▲PYRAMID

IIT-JEE | MEDICAL | FOUNDATION

'y{;* TEST SERIES 2021-22

STD : XII
SUBJECT : PHYSICS
TOPIC : FULL SYLLABUS

TIME : 3 HR.   **MAX. MARKS : 70**

General Instructions :

Question paper divided into **FOUR** sections,

(1) ***Section - A :***   Q. No. 1 contains 10 multiple choice type questions carrying one mark each.

Q. No. 2 contains 8 very short answer type questions carrying one mark each.

(2) ***Section - B :***   Q. No. 3 to Q. No. 14 are 12 short answer-I type questions carrying two marks each. Attempt any eight questions.

(3) ***Section - C :***   Q. No. 15 to Q. No. 26 are 12 short answer-II type questions carrying three marks each. Attempt any eight questions.

(4) ***Section - D :***   Q. No. 27 to Q. No. 31 are 5 long answer type questions carrying four marks each. Attempt any three questions.

(5)   Use of Logarithm tabeles is allowed. Use of calculator is not allowed

(6)   Figure to the right indicate full marks.

(7)   For each MCQ, the correct answer must be written with alphabet :
e.g.. (a) ...... / (b) ...... / (c) ...... / (d) ......, J. Only the first attempt will be considered for evalutaions.

(8)   ***Physical constants***

Acceleration due to gravity, $g = 10$ m/s; $\pi = 3.412$; $\epsilon_0 = 8.85 \times 10^{-12}$ S.I. units. Universal gas constant, $R = 8.31$ J/mol K.; Plank's constant $h = 6.63 \times 10^{-34}$ J-S; speed of light, $C = 3 \times 10^{8}$ m/s, Rydberg's constant, $R = 1.097 \times 10^{-7}$ m; $\mu_0 = 3\pi \times 10^{7}$ Wb/A-m

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'You should never let your fears prevent you from doing what you know is right.'
Aung San Suu Kyi - Burmese politician, diplomat and author (b.1945)

SECTION - A (18 M)

Q.1 Select and write answers of the following questions. [10]

i. A Stone is tied to a string and rotate in horizontal circle with constant angular velocity. If the string is released, the stone flies.
(a) radially inward
(b) tangentially forward
(c) radially outward
(d) tangentially backward

ii. P is the pressure and d is the density of a gas at constant temperature, then ____
(a) $P \propto d$
(b) $P \propto \dfrac{1}{\sqrt{d}}$
(c) $P \propto \dfrac{1}{d}$
(d) $P \propto \sqrt{d}$

iii. A galvanometer can be converted into a voltmeter by connecting a
(a) High resistance in parallel
(b) Low resistance in parallel
(c) High resistance in series
(d) Low resistance in series

iv. The force constant of SHM is measured in
(a) Nm
(b) N/m
(c) N
(d) m/N

v. Henry, the unit of inductance, is equivalent to
(a) Ampere / second
(b) Ampere - second
(c) Ohm - second
(d) Ohm / second

vi. The number of photoelectrons emitted varies
(a) Inversely with frequency
(b) Directly with frequency
(c) Inversely with intensity
(d) Directly with intensity

vii. When an electron jumps from the fourth orbit to the second orbit, one gets
(a) the first line of Balmer series
(b) the second line of Balmer series
(c) the first line of Paschen series
(d) the second line of Paschen series

viii. A liquid rises in a capillary tube up to a height of 9 cm. If the area of cross-section of the tube is made one-fourth, then the water will rise in the tube up to a height of
(a) 12 cm
(b) 18 cm
(c) 24 cm
(d) 6 cm

ix   In a series LCR circuit, R = 2 ohm, X_L = 8 ohm and X_C = 4 ohm. The impedance of the circuit is

(a) 13 ohm   (b) 7 ohm   (c) 5 ohm   (d) 25 ohm

x.   A gate has the following truth table.

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(a) AND   (b) OR   (c) NOR   (d) NAND

Q.2   Answer the following Questions.   [08]

i.   Define Surface tension.

ii.   Write any two properties of stationary waves.

iii.   State Wien's displacement law.

iv.   What do you mean by the turn ratio of transformer?

v.   Define work function of a metal.

vi.   A 0.5 kg mass is rotated in horizontal circle of radius 20 cm. Calculate the centripetal force acting on it, if its angular speed of rotation is 0.6 rad/s.

vii.   The maximum velocity and maximum acceleration of a particle moving in simple harmonic motion are 2 m/s and 4 m/s² respectively. What is the time period of particle?

viii.   All photons of electromagnetic radiation of a particular frequency have the same energy but different momentum. Is the statement true or false? If false, write the correct statement.

SECTION - B (16 M)

Attempt any EIGHT questions of the following. (8 x 2 = 16)

Q.3   Obtain an expression for the maximum safe speed of a vehicle moving along a horizontal circular track.

Q.4   Using the law of linear density, show that the fundamental frequency of a vibrating string is inversely proportional to the radius of the string.

Q.5   Draw a neat labelled diagram of a moving coil galvanometer.

Q.6   Derive an expression for the orbital magnetic moment of an electron revolving around the nucleus of an atom.

Q.7   State and explain Einstein's photoelectric equation.

Q.8   Draw the phasor diagram for a purely capacitive circuit.

Q.9   What would be the diameter of a water drop so that the excess pressure inside is 90 N/m^2? (Surface Tension of water = 0.073 N/m).

Q.10 A coil having 3000 turns with area 2.5 cm^2 is placed in a magnetic field of 0.7 T. The coil is rapidly moved out of the field in a time of 0.3 seconds. Calculate the e.m.f. induced across the coil.

Q.II   Find the kinetic energy of 6 litres of a gas at S.T.P.
(Standard pressure = 1.013 x 10^5 N/m).

Q.12 A parallel plate capacitor has an area of 6 cm^2 and a plate separation of 3 mm. What is its capacitance if the space between the plates is filled completely with a dielectric having dielectric constant of 4.5?

Q.13 What is the value of the shunt resistance that allows 30% of the main current through a galvanometer of 100 ohm ?

Q. 14 Obtain an expression for the radius of the orbit about which the electron in a hydrogen atom revolves.

SECTION - C (24 M)

Attempt any EIGHT questions of the following. (8 x 3 = 24)

Q.15 Define angle of contact. State any two factors affecting the angle of contact. Draw a neat labeled diagram showing the concave meniscus when a liquid wets a solid surface.

Q.16 Derive an expression of parallel axes theorem.

Q.17 Obtain an expression for the period of a simple pendulum.

Q.18 Show that $S_p - S_v = \dfrac{R}{M_0 J}$ where S_p and S_v are the principal specific heats at constant pressure and volume respectively, R is the universal gas constant, M_0 is the molar mass and J is the mechanical Equivalent of heat.

Q.19 Prove the laws of reflection of light using Huygens' principle.

Q.20 Show that the work done in pulling a loop through a magnetic field appears as heat energy in the loop.

Q.21 Describe how a potentiometer is used to determine the internal resistance of a cell. Derive the necessary formula.

Q.22 An AC supply e = 300 sin 314.2 t volt is connected across a resistance of 30 ohm. Calculate
(i) peak value of emf   (ii) rms value of emf   (iii) rms current of the circuit.

Q.23 When a plate of magnetic material of size 10 cm x 0.6 cm x 0.2 cm is located in a magnetizing field of 0.6 x 10^4 A/m, then a magnetic in moment of 6 A/m² is induced in it. Find out the magnetic induction in The rod.

Q.24 A set of 48 tuning forks are arranged in a series of descending frequencies such that each fork gives 4 beats per second with the preceding one. The frequency of the first tuning fork is 1.5 times the Frequency of the last fork. Find the frequency of the first and the 42nd tuning forks.

Q.25 2 moles of gas at temperature 127°C expands isothermally from an initial volume of 3 litres to a final volume of 6 litres. What is the work done by the gas?

Q.26 Calculate the shortest and longest wavelength of the Balmer series.

SECTION - D (12 M)

Attempt any THREE question of the following. (3 x 4 = 12)

Q.27 State four advantages of a Light Emitting Diode.
The common base DC current gain of transistor is 0.856. If the emitter current is 10 mA, what is the value of the base current?

Q.28 Explain Biot-Savart law.
Current of equal magntiude flows through two long parallel wires having a separation of 1.35 cm. If the force per unit length on each wire is 4 x 10-2 N/m, what is the value of the current flowing through the wires?

Q.29 Draw a neat labelled diagram of Fresnel Biprism.
In Fraunhofer diffraction by a narrow slit, a screen is placed at a distance of 2m from the lens to obtain the diffraction patter. If the slit width is 0.3 mm and the first minimum is 5 mm on either side of the central maximum, find the wavelength of the light.

Q.30 Derive an expression for the electric potential at a point due to an electric dipole.

Q.31 What is an isobaric process? Draw the P-V diagram of an isobaric process. Explain the thermodyanmics of an isobaric process.