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| **HY/PH/1220/B 05/11/2020** | | | | | | |
| **HALF YEARLY EXAMINATION (2020-21)** | | | | | | |
| **Subject: PHYSICS**  **Grade: XII** | | Max. Marks: 70Time: 3 Hours | | | | |
| **Name:** | | | | **Section:** | **Roll No:** | |
| **General Instructions:**   * All questions are compulsory. There are 33 questions in all. * This question paper has five sections: Section A, Section B, Section C, Section D and Section E. * 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. * There is no overall choice. However internal choice is provided. You have to attempt only one of the choices in such questions. * All answers to be written in the answer sheet provided. | | | | | | |
|  | **SECTION A**  **(All questions are compulsory. In case of internal choices, attempt any one of them.)** | | | | |  | |
| 1. | State the principle of working of a meter bridge. | | | | | 1 | |
| 2. | A steady current flow in a metallic conductor of non-uniform cross-section. Which of these quantities is constant along the conductor?  Current, current density, drift speed, electric field?  **OR**  A resistance R is connected across a cell of emf e and internal resistance r. A potentiometer now measures the potential difference between the terminals of the cell as V. Write the expression for ‘r’ in terms of e, V and R. | | | | | 1 | |
| 3. | An electron with charge -e and mass m travels at a speed v in a plane perpendicular to a magnetic field of magnitude B. The electron follows a circular path of radius R. In a time t, the electron travels halfway around the circle. What is the amount of work done by the magnetic field? | | | | | 1 | |
| 4. | Using the concept of force between two infinitely long parallel current carrying conductors, define one ampere of current. | | | | | 1 | |
| 5. | Define one tesla using the expression for the magnetic force acting on a particle of charge ‘q’ moving with velocity v in a magnetic field B . | | | | | 1 | |
| 6. | Where does the angle of dip is maximum? | | | | | 1 | |
| 7. | Define declination and horizontal component of earth’s magnetism.  **OR**  What are permanent magnets? Give one example. | | | | | 1 | |
| 8. | What is the significance of Gauss law in magnetism? | | | | | 1 | |
| 9. | To which part of the electromagnetic spectrum does a wave of frequency 5 × 1019 Hz belong?  **OR**  Name the physical quantity which remains same for microwaves of wavelength 1 mm and UV radiations of 1600 Å in vacuum. | | | | | 1 | |
| 10. | Arrange the following electromagnetic waves in order of increasing frequency: ϒ-rays, microwaves, infrared rays and ultraviolet rays. | | | | | 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 (A):** Magnification of concave mirror is always positive.  **Reason (R)**: Concave mirror diverges the parallel rays that are incident on it. | | | | | 1 | |
| 12. | **Assertion(A):** Microscope has convex lens of larger power.  **Reason (R):** Astronomical telescope has convex lens of smaller power | | | | | 1 | |
| 13. | **Assertion(A):** Coherent sources required to produce sustained interference.  **Reason (R):** Fringe width in YDSE is independent on wavelength of light used | | | | | 1 | |
| 14. | **Assertion(A):** Wave nature of radiation explains the phenomena of photoelectric effect successfully.  **Reason (R):** Photoelectric current depends on frequency of incident radiation. | | | | | 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. | **Deviation and Dispersion of light through prism:**    When light passes through a triangular prism it deviates from its original path, deviation of light depends on angle of the prism, refractive index etc. Different colour’s undergo different deviation which causes dispersion of light when white light passing through prism.  i) At minimum deviation:   1. r>i 2. i=e 3. r=e 4. i=r   ii) Which of the following colours has greater refractive index:   1. Red 2. Blue 3. Green 4. violet   iii) If the light incident on equilateral prism, at minimum deviation the angle of refraction is   1. 600 2. 900 3. 300 4. 450   iv)The process involved in rainbow formation   1. Dispersion 2. Deviation 3. Internal reflection 4. All the above   v) Which of the following colours have mean deviation in dispersion?   1. Red 2. Blue 3. Green 4. Yellow | | | | | 4 | |
| 16. | **Young’s Double Slit Experiment:**    In YDSE using two narrow slits, the beautiful pattern of sustained interference can be seen on screen. Width of all bright and dark fringes found to be same when the experiment is performed in air. If the entire apparatus is completely immersed in a transparent medium then the fringe width is found to be decreased.   1. If the distance between slits and screen increases then the fringe width 2. decreases 3. increases 4. remains same 5. none of the above 6. Condition for sustained interference 7. Sources must be coherent 8. Sources should emit the light continuously 9. Two slits must be narrow 10. All the above 11. If the entire apparatus of YDSE is immersed in a transparent liquid of refractive index n, then what happens to fringe width 12. Remains same 13. Increases 14. Decreases 15. doubled 16. Path difference for bright fringes is 17. (2n+1)π 18. nλ 19. (2n-1) λ/2 20. 2π-1 21. Width of central bright fringe is 22. Twice the width of bright fringes 23. Twice the width of dark fringes 24. Equal to the width of bright fringes 25. d) cannot predict | | | | | 4 | |
|  | **SECTION– C**  **(All questions are compulsory. In case of internal choices, attempt anyone.)** | | | | |  | |
| 17. | Draw a ray diagram of a reflecting type telescope. State two advantages of this telescope over a refracting telescope | | | | | 2 | |
| 18. | Trace the path of a ray of light passing through a glass prism (ABC) as shown in the figure. If the refractive index of glass is √3, find out of the value of the angle of emergence from the prism. | | | | | 2 | |
| 19. | A convex lens of focal length f1 is kept in contact with a concave lens of focal length f2 . Find the focal length of the combination. | | | | | 2 | |
| 20. | What is meant by the transverse nature of electromagnetic waves? Draw a diagram showing the propagation of an electromagnetic wave along the x-direction, indicating clearly the directions of the oscillating electric and magnetic fields associated with it. | | | | | 2 | |
| 21. | An electromagnetic wave of wavelength λ is incident on a photosensitive surface of negligible work function. If the photo-electrons emitted from this surface have the de-Broglie wavelength λ1 , prove that  **OR**  Derive an expression for the de-Broglie wavelength associated with an electron accelerated through a potential V. | | | | | 2 | |
| 22. | Define current sensitivity and voltage sensitivity of a galvanometer. Increasing the current sensitivity may not necessarily increase the voltage sensitivity of a galvanometer. Justify.  **OR**  A wire of length L is bent round in the form of a coil having N turns of same radius. If a steady current I flows through it in a clockwise direction, find the magnitude and direction of the magnetic field produced at its centre. | | | | | 2 | |
| 23. | Figure shows variation of stopping potential (V0) with the frequency (n) for two photosensitive materials M1 and M2.     * 1. Why is the slope same for both lines?   2. For which material will the emitted electrons have greater kinetic energy for the incident radiations of the same frequency? Justify your answer | |  | | | 2 | |
| 24. | The plot of the variation of potential difference across a combination of three identical cells in  series, versus current is as shown below. What is the emf of each cell? Find the internal resistance of each cell. | |  | | | 2 | |
| 25. | Define magnetic moment, Write its SI unit. Is it a vector or scalar? | | | | | 2 | |
|  | **SECTION -D**  **(All questions are compulsory. In case of internal choices, attempt anyone.)** | | | | |  | |
| 26. | A long straight wire of a circular cross-section of radius ‘a’ carries a steady current ‘I’. The current is uniformly distributed across the cross-section. Apply Ampere’s circuital law to calculate the magnetic field at a point ‘r’ in the region for (i) r < a and (ii) r > a. | | | | | 3 | |
| 27. | A variable resistor R is connected across a cell of emf E and internal resistance r.   * 1. Draw the circuit diagram.   2. Plot the graph showing variation of potential drop across R as function of R.   3. At what value of R current in circuit will be maximum.   **OR**  A storage battery is of emf 8V and internal resistance 0.5 ohm is being charged by d.c supply of 120 V using a resistor of 15.5ohm   1. Draw the circuit diagram. 2. Calculate the potential difference across the battery. 3. What is the purpose of having series resistance in this circuit? | | | | | 3 | |
| 28. | 1. Explain de-Broglie argument to propose his hypothesis. Show that de-Broglie wavelength of photon equals electromagnetic radiation. 2. If, deuterons and alpha particle are accelerated through same potential, find the ratio of the associated de-Broglie wavelengths of two.   **OR**  State the main implications of observations obtained from various photoelectric experiments. Can these implications be explained by wave nature of light? Justify your answer. | | | | | 3 | |
| 29. | A compound microscope consists of an objective lens of focal length 2.0 cm and an eyepiece of focal length 6.25 cm separated by a distance of 15 cm. How far from the objective should an object be placed in order to obtain the final image at (a) The least distance of distinct vision (25 cm), and (b) What is the magnifying power of the microscope in this case? | | | | | 3 | |
| 30. | In Young’s double slit experiment, the two slits 0.15 mm apart are illuminated by monochromatic light of wavelength 450 nm. The screen is 1.0 m away from the slits.   1. Find the distance of the second (i) bright fringe, (ii) dark fringe from the central maximum. 2. How will the fringe pattern change if the screen is moved away from the slits? | | | | | 3 | |
|  | **SECTION – E**  **(All questions are compulsory. In case of internal choices, attempt any one.)** | | | | |  | |
| 31. | 1. With the help of a diagram, explain the principle and working of a moving coil galvanometer. 2. What is the importance of a radial magnetic field and how is it produced 3. Why is it that while using a moving coil galvanometer as a voltmeter a high resistance in series is required whereas in an ammeter a shunt is used?   **OR**   1. Derive an expression for the force between two long parallel current carrying conductors. 2. Use this expression to define S. I. unit of current. 3. A long straight wire AB carries a current I. A proton P travels with a speed v, parallel to the wire, at a distance d from it in a direction opposite to the current as shown in the figure. What is the force experienced by the proton and what is its direction? | | | | | 5 | |
| 32. | 1. State the working principle of a potentiometer. With the help of the circuit diagram, explain how a potentiometer is used to compare the emf’s of two primary cells. Obtain the required expression used for comparing the emfs. 2. Write two possible causes for one sided deflection in a potentiometer experiment.   **OR**   1. State Kirchhoff’s rules for an electric network. Using Kirchhoff’s rules, obtain the balance condition in terms of the resistances of four arms of Wheatstone bridge. 2. In the meterbridge experimental set up, shown in the figure, the null point ‘D’ is obtained at a distance of 40 cm from end A of the meterbridge wire. If a resistance of 10Ω is connected in series with R1, null point is obtained at AD = 60 cm. Calculate the value of R1 and R2 | | | | | 5 | |
| 33. | 1. State Huygen’s principle. 2. Show, with the help of a suitable diagram, how this principle is used to obtain the diffraction pattern by a single slit. 3. Draw a plot of intensity distribution and explain clearly why the secondary maxima become weaker with increasing order (n) of the secondary maxima   **OR**   1. If two waves y1=a1sinωt and y2=a2 sin(ωt+ϕ) produces interference pattern. Obtain the expression for resultant amplitude and phase. If I1 and I2 are the corresponding intensities, write the expression for resultant intensity. 2. Write the conditions for constructive and destructive interference. 3. Write two differences between interference and diffraction | | | | | 5 | |
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