GURUKUL ACADEMY

FOR – XIth , XIIth & Competitive Exam.

Time – 3hr. **Test – Full Syllabus.** **M.M – 70.**

Question no 1 to 8 – [1 Marks each]. *Question no 9 to 17 – [2 Marks each].*
Question no 18 to 27 – [3 Marks each]. *Question no 28 to 30 – [5 Marks each].*

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General Instructions:

- All questions are compulsory.
- There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all questions of five marks. You have to attempt only one the choices in such questions.
- Question numbers 1 to 8 are very short answer type questions, carrying one mark each.
- Questions numbers 9 to 18 are short answer type questions carrying two marks each.
- Question numbers 19 to 27 are also short answer type questions, carrying 3 marks each.
- Question numbers 28 to 30 are long answer type questions, carrying five marks each.
- Use of calculators is not permitted. However, you may use log tables, if necessary.

You may use the following physical constants wherever necessary.

$c = 3 \times 10^8$ ms^{-1}
$h = 6.6 \times 10^{-34}$ Js
$e = 1.6 \times 10^{-19}$C
$\mu_o = 4\pi \times 10^{-7}$ TmA^{-1}
$1/4\pi\varepsilon_o = 9 \times 10^9$ N m^{2}C^{-2}
Avogadro number $N_A = 6.023 \times 10^{23}$ mol^{-1}
Mass of the neutron = 1.675×10^{-27} kg
Boltzmann constant, $k = 1.38 \times 10^{23}$ J K^{-1}

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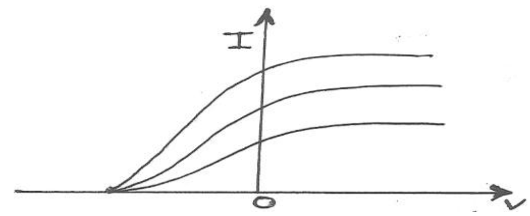
1. The distance of the field point, on the axis of a small electric dipole is doubled. By what factor will the electric field due to a dipole change?
2. How does the drift velocity of electrons in a metallic conductor vary with increase of temperature?
3. What is the power factor of an LCR series circuit at resonance?
4. Why is the transmission of signals using ground waves restricted to frequencies upto 1500KHz?
5. The polarizing angle of a medium is 60degrees.What is the refractive index of the medium?
6. How does the collector current change in a junction transistor, if the base region has larger width?
7. The photoelectric cut-off the voltage in a certain photoelectric experiment is 1.5V. What is the maximum kinetic energy of the photoelectrons emitted?
8. If a wire is stretched to double its original length without loss of mass, how will the resistivity of the wire be influenced?
9. What do you mean by modulation? Explain the need of modulation.

10. How can you determine the AND & OR Gate using NAND gate. Explain

11. In an experiment on photoelectric effect, the following graphs were obtained between the photoelectric current (I) and the anode potential difference (V). Name the characteristic of the incident radiation that was kept constant in this experiment.



12. How will the angular separation and visibility of fringes in Young's double slit experiment change when (i) screen is moved away from the plane of the slits. (ii)width of source slit is increased.

OR

The value of Brewster's angle for a transparent medium is different for lights of different colours, why?

13. Identify the part of the electromagnetic spectrum which is:
(i) suitable for radar systems used in aircraft navigation.
(ii) adjacent to low frequency end of electromagnetic spectrum.
(iii)produced in nuclear reactions and
(iv)produced by bombarding a metal target by high speed electrons.

14. Explain how does the width of the depletion layer in a p-n junction diode change when the junction is(i) forward biased (ii) reverse biased.

15. A magnet is moved in the direction indicated by an arrow between two coils AB and CD as shown in the fig. Suggest the direction of current in each coil.

16. For photoelectric effect in sodium, the figure shows the plot of cut-off voltage versus frequency of incident radiation. Calculate (i) threshold frequency (ii) Work function of sodium.

17. Calculate the binding energy per nucleon in $_{20}Ca$ nucleus. Given m ($_{20}Ca$) = 39.962589u, m_n = 1.008665u, m_p = 1.007825u, 1u = 931MeV/c^2.

18. What do you mean by self induction and self inductance? Derive an expression for the self inductance of a long air cored solenoid of length (l) and radius(r) and number of turns N.

OR

What are eddy currents? How are they produced? Give two applications of eddy currents.

19. With the help of a labeled diagram explain the construction and working if an AC generator. Deduce the expression for emf generated in the coil in terms of its speed of rotation.

20. Draw the graph, showing variation of binding energy per nucleon with mass number. Explain using the graph, why heavy nuclei can undergo fission.

21. A potentiometer wire of length 1m is connected to a driver cell of emf 3V as shown in fig. When a cell of emf 1.5V is used in the secondary circuit, the balance point is found to be 60cm.On replacing this cell by a cell of unknown emf, the balance point shifts to80cm.
(i)Calculate the 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

22. Deduce the condition for balance in a Wheatstone bridge. Using the principle of Wheatstone bridge describe the method to determine the specific resistance of a wire in the laboratory. Draw the circuit diagram and write the formula used.
23. With the help of a circuit diagram, explain how an n-p-n transistor can be used as an amplifier in common emitter configuration. Explain how the input and output voltages are out of phase by180^0
.
24. Draw a ray diagram to show the formation of image by a refracting type astronomical telescope for normal adjustment position. Obtain expression for its magnifying power.
25. A convex lens made up of glass of refractive index 1.5 is dipped, in turn, in:
    medium A of refractive index 1.65.
    medium B of refractive index 1.66.
    Explain giving reasons, whether it will behave as converging lens or a diverging lens in each of these two media.
26. State Huygen’s postulates and verify Snell's law of refraction using wave theory.
27. Explain the principle, construction and working of Van de Graaff generator with the help of a labeled diagram.
    (ii)A parallel plate capacitor with air between the plates has a capacitance of 8pF. What will be the
    capacitance if the distance between the plates is reduced by half and the space between them is filled with a substance of dielectric constant 6?

    OR

    (i)Derive an expression for the capacitance of a parallel plate capacitor, whose plates are separated by a dielectric medium?
    (ii)The area of each plate of a parallel plate capacitor is $100cm^2$ and the electric field strength between the plates is 100N/C. Calculate the charge on each plate.
28. Draw a neat and labeled diagram of a cyclotron. State the underlying principle and explain how a positively charged particle gets accelerated in this machine. Show mathematically that the cyclotron frequency does not depend upon the speed of the particle.

    OR

    Derive an expression for the torque acting on a loop of N-turns, area A, carrying current I, when held in a uniform magnetic field B. With the help of a circuit, show how a moving coil galvanometer can be converted into an ammeter of given range. Write the necessary mathematical formula.
29. Derive an expression for the distance of any bright fringe and dark fringe from the central fringe, in Young’s double slit experiment. Hence find the expression for fringe- width.
    Laser light of wavelength 630nm incident on a pair of slits produces an interference pattern in which the bright fringes are separated by 8.3 mm. A second light produces an interference pattern in which bright fringes are separated by 7.6 mm. Find the wavelength of the second light.

    OR

    (i)What is diffraction of light? Describe diffraction of light due to a single slit and write the expression for secondary maxima and minima. Draw a graph showing the variation of intensity with angle in a single slit diffraction experiment. Write one feature which distinguishes the observed pattern from the double slit interference pattern.
    (ii)What do you mean by the resolving power of an optical instrument? Write the formula for the resolving power of a microscope. How can the resolving power of microscope be increased?