Prelimnary Examination 2022

Std : XII Sci | Sub :-Physics [54] | Marks : 70

Time:- 3 Hours | Date:24/01/2022

General instruction :-

The question paper is divided into four section

1] Section A: **Q. No. 1** contains Ten multiple choice type of questions carrying one mark each.

Q. No.2 Contains Eight very short answer type of questions carrying one mark each.

2] Section B: Q. No. 3 to Q. No. 14 contains Twelve short answer type of questions carrying Two marks each. [Attempt any Eight]

3] Section C :Q. No. 15 to Q. No. 26 Contains Twelve short answer type questions carying Three marks each[Attempt any Eight]

4] Section D: Q. No 27 to 31 contains Five long answer type of questions carrying Four marks each. [Attempt any THREE]

5] Use of logarithmic table is allowed. Use electronic calculatore is not allowed.

6] Figures to right indicate full marks.

7] For each MCQ correct answer must be written along with its alphabet
e.g. a] ----/b]...../c]...../d].....

7] Physical constants.

i] $h = 6.63 \times 10^{-34}$ Js

ii]$c = 3 \times 10^{8}$ m/s

iii] $\pi = 3.142$

iv] $g = 9.8 m/s^2$

v] $\epsilon_0 = 8.85 \times 10^{-12} \frac{c^2}{Nm^2}$

vi] $\mu_0 = 4\pi \times 10^{-7} \frac{Wb}{A - m}$

Section A

Q. No.1 Select and write the correct answer **10**

i]The magnetic dipole moment of current loop is independent of

a] number of turns b] area of loop

c] current in the loop d] magnetic field in which it is lying

ii] The internal energy change in a system that has absorbed 2 kcal of heat and done 500 J of work is

a] 8900J b] 6400J c] 5400J d] 7900J

iii] The Dimensions of coefficent of viscosity are

a] $[M^{-1} L^{1} T^{-2}]$ b] $[M^{-1}L^{0}T^{-2}]$ c] $[M^{1}L^{1}T^{-2}]$ d] $[M^{1}L^{-1}T^{-1}]$

iv] The frequency resolution of the electron in the second Bohr orbit of the hydrogen atom is 8.15×10^{14}Hz What is the frequency of revoluation of the electron in the fourth Bohr orbit of the hydrogen atom ?

a] 1.012×10^{14}Hz b] 1.012×10^{-14}HZ

c] 1.012×10^{10}Hz d] 1.012×10^{-10}Hz

v] If the difference between the principal specific heats of nitrogen is 300 J/kgK and ratio of specific heat is 1.4 then Cv will be ---

a] 1500J/kgk b]250 J/ kgk c] 750J/kgk d] 150J/kgk

vi] A body of mass 'm' performs U.C.M. along a circular path of radius 'r' velocity 'v' if its angular momentum is 'L' then the centripetal force acting on it is -----

a] $\frac{mL^2}{r^2}$ b] $\frac{L^2}{mr}$ c] $\frac{L^2}{mr^2}$ d] $\frac{L^2}{mr^3}$

vii] An ideal voltmeter has ----

a] high resistance b] low resistance

c] Infinite resistance d] zero resistance

viii] Which property of light does not change when it travels from one medium to another

a] velocity b] wavelength c] frequency d] Amplitude

ix] The power factor of LCR circuit is---

a] R/Z b] Z/R c] Rx Z d] $\frac{1}{RZ}$

x] When a charged capacitor is allowed to discharge through a non resistive inductor electrical oscillations of constant amplitude and frequency are produced called -------

a] Rc oscillations b] LC oscillations

c] Fc oscillations d] Rf oscillations

Q.2 Answer the following. **8**

i] Find the radius of gyration of a uniform disc about an axis perpendicular to its plane and passing through is centre

ii] What is the minimum angular momentum of the electron in an hydrogen atom

iii] What is Mechanical equilibrium

iv] Does the angle of banking depend on the mass of the vehicle ?

v] What is the internal resistance of the cell ?

vi] Above the what temperature all bodies radiate electromagnetic radiation ?

vii] A plane wavefront of light of wavelength $5500A^0$ is incident on two slits in a screen perpendicular to the direction of light rays if the total separation of 10 bright fringes on a screen 2m away is 2cm find the distance between the slits.

viii] Define molecular range

SECTION B

Attempt any ' Eight' of the following **16**

Q.3 Find the distance betweeen two successive nodes in a stationary wave on a string vibrating with frequency 64 Hz the velocity of progressive wave that resulted in the stationary wave is 48 m/s

Q.4 An iron rod is placed parallel to magnetic field of intensity 2000A/m The magnetic flux through the rod is 6×10^{-4}wb and its cross sectional Area is $3cm^2$ calculate the magnetic permeablity of the rod in Wb/ A.m.

Q.5 A 100mH inductor, a 25μF capacitor and a 15Ω resistance are connected in series to a 120 v, 50Hz AC source calculate

i] imnpedance of the circuit at resonance

ii] current at resonance.

Q. 6 Draw a neat labelled diagram of Ferry's black body

Q.7 What are logic gate ? Draw the schematic symbol of NoT and NOR gate

Q.8 Derive an expression for potential energy of the body performing linear SHM

Q.9 Write a note on zero potential

Q.10 What is mean by dual nature of matter.

Q.11 What should be the diameter of a water drop so that the excess pressure inside it is $80N/m^2$ (Surface tension of water = 7.27×10^{-2} N/m)

Q.12 Explain why it is necessary to use cylindrically concave pole pleces in construction of moving coil galvanometer.

Q.13 One mole of an ideal gas is initially kept in a cylinder with a movable and massless piston at pressure of 1.0 mPa and temperature 27^0c it is then expanded till its volume is doubled How much work is done if the expansion is isobaric ?

Q.14 What is wavefron ? What is the shape of the wavefront at a point far away from the source of light ?

SECTION C

Explain any 'Eight' of the following **24**

Q.15 Explain the classification of thermodynamic system

Q.16 Derive an expression for electrostatic potential due to system of charges

Q.17 The energy of a photon is 2 eV, find its frequency and wavelength

Q.18 A plan coil of 10 turns is tightly wound arounda solenoid of diameter 2cm having 400 turns per cm the relative permeablity of the core is 800 calculate the mutual inductance.

Q.19 Explain what do you understand by interference of light

Q.20 A 60 watt filament lamp loses all its energy by radiation from its surface the emissivity of the surface is 0.5 the area of the surface is 5×10^{-5} m^2 find the temperature of the filament.[$\delta = 5.67 \times 10^{-8}$ J/m^2sk^4]

Q.21 State any two advantages of full wave rectifier explain Ripple factor.

Q.22 Explain Biot Savart Law

Q.23 Explain the term inductive reactance

Q. 24 A spherical oil drop falls at a constant speed of 4cm/s in steady air, calculate the radius of thedrop the density of the oil is 0.9g/cm^3, density of air is 1.0 g/cm^3 and the coefficent of viscosity of the air is 1.8×10^{-4} poise [g = 980 m/s^2]

Q.25 Define magnetization state its formula S./I unit and dimension what is the magnetic susceptibility of a medium.

Q. 26 Two parallel SHM's are given by $X_1 = 20 \sin(8\pi t)$ m and $x_2 = 10\sin(8\pi t + \pi/6)$ find the Resultant amplitude and initial phase of the resultant SHM.

SECTION D

Attempt any 'Three' of the following. **12**

Q.27 i] Obtain an expression for the radiu of n^{th} Bohr orbit and show that the radius is proportional to square of the principal quantum number.

ii] How long will it take for radioactive sample to reduced to 1% of its original activity [Half life of the sample is 5.3 years]

Q.28 Derive an expression for time period of a conical pendulum on what factors does the frequency of a canical pendulum dpends is it indpendent of some factors ?

Q.29 i] Distinguish between Harmonics and overtone

ii] An air column is of length 17cm long calculate the frequency of 5^{th} overtone if air column is a] closed at one end & b] open at both ends

[Vel of sound in air = 340 m/s]

Q.30 Derive an expression for the power expended in pulling a conducting loop of a magnetic field

Q.31 i] State any two sources of errors in meter bridge experiment explain how they can be minimized

ii] Two batteries with emf 12v and 13v are connected in parallel across a load resistor of 10Ω the interal resistance of the two batteries are 1Ω and 2Ω respectively what is the voltage across the load lies between ?