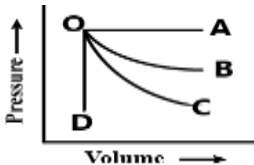# HISSAN CENTRAL EXAMINATION - 2080 (2024)

Class: XII **Subject: Physics** **Subject Code: 1021 D1**

F.M: 75 (11 Marks Obj+ 64 Marks Sub) **Time : 3hrs**

Group A: Multiple Choice Question [11 × 1 = 11] Time: 25 Minutes
Attempt all questions.
Rewrite the correct option in your answer sheet.

1. The ratio of the magnitudes of angular velocity of the hour hand of a watch to that of earth's rotation about its own axis is
   a) 2:1 b) 1:3 c) 1:1 d) 3:2

2. The maximum velocity of a particle executing SHM with amplitude 7 mm is 4.4 m/s. The time period of oscillation is
   a) 0.10 sec b) 0.01 sec c) 10.0 sec d) 1.00 sec

3. Surface tension of liquid is independent with…….
   a) Density b. temperature c. intermolecular force d. volume of liquid

4. In the given P-V diagram curve OC represents...
   a) Isothermal process
   b) Adiabatic process
   c) Isochoric process
   d) Isobaric process

5. The refrigerator works on the principle of
   a) First law of thermodynamics b) Second law of thermodynamics
   c) Stefan's law d) Zeroth law of thermodynamics

6. If the speed of sound in air at 20°C is 344m/s, the change in speed for 1°C change in air temperature is
   a) 0.273 m/s b) 0.425 m/s c) 0.587 m/s d)0.873 m/s

7. The ratio of frequencies (a), (b) and (c) is
   a) 1:2:3
   b) 1:3:5
   c) 3:2:1
   d) 5:3:1

8. Which of the following pair of metals gives maximum thermo-emf?
   a) Cu - Sb b) Cu - Fe c) Fe - Pb d) Sb–Bi
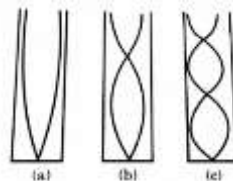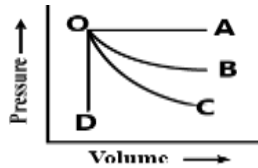
9. Current sensitivity of a moving coil galvanometer is 5div/mA and its voltage sensitivity is 20 div/V. The resistance of the galvanometer is
   a) 50 Ω b) 100 Ω c) 250 Ω d) 500 Ω

10. Electromagnets are made of soft iron because soft iron has
    a) Low retentivity and high coercivity
    b) High retentivity and high coercivity
    c) Low retentivity and low coercivity
    d) High retentivity and low coercivity

11. A hydrogen atom is in its third excited state. How many spectral lines can be emitted by it before coming to the ground state?
    a) 5 b) 4 c) 6 d) 3

HISSAN CENTRAL EXAMINATION - 2080 (2024)

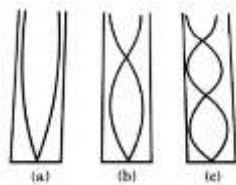**Class: XII** **Subject: Physics** **Subject Code: 1021 D1**

F.M: 75 (11 Marks Obj+ 64 Marks Sub) **Time : 3hrs**

Attempt all questions.

## GROUP B

Short Answers Question: [8×5=40]

12. a) State and explain the principle of conservation of angular momentum. [2]

b) Why the angular velocity of the earth decreases when it is struck by a asteroid? [1]

c) A wheel of moment of inertia, 0.40 kgm^2 is rotated steadily at 140 rad/s by an electric motor. Calculate the value of frictional couple opposing the rotation if time taken for the wheel to come to rest is 2.00 sec, after the motor has been switched off. [2]

13. a) The displacement (y) of a particle executing simple harmonic motion is $y = r \sin \omega t$, where r is the amplitude of vibration.

I) Define frequency. [1]

II) Calculate the acceleration of the motion. [2]

b) A body of mass 2 kg is suspended from a spring of negligible mass and is found to stretch the spring by 0.1m. Calculate the force constant and the time period**. [2]

OR

In an experiment shown in figure a spherical ball of radius ' r ' and density ' ρ ' falls freely through the glycerine of density $'\sigma'$.

a. Write the name of components of forces acting on the body by drawing free body diagram. [1]

b. If the drop soon attains constant downward velocity, then find the expression of the coefficient of viscosity. [2]

c. A capillary tube of 0.55mm diameter is placed vertically inside a liquid of density of 810 kg/m^3 surface tension 5.0×10^{-2} N/m
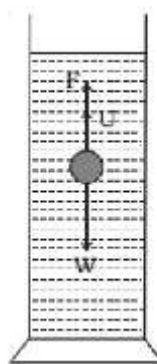
and angle of contact of 30^0.Calculate the height to which liquid rises in the capillary tube. [2]

14. a) What is the basic difference between the first law and the second law of thermodynamics? [1]

b) What is heat engine? Discuss the function of components of heat engine shown in figure hence find its efficiency. [3]

c) Why does diesel engine need no spark plugs? [1]
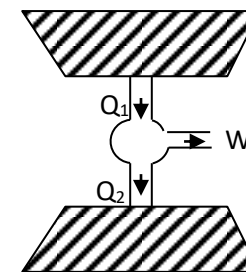
15. A Flute is important musical instrument in Nepal.

a) Find the frequency of vibration in different mode for a closed organ pipe. [3]

b) Calculate the frequency of a sound produced by a 25 cm long organ pipe open at both ends and being played in the first harmonic. [Velocity of sound in air = 342 m/s] [2]

16. a) What is potentiometer? Why the potential gradient of potentiometer wire must be small? [2]

b) Potentiometer wire of length 100 cm has a resistance of 10Ω. It is connected in series with a resistance and a cell of emf 2V and negligible internal resistance. A source of emf of 10 mV is balanced by a length of 40cm of the potentiometer wire. Find the value of the resistance. [3]

17. a) State and explain Lenz's law. [2]

b) How this law is in accordance with law of conservation of energy? [1]

c) A Nepal Airlines wide body plane with a wingspan of 35m flies with a ground speed of 1000km/hr in a direction due east at constant attitude in a region of the northern hemisphere where the vertical component of the earth's magnetic field is 1.6x10^{-5}T. Find the p.d in volts that exist between the wingtips. [2]

18. A light can be converted into electrical energy.

a) Write down the required photoelectric equation to convert light energy into kinetic energy of electrons. Explain the terms evolving in the equation. [2]

b) The photo electric work function of a metal is 1.35 eV.
   (i) What is the longest wavelength that can cause photoelectric emission from the metal?
   (ii) What is the maximum velocity with photoelectrons will be emitted from the metal surface when illuminated with light of wavelength 4×10^{-7} m?
   $(h = 6.6 \times 10^{-34}$Js , c = 3 x 10^{8} m/s; m= 9.1×10^{-31} Kg] [3]

19. a) What are X-rays? [1]
    b) How can we control quality and intensity of X-ray in Coolidge tube. [2]
    c) Find the maximum frequency of the X-rays emitted by the X-rays tube operating at 30kV. What is the minimum wavelength?[c = 3×10^{8} m/s] [2]

OR

a) What is P-N junction diode? How it is formed? [2]
b) Explain the action of two junction diodes as a full wave rectifier. [3]

GROUP C

Long Answer Question: **[3 × 8=24]**
20. a) A student wants to study interference pattern. Explain how he/ she can produce interference pattern using a source. [2]
    b) Prove that width of bright fringe and dark fringe in the interference pattern are equally spaced. [3]
    c) A diffraction grating has 400 lines per mm and is illuminated normally by monochromatic light of wavelength 590 nm. Calculate (i) the grating spacing (ii) the angle to the normal at which first order maximum is seen. [3]

21. a) What are the difference values of a.c.? [2]
    b) Discuss the phase relation between the voltage and current in the a.c. circuit containing capacitor and resistor in series and hence derive an expression for the impedance for the circuit. [3]
    c) An iron cored coil of 2H and 50Ω resistance is placed in series with a resistor of 950 Ω and 220V, 50Hz a.c. supply is connected across the arrangement. Find (i) the current flowing through the circuit (ii) the voltage across the coil. [3]

OR

a) How does a current loop behave as a magnetic dipole? [1]

b) State and explain Biot – Savart law. [2]
c) Use this law to find the magnetic field at the center of the current carrying circular coil. [2]
d) Calculate the flux density at a distance of 1cm from a very long vertical straight wire carrying   a current of 5A. At what distance from the wire will the flux density becomes 2×10^{-5} T when the current is halved?
   [$\mu_0 = 4\pi \times 10^{-7}$Hm^{-1}] [3]

22. a) How Millikan's experiment explains the quantum nature of electric charge? [2]
    b) Why is the electron's motion in magnetic field circular? Prove that frequency and time period are independent of velocity of the electron. [3]
    c) An electron and proton moves with same speed in a uniform magnetic field of equal magnitude compare the radii of their circular path. [3]

OR

a) What is Radioactivity? [1]
b) A physics professor explains about the formation of nitrogen $_7N^{14}$ from radioactive carbon $_6C^{14}$. Is it possible? Give the suitable nuclear reaction. [2]
c) Radioactive carbon disintegrates according to certain laws of radioactive disintegration. What are the laws of radioactive disintegration? [2]
d) Radium has a half-life of 1620 years. Find the time after which its activity is reduced to 1/10 of original value [3]

THE END