Set – I Std. – 12th HSC	Subject – Physics	Marks: 70 Time: 3 Hrs.

General Instructions :

1. *The question paper is divided into four sections:*

(1) ***Sections A:*** *Q. No. 1 contains **10** multiple choice 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.** 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 mark** each. Attempt any **three** questions.*

2. *Use of logarithm Tables is allowed. Use of calculator is **not** allowed.*

3. *Figures to write indicate full marks.*

4. *For each MCQ the correct answer must be written along with alphabet:*
e.g., (a)……. / (b) ……. / (c)……. / (d)……. .

Physical constants: (1) $\pi = 3.142$ (2) $g = 9.8\ m/s^2$ (3) $\sigma = 5.67 \times 10^{-8}\ W.\ m^2/K^4$
(4) $E_0 = 8.85 \times 10^{-12}\ F/m$ (5) $h = 6.63 \times 10^{-34}\ J.s$

Section – A

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

i) In the case of ideal gases, (1)

1. the molar specific heat at constant pressure is the same for all gases.
2. the molar specific heat at constant volume is same for all gases.
3. the ratio of the molar specific heat at constant volume and at constant pressure is the same for all gases.
4. the difference between the molar specific heat at constant pressure and at constant volume is the same for all gases.

ii) For work done to be reversible, the process should be_____ (1)

1. Cyclic
2. Isobaric
3. Isochoric
4. Adiabatic

iii) A particle is performing simple harmonic motion with amplitude A and angular velocity ω. The ratio of maximum velocity to maximum acceleration is: (1)

1. ω
2. I/ω
3. ω^2
4. A/ ω

iv) In the law of tension, the fundamental frequency of the vibrating string is: (1)

1. Inversely proportional to the square root of tension
2. Directly proportional to the square of tension
3. Directly proportional to the square root of tension
4. Inversely proportional to the density

v) The integral multiple of fundamental frequencies are: (1)

1. Beats
2. Resonance
3. Overtones
4. Harmonics

vi) An LED emits visible light when its: (1)

1. Junction is reversed biased
2. Depletion layer widens
3. Holes and electrons recombine
4. Junction becomes hot

vii) Insect moves over the water surface because of: (1)

1. Elasticity
2. Surface tension
3. Friction
4. Viscosity

viii) Two capillary tubes of radii 0.6 cm and 0.3 cm are dipped in the same liquid. The ratio of heights through which the liquid will rise in the tubes is: (1)

1. 2:1
2. 1:2
3. 4:1
4. 1:4

ix) Light of wavelength 5000 A.U. falls on a plane reflecting surface. The frequency of reflected light is: (1)

1. $6X10^{14}$Hz
2. $5X10^{14}$Hz
3. $2X10^{14}$Hz
4. $1.666X10^{14}$Hz

x) You are given a number of capacitors labelled as 8μF-250V. Find the number of capacitors needed to get an arrangement equivalent to 16μF-1000V. (1)

1. 4
2. 16
3. 32
4. 64

Q.2 Answer the following. [8]

i) What are cohesive forces? (1)

ii) Under which condition laws of Boyle, Charles, and Gay-Lussac are valid? (1)

iii) When the two objects are said to be in thermal equilibrium? (1)

iv) A simple pendulum moves from one end to other in ¼ second. What is its frequency? (1)

v) What is the basis of Kirchhoff's current law and voltage law? (1)

vi) What does the ratio of magnetization to magnetic intensity indicate? (1)

vii) A square metal plate of area $100cm^2$ moves parallel to another plate with a velocity of 10 cm/s, both plates immersed in water. If the viscous force is 200 dyne and the viscosity of water is 0.01 poise, what is the distance between them. (1)

viii) What do you mean by dielectric polarization? (1)

Section – B

Attempt *any eight* : **[16]**

Q.3 A flywheel is revolving with a constant angular velocity. A chip of its rim breaks and flies away. What will be the effect of on its angular velocity? (2)

Q.4 Draw p-V diagram of reversible process. (2)

Q.5 Draw p-V diagram showing negative work with varying pressure. (2)

Q.6 Distinguish between overtone and harmonic. (2)

Q.7 What are stationary waves? Why are they called stationary waves? (2)

Q.8 Draw a neat labelled diagram of a schematic of the experimental setup for the photoelectric effect. (2)

Q.9 State any two advantages and disadvantages of a photodiode. (2)

Q.10 The moment of inertia of a body about a given axis is 1.2 kgm^2. Initially, the body is at rest. For what duration on the angular acceleration of 25 radian/ sec^{-2} must be applied about that axis in order to produce rotational kinetic energy of 1500 Joules? (2)

Q.11 1000 calories of radiant heat are incident on a body. If the body absorbs 400 calories of heat, find the coefficient of emission of the body. (2)

Q.12 Four resistances 6Ω, 6Ω, 6Ω, and 18Ω form a Wheatstone bridge. Find the resistance which connected across the 18Ω resistance will balance the network. (2)

Q.13 Answer the following (2)

i. State the relation for magnetic force in vector form.

ii. Define the term Eddy currents.

Q.14 Define current amplification factor α_{DC} and β_{DC}. Obtain the relation between them. (2)

Section – C

Attempt *any eight* : **[24]**

Q.15 Derive an expression for the kinetic energy of a rotating body with uniform angular velocity. (3)

Q.16 Explain the phenomenon of surface tension on the basis of molecular theory. (3)

Q.17 Obtain an expression for the resultant amplitude of the composition of two SHMs having the same period along the same path. (3)

Q.18 Explain the reflection of light at a plane surface with the help of a neat ray diagram. (3)

Q.19 Describe Young's double slit experiment with the neat labelled diagram showing points of maximum and minimum intensity. (3)

Q.20 Compare resistance and Impedance. (3)

Q.21 Explain the term inductive reactance. State the unit and dimensions of the same. (3)

Q.22 An alternate emf of 230V, 50Hz is connected across a pure ohmic resistance of 50Ω. Find: 1) the current, 2) equations for the instantaneous values of current and voltage. (3)

Q.23 The work function of a surface is 3.1 eV. A photon of frequency of $1X10^{15}$ Hz is incident on it. Calculate the incident wavelength and state if photoelectric emission occurs or not. (3)

Q.24 The primary of a transformer has 40 turns and works on 100V and 100W. Find a number of turns in the secondary to step up the voltage to 400V. Also calculate the current in the secondary and primary. (3)

Q.25 A circular loop of radius 9.7 cm carries a current 2.3 A. Obtain the magnitude of the magnetic field: a) At the centre of the loop, b) At a distance of 9.7 cm from the centre of the loop but on the axis (3)

Q.26 A cell of emf 1.5 V and negligible internal resistance is connected in series with a potential meter of length 10 m and the total resistance of 20Ω. What resistance should be introduced in the resistance box such that the potential drop across the potentiometer is one microvolt per cm of the wire? (3)

Section – D

Attempt *any three* : **[12]**

Q.27 Explain the spectral distribution of blackbody radiation.

Q.28 State the postulates of Bohr's atomic model. Hence show the energy of electrons varies inversely to the square of the principal quantum number.

Q.29 (i) Draw a neat labelled diagram showing energy levels and transition between them for hydrogen atoms.

(ii) An electron in an atom is revolving around the nucleus in a circular orbit of a radius of $5.3X10^{-11}$m with the speed of $2X10^{6}$ m/s. Find the resultant orbital magnetic moment and angular momentum of the electron. [$e=1.6X10^{-19}$C, $m_e= 9.1X10^{-31}$kg]

Q.30 (i) Define magnetization. State its SI unit and dimensions. Derive the relation between magnetic field intensity (H) and magnetization (M) for a magnetic material placed in a magnetic field.

(ii) Two capacitors each of capacity 2μF capacity are connected in parallel. This system is connected in series with the third capacity of 12μF capacity. Find the equivalent capacity of the system.

Q.31 (i) Using Ampere's law, obtain an expression for the magnetic field for the magnetic induction near a current carrying straight infinitely long wire.

(ii) Two spheres A and B of radius a and b respectively are at the same potential. Find the ratio of the surface charge densities of A and B.