GRADE: XII **SPLIT TEST 1** **DATE: 02.11.22**

MARKS: 70 **PHYSICS (042)** **TIME: 3.00 Hrs**

General Instructions:

Read the following instructions very carefully and strictly follow them:

(1) There are 35 questions in all. All questions are compulsory

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

(3) Section A contains eighteen MCQ of 1 mark each, Section B contains seven questions of two marks each, Section C contains five questions of three marks each, section D contains three long questions of five marks each and Section E contains two case study based questions of 4 marks each.

(4) There is no overall choice. However, an internal choice has been provided in section B, C, D and E. You have to attempt only one of the choices in such questions.

SECTION-A

1. Which device will have the least resistance?
   (a) Ammeter of range 1A (b) Ammeter of range 10 A
   (c) Voltmeter of range 1 V (d) Voltmeter of range 10 V

2. The strength of magnetic field around an infinite current carrying conductoris
   (a) same everywhere
   (b) inversely proportional to the distance
   (c) directly proportional to the distance
   (d) None of these

3. A lamp is connected in parallel with a large inductor and the combination is connected across the battery source through switch which is in ‘ON’ mode. Then while switching ‘OFF’

(a) The bulb continues to glow with same intensity as in ‘ON’ state .

(b) The intensity of glow decreases gradually and falls to zero as switch is made ‘OFF’

(c) The intensity of glow first increases & then falls to zero as switch is made ‘OFF’

(d) The intensity of glow suddenly decreases to zero.

4. The dimensional formula of inductance is;

(a) $[ML^{2}T^{-3}A^{-2}]$

(b) $[ML^{3}T^{-2}A^{-2}]$

(c) $[ML^{1}T^{-3}A^{-1}]$

(d) $[ML^{2}T^{-2}A^{-2}]$

5. A ray of light travels from vacuum to a medium of refractive index n. If the angleof incidence is found to be twice angle of refraction, then angle of incidence is

a) $\cos^{-1}(n/2)$ b) $2\cos^{-1}(n/2)$ c) $\sin^{-1}(n/2)$ d) $2\sin^{-1}(n/2)$

6. The angle of the prism is 30˚.The rays incident at 60 ˚ at one refracting face suffer a deviation of 30 ˚. The angle of emergence is

a) 0 ˚ b) 30 ˚ c) 60 d) 90 ˚

7. In a compound microscope the intermediate image is

a) virtual, inverted and magnified b) real, inverted and diminished

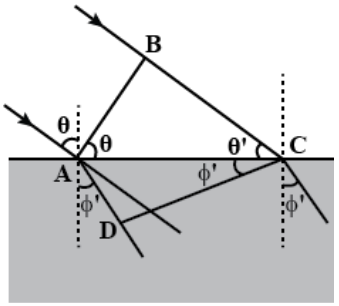
c) virtual erect and magnified d) real , inverted and magnified

8. Two slits in young’s double slit experiment have widths in the ratio 81 :1. Theratio of the amplitudes of light waves is

(a) 3 :1 (b) 3 : 2 (c) 9 :1 (d) 6:1

9. In the adjoining figure, a wave front AB moving in air is incident on a plane glass surface XY. Its position CD, after refraction through a glass slab, is as shown also along with the normal drawn at A and D. The refractive index of glass with respectto air will be equal to

(a) BD/AC (b) AB/CD (c) BD/AD (d) AC/AD



10. A parallel beam of monochromatic light of wavelength $5000A^0$ is incident normally on a single narrow slit of width 0.001mm. The light is focused by a convex lens on a screen placed in focal plane. The first minimum will be formed for the angle of diffraction is equal to

(a) 0^0 (b) 15^0 (c) 30^0 (d) 5^0

11. Photons are deflected by

a. electric field only b. magnetic field only

c. electromagnetic field d. None of these

12. The slope of stopping potential vs frequency of the incident light graph is

a. e/h b. h/e c. h/c d. c/h

13. If an electron and proton are propagating in the form of waves having thesame λ , it implies that they have the same

a. Energy b. Momentum

c. Velocity d. angular momentum

14. The ionization energy of hydrogen atom is 13.6 eV. Following Bohr's theorythe energy corresponding to a transition between 3rd and 4th orbits is

(a) 3.40 eV (b) 1.51 eV (c) 0.85 eV (d) 0.66 eV

15. In terms of Rydberg constant R, the wave number of the first Balmer line is

(a) R (b) 3R (c) 5R/36 (d) 8R/9

Q.No 16 to 18 contain statements one labeled Assertion (A) and the other labeled 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

16. **Assertion (A):** In an interference pattern observed in Young's double slit experiment, if the separation (d) between coherent sources as well as the distance (D) of the screen from the coherent sources both are reduced to 1/3rd, then new fringe width remains the same.

Reason (R): Fringe width is proportional to (d/D).

17. **Assertion (A):** The kinetic energy of a charged particle moving in a uniformmagnetic field does not change.

Reason (R): In a uniform magnetic field no force acts on the charge particle.

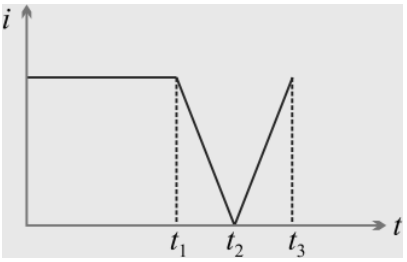
18. **Assertion (A) :** The images formed by total internal reflections are brighterthan those formed by mirrors or lenses.

Reason (R) : There is no loss of intensity in total internal reflection.

SECTION B

19. The force per unit length between two parallel long current carrying conductor is F. If the current in each conductor is tripled, what would be the value of the force per unit length between them?

20. The current ' i ' in an induction coil varies with time t according to the graph.Draw the graph of induced e.m.f. with time.



21. Define critical angle for total internal reflection. Obtain an expression for refractive index of the medium in terms of critical angle.

(OR)

Define total internal reflection. State its two conditions with a diagram.

22. Three immiscible liquids of densities d1 > d2 > d3 and refractive indices μ1 > μ2 > μ3 are put in a beaker. The height of each liquid is . A dot is made at the bottom of the beaker. For near normal vision, find the apparent depth of thedot.

23. A narrow slit is illuminated by a parallel beam of monochromatic light of wavelength λ equal to 6000 Å and the angular width of the central maximum in the resulting diffraction pattern is measured. When the slit is next illuminated by light of wavelength λ', the angular width decreases by 30%. Calculate the value of the wavelength λ'.

24. Plot a graph showing the variation of stopping potential with the frequency of incident radiation for two different photosensitive materials having work functions W1 and W2 (W1>W2). On what factors does the slope of the lines depend?

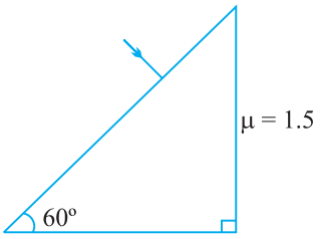
25. The ground state energy of hydrogen atom is – 13.6 eV. If an electron makes a transition from an energy level – 1.51 eV to – 3.4 eV, calculate the wavelength

of the spectral line emitted and name the series of hydrogen spectrum to which it belongs.

SECTION C

26. Two long straight parallel conductors carrying currents I_1 and I_2 are separated by a distance d. If the currents are flowing in the same direction, show how the magnetic field produced by one exerts an attractive force on the other. Obtain theexpression for this force and hence define 1 ampere.

27. Complete the path of light with correct value of angle of emergence. Also find angle of incidence and emergence.



28. Derive Snell's law on the basis of Huygens's wave theory.

(OR)

Two narrow slits are illuminated by a single monochromatic sources.
(a) Draw the intensity pattern and name the phenomenon
(b) One of the slits is now completely covered. Draw the intensity pattern now obtained.

29. Light of intensity I and frequency v is incident on a photosensitive surface and causes photoelectric emission. Justify with the help of graph, the effect on photoelectric current when

(i) the intensity of light is gradually increased

(ii) the frequency of incident radiation is increased

(iii) the anode potential is increased

In each case, all other factors remain the same.

30. The total energy of an electron in the first excited state of the hydrogen atom is about – 3.4 eV. What is (a) the kinetic energy, (b) the potential energy of the

electron? (c) Which of the answers above would change if the choice of the zero of potential energy in changed to (i) + 0.5 eV (ii) – 0.5 eV

SECTION D

31. a) State Biot-Savart law.

b) Use it to obtain the magnetic field at an axial point, distance d from the centre of a circular coil of radius 'a' and carrying current I.

c) A long wire is first bent into a circular coil of one turn and then into a circular coil of smaller radius having n turns. If the same current passes in both the cases, find the ratio of the magnetic fields produced at the centres in the two cases.

(OR)

a) Write the principle, working of a moving coil galvanometer with the help of neat labeled diagram. What is the importance of radial field and phosphor bronze used in the construction of moving coil galvanometer?

b) If the current sensitivity of a moving coil galvanometer is increased by 20% and its resistance also increased by 50% then how will the voltage sensitivity of the galvanometer be affected?

32. a) Diagrammatically show the phenomenon of refraction through a prism. Define angle of deviation in this case. Hence for a small angle of incidence derive the relation $\delta = (\mu - 1) A$.

b) Two thin converging lens of focal lengths 15 cm and 30 cm respectively are held in contact with each other. Calculate power and focal length of the combination.

(OR)

a) State the condition under which the phenomenon of diffraction of light takes place. Also draw the intensity pattern with angular position.

b) How will the interference pattern in Youngs double slit experiment change, when

(i) distance between the slits S1 and S2 are reduced and

(ii) the entire set up is immersed in water?

Justify your answer in each case.

33. a) State Bohr's postulates. Using these postulates, derive an expression for total energy of an electron in the nth orbit of an atom. What does negative of this energy signify?

b) Calculate the radius of the third Bohr orbit of hydrogen atom and energy of electron in third Bohr orbit of hydrogen atom.

(OR)

a) Ultraviolet light of wavelength 350 nm and intensity 1 W/m^2 is directed at a potassium surface having work function 2.2 eV.
(i) Find the maximum kinetic energy of the photoelectron.
(ii) If 0.5 percent of the incident photons produce photoelectric effect, how many photoelectrons per second are emitted from the potassium surface that has an area 1 cm^2.
b) An electron and a proton are possessing same amount of K.E, which of the two have greater de-Broglie, wavelength? Justify your answer.

SECTION E

34. Self-Induction: When a current I flow through a coil, flux linked with it is $\varphi = LI$, where L is a constant known as self-inductance of the coil. Any charge in current sets up an induced emf in the coil. Thus, self-inductance of a coil is the induced emf set up in it when the current passing through it changes at the unit rate. It is a measure of the opposition to the growth or the decay of current flowing through the coil. Also, value of self-inductance depends on the number of turns in the solenoid,its area of cross-section and the permeability of its core material.

i) The inductance in a coil plays the same role as_____in mechanics. Justify

ii) Give the unit of self-inductance.

iii) The induced emf in a coil of 10 Henry inductance in which current varies from 9A to 4 A in 0.2 second is

iv) Draw the graph showing the variation of Induced emf across the Inductor whenthe emf $\varepsilon=5t^2+2t$

35. Lenard observed that when ultraviolet radiations were allowed to fall on the emitter plate of an evacuated glass tube, enclosing two electrodes (metal plates), current started flowing in the circuit connecting the plates. As soon as the ultraviolet

radiations were stopped, the current flow also stopped. These observations proved that it was ultraviolet radiations, falling on the emitter plate, that ejected some charged particles from the emitter and the positive plate attracted them.

i) Alkali metals like Li, Na, K and Cs show photo electric effect with visible light but metals like Zn, Cd and Mg respond to ultraviolet light. Why?

ii) What is the effect of increase in intensity on photoelectric current?

iii) How does the maximum K.E of the electrons emitted vary with the workfunction of metal?

iv) Electrons are emitted with zero velocities from metal surface when exposed to radiation of wavelength 6800 A^o. Calculate photon's frequency and work function.