each other.	1 1 1 1

	 OR (a) proving the electric field. (i) in the outer regions of both the plates is zero. (ii) is σ/ε_0 in the inner region between the charged plates. (b) (i) the electric field decreases by k (ii) the capacitance of the capacitor increases by a factor k	1 1 ½ 1 ½ 1 1
33.	(a) Definition- mutual inductance and S.I. unit-Henry (b) Deriving an expression for the mutual inductance of two long co-axial solenoids of same length wound one over the other. $\frac{\mu_0 N_1 N_2 A_2}{l}$ Given, radius $= 15\text{cm}$, cross − section $= 12\text{cm}^2, N = 1200$ The self inductance of toroid is given by: $l = \frac{\mu_0 N^2 A}{2\pi r} = \frac{2\times10^{-7}(1200)^2\times12\times10^{-4}}{0.15} = 0.000023 = 2.3\ \text{mH}$ OR (*a*) Statement of the principle of an a.c. generator. (*b*) labelled diagram, working and obtaining the expression for the emf generated in the coil. (*c*) $e = \frac{d\phi}{dt} = \frac{d}{dt}(BA) = A\frac{d}{dt}\left(\mu_0\frac{N}{l}i\right) = A\mu_0\left(\frac{N}{l}\right)\frac{di}{dt} = \left(2\times10^{-4}\right)\times4\pi\times10^{-7}\times1500\times20V$ $e = 7.5\times10^{-6}V$	½ + ½ 2 1+1 1 1+1+1 1+1