SAMPLE PAPER FOR HSC PRELIM EXAM

CLASS 12

PHYSICS

MAHARASHTRA STATE BOARD SYLLABUS

2020 - 21

Max. Marks - 70 **Time - 3 Hours**

Instructions :

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 14 contains twelve short answer (SA1) types of questions carrying two marks each. (Attempt any Eight)

3) **Section C** Q. No. 15 to 26 contains Twelve short answer (SA2) type of questions carrying 3 marks each. (Attempt any Eight)

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

5) Use Log – Table if necessary. Use of calculator is not allowed.

6) Figures to the right indicate full marks.

7) 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.

Physical Constants:

(a) $h = 6.63 \times 10^{-34} Js$ (b) $g = 9.8\ m/s^2$ (c) $c = 3 \times 10^8 m/s$

(d) $\epsilon_o = 8.85 \times 10^{-12} \frac{c^2}{Nm^2}$ (e) $\pi = 3.142$ (f) $\mu_o = 4\pi \times 10^{-7} \frac{Wb}{A-m}$

Section A

Q1. Select and write the correct answers of the following questions: **[10]**

i. Laminar or streamline flow of liquid is determined by_____

(A) Reynold's number (B) Density of liquid

(C) Stoke's law (D) Coefficient of viscosity

ii. In stationary wave, the distance between a node and it's adjacent antinode is ____

(A) λ (B) $\lambda/4$ (C) $\lambda/2$ (D) 2λ

iii. A Stone is tied to a string and rotated in a horizontal circle with constant angular velocity. If the string is released, the stone flies___

(A) Radially inward (B) Radially outward

(C) Tangentially outward (D) Along the circular path

iv. An athermanous metal plate has the coefficient of absorption 0.65. It's coefficient of reflection is__

(A) 0 (B) 0.35 (C) 0.45 (D) 0.65

v. In the spectrum of hydrogen atom which transition will yield longest wavelength?

(A) n=2 to n=1 (B) n=5 to n=4 (C) n=7 to n=6 (D) n= 8 to n=7

vi. Two parallel wires carrying current in the same direction attract each other, because of

(A) potential difference between them (B) magnetic force between them

(C) electric forces between them (D) mutual inductance between them

vii. S.I.unit of magnetic permeability of free space is_____

(A) $Tm^{-1}A^{-1}$ (B) $Tm^{-2}A^{-1}$ (C) $Wbm^{-2}A^{-1}$ (D) $Wbm^{-1}A^{-1}$

viii. A metal foil of negligible thickness is introduced between two plates of a capacitor at the centre. The capacitance of capacitor will be_____

(A) same (B) doubled (C) half (D) infinite

ix. A straight line conductor of length 0.4 m is moved with a speed of 7 m/s perpendicular to magnetic field of intensity 0.9 Wb/m^2 . The induced e.m.f. across the conductor is_____

(A) 1.26 V (B) 2.52 V (C) 5.24 V (D) 25.2 V

x. In an LCR circuit, capacitance is changed from C to 2C. For the resonant frequency to remain unchanged, the inductance should be changed from L to_____

(A) 4L (B) 2L (C) L/2 (D) L/4

Q. 2 Answer the following questions: **[08]**

i. State Wien's displacement law.

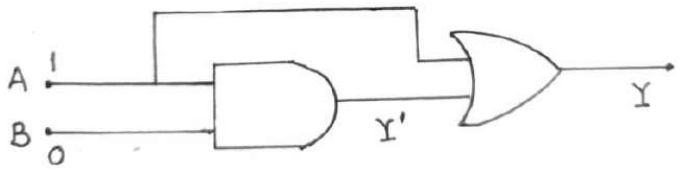
ii. A car of mass 1500 kg rounds a curve of radius 250 m at 25 m/s. Calculate the centripetal force acting on it.

iii. What is the phase difference between the voltage across an inductor and a capacitor in an a.c. circuit ?

iv. State the Faraday's (quantitative) Law of electromagnetic induction.

v. State the Kirchhoff's voltage law.

vi. Determine output (Y) for the given combination of gates



vii. Give an example of some familiar process in which heat is added to an object, without changing its temperature.

viii. Define coefficient of viscosity.

Section B

Attempt any EIGHT questions of the following : **[16]**

3. State any two conditions for system to be in mechanical equilibrium?

4. Draw a neat labelled diagrams of the 1st two modes of vibrations of an air column open at both ends.

5. On which factors does amount of heat radiated by a body depend?

6. Explain the term Uniform Circular Motion with the help of an example.

7. State any two postulates of Bohr's theory of hydrogen atom.

8. Show that the orbital magnetic dipole moment of a revolving electron is $\frac{eVr}{2}$.

9. Explain how moving coil galvanometer is converted into a voltmeter. Derive the necessary formula.

10. Calculate the viscous force acting on a rain drop of diameter 4 mm, falling with a uniform velocity 3 m/s through air. The coefficient of viscosity of air is 2.8×10^{-5} Ns/m^2.

11. An electric dipole consists of two opposite charges each of magnitude 2 μC separated by 4 cm. The dipole is placed in an external electric field of 10 NC^{-1}. Find the work, that external agent will have to do in turning the dipole through 180^0 starting from the position $\theta=0^0$.

12. An alternating e.m.f. of peak value 120V and frequency 50 Hz is connected across LCR series circuit with R= 15 Ω ,L= 100 mH and C= 25 μF. Calculate current and impedance of the circuit at resonance.

13. A moving coil galvanometer has been fitted with a rectangular coil having 50 turns and dimensions 5 cm × 3 cm. The radial magnetic field in which the coil is suspended is of 0.05 Wb/ m^2 . The torsional constant of the spring is 1.5 × 10 $^{-9}$ Nm/degree. Obtain the current required to be passed through the galvanometer so as to produce a deflection of 30^0.

14. The total energy of a body of mass 2 Kg performing S.H.M. is 40 J. Find it's speed while crossing the center of the path.

Section C

Attempt any EIGHT questions of the following : [24]

15. Show that angle of incidence is equal to angle of reflection by using Huygen's wave theory of light.

16. Derive the expression for the period of a magnet vibrating in a uniform magnetic field and performing S.H.M.

17. State Einstein's photoelectric equation. Explain two characteristic of photoelectric effect on the basis of Einstein's photoelectric equation.

18. State Ampere's law and hence obtain an expression for magnetic induction at any point near a straight current carrying conductor.

19. Define coefficient of self-induction and explain the phenomenon of self-induction.

20. Derive an expression for electric field intensity at a point outside a charged sphere.

21. Derive the relation between surface tension & surface energy in case of liquid.

22. Find the temperature of a blackbody if it's spectrum has a peak at

i. λ_{max} = 700 nm (visible)
ii. λ_{max} = 3 cm (microwave region)
iii. λ_{max} = 3 m (FM radio)

23. Half life period of a certain radioactive material is 5.3 years. After what lapse of time, the undecayed fraction of the material will be 1% of its initial activity?

24. An air column is of length 17 cm long. Calculate the frequency of 5^{th} overtone if air column is

i. Closed at one end.
ii. Open at both ends. (Velocity of sound in air = 340 m/s)

25. A 10 m long wire of uniform cross- section and 20 Ω resistance is used in a potentiometer. The wire is connected in series with a battery of 5 V along with an external resistance of 480 Ω. If an unknown e.m.f. E is balanced at 6 m length of the wire, Find the value of unknown e.m.f. and the potential gradient of the potentiometer wire.

26. A solid cylinder of mass 20 kg rotates about it's axis with angular speed 100 rad/s. The radius of the cylinder is 0.25 m. What is Kinetic energy associated with the rotation of the cylinder? What is the magnitude of angular momentum of the cylinder about it's axis?

Section D

Attempt any THREE questions of the following : **[12]**

27. Draw a P-V diagram and explain the concept of positive and negative work in thermodynamics. Give one example each.

28. Explain working of a transistor as a common emitter amplifier with the help of neat labelled diagram.

29. In a single slit diffraction experiment, 1st minimum for a light of wavelength 6800 A^0 coincides with first maximum of some other unknown wavelength. Calculate unknown wavelength.

Explain Fraunhofer and Fresnel diffraction.

30. Two coils having self-inductance L_1=85 mH and L_2= 55mH are coupled with each other.

The coefficient of coupling (K) is 0.75 calculate the mutual inductance (M) of the two coils.

Show that : $H = \frac{B}{\mu_0} - M$, Where symbols have their usual meanings.

31. Distinguish between Resistance and Reactance.

The threshold wavelength of the silver is 3800 A^0. Calculate the maximum kinetic energy in eV of photoelectrons emitter, when ultraviolet light of wavelength 2600 A^0 falls on it.

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