CBSE Sample Paper

Class: XII

PHYSICS (Theory)

Time allowed : 3 hours *Maximum Marks : 70*

General Instructions :

(i) All questions are compulsory.

(ii) 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 question of five marks. You have to attempt only one of the choices in such questions.

*(iii) Question numbers **1** to **5** are very short answer type questions, carrying **one** mark each.*

*(iv) Question numbers **6** to **12** are short answer type questions, carrying **two** marks each.*

*(v) Question numbers **13** to **24** are also short answer type questions, carrying **three** marks each.*

*(vi) Question numbers **25** to **27** are long answer type questions, carrying **five** marks each.*

(vii) Use of calculators is not permitted. However, you may use log tables, if necessary.

(viii) You may use the following values of physical constants wherever necessary :

$c = 3 \times 10^{8}\ ms^{-1}$

$h = 6.6 \times 10^{-34}\ Js$

$e = 1.6 \times 10^{-19} C$

$\mu_0 = 4\pi \times 10^{-7} T\ m\ A^{-1}$

Mass of neutron $m_n \cong 1.6 \times 10^{-27} kg$

Boltzmann's constant $k = 1.38 \times 10^{-23}\ J\ K^{-1}$

Avogadro's number $N_A = 6.023 \times 10^{23}$ / mole

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1. A net charge of 3μC is in a spherical shell of radius 2cm. What is the electric flux crossing the surface. How much would it be if the radius is doubled.
2. An electromagnetic wave of frequency 25MHz is traveling in the positive y direction with an amplitude of electric field as 6.3 V/m in the z direction. What is the magnitude and direction of propagation of the magnetic field wave.
3. Light of frequency 6.0×10^{14} Hz is produced by a laser. If its power is 2×10^{-3} W calculate the number of photons emitted.
4. A certain radioactive nuclei has a half life of 12.5yrs. What fraction of the sample will remain undecayed after 50years.
5. Draw a circuit diagram to show the diode used as a demodulator (or detector).
6. Three capacitors of 2pF, 3pF, and 4pF are connected in parallel.
   a. What is the capacitance of the combination?
   b. Determine the charge on each if it is connected to a 100V source.
7. What is Seebeck effect ? Plot a graph showing the variation of thermo emf with temperature of the hot junction (keeping the cold junction at 0°C) of a thermocouple.

OR

What is a Voltameter. State the Faradays laws of electrolysis and express them mathematically.

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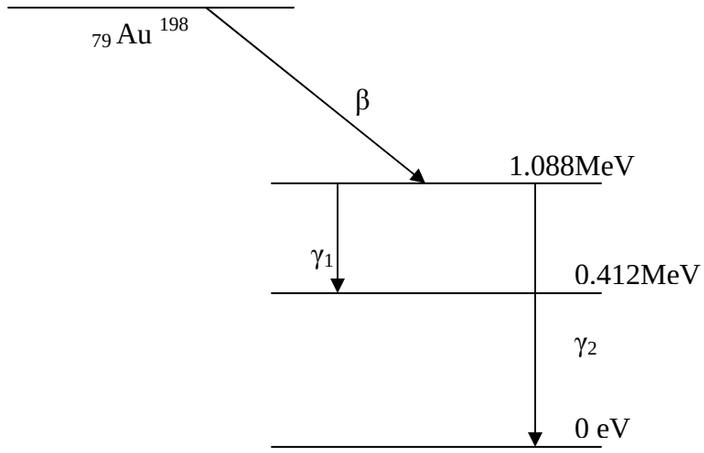
8. A circular coil of radius 8 cm and 20 turns rotates about its vertical diameter with an angular speed of 50 s^{-1} in a uniform horizontal magnetic field of magnitude 3×50^{-2}T. Find the maximum and average value of the emf induced in the coil.

9. Two coils, one of small radius r_1 and another of very large radius r_2 are placed coaxially with centers coinciding. Obtain the mutual inductance of the arrangement.

10. Calculate the electric and magnetic fields produced by the radiation coming from a 100W bulb at a distance 3m. Assume the efficiency to be 2.5% and it's a point source.

11. How does the resolving power of a compound microscope change, when refractive index of the medium between the object and the objective lens increases; and wavelength of the radiation used is increased ?



12. Find the energy corresponding to the emissions γ_2 and γ_1 in the diagram shown. Also predict the nucleus formed after the β decay.

OR

Two radioactive nuclei X and Y initially contain equal number of atoms. The half life is 1 hour and 2 hours respectively. Calculate the ratio of their rates of disintegration after two hours.

13. Give reasons for the following

i) The resistivity of manganin is almost independent of temperature.

ii) It is easier to start a car on a warm day than a chill day.

iii)An ammeter should have a very small value of resistance.

14. Six cells , 2V, 0.015Ω are connected in series to drive current through a 8.5 Ω resistor. Find the current drawn and terminal voltage of the cells. If a 10V cell is used to recharge this arrangement, draw a circuit diagram to represent the same.

15. Explain the principle and working of a moving coil galvanometer.

OR

Deduce an expression for the force and torque acting on a current loop placed in a magnetic field.

16. Define the terms i) magnetic dip ii) magnetic declination

Draw a hysteresis curve and mark all the significant points on it.

17. A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to series LCR circuit in which R = 3 Ω , L = 25.48 mH and C = 796 μF. Find i) the impedance of the circuit, ii) the phase difference between voltage and current iii) power factor.

18. Discuss the various losses in a transformer and suggest ways of minimizing them.

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Draw a graph to show the variation of current with frequency for an LCR series circuit for R = 100 Ω and for R = 200 Ω.

19. A beam of light converges to a point P. 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 (i) a convex lens of 20 cm focal length and (ii) a concave lens of 16 cm focal length ? Draw a 1/u vs 1/v graph for a convex lens and state how the focal length can be determined from it.

20. State the laws of photoelectric effect and represent the same graphically. Two photons of energy 2.1ev are incident on a metal with work function 4ev. What is the stopping potential of the emitted photoelectron.

21. Deduce an expression for the binding energy of a nucleus. Draw the binding energy per nucleon vs mass number curve and explain the same.

22. Distinguish between conductors, insulators and semiconductors based on the energy band theory of solids.

23. Explain the term remote sensing in communication. Name the satellite used for this purpose. Mention its any two applications

24. What are characteristics required for a source and detector in an optical communication system. What are the advantages of optical communication over other guided communication systems.

25. a) How can a diode be used as voltage regulator. Draw a circuit diagram for the same and explain.

b) Draw a circuit diagram to show the working of a diode as a full wave rectifier. If the frequency of the input voltage is 25Hz what would the frequency of the output be?

OR

How can a transistor be used as an amplifier.

A transistor has a current gain of 50. In a CE amplifier circuit, the collector resistance is chosen as 5 kilo ohms and the input resistance is 1 kilo ohm. Calculate the output voltage if input voltage is 0.4V.

26. Draw a labelled ray diagram of an astronomical telescope used so as to obtain the image at infinity. Define its magnifying power.

How will magnifying power of telescope be affected on increasing for its eye-piece a)focal length and) the aperture ? Justify your answer

Show that the image formed by a convex lens is virtual if the object is placed inside the focus.

OR

A spherical surface of radius of curvature R and of refractive index μ_2 is placed in a medium of refractive index μ_1, where $\mu_1 < \mu_2$. A real image is formed due to an object kept in front of it. Derive an expression relating object distance, image distance, μ_1, μ_2 and R. Write the assumptions and the sign convention employed. Show that the image formed by a concave lens is always virtual.

27. a) With a relevant circuit diagram explain the method of comparing the resistances of two wires using a Metrebridge.

b) State Kirchoff's loop rule and find the magnitude and direction of current through 3 Ω resistor in the circuit shown.

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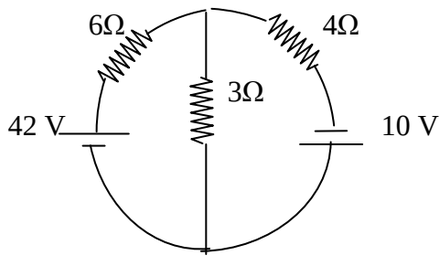

OR

State the principle of a potentiometer. How can its sensitivity be increased

The length of a potentiometer wire is 600 cm and it carries a current of 40 mA. For a cell of e.m.f. 2V and internal resistance 10 Ω, the null point is found to be at 500 cm. If a voltmeter is connected across the cell, the balancing length is decreased by 10 cm. Find (*i*) the resistance of whole wire, (*ii*) reading of voltmeter, and (*iii*) resistance of voltmeter

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