Pre-Board Examination : 2025-26

Sub : Physics

(The figures in the margin indicate full marks for the questions)

Time – 3 hours   **Full marks-70**

| Section A (Each question carries 1 mark)	
1	Electric potential on the surface of a metallic conductor is 7 Volt. Electric potential inside the conductor is (A) 14V (B) 7V (C) ZERO (D) data insufficient
2	A radio can tune any station in the 7.5MHz to 12 MHz What is the responding wavelength band? (A)80m -25 m (B)40m – 25m (C)20m – 10m (D)10m-25m
3	According to Einstein's photoelectric equation, the plot of the kinetic energy of the emitted photo electrons from a metal versus the frequency of the incident radiation gives a straight line whose slope (A)Is the same for all metals and independent of the intensity of the radiation (B)Depends on the intensity of the radiation (C)Depends both on the intensity of the radiation and the metal used (D)Depends on the nature of the metals used
4	A proton and an alpha particle are having same velocity. the ratio of their De Broglie wave length is

	(A) 1:2 (B) 2:1 (C)1:4 (D) 4:1
5	Colors observed on a CD (Compact Disk) is due to (A) Reflection (B) Diffraction (C) Dispersion (D) Absorption
6	A silver wire has a resistance of 2.1 Ω at 27.5 °C, and a resistance of 2.7 Ω at 100°C. What is the temperature coefficient of resistivity of silver? (A) 0.0059 (B) 0.0039 (C) 0.0129 (D) 0.0159
7	Give the number of electrons passing through a wire per minute. The current flowing through it is 500mA. (A)1.875×10^{20} (B)6.875×10^{20} (C)1.875×10^{-20} (D)6.875×10^{-20}
8	A point object is placed at the centre of a glass sphere of radius 6 cm and refractive index 1.5. The distance of virtual image from the surface of the sphere is (A) 2cm (B) 4cm (C)6cm (D)12cm
9	A Compound microscope uses an objective lens of focal length 4 cm and eyepiece lens of focal length 10 cm. An object is placed at 6 cm from the objective lens. The magnifying power of the compound microscope if final image is formed at infinity is (A)6 (B) 10 (C) 12 (D) 5
10	During Faraday's electromagnetic induction experiment the mechanical efforts of movement of magnet near a coil produces electrical energy within the coil. This

	phenomenon can be best explained on the basis of: (A) Lenz's law and conservation of energy (B) Lenz's law and conservation of charge (C) Faraday's law and conservation of energy (D) None of the above
11	Two thin lenses of power +4D and -2D are placed in contact focal length of the combination is (A) 10cm (B) 50cm (C) 40cm (D) 2cm
12	The mass number of two nuclei are in the ratio 27:125. The ratio of their nuclear radii is . (A)1:1 (B) 3:4 (C) 5:3 (D) 3:5
13	(a) If both Assertion and Reason are true and Reason is correct explanation of Assertion. (b) If both Assertion and Reason are true but Reason is not the correct of Assertion. (c) If Assertion is true but Reason is false. (d) If both Assertion and Reason are false. Assertion (A): When two coils are wound on each other, the mutual induction between coil is maximum Reason(R) -- Mutual induction doesn't depends on the orientation of the coils
14	Assertion (A): On increasing the current sensitivity of a galvanometer by increasing the number of turns may not necessarily increase its voltage sensitivity. Reason(R) : The resistance of the coil of the galvanometer increases on increasing the number of turns.

15	Reason (R): The momentum of the freely falling body increases with time. Assertion (A): de Broglie's wavelength of a freely falling body keeps decreasing with time.
16	Assertion (A) : No interference pattern is detected when two coherent sources are infinitely close to each other. Reason (R) : The fringe width is inversely proportional to the distance between the two slits.
	Section B (Each question carries 2 marks)
17	Identify the following part of electromagnetic spectrum and arrange them as per descending order of their wavelength. (a) Produced by Klystron valve (b)Used in Remote control (b) Widely used in medical science (d) Absorbed by ozone layer
18	Derive the relation between drift velocity V_d of electrons and current I flowing in a conductor having area of cross section A.
19	A 0.5m long solenoid of 10 turns/cm has area of cross-section $1cm^2$. Calculate the voltage induced across its ends if the current in the solenoid is changed from 1A to 2A in 0.1 sec.
20	Draw a graph showing the variation of stopping potential with frequency of incident radiation in relation

	to photoelectric effect. Deduce an expression for the slope of graph using Einstein's photo electric equation.
	OR
	Write Einstein's photo electric equation Using this equation find out what changes will occur in the following quantities if the frequency of incident radiation on a photocell is doubled for the same intensity, (i) kinetic energy of photo electrons emitted (ii) photoelectric current (iii) Work Function
21	Draw the energy band diagram for N-type and P-type semiconductor at (i) T=0 K & (ii) room temperature.

Section C (Each question carries 3 marks)

22	If a nucleus $_{26}Fe^{56}$ splits into two nuclei of $_{13}Al^{28}$, would the energy be released or needed for this purpose to occur?
	Given mass($_{26}Fe^{56}$) = 55.934944 u &
	mass($_{13}Al^{28}$) = 27.98191u,
	1u = 931MeV/c^2 .
	Calculate the energy in MeV.
23	Find the expression for the capacitance of a parallel plate capacitor of plate area A and plate separation d when a dielectric slab of thickness t (t < d) is introduced between the plates of the capacitor. What is capacitance if, metal slab of same thickness is used?
24	Using Kirchhoff's laws find out the value of current I_1, I_2 and I_3.
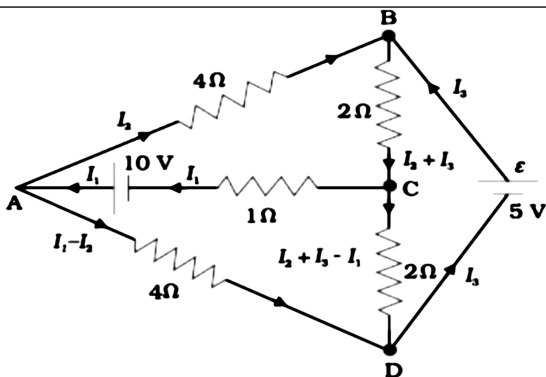
25	A plane wavefront (AB) is incident on a refracting surface XY. Using Huygen's principle verify the laws of refraction if the rays incident from denser medium.
26	State Bohr's postulate for the permitted orbits for the electron in a hydrogen atom. Use this postulate to prove that the circumference of the nth permitted orbit for the electron can contain exactly 'n' wavelengths of the de-Broglie wavelength associated with the electron in that orbit. OR Find out longest and shortest wave length of Balmer series of Hydrogen spectrum. In which region of electromagnetic spectrum does it belongs?
27	In a two slit experiment with monochromatic light, fringes are obtained on a screen placed at some distance D from the slits. if the screen is moved 5×10^{-2} m towards the slits, the change in fringe width is 3×10^{-5} m. if the distance between the slits is 10^{-3} m, calculate the wavelength of the light used.

28	Differentiate between Para , Ferro and Dia magnetic substances in respect of following parameters
	i) Behaviour in presence of external magnetic field
	ii) Relative magnetic permeability
	iii) Effect of temperature
	Also write one example each of Para, Ferro and Dia magnetic substances

**Section D(Each question carries 4 marks)**

29	<u>Read the following paragraph & answer the questions follow</u>

Optical fibers:
Now-a-days optical fibers are extensively used for transmitting audio and video signals through long distances. Optical fibers too make use of the phenomenon of total internal reflection. Optical fibers are fabricated with high quality composite glass/quartz fibers. Each fiber consists of a core and cladding. The refractive index of the material of the core is higher than that of the cladding. When a signal in the form of light is directed at one end of the fiber at a suitable angle, it undergoes repeated total internal reflections along the length of the fiber and finally comes out at the other end. Since light undergoes total internal reflection at each stage, there is no appreciable loss in the intensity of the light signal. Optical fibers are fabricated such that light reflected at
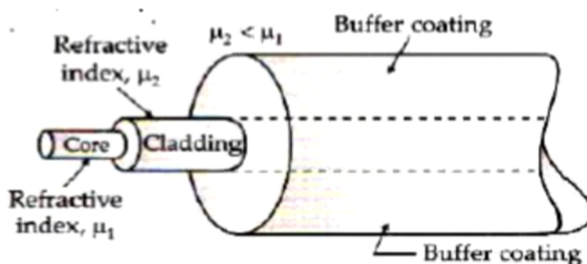
one side of inner surface strikes the other at an angle larger than the critical angle. Even if the fiber is bent, light can easily travel along its length. Thus, an optical fiber can be used to act as an optical pipe.

(i) Which of the following statement is not true.

(A) Optical fibers is based on the principle of total internal reflection.

(B) The refractive index of the material of the core is less than that of the cladding.

(C) An optical fiber can be used to act as an optical pipe.

(D) There is no appreciable loss in the intensity of the light signal while propagating through an optical fiber.

(ii) What is the condition for total internal reflection to occur?

(A)angle of incidence must be equal to the critical angle.

(B)angle of incidence must be less than the critical angle

(C) angle of incidence must be greater than the critical angle.

(D) None of the above.

(iii) Which of the following is not an application of total internal reflection?

(A) Mirage

(B) Sparkling of diamond

(C) Splitting of white light through a prism.

(D) Totally reflecting prism

(iv) Optical fibers are used extensively to transmit

(A) Optical Signal   (B) current

(C) Sound waves   (D) None of the above

| 30 | **Read the following paragraph & answer the questions follow.** |

The galvanometer is a device used to detect the current flowing in a circuit or a small potential difference applied to it. It consists of a coil with many turns, free to rotate about a fixed axis, in a uniform radial magnetic field formed by using concave pole pieces

of a magnet. When a current flows through the coil, a torque acts on it.
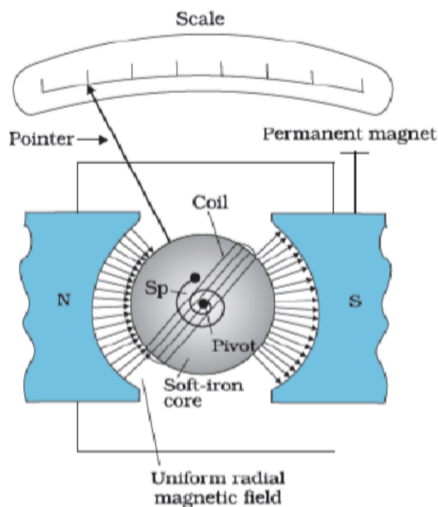
(i) What is the principle of moving coil galvanometer?
(A) Torque acting on a current carrying coil placed in a uniform magnetic field.
(B) Torque acting on a current carrying coil placed in a non-uniform magnetic field.
(C) Potential difference developed in the current carrying coil.
(D) None of these.

(ii) If the field is radial, then the angle between magnetic moment of galvanometer coil and the magnetic field
(A) 0°   (B) 30°   (C) 60°   (D)90°

(iii) Why pole pieces are made concave in the moving coil galvanometer?
(A) to make the magnetic field radial.

(B) to make the magnetic field uniform.

(C) to make the magnetic field non-uniform.

(D) none of these.

(iv) A galvanometer can be converted to ammeter by connecting

(A) Very high resistance in parallel with the galvanometer

(B) Very low resistance in series with the galvanometer

(C) Very low resistance in parallel with the galvanometer

(D) Very High resistance in series with the galvanometer

OR

(iv) A galvanometer can be converted to voltmeter by connecting

(A) Very high resistance in parallel with the galvanometer

(B) Very low resistance in series with the galvanometer

(C) Very low resistance in parallel with the galvanometer

(D) Very High resistance in series with the galvanometer

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	Section E (Each question carries 5 marks)
31	(a) Using phasor diagram, drive an expression for the impedance of a series LCR circuit. What do you mean by resonance condition of such a circuit? (b) (b) Resonant frequency of a series LCR circuit is f find out change in resonant frequency when inductance, Resistance and Capacitance each become half of its initial value. OR

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(a) With the help of a labelled diagram explain the principle, construction and working of a transformer.
(b) A transformer having efficiency of 90% is working on 200 V and 3 kW power supply. If the current in the secondary coil is 6 A, find out the voltage across the secondary coil and the current in the primary coil .

32 (a) With the help of circuit diagram explain the working of full wave rectifier. Also draw input and output waveform
(b) A circuit shown in the figure contains two diodes each with a forward resistance 60ohm and infinite backward resistance calculate the current in the 100ohm resistance
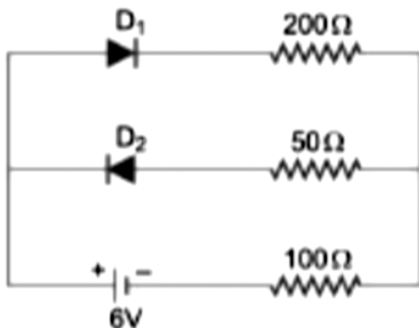
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OR
(a)With the help of circuit diagram explain the working of half wave rectifier. Also draw input and output waveform
(b)Two semi-conductor materials X and Y shown in the figure are made by doping a Ge crystal with Indium and Arsenic respectively .They are joined end to end and connected to a battery as shown
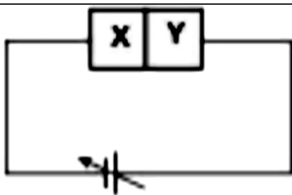
i)Will the junction be forward bias or reverse bias

ii)Sketch a V-I graph for this arrangement

| 33 | a) State Gauss's theorem in electrostatics. Using this theorem, derive an expression for the electric field due to an infinitely long straight wire of linear charge density λ.

(b)Two point charges $q_1 = 3$ μC and $q_2 = -3$ μC are located 20 cm apart in vacuum.

(i) What is the electric field at the midpoint O of the line AB joining the two charges?

(ii) If a negative test charge of magnitude 1.5×10^{-9} C is placed at this point, what is the force experienced by the test charge?

OR

(a)Define electric flux and write its SI unit. Use Gauss's law to obtain the expression for the electric field due to a uniformly charged infinite plane sheet of charge.

(b) A point charge causes an electric flux of -1.0×10^3 Nm^2/C to pass through a spherical Gaussian surface of 10.0 cm radius centered on the charge.

(i) If the radius of the Gaussian surface were doubled, how much flux would pass through the surface?

(ii) What is the value of the point charge?