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 16   – [2 Marks each].*
Question no 17 to 25 – [3 Marks each].   *Question no 27 to 29 – [5 Marks each].*
Question no 26 – [4 Marks, Value based question]
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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 16 are short answer type questions carrying two marks each.
- Question numbers 17 to 25 are also short answer type questions, carrying 3 marks each.
- Question numbers 26 value based type question, carrying four marks each.
- Question numbers 27 to 29 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.
  $c = 3 \times 10^8 \text{ ms}^{-1}$
  $h = 6.6 \times 10^{-34} \text{ Js}$
  $e = 1.6 \times 10^{-19} \text{C}$
 $\mu_o = 4\pi \times 10^{-7} \text{ TmA}^{-1}$
  $1/4\pi\varepsilon_o = 9 \times 10^9 \text{ N m}^2\text{C}^{-2}$
  Avogadro number $N_A = 6.023 \times 10^{23} \text{ mol}^{-1}$
  Mass of the neutron = $1.675 \times 10^{-27} \text{ kg}$
  Boltzmann constant, $k = 1.38 \times 10^{23} \text{ J K}^{-1}$

1. A charge q is placed at the center of a cube side L. What is the electric flux passing through each face of the cube?

2. If a wire is stretched to double its original length without loss of mass, how will resistivity of the wire be influenced?

3. Paramagnetic material display greater magnetization as their temperature is lowered why?

4. How a quality factor of a LCR circuit changes when a resistance is increased? Write the relation.

5. Give one example each of a system that uses the (a) sky wave (b) space wave mode of propagation

6. The polarizing angle of a medium is 60^0. What is the refractive index of the medium?

7. Name the device which shows the variation of current (I) with voltage (V) as shown:

8. Define the term Transducer for a communication system.
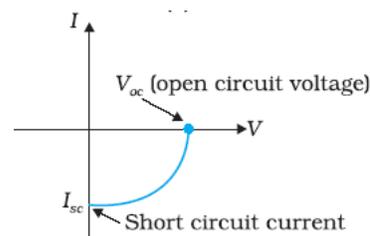
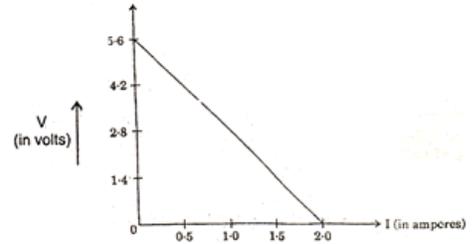*GURUKUL ACADEMY Test paper based on C.B.S.E Exam 2013*
By – A.K. Pandey, 9958655311, 100% Success guarantee in board exam.

9. N spherical droplets each of radius r have been charged to have a potential V each. If all these droplets were to coalesce to form a single large drop, what would be the potential of this large drop?

Or

Two point charges q_1 and q_2 are located at points (a,0,0) and (0,b,0) respectively. Find the electric field due to both the charges , at the point (0,0,c)

10. 4 cells of identical emf E, internal resistance r, are connected in series to a variable resistor. The following graph shows   the variation of terminal voltage of the combination with the current output:
    (i) What is the emf of each cell used?
    (ii) For what current from the cells, does maximum power dissipation occur in the circuit?

11. A circular coil of closely wound N turns and radius r carries a current I. Write the expressions for following:
    (i)The magnetic field at its center. (ii)The magnetic moment of this coil.

12. By what percentage would the range of an antenna increase if its length is increased by 21%

13. In young's double slit experiment, the two slits0.15 mm apart are illuminated by monochromatic light of wave length 450 nm. The screen is 1 m away from the slits.
    (i) Find the distance of the second bright fringe and second dark fringe from the central maximum.
    (ii) How will the fringe pattern change if the screen is moved away from the slits?

14. When four hydrogen nuclei combine to form a helium nucleus, estimate the amount of energy in MeV released in this process of fusion.(Neglect the masses of electrons and neutrinos)Given:
    Mass of $_1H^1$ =1.007825u, Mass of helium nucleus =4.002603 u   1u=931 MeV/c^2

15. An electron is moving at 10^6 m/s in a direction parallel to a current of 5 A, flowing through an infinitely long straight wire, separated by a perpendicular distance of 10cm in air. Calculate the magnitude of the force experienced by the electron. What is the direction of this force?

16. Draw a logic circuit diagram showing how a NAND gate can be converted into a NOT gate.

17. Describe briefly with the help of a circuit diagram ,how the common emitter transistor act as a switch.

18. A ray of light while travelling from a denser to a rarer medium undergoes total internal reflection. Derive the expression for the critical angle in terms of the speed of light in the respective medium.

19. Define relaxation time of free electrons drifting in a conductor .How it's related to the velocity of electrons ? Use this relation to deduce the expression for the electrical resistivity of the material

20. Two cells E1 and E2 in the given circuit diagram have an emf of 5 V and 9 V and internal resistance of 0.3Ω and 1.2Ω respectively. Find the current in 3 Ω
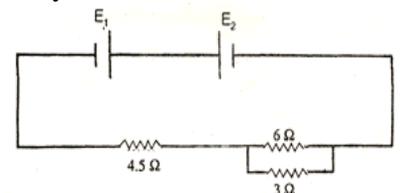
21. How a secondary rain bow is formed? Draw the diagram of the secondary rainbow formation through a water drop. How it is different from primary rain bow?

22. The following are the observations regarding an unknown beam "X". What does each signify?
    (a) "X" shows interference and diffraction   (b) It travels in vacuum with the speed of 3x10^{8}m/s
    (c) It does not get deflected on passing through an electric field
    (d) After passing through a nicol prism, the intensity is reduced.

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23. A bar magnet is placed in a uniform magnetic field find the expression of net force and torque .Write the expression of the work done as bar magnet rotates from angle α to β .

24. State Huygens's postulates and verify Snell's law of refraction using wave theory.

25. Using a Gauss theorem derive an expression for the electric field due to a charged spherical shell. Also plot a graph between Electric field intensity and distance

26. Bhavika's grandmother has recently started having problem in reading the newspaper clearly. She took her to an eye specialist and got a spectacles made for her.
    What are the values displayed by Bhavika
    Draw the diagram to show the eye defect and its correction using a suitable spectacle.

27. (a) Explain input and output characteristics of a common emitter transistor graphically. Draw the circuit diagram. (b)Two amplifiers are connected one after the other in series (cascaded).The first amplifier has a voltage gain of 10 and the second has a voltage gain of 20. If the input signal is 0.01 volt, calculate the output ac signal.

<div align="center">OR</div>

(a)Describe briefly, with the help of a diagram, the role of the two important processes involved in the formation of p-n junction. (b) Name the device which is used as voltage regulator. Draw the necessary circuit diagram and explain its working.

28. (a) Draw a schematic sketch of a cyclotron. Explain briefly how it works and how it is used to accelerate the charged particles. (b)An electron emitted by a heated cathode and accelerated through a potential difference of 2.0 kV, enters a region with uniform magnetic field of 0.15 T. Determine the trajectory of the electron if the field (i) is transverse to its initial velocity, (ii) makes an angle of 30º with the initial velocity.

<div align="center">OR</div>

(a)Explain, giving reasons, the basic difference in converting a galvanometer into (i) a voltmeter and (ii) ammeter.
(b)Two long straight parallel conductors carrying currents I_1 and I_2 are separated by a distance d. Explain briefly, with the help of a suitable diagram, how the magnetic field due to one conductor acts on the other. Hence deduce the expression for the force acting between the two conductors .Mention the nature of this force.

29. (a) How does an unpolarized light incident on a Polaroid get polarized? Describe briefly, with the help of necessary diagram, the polarization of light by reflection from a transparent medium. (b) Two Polaroid's A and B are kept in crossed position. How should a third Polaroid C be placed between them so that the intensity of polarized light transmitted by Polaroid B reduces to $1/8^{th}$ of the intensity of unpolarized light incident on A?

<div align="center">OR</div>

(i)A thin lens, having two surfaces of radii of curvature R_1 and R_2 made from a material of refractive index $μ_2$, is kept in a medium of refractive index $μ_1$.Derive the Lens Maker's formula for this set-up
(ii)A convex lens is placed over a plane mirror. A pin is now positioned so that there is no parallax between the pin and its image formed by this lens-mirror combination. How can this observation be used to find the focal length of the convex lens? Give appropriate reasons in support of your answer.