SHIKSHA CLASSES

Std. XII Sci.:
PHYSICS
PRELIMINARY QUESTION PAPER - 2

Time: 3 Hours | **Total Marks: 70**

General instructions:

i. The question paper is divided into four sections.

ii. **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.

iii. **Section B:** Q.No.3 to Q. No. 14 contains Twelve short answer type of questions carrying **Two marks** each. (Attempt any Eight).

iv. **Section C:** Q.No.15 to Q. No. 26 contains Twelve short answer type of questions carrying **Three marks** each. (Attempt any Eight).

v. **Section D:** Q.No.27 to Q. No. 31 contains Five long answer type of questions carrying **Four marks** each. (Attempt any Three).

vi. Use of log table is allowed. Use of calculator is not allowed.

vii. Figures to the right indicate full marks.

viii. For each MCQ, correct answer must be written along with its alphabet.

e.g., (a)...../ (b)..../ (c)..../ (d)..... Only first attempt will be considered for evaluation.

ix. Physical constants:

a. Acceleration due to gravity (g) = 9.8 m/s^2
b. Planck's constant (h) = 6.63×10^{-34} Js
c. Atmospheric pressure (P_0) = 1.013×10^5 Pa
d. Charge on electron (e) = 1.6×10^{-19} C
e. Mass of electron (m) = 9.1×10^{-31} kg

SECTION A

Q.1. Select and write the correct answer: [10]

i. The equation of S.H.M is given as $x = 3 \sin 20\pi t + 4 \cos 20\pi t$, where x is in cm and t is in second. The amplitude is

(A) 5 cm　　　(B) 4 cm　　　(C) 3 cm　　　(D) 7 cm

ii. In a double slit experiment, instead of taking slits of equal widths, one slit is made twice as wide as the other. Then, in the interference pattern

(A) the intensities of both the maxima and the minima increases.
(B) the intensity of the maxima increases and the minima has zero intensity.
(C) the intensity of the maxima decreases and that of the minima increases.
(D) the intensity of the maxima decreases and the minima has zero intensity.

iii. The coefficient of viscosity for hot air is

(A) greater than the coefficient of viscosity for cold air.
(B) smaller than the coefficient of viscosity for cold air.
(C) same as the coefficient of viscosity for cold air.
(D) increases or decreases depending on the external pressure.

iv. Bohr magneton is

(A) magnetic induction of electron when it is revolving in the first Bohr orbit.
(B) magnetic moment of electron when it is revolving in the first Bohr orbit.
(C) angular momentum of electron when revolving in the first Bohr orbit.
(D) angular momentum of electron when revolving in last Bohr orbit.

v. Two tuning forks have frequencies 450 Hz and 454 Hz respectively. On sounding these forks together, the time interval between two successive maximum intensities will be _____.

(A) $\frac{1}{4}$s　　　(B) $\frac{1}{2}$s　　　(C) 1s　　　(D) 4s

vi. At resonance, the voltage and current are
   (A) out of phase by π.
   (B) different in phase by $\pi/2$.
   (C) different in phase by $\pi/4$.
   (D) in phase

vii. A charged particle is in motion having initial velocity $\vec{v}$ when it enters into a region of uniform magnetic field perpendicular to $\vec{v}$. Because of the magnetic force the kinetic energy of the particle will
   (A) remain unchanged.
   (B) get reduced.
   (C) increase.
   (D) be reduced to zero

viii. Instrument which can measure terminal potential difference as well as electro motive force (e.m.f.) is
   (A) Wheatstone's metrebridge.
   (B) Voltmeter.
   (C) Potentiometer.
   (D) Galvanometer.

ix. In a thermodynamic process, the pressure of a fixed mass of a gas is changed in such a manner that the gas releases 20 J of heat and 8 J of work is done on the gas. If the initial energy of the gas was 30 J, then the final internal energy will be
   (A) 2 J
   (B) 18 J
   (C) 42 J
   (D) 58 J

x. An electric dipole of moment p is placed in the position of stable equilibrium in a uniform electric field of intensity E. The torque required to rotate, when the dipole makes an angle θ with the initial position is
   (A) $pE\cos\theta$
   (B) $pE\sin\theta$
   (C) $pE\tan\theta$
   (D) $pE\cot\theta$

Q.2. **Answer the following:** [8]
i. On what factors does the potential gradient of the wire depend?

ii. Find the pressure 200 m below the surface of the ocean if pressure on the free surface of liquid is one atmosphere. (Density of sea water = 1060 kg/m^3)

iii. What is power in an AC circuit?

iv. What is the shape of the wavefront if the source of light is linear, say, a tube light?

v. Why does work done at constant volume is zero?

vi. Define linear simple harmonic motion.

vii. What does the hysteresis loop represents?

viii. State right hand thumb rule.

SECTION B (Attempt any Eight)	[16]

Q.3. If a copper disc of a pendulum swings between the poles of a magnet, the pendulum comes to rest very quickly. Explain the reason. What happens to the mechanical energy of the pendulum?

Q.4. A vehicle is moving on a circular track whose surface is inclined towards the horizon at an angle of 10°. The maximum velocity with which it can move safely is 36 km/hr. Calculate the length of the circular track.
[Take $\pi = 3.142$]

Q.5. State and explain the principle of superposition of waves.

Q.6. State any two sources of errors in metrebridge experiment. Explain how they can be minimized.

Q.7. A gas contained in a cylinder fitted with a frictionless piston expands against a constant external pressure of 1 atm from a volume of 5 litres to a volume of 10 litres. In doing so it absorbs 400 J of thermal energy from its surroundings. Determine the change in internal energy of system.

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Add : - M-19 MHADA Colony, Khat Road, Bhandara.
Contact :- 8625055707 | Website:- shikshaclasses.co.in

Q.8. Define plane of vibration and plane of polarization.

Q.9. Explain the necessary modifications to convert the moving coil galvanometer into an ammeter.

Q.10. A typical FM radio station has its broadcast frequency 98.3 MHz. What is the energy of an FM photon of this frequency?

Q.11. How much amount of work is done in forming a soap bubble of radius r?

Q.12. Find the angular momentum of the electron in the first orbit in a hydrogen atom.

Q.13. A 10 µF capacitor is connected with 100 V battery. What is the electrostatic energy stored?

Q.14. Why should a photodiode be operated in reverse biased mode?

SECTION C (Attempt any Eight)	**[24]**

Q.15. An ideal monatomic gas is adiabatically compressed so that its final temperature is twice its initial temperature. What is the ratio of the final pressure to its initial pressure?

Q.16. A body of mass 1 kg is made to oscillate on a spring of force constant 16 N/m. Calculate:
i. Angular frequency,
ii. Frequency of vibration

Q.17. State the factors on which coefficient of coupling depends on

Q.18. Compare the rates of emission of heat by a blackbody maintained at 727 °C and at 227 °C, if the blackbodies are surrounded by an enclosure (black) at 27 °C. What would be the ratio of their rates of loss of heat?

Q.19. Derive an expression for electric potential due to a point charge.

Q.20. Derive expression for angle of banking when a vehicle (consider to be a point) moves along a curved banked road neglecting friction.

Q.21. In a single slit diffraction experiment, first minimum for a light of wavelength 6800 Å coincides with first maximum of some other unknown wavelength. Calculate unknown wavelength.

Q.22. Define following terms and explain them.
i. AC current gain (β_{AC})
ii. Voltage gain of amplifier
iii. Power gain of the amplifier

Q.23. State Pascal's law of fluid pressure. Describe the experimental proof for the same.

Q.24. On the basis of de Broglie hypothesis, obtain the relation for wavelength of an electron accelerated by a potential difference of 'V' volt.

Q.25. State the laws of a vibrating string.

Q.26. An electron in an atom is revolving round the nucleus in a circular orbit of radius 5.3×10^{-11} m, with a speed of 2×10^6 ms^{-1}. Find the resultant orbital magnetic moment and angular momentum of electron.

SECTION D (Attempt any Three)	**[12]**

Q.27.
i. What do you mean by an impedance triangle?
ii. A capacitor of capacitance 0.5 µF is connected to a source of alternating e.m.f. of frequency 100 Hz. What is the capacitive reactance? (π = 3.142)

Q.28.
i. Explain why magnetic force never does any work on moving charges.
ii. A particle carrying a charge moves with velocity 3×10^6 m/s, at right angle to a uniform field of magnetic induction 0.005 T. Find the value of the charge of the particle if it experience a force of 2×10^{-2} N.

Q.29.
i. State the conditions under which the theorems of parallel axes and perpendicular axes are applicable. State the respective mathematical expressions.
ii. State the expression for self inductance of a coil. Hence define SI unit of self inductance.

Q.30.
i. Derive relation between average life and half life of a radioactive material.
ii. The decay constant of radioactive substance is 4.33×10^{-4} per year. Calculate its half life period.

Q.31. With a neat and labelled diagram, explain Ferry's perfectly blackbody.