No. of printed pages:6

INDIAN SCHOOL SOHAR
PREBOARD EXAMINATION (2019-20)
PHYSICS – THEORY

CLASS: XII **MAXIMUM MARKS: 70**
DATE: 7/1/2020 **DURATION: 3Hrs**

General Instructions:

1. All questions are compulsory.
2. There are 37questions in all. Questions 1 to 20 carry one mark each, questions 21 to 27 carry two marks each, questions 28 to 34 carry three marks each, questions 35 to 37 carry five marks each.
3. There is no overall choice. However, internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each.
4. You have to attempt only one of the given choices in such questions.
5. Use of calculator is not permitted.

MULTIPLE CHOICE QUESTIONS:(1 mark each)

1. If $\oint \mathbf{E}.\mathbf{ds}$ = 0 over a surface , then
(a) the electric field inside the surface and on it is zero .
(b) the electric field inside the surface is necessarily uniform.
(c) the number of flux lines entering the surface must be equal to the number of flux lines leaving it.
(d) all charges must not necessarily be outside the surface.

2. Equipotential surfaces:
(a) are closer in regions of lower electric fields compared to regions of larger electric fields.
(b) will be more crowded near sharp edges of a conductor
(c) will be more crowded near the regions of lower charge densities.
(d) will always be equally spaced

3. Consider a wire carrying a steady current I placed in a uniform magnetic field B perpendicular to its length . Consider the charges inside the wire. It is known that magnetic forces do not work . This implies that
(a) motion of charges inside the conductor is unaffected by B since they do not absorb energy .
(b) all charges inside the wire move to surface as a result of B.
(c) if the wire moves under the influence of B , no work is done by the force .
(d) if the wire moves under the influence of B , no work is done by the magnetic force on the ions , assumed fixed within the wire.

4. A long solenoid has 1000 turns per metre and carries a current of 1A . It has a soft iron core of u_r = 1000. The core is heated beyond the Curie temperature T_C.
(a) The H field in the solenoid is (nearly) unchanged but the B field decreases drastically.
(b) The H and B fields in the solenoid are nearly unchanged.
(c) The magnetisation in the core reverses the direction .
(d) The magnetization in the core enlarges by a factor of about 10^8.

5. Two identical current carrying coaxial loops carry current I in an opposite sense. A simple amperian loop passes through both of them once. Calling the loop as C.
(a) $\oint \boldsymbol{B}.\boldsymbol{dl}$ =$2\mu_0$I
(b) the value of $\oint \boldsymbol{B}.\boldsymbol{dl}$ is independent of C
(c) there may be a point on C where **B** and ***dl*** are perpendicular.
(d) B vanishes everywhere on C.

6. Hydrogen atom excites energy level from fundamental state to n=3. The number of spectral lines according to Bohr.
(a) 4 (b) 3 (c) 1 (d) 2

7.To reduce the resonant frequency in an LCR series circuit with a generator
(a) the generator frequency should be reduced
(b) another capacitor should be added in parallel to the first.
(c) the iron core of the inductor should be removed
(d) dielectric of the capacitor should be removed.

8. β- rays emitted from a radioactive material are known as
(a) neutral particles (b) electromagnetic radiations
(c) charged particles emitted by nucleus (d) electrons orbiting around the nucleus

9. A convex lens is dipped in a liquid whose refractive index is equal to refractive index of the lens.Then its focal length will
(a) become zero (b) become infinite (c) reduce (d) increase

10. These are 3 wavelengths 10^{7}m,10^{-10}m,10^{-7}m. Find their respective names
(a) Radiowaves, X-Rays, visible rays (b) X-Rays, visible rays, Radiowaves
(c) X-Rays,Y-Rays, visible rays (d) visible rays, Y-Rays ,X-Rays

FILL IN THE BLANKS WITH APPROPRIATE ANSWER:(1 mark each)

11. A nucleus ${}_{n}X^{m}$ emits one alpha particle and two----------. The resulting nucleus is ${}_{n}X^{m-4}$

OR

11. Product of half life and wave length is equal to----------.

12. Nature of magnetic field in a moving coil galvanometer is----------.

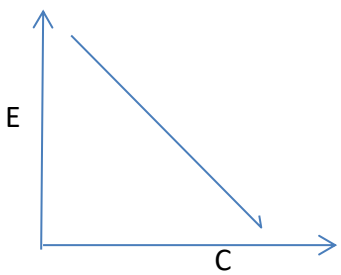
13.---------- is the main cause of zener breakdown.

14.The angular resolution of a 10 cm diameter telescope at a wave length of 5000 A^{0} is of the order of ----------.

15. Work done in moving a unit positive charge through a distance of x meter on a equipotential surface is----------.

ANSWER THE FOLLOWING VERY SHORT ANSWER TYPE QUESTIONS:(1 mark each)

16. The graph below shows the variation of the total energy E stored in a capacitor against the value of the capacitance C itself. Which of the two, the charge on the capacitor or the potential used to charge it, is kept constant for this graph.



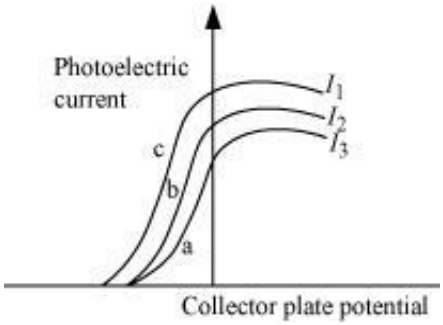
17. You are given following three lenses. Which two lenses will you use as an eyepiece and as an objective to construct an astronomical telescope?

Lens	Power (P)	Aperture (A)
L1	3D	8 cm
L2	6D	1 cm
L3	10D	1 cm

OR

17.If the angle between the pass axis of polarizer and the analyser is 45^0, write the ratio of the intensities of original light and the transmitted light after passing through the analyser

18.The figure shows a plot of three curves a, b, c, showing the variation of photocurrent vs collector plate potential for three different intensities I_1, I_2 and I_3having frequencies v_1, v_2 and v_3 respectively incident of a photosensitive surface. Point out the two curves for which the incident radiations have same frequency but different intensities.



19.Two nuclei have mass numbers in the ratio 1: 2. What is the ratio of their nuclear densities?

20. What happens when reverse bias is applied to p-n junction?

OR

20. Why is the I-V characteristic of solar cell drawn in the fourth quadrant of the coordinate axis?

<u>ANSWER THE FOLLOWING SHORT ANSWER TYPE QUESTIONS</u>:(2 mark each)

21.Derive the expression for the electric potential at any point due to a point charge in the absence of external electric field.

22. Define magnetic susceptibility of a material. Name two elements, one having positive susceptibility and the other having negative susceptibility. What does negative susceptibility signify.

23.The oscillating magnetic field in a plane electromagnetic wave is given by

$$B_y = \left(8\times10^{-6}\right)\sin\left[2\times10^{11}t + 300\pi x\right]\ \mathrm{T}$$

(i) Calculate the wavelength of the electromagnetic wave.
(ii) Write down the expression for the oscillating electric field.

24. Prove that an ideal capacitor, in an a.c. circuit does not dissipate power.

OR

24. Derive an expression of the impedance of an ac circuit consisting of an inductor and a resistor.

25. A nucleus $^{23}_{10}Ne$ undergoes β^- decay and becomes $^{23}_{11}Na$. Calculate the maximum kinetic energy of electrons emitted assuming that the daughter nucleus and anti − neutrino carry negligible kinetic energy.

$$\begin{bmatrix} \text{mass of } ^{23}_{10}Ne = 22.994466\,u \\ \text{mass of } ^{23}_{10}Na = 22.989770\,u \\ 1u = 931.5\ MeV/c^2 \end{bmatrix}$$

OR

25. Sketch a graph showing the variation of binding energy per nucleon as a function of mass

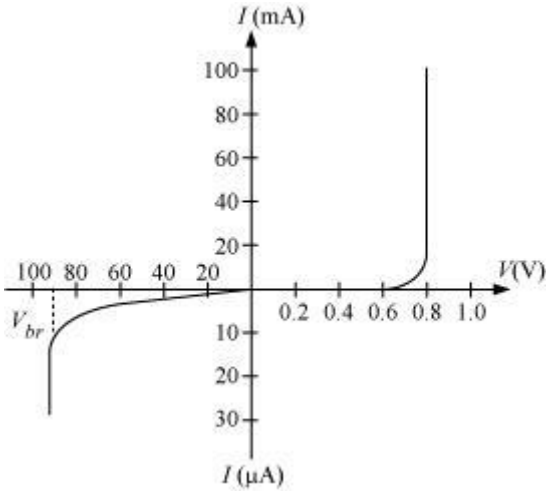
number State briefly , from which region og the graph, can release of energy in the process of nuclear fusion be explained.

26.Draw a ray diagram of a reflecting type telescope. State two advantages of this telescope over a refracting telescope.

27.A ray of light passing through an equilateral triangular glass prism from air undergoes minimum deviation when angle of incidence is ¾ th of the angle of prism. Calculate the speed of light in the prism.

ANSWER THE FOLLOWING SHORT ANSWER TYPE QUESTIONS:(3 mark each)

28.The figure below shows the *V-I* characteristic of a semiconductor diode.



(i) Identify the semiconductor diode used.
(ii) Draw the circuit diagram to obtain the given characteristic of this device.
(iii) Briefly explain how this diode can be used as a voltage regulator.

29. Using Gauss's law, derive an expression for the electric field intensity at any point outside a uniformly charged thin spherical shell of radius R and charge density σ C/m^2. Draw the field lines when the charge density of the sphere is (i) positive (ii) negative.

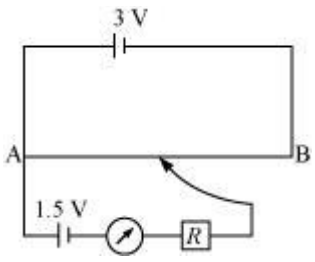
30. Prove that the current density of a metallic conductor is directly proportional to the drift speed of electrons.

OR

30. A number of identical cells, *n*, each of emf *E*, internal resistance *r* connected (1) in series and (2) parallel with a external resistor *R*.

(i) Draw the circuit arrangement.
(ii) Deduce the expressions for the changing current and (b) the potential difference across the combination of the cells.

31. A potentiometer wire of length 1 m is connected to a driver cell of emf 3 V as shown in the figure. When a cell of 1.5 V emf is used in the secondary circuit, the balance point is found to be 60 cm. On replacing this cell and using a cell of unknown emf, the balance point shifts to 80 cm.

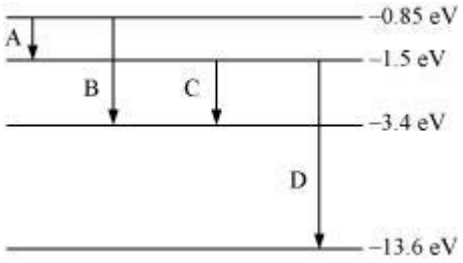


(i) Calculate unknown emf of the cell.
(ii) Explain with reason, whether the circuit works, if the driver cell is replaced with a cell of emf 1V
(iii) Does the high resistance *R*, used in the secondary circuit affect the balance point? Justify your answer.

32. 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 λ_1, prove that $\lambda = \left(\frac{2mc}{h}\right)\lambda_1^2$

OR

32. An energy level diagram of an element is given below. Identify, by doing necessary calculations, which transition corresponds to the emission of a spectral line of wavelength 102.7 nm.



33.State the principle of working of p-n diode as a rectifier. Explain, with the help of a circuit diagram, the use of p-n diode as a full wave rectifier. Draw a sketch of the input and output waveforms.

34. Explain the construction and the working of an optical fibre? Give its applicaions.

<u>ANSWER THE FOLLOWING LONG ANSWER TYPE QUESTIONS</u>:(5 mark each)

35.Draw a labelled diagram of a moving coil galvanometer. State the principle on which it works. Deduce an expression for the torque acting on a rectangular current carrying loop kept in a uniform magnetic field. Write two factors on which the current sensitivity of a moving coil galvanometer depends.

OR

35. State Biot-Savart law. Use it to derive an expression for the magnetic field at the centre of a circular loop of radius R carrying a steady current I. Sketch the magnetic field lines for such a current carrying loop.

36. What are coherent sources? Obtain a general value for the phase difference of constructive and destructive interference of coherent sources.
In Young's double slit experiment, the two slits are 0.03 cm apart and the screen is placed at a distance of 1.5 m away from the slits. The distance between the central bright fringe and fourth bright fringe is 1 cm. Calculate the wavelength of light used.

OR

36.(a) Draw a labelled diagram for a refracting type astronomical telescope and explain its working.
(b) A slit of width 'a' is illuminated by a monochromatic light of wavelength 700 nm at normal incidence. Calculate the value of 'a' for position of
(i) first minimum at an angle of diffraction of 30°
(ii) first maximum at an angle of diffraction of 30°

37.(a) Obtain the expression for the magnetic energy stored in a solenoid due the current I flowing in it.
(b) Obtain the expression for magnetic energy stored in the solenoid in terms of magnetic field B, area of cross-section A and length L of the solenoid.
(b) How is this magnetic energy per unit volume compared with the electrostatic energy per unit volume stored in a parallel plate capacitor.

OR

37.(a) With the help of a labeled diagram, describe briefly the underlying principle and working of a step up transformer.
(b)An inductor 200 mH, a capacitor 500 μF and a resistor 10 Ω are connected in series with a 100 V variable frequency a.c. source. Calculate the
(i) frequency at which the power factor of the circuit is unity.
(ii) current amplitude at this frequency.
(iii) Q-factor.