

Section – A

Q.1 Select and write correct answers for the following multiple choice type question : **16**

(i) The output of the given gate is : **1**



- (A) 1 (B) ∞
(C) 0 (D) - 1

(ii) The permittivity of medium is $26.55 \times 10^{-12} \text{ C}^2/\text{Nm}^2$. The dielectric constant of the medium will be **1**

- (A) 2 (B) 3
(C) 4 (D) 5

(iii) If the polarizing angle for a given medium is 60° then the refractive index of the medium is **1**

- (A) $\frac{1}{\sqrt{3}}$ (B) 3
(C) 1 (D) $\sqrt{3}$

(iv) Two droplets coalesce in a single drop. In this process **1**

- (A) energy is liberated
(B) energy is absorbed
(C) energy does not change
(D) some mass is converted into energy.

(v) During refrigeration cycle heat is rejected by the refrigerant in the : **1**

- (A) condenser (B) cold chamber
(C) evaporator (D) hot chamber

(vi) The average displacement over a period of S.H.M. is **1**

- (A) 0 (B) A
(C) 2A (D) 4A

(vii) Work done in splitting a drop of water of 1mm radius into 10^6 droplets is **1**

[Surface Tension of water = $72 \times 10^{-3} \text{ J/m}$]

- (A) $9.58 \times 10^{-5} \text{ J}$ (B) $8.95 \times 10^{-5} \text{ J}$
(C) $5.89 \times 10^{-5} \text{ J}$ (D) $5.98 \times 10^{-6} \text{ J}$

(viii) In a given process for an ideal gas, $W = 0$ and $Q < 0$. Then for the gas **1**

- (A) temperature will decrease

- (B) volume will increase
 (C) pressure will remain constant
 (D) temperature will increase
- (ix) When a transverse wave on a string is reflected from the free end, the phase change produced is, 1
- (A) 0° (B) $\frac{\pi}{2}^\circ$
 (C) $\frac{3\pi}{4}^\circ$ (D) π°
- (x) Waves that cannot be polarized are 1
- (A) radio waves (B) X-rays
 (C) visible light (D) sound waves

Q.2 Answer the following questions.

- (i) Distinguish between polar and non-polar dielectric. 1
- (ii) Calculate the work done in blowing a soap bubble to a radius of 1cm. The surface tension of soap solution is 2.5×10^{-2} N/m. 1
- (iii) What is meant by shunt ? 1
- (iv) A transformer converts 240V AC to 60V AC. The secondary has 75 turns find the number of turns in primary. 1
- (v) What does hysteresis loop represent ? 1
- (vi) Why is a low density liquid used as a manometric liquid in a physics laboratory ? 1
- (vii) What do you mean by Electromagnetic induction ? 1
- (viii) State the expression of displacement, velocity and acceleration for a body performing linear S.H.M at a time t. 1

Section - B

Attempt any EIGHT questions of following :

- Q.3** On what factors does frequency of a conical pendulum depend ? Is it independent of some factors ? 2
- Q.4** What is Lorentz Force? Obtain the equation of Lorentz Force Law. 2
- Q.5** What is the value of Shunt resistance that allows 20% of the main current through a galvanometer of 99Ω ? 2
- Q.6** A fan is rotating at 90 rpm. It is then switched off. It stops after 21 rotations. Calculate the time taken by it to stop assuming that the frictional torque is constant. 2
- Q.7** An aircraft of wing span of 50 m flies horizontally in Earth's magnetic field of 6×10^{-5} T at a speed of 400 m/s. Calculate the emf generated between the tips of the wings of the aircraft. 2
- Q.8** State the characteristics of photon 2

- Q.9** Why is a NOT gate known as an inverter ? 2
- Q. 10** Calculate the internal energy of Argon and Oxygen 2
- Q. 11** For a stationary wave set up in a string having both ends fixed, what is the ratio of fundamental frequency to the second harmonic ? 2
- Q. 12** Calculate the radius of 3rd orbit of electron in hydrogen atom. 2
- Q. 13** What is a junction transistor ? What are its two types ? 2
- Q. 14** State main postulates of Huygens's wave theory of light. 2

Section - C

Attempt any EIGHT question of the following :

- Q. 15** Derive the relation between surface tension and surface energy per unit area. 3
- Q. 16** Compare the conditions for positive, negative and zero internal energy. 3
- Q. 17** Obtain an expression relating torque with angular acceleration for rigid body. 3
- Q. 18** Describe what is Rayleigh's criterion for resolution. 3
- Q. 19** Derive Meyer's relation for molar specific heats. 3
- Q. 20** Obtain expression for period of a simple pendulum performing S.H.M. 3
- Q. 21** Two batteries of 7V and 13V and internal resistances 1Ω and 2Ω respectively are connected in parallel with a resistance of 12Ω . Find the current through each branch of circuit and the potential difference across 12Ω resistance. 3
- Q. 22** State Lenz's law and explain how magnet's motion creates a magnetic dipole in the coil. 3
- Q. 23** The threshold wavelength of Tungsten is 2.76×10^{-5} cm. What will be the maximum kinetic energy of electrons ejected in each of the following cases : 3
- (i) If UV radiation of wavelength 1.80×10^{-5} cm and
- (ii) Radiation of frequency 4×10^{15} Hz is made incident on tungsten surface.
- Q. 24** An AC circuit consists of only an inductor of inductance 2H. If the current is represented by a sine wave of amplitude 0.25 A and frequency 60 Hz, calculate the effective potential difference across the inductor. 3
- Q. 25** Derive an expression for equation of a stationary wave on a stretched string. 3
- Q. 26** If the effective current in a 50 cycle AC circuit is 5A, what is the peak value of current ? 3
- what is the current $\frac{1}{600}$ sec after it was zero ?

Section – D

Attempt any THREE question of the following:

- Q. 27** Derive an expression for pressure exerted by a gas on the basis of kinetic theory of gases. 4
- Q. 28** i) Explain the concept of Dielectrics. 2
- ii) When 10^8 electrons are transferred from one conductor to another, a potential difference of 10 V appears between the conductors. Find the capacitance between two conductors. 2

- Q. 29** Derive an expression for magnetic field along axis of a current carrying circular loop. 4
- Q.30** (i) Calculate the gyro magnetic ratio of electron. 4
(ii) A circular coil of 300 turns and diameter 14 cm carries a current of 15A. Calculate the magnitude of magnetic dipole moment associated with the coil.
- Q.31** Draw a Binding energy curve to show the variation of binding energy per nucleon with mass number. What inferences can be drawn from B.E. curve? 4