Class-XII

Time allowed: 3 Hrs Physics(Theory) Maximum Marks: 70

GENERAL INSTRUCTIONS:

1. All questions are compulsory.
2. There are 29 questions in total. Questions 1 to 8 are very short answer type questions and carry one mark each.
3. Questions 9 to 16 carry two marks each, question 17 to 25 carry three marks each, question 26 carry four mark s is a value based, and questions 27 to 29 carry five marks each.
4. There is no overall choice. However an internal choice has been provi ded in one question of two marks, one question of three mark and all three questions of five marks each. You have to attempt only one of the given choices in such questions .
5. Use of calculators is not permitted. However you may use log tables if necessary.
6. You may use the following values of physical constants where ver necessary.

$c = 3 \times 10^{8}$ m/s
$h = 6.63 \times 10^{-34}$ Js
$e = 1.6 \times 10^{-19}$ C
$\mu_0 = 4\pi \times 10^{-7}$ TmA^{-1}
$1/4\ \pi\varepsilon_0 = 9 \times 10^{9}$ Nm^2/s^2

01. You are asked to measure e.m.f of a cell. Which instrument will you use? A high resistance Voltmeter or Potentiometer and why? (1)

02. An electron and a proton, having equal moment a, enter a uniform magnetic field at right angles to the field lines. What will be the ratio of their trajectories? (1)

03. Why is short wave band used for long distance Radio Broadcast? (1)

04. If a wire is stretched to double its original length without loss of mass, how will the resistivity of the wire be influenced? (1)

05. When light travel from a rarer to denser medium, the speed decreases. Does this decrease in speed imply a decrease in the energy carried by the light wave? Justify your answer. (1)

06. If the potential difference across a capacitor is doubled, what hap pens to :

(a) The charge on the capacitor and

(b) The energy stored in the capacitors. (1)

07. Give block diagram of basic unit s of all communication system. (1)

08. Which of the following 120 V ac device costs more to ope rate:

(a) One that draws an rms current of 10 A or

(b) One that draws a Peak current of 12 A ? (1)

9. Write Einstein's photoelectric equation. Explain the terms.

(i) Threshold frequency and

(ii) Stopping potential. (2)

10. Suggest a suitable method to invert an image

(i) Without change in size.

(ii) Without change in size and without deviation from it s original direction of view .

Explain how the same is achieved? (2)

11. Define Self -inductance of a coil. Show that magnetic energy required building up the current I in a coil of self -inductance L is given by ½ LI ^{2} (2)

12. 'n' identical capacitors when joined in series give an effective capacitance of C Units. What will be the capacitance if the capacitors are now placed in parallel combination? (2)

13 . Show that the power due to the force exerted by the magnetic field on a moving charge is zero. (2)

Or

Find the ratio of the de -Broglie wavelength, associated with

(i) Protons, accelerated through a potential of 128 V and

(ii) α - particles, accelerated through a potential of 64 V

14. Two identical cells of emf 1.5V each joined in parallel, provide supply to an external circuit consisting of two resistors o f 17 Ω. Each joined in parallel. A very high resistance voltmeter reads the terminal voltage of the cells to be 1.4V. What is the internal resistance of each cell ? (2)

15. Draw a plot showing the variation of
(i) Electric field (E) and
(ii) Electric potential (V) with di stance r due to a point charge Q. (2)

16. A change of 0.2 mA in the base current causes a change of 5m A in the collector current for a common emitter amplifier.
(i) Find the a.c. current gain of the transistor.
(ii) If the in put resistance is 2k Ω, and its voltage gain is 75, calculate the load resistor used in the circuit. (2)

17. The binding energy per nucleon of deuteron ($^{2}H_{1}$) and helium nucleus ($^{4}He_{2}$) is known to be 1.1 MeV and 7 MeV respectively. If two deuteron nuclei react to form a single helium nucleus; calculate the energy released? (3)

18. A per son with a normal near point (25 cm) using a compound microscope with an objective of focal length 8 mm and an eye piece of focal length 2.5cm can bring a object placed 9 mm from the objective in sharp focus. What is the separation between the two lenses? How much is the magnifying power of the microscope? (3)

19. (i) define ' activity ' of a radioactive material and write its S.I unit.
(ii) The sequence of step wise decay of a radioactive nucleus is

$$D \xrightarrow{\alpha} D_1 \xrightarrow{\beta^{-1}} D_2$$

If the atomic number and mass number of D_2 are 71 and 176 respectively, what are their corresponding values for D? (3)

20 . a) Define the term "modulation index" for an AM wave. What would be the modulation index for an AM wave for which the maximum amplitude is "a" while the minimum amplitude is "b"?

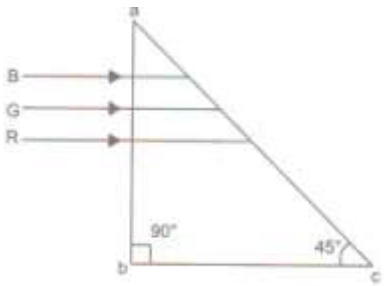
(Or)

b) What is space wave propagation? Which two communication methods m ake use of this mode of propagation ? If the sum of the heights of transmitting and receiving antenna in line of sight of communication is fixed at h, how that the rang e is maximum when the two antenna have a height h/2 each. (3)

21. Write the principle of working of a potentiometer. Describe briefly, with the help of a circuit diagram, how a potentiometer is used to compare the emf of two cells? (3)

22. Give a labeled diagram and explain the principle and working of a van de Graff generator. (3)

23. Three light rays red (R), green (G), and blue (B) are incident on a right angled prism abc at face 'ab'. The refractive indices of the material of the prism for red, green and blue wavelengths are 1.39, 1.44 and 1.47 respectively. Out of the three which colour ray will emerge out of face "ac"? trace the path of these rays after passing through face "ab"? (3)



24. An electromagnetic wave is travelling in a medium with a velocity V = V î. The electric field oscillations of the electromagnetic wave are along the Y-axis. (3)

(a) Identify the direction in which the magnetic field oscillations of the electromagnetic wave are taking place.

(b) How are the magnitudes of the electric field and magnetic field in the electromagnetic wave related to each other?

25. Using Biot-Savarts law, derive the expression for the magnetic field in the vector form at a point on the axis of a circular current loop. (3)

26. (a) On what principle electromagnetic crane works?

(b) One day Mrs. Rita mother of Master. Rahul kept her charged mobile phone over a refrigerator in the evening and she took it next day morning, she found that the charge was totally very low, and she was discussing this to Master Rahul. Immediately Master. Rahul said that mobile phone has a battery so due to excessive heat from refrigerator; battery will loose its magnetic property so that mobile phone shows lesser charge?

(c) What character was highlighted by Master Rahul? (4)

27. Derive an expression for the impedance of a series LCR circuit connected to an AC supply of variable frequency. Plot a graph showing variations of current with the frequency of the applied voltage. Explain briefly how the phenomenon of resonance in the circuit c an be used in the tuning mechanism of a radio or a TV set? (5)

Or

Explain with the help of a labeled diagram, the principle, construction and working of an a.c generator.

28. State the assumptions and sign conventions in deriving the lens makers formula and also derive an expression for it. (5)

Or

(a) How is a wave front different from a ray?

(b) Draw the geometrical shape of the wave fronts when

(i) Light diverges from a point source.

(ii) Light emerges out of a convex lens, when a point source is placed at its focus

(c) State Huygens principle. With the suitable diagram, prove law of reflec tion using Huygens principle.

29. (a)Draw a circuit diagram of a common emitter amplifier using p -n-p transistor. Show input and output voltages graphically. The current gain for common emitter amplifier is 59. If the emitter current is 6mA find (i) base current and (ii) collector current. (5)

Or

a) Distinguish between metals, insulators and semiconductors on the basis of their energy bands.

b) Why are photodiodes used preferably in reverse basis condition? A Photodiode is fabricated from a semiconductor with band gap of 2.8 ev. Can it detect a wavelength using 6000nm? Justify.