Practice Question Paper -3

12th Standard Physics

Session 2020-21

Practice Question Paper (theory)

Maximum Marks: 70 Marks | Time Allowed: 3 hours

General Instructions:

(1) All questions are compulsory. There are 33 questions in all.

(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E.

(3) Section A contains ten very short answer questions and four assertion reasoning MCQs of 1 mark each, Section B has two case based questions of 4 marks each, Section C contains nine short answer questions of 2 marks each, Section D contains five short answer questions of 3 marks each and Section E contains three long answer questions of 5 marks each.

(4) There is no overall choice. However internal choice is provided. You have to attempt only one of the choices in such questions.

Sr. No.		Marks
	Section – A **All questions are compulsory. In case of internal choices, attempt any one of them.**	
1	Name the physical quantity having unit Am^2	1
2	Mention one use of part of electromagnetic spectrum to which a frequency of 4000MHz belongs. **OR** What physical quantity is same for X- rays of wavelength 10^{-10} and red light of wavelength 6800 A^o .	1
3	Magnetic field lines can be entirely confined within the core of a toroid, but not within a straight solenoid. Why?.	1

4	A pair of adjacent coils has a mutual inductance of 1.5 H. If the current in one coil changes from 0 to 20 A in 0.5 s, what is the change of flux linkage with the other coil. Or Write the average value of V =Vo sin ωt over the time interval 0 to π/2ω	1
5	The ground state energy of hydrogen atom is -13.6 eV. What is K.E. of electron in first excited state?	1
6	In a photoelectric experiment, the potential required to stop the ejection of electrons from cathode is 8V. How does it change when intensity of incident light is changed to four times of previous value?	1
7	Two nuclei have mass numbers in the ratio 1:27. What is the ratio of their nuclear radii **OR** In the following nuclear reaction, Identify unknown labelled X. $^{22}_{11}Na + X \rightarrow {}^{22}_{10}Ne + \nu_e$	1
8	State the reason, why Si is not a suitable material used in making of a LED Or What happens to the width of depletion layer of a p-n junction when it is (i) forward biased, (ii)reverse biased?	1
9	Write two criteria for selecting a material for making of solar cell.	1
10	What is the net charge on 1) N type semiconductor 2) p type semiconductor	1

	For question numbers 11, 12, 13 and 14, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. **a) Both A and R are true and R is the correct explanation of A** **b) Both A and R are true but R is NOT the correct explanation of A** **c) A is true but R is false** **d) A is false and R is also false**	

11	Assertion: Magnetic field lines do not intersect each other. Reason: There cannot be two direction of the magnetic field at a point.	1
12	**Assertion(A):** Work done in moving a charge between two points in an electric field is independent of the path followed by the charge between these points. **Reason(R):** Electrostatic forces are non-conservative forces.	1
13	**Assertion(A):** if a convex lens made of material of refractive index 1.5 is kept in water of refractive index 1.33, it behaves as a diverging lens. **Reason(R):** focal length of the lens does not depend on its refractive index of the lens w.r.t. surrounding medium.	1
14	Assertion (A) : If the objective and eyepiece of a microscope are interchanged then it can work as telescope. Reason (R) : The objective lens of telescope has small focal length.	1
	Section – B **Questions 15 and 16 are Case Study based questions and are compulsory. Attempt any 4 sub parts from each question. Each question carries 1 mark.**	
15	When a potential difference V is applied across the two ends of a conductor, the free electrons in the conductor experience a force and are accelerated towards the positive end of conductor. On their way, they suffer frequent collisions with the ions/atoms of the conductor and lose their gained kinetic energy and again get accelerated due to electric field and lose the gained kinetic energy in the next collision and so on. The average velocity with which the free electrons get drifted towards the positive end of the conductor under the effect of applied electric field is called drift velocity.	4

	i) The motion of electrons between two successive collisions (with the atoms/ions) in the presence of electric field follows: a) Straight line path b) Circular path c) Elliptical path d) Curved path ii) The drift velocity of the electrons depends on a) Dimensions of the conductor b) Number density of free electrons in the conductor c) Both a and b d) None of these. iii) When potential difference across a given copper wire is increased, drift velocity of free electrons a) Decreases b) Increases c) Remain same d) Get reduced to zero iv) Two wires of same material having radii in the ratio 1:2, carry currents in the ratio 4:1. The ratio of drift velocities of electrons in them is a) 2:1 b) 1:1 c) 1:4 d) 16:1 v) If the temperature of a conductor increases, the drift velocity of free electrons a) Remains same b) Increases c) Decreases d) May increase or decrease.	
16	**Mirage** Its an optical phenomenon, especially in the desert or at sea, by which the image of some object appears displaced above, below, or to one side of its true position as a result of spatial variations of the index of refraction of air.	4

1. Mirage is a phenomenon due to
(a) refraction of light
(b) reflection of light
(c) total internal reflection of light
(d) diffraction of light.

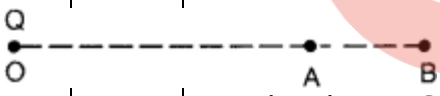
2. Critical angle of glass is θ2 and that of water is θ2. The critical angle for water and glass surface would be (μg = 3/2, μw = 4/3).
(a) less than θ2
(b) between θ1 and θ2
(c) greater than θ2
(d) less than θ1

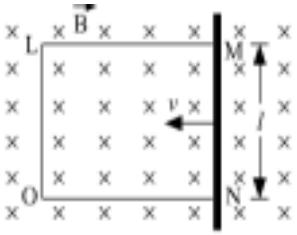
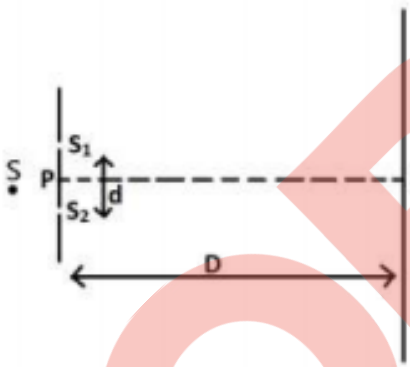
3. If the critical angle for total internal reflection from a medium to vacuum is 30^o, the velocity of light in the medium is (a) 3 X 10^8 m/s
(b) 1.5 X 10^8 m/s
(c) 0.5 X 10^8 m/s
(d) 0.2 X 10^8 m/s

4. Critical angle is
a) The angle of refraction in the denser medium corresponding to which the angle of incidence in the rarer medium is 90°.
b) The angle of incidence in the denser medium corresponding to which the angle of refraction in the rarer medium is 0°.
c) The angle of incidence in the denser medium corresponding to which the angle of refraction in the rarer medium is 90°.
d) The angle of incidence in the rarer medium corresponding to which the angle of refraction in the denser medium is 90°

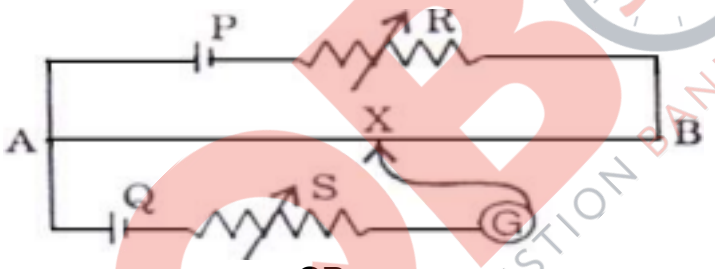
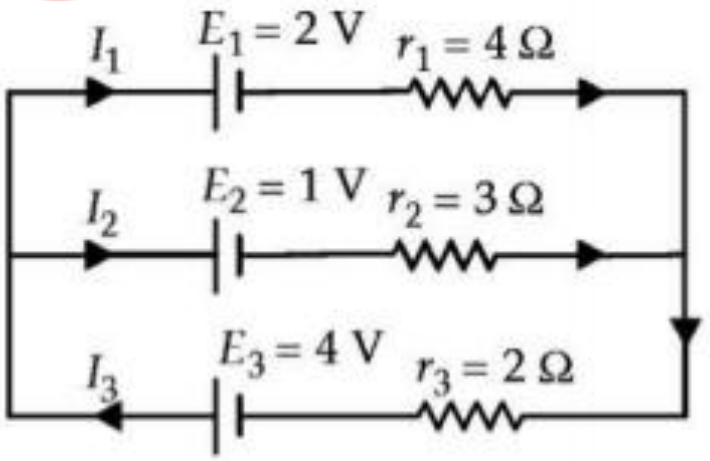
5. Optical fibre communication uses the principle

A. light scattering
B. light path reversibility
C. Total internal reflection
D. Interference.

	Section – C **All questions are compulsory. In case of internal choices, attempt anyone.**	
17	A galvanometer is first converted into a voltmeter of range 0 – 3V and then into a voltmeter of range 0 – 6 V. In which case the resistance would be higher one? Why?.	2
18	Derive Snell's law on the basis of Huygen's wave theory when light is travelling from a denser to a rarer medium. OR Depict the shape of a wavefront in each of the following cases. (i)Light diverging from point source. (ii)Light emerging out of a convex lens when a point source is placed at its focus.	2
19	A 500 µC charge is at the centre of a square of side 10 cm. Find the work done in moving a charge of 10 µC between two diagonally opposite points on the square. **OR**  A point charge Q is placed at point O as shown in the figure. Is the potential difference VA – VB positive, negative or zero, if Q is (i) positive (ii) negative?	2
20	Draw a circuit diagram to explain the working of a photodiode. Also draw the V-I characteristics of this semiconductor diode..	2

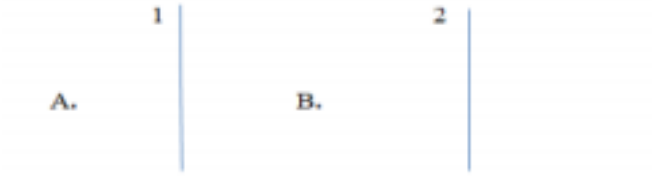
21	A rectangular conductor LMNO is placed in a uniform magnetic field of 0.5 T. The field is directed perpendicular to the plane of the conductor. When the arm MN of length of 20 cm is moved towards left with a velocity of 10 ms^{-1}, calculate the emf induced in the arm. Given the resistance of the arm to be 5 Ω (assuming that other arms are of negligible resistance) find the value of the current in the arm. 	2
22	In the figure given below SS1- SS2 = λ/4. Find the position of central maxima from 'O' if P is midpoint of S1& S2 	2
23	Explain the working of half wave rectifier with proper circuit diagram.	2
24	Define the terms angle of dip. Where on the earth's surface is the value of angle of dip (i) maximum (ii) minimum? **OR** Horizontal component of earth's magnetic field at a place is $1/\sqrt{3}$ times the vertical component. What is the value of inclination at that place?	2
25	Draw a ray diagram of a reflecting type telescope. State two advantages of this telescope over a refracting telescope.	2

	Section -D **All questions are compulsory. In case of internal choices, attempt any one.**	

26.	How does the mutual inductance of a pair of coils change when: (i) The distance between the coils is increased? (ii) The number of turns in each coil is decreased? (iii) thin iron sheet is placed between the two coils, other factors remaining the same? Explain each case.	
27	In the potentiometer circuit shown, the balance point is at X. State with reason, where the balance point will be shifted when (i) R is increased, (ii) S is increased, keeping R constant. (iii) Cell P is replaced by another cell whose emf is lower than that of cell Q.  **OR** State Kirchhoff's rules. Use these rules to write the expressions for the currents I1 , I2 and I3 in the circuit diagram shown.  	3

28	a) Explain de-Broglie argument to propose his hypothesis. Show that de- Broglie wavelength of photon equals electromagnetic radiation. b) If, proton and alpha particle are accelerated through same KE, find the ratio of the associated de-Broglie wavelengths of two. **OR** (I) State two important features of Einstein's Photoelectric equation. (II) Radiation of frequency 10^{15} Hz is incident on two photosensitive surface P and Q. there is no photoemission from surface P. photoemission occurs from surface Q but photoelectrons have zero kinetic energy. Explain this observation and find the value of work function for surface Q. .	3

29	A 12.5 eV electron beam is used to bombard gaseous hydrogen at room temperature. Up to which energy level the hydrogen atoms would be excited ? Calculate the wavelength of the first member of Lyman and first member of Balmer series.	3
30	a) Calculate the energy released in MeV in the following nuclear reaction: $^{238}_{92}U \longrightarrow {}^{234}_{90}Th + {}^{4}_{2}He + Q$ [Mass of $^{238}_{92}U = 238.05079$ u, Mass of $^{234}_{90}Th = 234.043630$ u, Mass of $^{4}_{2}He = 4.002600$ u, $1u = 931.5$ MeV/c^2] (b) Radioactive nucleus 'A' undergoes a series of decays according to the following scheme $A \xrightarrow{\alpha} A_1 \xrightarrow{\beta} A_2 \xrightarrow{\alpha} A_3 \xrightarrow{\gamma} A_4$ The mass number and atomic number of A are 190 and 75 respectively. What are these numbers for A4?	3
	Section – E **All questions are compulsory. In case of internal choices, attempt any one.**	

31.	(a) Two thin infinite sheets 1 and 2 having surface charge densities + σ and - 2 σ respectively are as shown in the diagram.  Find the electric field at points A and B. (b) A capacitor of capacity C is charged fully by connecting it to a battery of emf E. It is then disconnected from the battery. If the separation between the plates of the capacitor is doubled then how the following parameters will change:- i) Charged stored in the capacitor ii) Field strength between the plates iii) Energy stored by the capacitor **OR** (a) Define electric dipole. Derive an expression for the electric potential on the axial line due to an electric dipole. (b) An electric dipole of length 4cm, when placed with its axis making an angle of 60° with a uniform electric field, experiences a torque of $4\sqrt{3}$ Nm. Calculate the potential energy of the dipole, if it has a charge of ±8nC	
32	A series LCR circuit is connected to an ac source. Using the phasor diagram, derive the expression for the impedance of the circuit. Plot a graph to show the variation of current with frequency of the source, explaining the nature of its variation and hence calculate impedance at resonance. **OR** Define the coefficient of self-inductance. Find the coefficient of self-inductance of a long co axial solenoid. a) **(b)** A metallic rod of length *l* is rotated at a constant angular speed *ω*, normal to a uniform magnetic field *B*. Derive an expression for the current induced in the rod, if the resistance of the rod is	5

33	(a) Derive lens maker's formula for a given biconvex lens. (b) Double convex lenses are to be manufactured from a glass of refractive index 1.55 with both faces of the same radius of curvature. What is the radius of curvature required if focal length is to be 20 cm? **OR** (a) Draw the ray diagram of image formation by a telescope when final image is formed at infinity. Write the formula for its magnifying power. (b) A small telescope has an objective lens of focal length 144 cm and an eyepiece of focal length of 6 cm. Calculate its magnifying power and separation between both lenses.	5