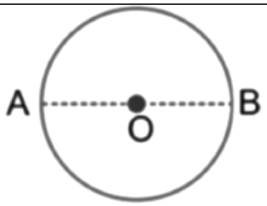
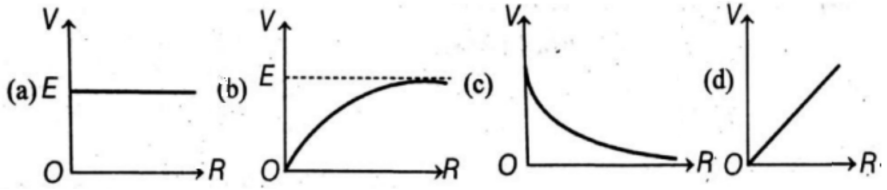
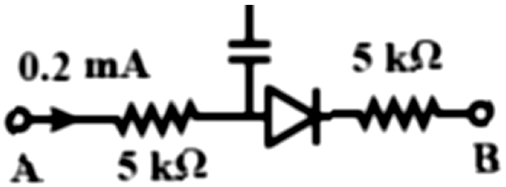
Pre-Board Examination : 2025-26

Sub : Physics

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

Time – 3 hours Full marks-70

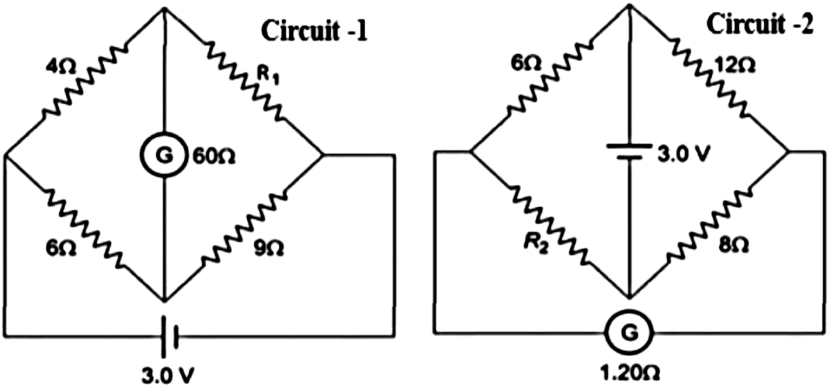
Section A (Each question carries 1 mark)	
1	The threshold frequency for a photosensitive metal is 3.3×10^{14} Hz. If light of frequency 8.2×10^{14} Hz is incident on this metal, the cut-off voltage for the photoelectron emission is nearly (a) 1 V (b) 2 V (c) 3 V (d) 5 V
2	 A wire of resistance 12Ω/m is bent to form a complete circle of radius 10 cm. The resistance between its two diametrically opposite points A & B as shown in figure is (a) 3 Ω (b) 6 π Ω (c) 6 Ω (d) 0.6πΩ
3	A cell of emf E and internal resistance r is connected across a variable external

	resistance R. The graph of terminal potential difference V as a function of R is 
4	The impurity atoms to be doped in pure silicon to form p-type semiconductor are, of (a) phosphorus (b) germanium (c) antimony (d) aluminium
5	In the circuit shown in figure, if the diode forward voltage is 0.3 V, the voltage difference between A and B is  (a) 1.3 V (b) 2.3 V (c) 0 (d) 0.5 V
6	The ratio of energies of the hydrogen atom in its first to second excited state is…….. (a) 1 : 4 (b) 4 : 1 (c) 4 : 9 (d) 9 : 4
7	If the focal length of objective lens is increased, then magnifying power of

	(a) microscope will increase but that of telescope decrease (b) microscope and telescope both will increase (c) microscope and telescope both will decrease (d) microscope will decrease but that of telescope will increase
8	The angle between electric field and equipotential surface is (a) 90^0 always (b) 0^0 always (c) 0^0 to 90^0 (d) 0^0 to 180^0
9	The S I unit of inductance is (a) Farad (b) Henry (c) weber (d) Tesla
10	The permeability of a magnetic material is 0.9983. Name the type of magnetic materials it represents. (a)Paramagnetic (b)Ferromagnetic (c)Diamagnetic (d) all of above
11	Out of the following options which one can be used to produce a propagating electromagnetic wave? (a) A charge less particles (b) An accelerating charge

	(c) A charge moving at constant velocity (d) A stationary charge
12	A proton and a deuteron are accelerated through the same accelerating potential, value of de-Broglie wavelength of (a) proton greater than deuteron (b)deuteron greater than proton (c) deuteron and proton have same (d) none of the above
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:** Thin films such as soap bubble or a thin layer of oil on water show beautiful colours when illuminated by white light. **Reason:** It is due to interference of sun's light reflected from upper and lower surfaces of the film.

14	**Assertion:** Two parallel conducting wires carrying currents in same direction, come close to each other. **Reason:** Parallel wires carrying currents in same direction repel and Parallel wires carrying currents in opposite direction attract.
15	**Assertion (A)**: On increasing the intensity of light the photocurrent increases. **Reason (R):** The photocurrent increases with increase of frequency of light.
16	**Assertion (A)**: If a convex lens is kept in water, its convergence power decreases. **Reason (R):** The refractive index of convex lens relative to water is less than that relative to air.
Section B(Each question carries 3 marks)	
17	Figure shows two circuits each having a galvanometer and a battery of 3 V. When the galvanometers in each arrangement do not show any deflection, obtain the ratio R_1/R_2.

	
18	What role does infra-red radiation play in (i) maintaining the earth's warmth and (ii) physical therapy?
19	(i) Draw a graph showing variation of photo-electric current (I) with anode potential (V) for different intensities of incident radiation. Name the characteristic of the incident radiation that is kept constant in this experiment.
20	(A) Distinguish between diamagnetic and ferromagnetic material. OR (B) Show diagrammatically the behaviour of magnetic field lines in the presence of (i) paramagnetic and (ii) diamagnetic

<table>
<tr><td></td><td>substances.
How does one explain this distinguishing feature?</td></tr>
<tr><td>21</td><td>(A) What is total internal reflection? Write the conditions for total internal reflection
OR
(B) A small bulb is placed at the bottom of a tank containing water to a depth of 80 cm. What is the area of the surface of water through which light from the bulb can emerge out? Refractive index of water is 4/3.</td></tr>
<tr><td colspan="2">Section C(Each question carries 3 marks)</td></tr>
<tr><td>22</td><td>(A) Which two of the following lenses L_1, L_2 and L_3 will you select as objective and eyepiece for constructing best possible (i)telescope (ii) microscope? Give reason to support your answer.
<table>
<tr><th>Lens</th><th>Power (P)</th><th>Aperture (A)</th></tr>
<tr><td>L_1</td><td>6 D</td><td>1</td></tr>
<tr><td>L_2</td><td>3 D</td><td>8</td></tr>
<tr><td>L_3</td><td>10 D</td><td>1</td></tr>
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</td></tr>
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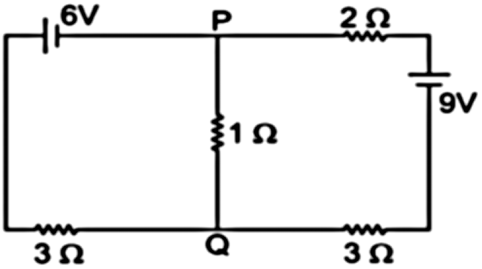
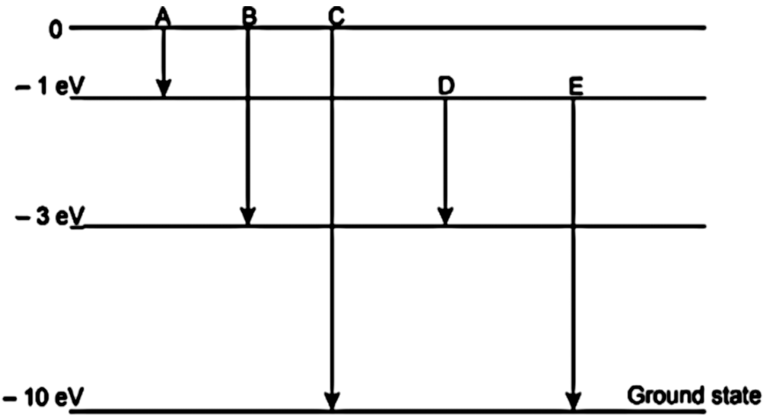
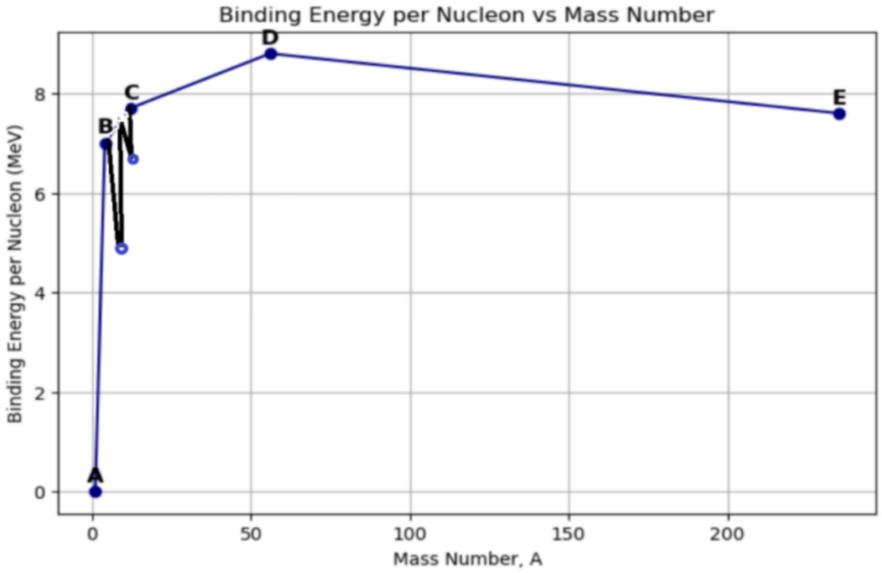
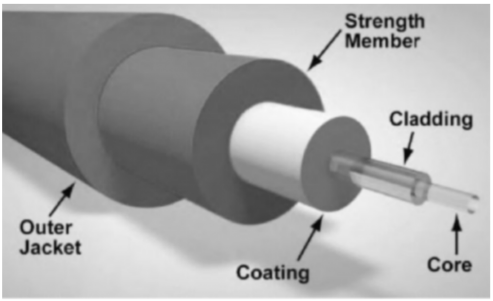
	(B) In a Young's double-slit experiment the fringe width is found to be 0.4 mm. If the whole apparatus is dipped in water of refractive index 4/3, without disturbing the arrangement, Find the value of new fringe width.
23	An ac source of voltage $V = V_0 \sin \omega t$ is connected to a series combination of L, C and R. Use the phasor diagram to obtain expressions for impedance of the circuit and phase angle between voltage and current.
24	Find the magnitude and direction of current in 1Ω resistor in the given circuit. 
25	(A) Define wave front. (B) What is the shape of the wavefront in each of following cases- (i) light diverging from a point source. (ii) light emerging out

	of a convex lens when a point source is placed at its focus.
26	State Gauss's law derive an expression for electric field due to an infinite charged plane sheet.
27	(A) Show that energy of electron in Bohr's orbit is inversely proportional to square of principle quantum number. OR (B) The energy levels of an atom of element X are shown in the diagram. Which one of the level transitions will result in the emission of photons of wavelength 620 nm ? Support your answer with mathematical calculations. 

28	Why do stable nuclei never have more protons than neutrons? The figure shows the plot of binding energy (BE) per nucleon as a function of mass number A. The letters A, B, C, D and E represent the positions of typical nuclei on the curve.Point out, giving reasons , the two processes (in terms of A, B, C, D and E), one of which can occur due to nuclear fission and the other due to nuclear fusion. 
Section D (Each question carries 4 marks)	
29	**Read the following paragraph & answer**

the questions follow



An optical fibre is a thin rod of high-quality glass. Light/infrared getting in at one end undergoes repeated total internal reflection and emerges at the other end. Optical Fibre is wave guided die – electric cable which non-conducting in nature used to data transmission using light pulses travelling in it. It transmits the light without any loss of energy. From one place to another for longer as well as for a shorter distance.

In optical fibre cable light pulses bounce back and transmit from one place to another with any loss in the energy of light. Basically bounce back of light is the phenomena of Reflection of light in the same medium and happens without any loss. We can say

	Optical Fibre works on the principle of total internal reflections. It is a power full Phenomena which is used in optical fibre cable to transmit data from one place to another place. (i) **On which principle, optical fibre works?** (a) refraction of light (b) interference of light (c) diffraction of light (d) total internal reflection of light (ii) **The refractive indices of core is** (a) equal to cladding (c) less than cladding (b) more than cladding (d) none of the above (iii) Write two examples similar to optical fibre which are also working on the principle of total internal reflection. (a) Mirage, endoscopy (medical diagnostic tool)

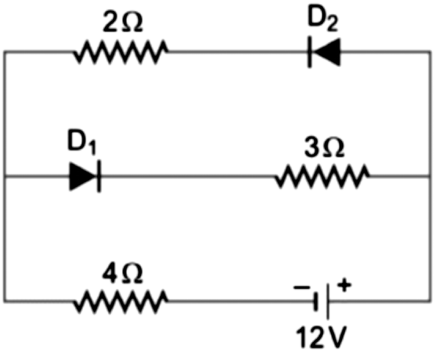
	(b) Mirage, MRI (medical diagnostic tool) (c) Mirage and X-ray (medical diagnostic tool) (d) brilliance of diamond and ECG (medical diagnostic tool) (iv) An optical fiber system is designed for efficient data transmission. If a system uses a fiber with a core refractive index of n_1=1.53 and a cladding with an index of n_2. The possible value of n_2 is. (a) 1.63 (b) 1.58 (c) 1.48 (d) 1.65
30	**Read the following paragraph & answer the questions follow.** Electromagnetic induction finds many applications such as in electrical components which includes transformers, inductors, and other devices such as electric motors and generators. An inductor is a passive component that is used in most power electroniccircuits to store energy in the form of magnetic energy when electricity is

	applied to it. When a current begins to flow through a coil of wire, it undergoes an opposition to its flow in addition to the resistance of the metal wire. On the other hand, when an electric circuit carrying a steady current and containing a coil is suddenly opened, the collapsing, and hence diminishing, magnetic field causes an induced electromotive force that tends to maintain the current and the magnetic field and may cause a spark between the contacts of the switch. (i) Why does a spark appear when a current-carrying circuit with a coil is suddenly opened? (ii) What is the basic principle behind the working of electric generators and transformers? (iii) Two spherical bobs, one metallic and the other of glass, of the same size are allowed to fall freely from the same height above the

	ground. Which of the two would reach earlier and why?
Section E (Each question carries 5 marks)	
31	(a) Show that the potential energy of a dipole making angle θ with the direction of the field is given by U = $-\vec{p}.\vec{E}$. Hence find out the amount of work done in rotating it from the position of unstable equilibrium to the stable equilibrium. (b) Plot a graph comparing the variation of potential V and electric field E due to a point charge Q as a function of distance R from the point charge. OR (a) An infinitely long positively charged straight wire has a linear charge density λ C/m. An electron is revolving around the wire as its centre with a constant velocity in a circular plane perpendicular to the wire. Deduce the expression for its kinetic energy. (b) Plot a graph of the kinetic energy as a

	function of charge density λ. (c) Five point charges, each of charge +q are placed on five vertices of a regular hexagon of side '*l*'. Find the magnitude of the resultant force on a charge – q placed at the centre of the hexagon.
32	(a) Derive an expression for the force per unit length between two long straight parallel current carrying conductors. Hence define SI unit of current (ampere). (b) Draw graphs showing dependence of (i) F on I_1, I_2 when d is kept constant (ii) F on d when the product I_1 I_2 is maintained at a constant positive value. OR (a) What is working principle moving coil galvanometer. Show that deflection in galvanometer is directly proportional to current flowing through coil. (b) A galvanometer coil has a resistance of 12 Ω and the meter shows full scale

	deflection for a current of 3 mA. How will you convert the meter into a voltmeter of range 0 to 18 V?
33	(a) Explain how the width of depletion layer in a p-n junction diode changes when the junction is (i) forward biased (ii) reverse biased. (b) Draw V – I characteristics of a p–n junction diode. Answer the following questions, giving reasons: (i) Why is the current under reverse bias almost independent of the applied potential upto a critical voltage? (ii) Why does the reverse current show a sudden increase at the critical voltage? OR (a) Explain the working of P-N junction diode as a full wave rectifier. (b) The circuit shown in the figure has two oppositely connected ideal diodes connected in parallel.



Find the current flowing through each diode in the circuit.

(c) A p-n junction diode is damaged by a strong current, why?