Second Terminal Examination – 2080
GRADE XII (SCIENCE)

Subject: Physics **SET A** **F.M. : 75**
Time : 3:00 hrs. **P.M : 30**

GROUP 'A'

MULTIPLE CHOICE QUESTIONS (1×11=11)

1. A couple is acting on a body under the action of two forces $\vec{F}_1$ and $\vec{F}_2$. Which of the following statement is not true for the pairs of $\vec{F}_1$ and $\vec{F}_2$? [a] they have same magnitude [b] they are in opposite direction [c] they are acting with different lines of action [d] they are in same direction.
2. If the total energy particle executing SHM is E, the KE of particle at half of amplitude is a) $\frac{E}{2}$ b) $\frac{E}{4}$ c) $\frac{E}{\sqrt{2}}$ d) $\frac{3E}{4}$
3. The dimensional formula of co-efficient of viscosity is-
   a) $[ML^{-1}T^{-1}]$ b) $[ML^{-2}T^{-1}]$ c) $[M^2L^{-1}T^{-1}]$ d) $[ML^{-1}T^{-2}]$
4. When a gas undergoes adiabatic compression, its internal energy
   a) increases b) decreases c) remains same d) none
5. The heat engine having maximum efficiency work in between
   a) 300K and 250K b) 600K and 300K
   c) 300K and 100K d) 100K and 10K
6. Keeping temperature constant, if the pressure is increased; the speed of sound in a gas (a) increases (b) decreases (c) remain unaffected (d) cannot be predicted.
7. In the equation, $y = A \sin 2\pi \left(\frac{t}{T} - \frac{x}{\lambda}\right)$, where A, T and λ are positive constants, represents a wave whose a) amplitude is 2A b) velocity is in negative X-axis c) period is $\frac{T}{\lambda}$ d) speed is $\frac{\lambda}{T}$
8. The phenomenon of superconductivity was observed at first on (a) mercury (b) lead (c) magnesium diboride (d) Niobium
9. A potentiometer is properly set the balancing length (L) for a cell is obtained. If the current through the potentiometer wire is decreased, then the balancing length a) is decreased b) is increased c) is not charged d) becomes half
10. When the current flowing in a circular coil is doubled and the number of turns of the coil in it is halved, the magnetic field at its center will become a)Same b) Four times c) Half d) Double
11. In Millikan oil drop experiment a charged drop of mass 1.8×10^{-14} kg is stationary between its plates. The distance between the plates is 0.90 cm and potential difference is 2 kV. The number of electrons on the drop is (a) 500 (b) 5 (c) 50 (d) 10

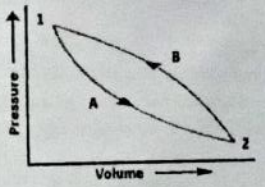
GROUP B

SHORT ANSWER QUESTIONS: (8×5=40)

12. a) State principle of conservation of angular momentum? [2]
    b) A ballet dancer stretches her hands when she wants to come to rest, why? [1]
    c) A disc of moment of inertia 5×10^{-4} kgm² is rotating freely about the axis through the center at 40 rpm. calculate the new revolution per minute if some wax of mass 0.02kg dropped gently on to the disc 0.08m from the axis [2]
13. a) What is simple harmonic motion? [1]
    b) Show that the small oscillations of a mass loaded spring suspended vertically are simple harmonic and deduce the expression for time period of it. [3+1]

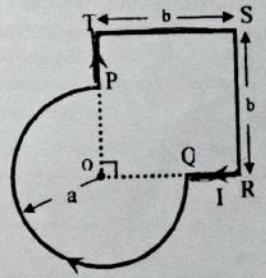
OR

    a) Define viscosity of fluid. [1]
    b) Derive Newton's formula for viscosity of fluid. [3]
    c) Convert 1 Pa.s into Poise. [1]
14. a) State first law of thermodynamics. [1]
    b) If the thermodynamics process starts from 1 and comes to 1 using the path A and B as shown by arrow, does the net work done be zero? Explain. [2]
    c) An ideal gas the ratio of heat capacities is 5/3. At 72°C, gas is expanded adiabatically to eight times to its original volume. Calculate the rise in temperature of the gas. [2]



OR

    a) Explain the working of diesel engine with the help of a P-V diagram. [3]
    b) A diesel engine perform 2200 J of mechanical work and discards 4300 J of heat in each cycle. What is the thermal efficiency of the engine? [2]
15. a) State and explain the Huygen's principle. [1+1]
    b) Use Huygen's principle to verify the laws of reflection of light. [3]
16. A wire carrying current I = 2 A has the configuration as shown in Fig. Four straight sections are connected by a circular arc with all sections lying in the same plane. If a =5 cm and b= 7cm, Find the magnetic field intensity $\vec{B}$ at the center O of the circular arc due to –



    (i) circular segment QP. [1]
    (ii) straight segments PT and QR. [1]
    (iii) straight segment TS and SR. [1+1]
    (iv) Total field intensity at O. [1]

17. a) Why is the potentiometer preferred to a voltmeter to measure the emf of a cell.[2]
b) The driver cell of a potentiometer has an emf of 2V and negligible internal resistance. The potentiometer wire has a resistance of 3Ω. Calculate the resistance needed in series with the wire if p.d. of 5mV is required across the whole wire. [3]

18. a) Does an electron deflect in electric & magnetic field? Explain [2]
b) In a Millikan typed apparatus, the horizontal plates are 1.5 cm apart. When the electric field switched off, an oil drop is observed to fall with steady velocity 2.5×10^{-2} cm/s. When electric field is switched on, the upper plate being positive, the drop just remains stationary when the potential difference between plates is 1500 V. (i) calculate the radius of the drop. (ii) How many excess electronic charges does it carry? (Neglect the air resistance, η for air = 1.8×10^{-5} Nsm^{-2}, density of oil = 900 kg/m^3) [1+2]

19. a) Define decay constant for a radioactive substance and deduce the expression $N = N_0 e^{-\lambda t}$. [3]
b) If 15% of the radioactive material decays in 5 days, what would be the percentage of amount of original material left after 25 days? [2]

GROUP C

LONG ANSWER QUESTIONS: **(3×8=24)**

20. a) Write down the Newton's formula for the velocity of sound in air [1]
b) Explain, why this formula has to be modified [1]
c) Discuss Laplace's correction and derive the formula for the velocity of sound in a gas [3]
d) A source of frequency 550Hz emits waves of wavelength 60 cm in air at 20°C. What would be the wavelength of sound from the source in air at 0°C.? [3]

21. When a current carrying conductor is placed in a magnetic field it experiences a magnetic force.
a) Derive the expression for the force experienced by the current carrying conductor in a magnetic field. [3]
b) Write the expression of the force in vector form. [1]
c) Does a current carrying conductor in a magnetic field always experienced force [1]
d) A horizontal straight wire of length 5cm and weighing 1.2g/m is placed perpendicular to a uniform horizontal magnetic field of flux density 0.6T. if the resistance of the wire is 3.8 Ω/m. Calculate the potential difference that has to be applied between the end of the wire to make it just self-supporting. [3]

OR

a) State Biot-Savart's law. [1]
b) Derive the relation for the magnetic field along the axis of a solenoid carrying current. [3]
c) Sketch the nature of curve of variation of magnetic field intensity with the distance along its axis. [1]
d) A solenoid having 1000 turns per meter carries a current 2 A. Calculate the magnetic field intensity at its (i) center (ii) ends [2+1]

22. a) Write the postulates of Bohr's model of atom [2]
b) Obtain the expression for total energy of electron in n^{th} orbit of H-atom [3]
c) Explain, why electrons can't lie inside the nucleus [1]
d) Find the wave length of radiation emitted from hydrogen atom when an electron jumps from third orbit to second orbit . ($\epsilon_0 = 8.854\times10^{-12}$ N^{-1}m^{-2}, $h = 6.62\times10^{-34}$ Js, mass of electron = 9.1×10^{-31} kg) [2]

OR

Einstein got Nobel prize in physics in 1921 for discovery of the law of the photoelectric effect which became a pivotal step in the development of quantum theory. Answer the following questions:
(a) What do you mean by quantum theory of radiation? [2]
(b) Derive the relation $eV_o = h(f - f_o)$, where V_o is the stopping potential, taking Einsein's photoelectric equation. [3]
(c) A laser pointer with a power output of 5.00 mW emits red light of wavelength 650 nm. (a) What is the magnitude of the momentum of each photon? (b) How many photons does the laser pointer emit each second? [2+1]

Good Luck

1.33x10^11 4.53x10^-7