INDIAN SCHOOL MUSCAT

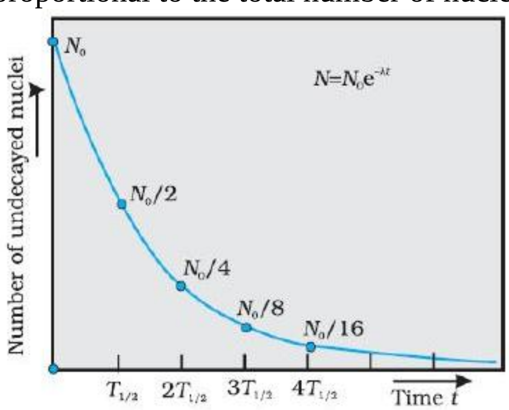
FIRST PRELIMINARY EXAMINATION

SET B

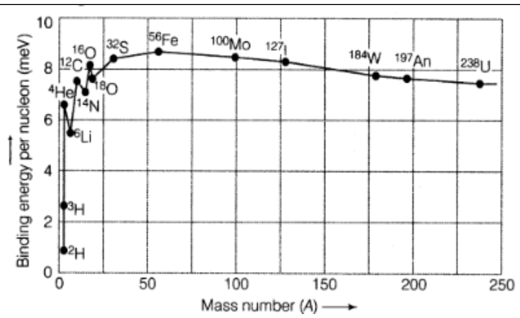
JANUARY 2019

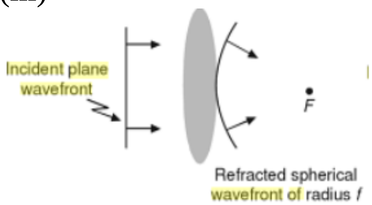
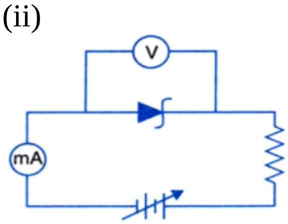
CLASS XII

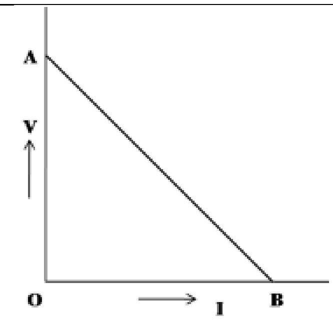
Marking Scheme – SUBJECT[THEORY]

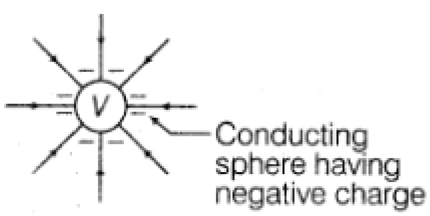
Q.NO.	Answers	Marks (with split up)
1.	Zero.	1
2.	The output produced by square law device is passed to band pass filter which rejects the dc and the sinusoids of frequencies w_m, $2w_m$ and $2w_c$ and retains the frequencies w_c, $w_c - w_m$ and $w_c + w_m$. The output of band pass filter is an AM wave. **OR** NAND and NOR gates .Because all the other basic gates like OR gate , AND gate and NOT gate can be made from NAND and NOR gates.	1
3.	Beta particle as its mass is the least.	1
4.	Converging lens since refractive index of surrounding is greater than refractive index of lens. **OR** deviation produced by violet is more than that of red light Wavelength of red light is more than violet light $\lambda \propto \frac{1}{\mu}$ Refractive index of red is less than violet	1
5.	The fractional change in Resistivity per degree change in the temperature from a substance's original temperature.	1
6.	Davisson-Germer experiment Diffraction effects of electron beam	1 1
7.	In any radioactive sample, the number of nuclei undergoing the decay per unit time is proportional to the total number of nuclei in the sample.  	1 1

8.	$\mu = \frac{A_{max} - A_{min}}{A_{max} + A_{min}}$ $= 10 - 2/10 + 2$ $= 0.67$	1 ½ ½
9.	$f = \frac{2}{3}R$ $R_1 = R$ $R_2 = -R$ (1/2) $\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ $\frac{1}{\frac{2}{3}R} = (\mu - 1)\left(\frac{1}{R} - \frac{1}{-R}\right)$ (1/2) $\mu = \frac{7}{4} = 1.75$	1
10.	Deriving expression I = neAv_d **OR** Deriving expression $r = \left(\frac{l_1}{l_2} - 1\right)R$	1 1
11.	i) inductive reactance increases as soft iron is ferromagnetic and impedance increases and the current decreases so the bulb glows with less brightness. ii) inductive reactance decreases as bismuth is diamagnetic , impedance decreases and the current increases so the bulb glows brighter.	1 1
12.	The direction of induced current in a closed circuit is always such as to oppose the cause that produces it.” Consider a bar magnet and a loop. The bar magnet experiences a repulsive force due to the current induced. Hence, some amount of work is done to move the magnet. The energy which is spent by the person in moving the magnet is dissipated by Joul's heating produced by induced current. Therefore, the law of conservation of energy is validated. **OR** (i) AC generator are simpler & cheaper than DC generator as commutator is not used in AC generator (ii) AC Can be stepped up or down using transformer so its transmission is cheaper and efficient.	1 ½ ½
13.	Cyclotron-labelled diagram Principle working OR Moving coil galvanometer-labelled diagram Principle working	1 1 1 1 1 1

14.	 explanation of fission and fusion	1 1+1
15.	(i) a) No change b)increases (iii) blue light	1 1 1
16.	(a) The size of the antennas should be atleast λ/4 for high efficiency of signal radiation. This is because ground wave propagation is possible for radio waves of frequency band 540 kHz to 1600 kHz. If the band signal frequency is 15 kHz, the height of the antenna would be 5000 which is impossible. (b) To transmit audio signal converted to electromagnetic signal, an antenna of atleast size 15 km is needed. This impractical and also signals of different transmitter would mix up. (c) Modulation index,μ = V_m/v_c and its value should be less than 1. Thus, the amplitude of the modulating signal is kept less than the carrier waves so that no distortion occurs in the modulated wave. OR (i) Since optical and radio waves can pass through the earth's atmosphere and reach the surface, ground telescopes are optical and radio telescopes. ... But anysatellite orbiting around the earth can receive these X-rays. Therefore X-ray astronomy is possible only from the satellites. (ii) As they are sky waves reflected by the ionosphere , they can be used for long distance radio broad cast. (iii) No, for light of sight communication , the two antenna may not be at same height .	1 1 1 1 1 1
17.	(i) Angular separation of the fringes remains constant (= λ/*d*). The actual separation of the fringes increases in proportion to the distance of the screen from the plane of the two slits. (ii) The interference pattern gets less and less sharp, and when the source is brought too close the fringes disappear. Till this happens, the fringe separation remains fixed. (iii) The interference patterns due to different component colours of white light overlap (incoherently). The central bright fringes for different colours are at the same position. Therefore, the central fringe is white. The fringe closest on either side of the central white fringe is red and the farthest will appear blue. After a few fringes, no clear fringe pattern is seen.	1 1 1
18.	(i) difference between extrinsic and intrinsic semiconductors (any2) (ii) phase difference of 180degree	1 1

	(iii)solar cell and photodiode(one difference)	1
19.	(i)Total internal reflection (ii)conditions for TIR (iii)  OR (i) labeled diagram of reflecting type telescope (ii) Any two advantages of reflecting type over refracting type telescope	1 ½+1/2 1 2 1 2 1
20.	i) Infra red rays, used for taking photographs during fogs ii) UV rays , used to sterilize surgical instruments ii) X RAYS, used in detection of fracture of bones , concealed contra band goods at air ports	1 1 1
21.	(i) zener diode (ii)  (iii)Brief explanation of zener diode as a voltage regulator.	1 1 1
22.	(i) $C' = KC$ (ii) $E' = E/K$ (iii) $U' = U/K$ explanation for each	1 1 1
23.	- (i)Net magnetic flux through any closed surface is zero. - (ii)At poles - (iii)It is the angle the total Earth's magnetic field makes with a horizontal line in magnetic meridian. - It is the component of total intensity of Earth's magnetic field in the horizontal direction. OR Diagram for Obtaining an expression for the magnetic field due to a circular coil carrying current at a point along its axis usingBiot-Savart law	1 1 ½ ½ 1

	Derivation	2
24.	 Emf is given by the intercept on the vertical axis i.e., the V axis. Internal resistance is given by the slope of the line i.e.. slope of V vs. I graph.	1 1 1
25	(i) Verifying Snell's law of refraction using Huygen's principle Labeled diagram (ii) any two conditions for two light sources to be coherent. (iii) The wavelength and frequency of the reflected light are the same as that of the incident light. ∴ Wavelength of reflected light = 5000 Å Frequency of reflected light, $\nu = c/\lambda$ $= \frac{3 \times 10^8}{5000 \times 10^{-10}}$ Hz $= 6 \times 10^{14}$ Hz When, the reflected ray is normal to the incident ray, $i + r = 90°$ $i + i = 90°$ $2i = 90°$ i.e., $i = 45°$.	1 1 1 1
	OR	
	(i) ray diagram for the formation of image of a point object by a thin double convex lens having radii of curvature R_1 and R_2. deriving lens maker's formula for a double convex lens. (ii) Size of object, O = 3.0 cm Object distance, u = − 14 cm Focal length, f = − 21 cm $\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$ $= -\frac{1}{21} - \frac{1}{14}$ $m = \frac{I}{O} = \frac{v}{u}$ Image size, $= \frac{-8.4}{-14} \times 3$ $= 1.8$ cm image is errect and virtual of smallar size. As the object is moved away from the lens, the virtual image moves towards the focus of the lens but never beyond. The image progressively diminishes in size.	1 3 1 ½ ½

		½ ½
26	(i) proving that the electric field at a point due to a uniformly charged infinite plane sheet is independent of the distance from it.(ii)  (iii) $E = \vec{E_1} + \vec{E_2}$	2 1

	$= \frac{1}{4\pi\varepsilon_0} \cdot \frac{q_A}{r^2} + \frac{1}{4\pi\varepsilon_0} \frac{q_B}{r^2} = \frac{1}{4\pi\varepsilon_0 r^2}[q_A + q_B]$ $= \frac{9\times10^9}{(0.1)^2}[3\times10^{-6} + 3\times10^{-6}]$ $= 5.4 \times 10^6\ NC^{-1}$ along OB. $F=qE=8.1\times10^{-3}N$ **OR** (i)obtaining expression for the electric potential due to an electric dipole at any point on its axis. (ii) Electrical potential falls off at large distance, as $\frac{1}{r^2}$ and not as $\frac{1}{r}$, characteristic of the potential due to a single charge. (iii) $U = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r} = 9\times10^9 \times \frac{7\times(-2)\times10^{-12}}{0.18} = -0.7$ J. $W = U_2 - U_1 = 0 - U = 0 - (-0.7) = 0.7$ J.	1 1 2 1 1 1
27	(i) principle of a transformer (ii) Explanation of large scale transmission of electric energy over long distance done with the use of transformers (iii) any two sources of energy loss in a transformer (iv) Electric power available from the plant = $\eta \times h\rho g V$ $= 0.6 \times 300 \times 10^3 \times 9.8 \times 100$ $= 176.4 \times 10^6$ W = 176.4 MW **OR** (i)obtaining expression for the impedance of a series LCR circuit connected to an AC supply of variable frequency. (ii) Explanation of the phenomenon of resonance in the circuit in the tuning mechanism of a radio or a TV set. (iii) $\omega_r = \frac{1}{\sqrt{LC}}$	1 1 1 2 2 1 ½

	$= \dfrac{1}{\sqrt{2.0\times 32\times 10^{-6}}}$ $= \dfrac{10^3}{8}$ $= 125\ \text{rad/s}$ $Q = \dfrac{1}{R}\sqrt{\dfrac{L}{C}}$ $= \dfrac{1}{10}\sqrt{\dfrac{2}{32\times 10^{-6}}}$ $= \dfrac{1000}{40}$ $= 25.$	½ ½