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| **HY/PH/1220/A 4/11/2020** | | | | | | | |
| **HALF YEARLY EXAMINATION (2020-21)** | | | | | | | |
| **Subject: PHYSICS**  **Grade: XII** | | Max. Marks: 70Time:3 Hrs. | | | | | |
| **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.)** | | | | | |  |
|  | Graph showing the variation of current versus voltage for a material GaAs is shown in figure . Identify the region of   1. negative resistance 2. where Ohm’s law is obeyed. | | | |  | | **1** |
|  | In the study of photoelectric effect, the graph between stopping potential V and frequency ʋ of the incident radiation on two different metals P and Q is shown in the graph: Which one of the two metals has higher threshold wavelength? | | | |  | | **1** |
|  | A proton and alpha particle are moving in circular paths with same Kinetic Energies in the same magnetic fields. Calculated the ratio of their radii. | | | | | | **1** |
|  | State vector form of Biot Savart’s law. | | | | | | **1** |
|  | What is the magnetic field intensity due to a current carrying toroidal solenoid (i) inside the toroid and (ii) outside the toroid? | | | | | | **1** |
|  | Why do magnetic lines of force form continuous closed loops?  **OR**  State the Gauss’s law of magnetism | | | | | | **1** |
|  | . The magnetic field in a plane electromagnetic wave is given by  By=2 x 10-7sin(0.0005x + 1.5 x 1011t)Tesla.  What is the direction of propagation of the wave? | | | | | | **1** |
|  | Identify the part of the electromagnetic spectrum which is   1. Water Purification 2. Produced by bombarding a metal target by high speed electrons. | | | | | | **1** |
|  | What is the rest mass of a photon? Write any one property of photon.  **OR**  Find the minimum wavelength of X-rays produced by 30 kV electrons. | | | | | | **1** |
|  | At a place, horizontal and vertical components of earth’s magnetic field are equal. What is the angle of dip at that place? | | | | | | **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** | | | | | |  |
|  | **Assertion (A) :** The poles of magnet cannot be separated by breaking into two pieces. **Reason (R):** The magnetic moment will be reduced to half when a magnet is broken into two equal pieces. | | | | | | **1** |
|  | Assertion(A) : The e.m.f of the cell in secondary circuit must be less than e.m.f of cell in primary circuit in potentiometer. Reason (R): Balancing length cannot be more than length of potentiometer wire. | | | | | | **1** |
|  | **Assertion(A)** : photoelectric effect demonstrate the wave nature of light  **Reason (R):** the number of photoelectrons is proportional to the frequency of light. | | | | | | **1** |
|  | Assertion (A): X-ray travel with the speed of light. Reason (R): X-rays are electromagnetic rays. | | | | | | **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.** | | | | | |  |
|  | Nowadays optical fibres are extensively used for transmitting audio and video signals through long distances. Optical fibres make use of the phenomenon of total internal reflection. Optical fibres are fabricated with high quality composite glass/quartz fibres. Each fibre consists of a core and cladding.   1. Light cannot easily escape from fibre without multiple internal reflections. This is because: 2. Its critical angle with reference to outer covering is too large 3. Its critical angle with reference to outer covering is too small 4. The fibre is transparent 5. Rays always enter at angle greater than critical angle 6. The ratio of refractive indices of core and cladding must be 7. greater than one 8. less than one 9. equal to one 10. doesn’t make any difference 11. The basic reason for preferring optical fibres over copper cable 12. optical fibres are cheaper 13. optical fibres can easily bend 14. loss of intensity of the signal is almost negligible 15. electricity is not used at all 16. The index of refraction of transparent material is 1.4. The critical angle for total internal reflection, at a b-air interface, is nearly equal to: 17. 30° 18. 45° 19. 60° 20. 22° 21. Select another natural phenomenon which works on the same principle 22. swimming pool appears less deep 23. dispersion of light 24. mirage 25. d) brightness of full moon | | | | | | **4** |
|  | Diffraction occurs in an isotropic and homogeneous medium when light does not propagate in a straight line. This is the case, for example, when light waves encounter holes or obstacles of size comparable to the optical wavelength. When the optical waves may be considered as plane, which is reasonable at sufficient distances from the source or diffracting object, the phenomenon is known as Fraunhofer diffraction. Such diffraction affects all optical images. Even the best optical instruments never give an image identical to the object. Light rays emitted from the source diffract when passing through an instrument aperture and before reaching the image plane. Fraunhofer diffraction theory predicts that the complex amplitude of a monochromatic light in the image plane is given by the Fourier transform of the aperture transmission function.   1. Diffraction effects show that light does not travel straight lines. Under what condition the concepts of ray optics are valid. ( D = distance of screen from the slit) 2. D < Z f 3. D = Z f 4. D > Z f 5. D <<Z f 6. In the phenomena of Diffraction of light when the violet light is used in the experiment is used instead of red light then 7. Fringe width increases 8. No change in fridge width 9. Fringe width decreases 10. Colour pattern is formed 11. The wave-front due to source situated at the infinity is 12. Spherical 13. Plane 14. Cylindrical 15. Rectangular 16. A slit of width a is illuminated by white light. For red light (λ = 6500 Å) . The first minima is obtained at o θ = 30 degree . Then the value of a will be 17. 3250 Å 18. 4 6.5 x 10-4 mm 19. 1.3 micrometer 20. 2.5x10-4 cm 21. Diffraction aspect is easier to notice in case of the sound waves then in case of the light waves because sound waves 22. Have longer wavelength 23. Shorter wavelength 24. Longitudinal wave 25. Transverse waves | | | | | | **4** |
|  | **Section – C**  **All questions are compulsory. In case of internal choices, attempt anyone.** | | | | | |  |
|  | Sketch the variation of resistivity with temperature for a) conductor, b) Semiconductor | | | | | | **2** |
|  | The wavelength λ of a photon and the de Broglie wavelength of an electron has the value. Show that the energy of a photon is (2λmc/h) times the kinetic energy of electron; where m, c, h has their usual meaning  **OR** How is the de-Broglie wavelength associated with an electron accelerated through a potential difference of 100 volts? | | | | | | **2** |
|  | A charged particle, having a charge *q*, is moving with a speed v along the x-axis. It enters a region of space where an electric field *E(= Ej*) and a magnetic field B are both present. The particle, on emerging from this region, is observed to be moving along the x-axis only. Obtain an expression for the magnitude of B in terms of v and E. Give the direction of B.  **OR**  Find the magnitude and direction of the net magnetic field at the common center of the two coils | | | | | | **2** |
|  | Draw a schematic sketch of the electromagnetic waves propagating along the +x axis. Indicate the direction of the electric and magnetic fields. | | | | | | **2** |
|  | A beam of light converges at a point P. Now a lens is placed in the path of the convergent beam 12 cm from P. At what point does the beam converge if the lens is a convex lens of focal length 20 cm ? | | | | | | **2** |
|  | A ray of light is incident normally on the face AB of a right-angled glass prism of refractive index aμg = 1·5. The prism is partly immersed in a liquid of unknown refractive index. Find the value of refractive index of the liquid so that the ray grazes along the face BC after refraction through the prism. Trace the path of the rays if it were incident normally on the face AC | | |  | | | **2** |
|  | 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. Calculate the magnifying power of the compound microscope. Also, calculate the length of the microscope | | | | | | **2** |
|  | Define the terms magnetic inclination and horizontal component of earth’s magnetic field at a place. Establish the relationship between the two with help of a diagram.  **OR**  Horizontal component of earth’s magnetic field at a place is √3 times the vertical component. What is the value of inclination at that place? | | | | | | **2** |
|  | **The given graph shows the variation of photoelectric current (I) versus applied voltage (V) for two different photosensitive materials and for two different intensities of the incident radiations. Identify the pairs of curves that corresponds to different materials but same intensity of incident radiation.** | | | important-questions-for-class-12-physics-cbse-photoelectric-effect-3 | | | **2** |
|  | **Section -D**  **All questions are compulsory. In case of internal choices, attempt any one.** | | | | | |  |
|  | Applying Kirchhoff’s rule, find the current through each resistor? | | | 111 | | | **3** |
|  | A convex lens made up of glass of refractive index 1.5 is dipped, in turn, in (i) a medium of refractive index 1.65, (ii) a medium of refractive index 1.33.   1. Will it behave as a converging or a diverging lens in the two cases? 2. How will its focal length change in the two media?   **OR**  Derive the relation between the refractive index (n) and radius of curvature of R1 and R2 for a convex lens of focal length *f*. | | | | | | **3** |
|  | Write three characteristic features in photoelectric effect which cannot be explained on the basis of wave theory of light, but can be explained only using Einstein’s equation  **OR**  When a photosensitive material is irradiated with the light of frequency *v*, the maximum speed of electrons is given by Vmax . A plot of Vmax 2 is found to vary with frequency *v* as shown in the figure.  Use Einstein’s photoelectric equation to find the expressions for   1. Planck’s constant and 2. work function of the given photosensitive material, in terms of the parameters *l*, n and mass m of the electron. | | | | | | **3** |
|  | A galvanometer with a coil of resistance 12 ohms shows a full-scale deflection for a current of 2.5 mA. Calculate the value of the resistance required to convert it into an ammeter of range 0 to 7.5 A. Draw the diagram to show how you will connect this resistance to the galvanometer? | | | | | | **3** |
|  | The intensity, at the central maxima (0) in a Young's double slit set up is Io. find the intensity at a point P where path difference is λ/3 .  Board Paper Solutions for CBSE Class 12-science PHYSICS Board Paper 2019  All India Set 1 | | | | | | **3** |
|  | **Section – E**  **All questions are compulsory. In case of internal choices, attempt any one.** | | | | | |  |
|  | 1. State and proof the principle of potentiometer 2. Figure shows a potentiometer with a cell of 2.0 V and internal resistance 0.40 Ω maintaining a potential drop across the resistor wire AB. A standard cell which maintains a constant emf of 1.02 V (for very moderate currents upto a few mA) gives a balance point at 67.3 cm length of the wire. To ensure very low currents drawn from the standard cell, a very high resistance of 600 kΩ is put in series with it, which is shorted close to the balance point.      1. What purpose does the high resistance of 600 kΩ have? Is the balance point affected by this high resistance? 2. Would the method work in the above situation if the driver cell of the potentiometer had an emf of 1.0V instead of 2.0V?   **OR**   1. State and proof the principle of meter bridge 2. In the meter bridge experiment, balance point was observed at *J* with *AJ* = *l*. 3. The values of *R* and *X* were doubled and then interchanged. What would be the new position of balance point? 4. If the galvanometer and battery are interchanged at the balance position, how will the balance point get affected? | | | | | | **5** |
|  | a) Derive the expression for the force acting on a current carrying conductor of length L in a uniform magnetic field ‘B’.  b) The figure shows three infinitely long straight parallel current carrying conductors. Find the   * 1. magnitude and direction of the net magnetic field at point A lying on conductor 1,   2. magnetic force on conductor 2.     **OR**   1. State the principle of a moving coil galvanometer? Prove that the current flowing through the coil of a moving coil galvanometer is directly proportional to its deflection. 2. To increase the current sensitivity of a moving coil galvanometer by 50% , its resistance becomes twice its initial resistance. By what factor does its voltage sensitivity change? | | | | | | **5** |
|  | 1. Define a wave front. 2. Draw the diagram to show the shape of plane wave front as they pass through (i) a thin prism and (ii) a thin convex lens. State the nature of refracted wave front. 3. Verify Snell’s law of refraction using Huygens’s principle.   **OR**   1. Obtain an expression for fringe width in Youngs double slit experiment. What is the effect on the interference pattern in Youngs experiment when: 2. screen is moved closer to the plane of slits? 3. Separation between the two slits is increased. Explain your answer in each case. | | | | | | **5** |
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