

(a) What is angular momentum? Write its S.I. units and dimensions.

(b) A disc of moment of inertia  $5 \times 10^4 \text{ kg m}^2$  is rotating freely about the axis through its centre at 40 rpm. Calculate the new revolution per minute if some wax of mass 0.02 kg is dropped gently on to the disc 0.08 m from the axis.

- a. Does the moment of inertia of a body become zero as soon as it stops rotating? Explain.
- b. Define the terms: couple and moment of a couple.
- c. Derive an expression for the work done by a couple.
- a. Can a system have rotational kinetic energy without having angular momentum?
- b. Can a system have angular momentum without having rotational kinetic energy?
- c. If the radius of the earth suddenly doubles, how will the duration of a day change?
- a. State principle of conservation of angular momentum and explain its one application in daily life.
- b. A constant torque of 200 Nm turns a wheel about its center. The moment of inertia about the axis is  $100 \text{ kg m}^2$ . Find the angular velocity gained in 4 seconds and the kinetic energy gained after 10 revolutions.

(a) Why is it that a long jumper keeps his body long and straight before the jump, but a diver keeps his body slightly curled up?

(b) Derive relation between torque applied and angular acceleration produced in a rigid body and hence define moment of inertia.

(a) Define moment of inertia of a rigid body and give its analogy in translational motion.

(b) A 40 kg flywheel in the form of a uniform circular disc of 1 m radius is making 120 rpm. Calculate the angular momentum.

(a) What is radius of gyration?

(b) The torque of the weight of any body about any vertical axis is zero. Is it always correct?

(c) When tall buildings are constructed on earth, the duration of day-night slightly increases. Is it true?

(a) Write down the characteristics of SHM.

(b) What do you mean by resonance? Explain this phenomenon with an example of a bridge collapsed during storm.

(a) The time period of a simple pendulum is one second. What does it mean?

(b) A pendulum clock shows accurate time. If the length in summer increases by 0.1%, deduce the error in time per day.

(c) On what factors does its time period depend?

(a) Show that the motion of a vertical spring is SHM.

(b) Why does a spring clock give accurate time even on the moon which is not possible by a pendulum clock?

(a) What are the drawbacks of a simple pendulum?

(b) The time taken by a simple pendulum to perform 100 vibrations is 8 min 9 sec in Janakpur and 8 min 20 sec in Kathmandu. Calculate the ratio of acceleration due to gravity in Janakpur and Kathmandu.

(c) How does time period change with acceleration due to gravity?

(a) Derive the time period of simple pendulum.

(b) A simple pendulum has a period of 2s and oscillated with an amplitude 10 cm. Find its frequency and maximum speed.

(c) At what points of the swings is the acceleration of the pendulum bob a maximum? Calculate this acceleration.

A body is vibrating with SHM of amplitude 15 cm and frequency 4Hz.

(a) Find the maximum acceleration and velocity.

(b) What will be the acceleration and velocity when displacement is 9 cm.

(c) Find the time required to move from the mean position to a point 12 cm distance from it.

(a) Obtain the equation of SHM  $y = a \sin \omega t$ .

(b) Does time period of a particle in SHM depend on amplitude? If a particle moving with frequency 5 Hz and amplitude 0.5 km then find its maximum speed.

(c) Does its acceleration increase with increase in velocity? Find its maximum acceleration.

(a) Derive energy associated with a particle in SHM.

(b) Show graphically how kinetic energy and potential energy of the particle vary with distance from mean position.

(c) A particle in SHM has amplitude  $A$ . At what distance from the mean position is its kinetic energy is equal to its potential energy

- a. state joules law of heating.
- b. discuss experimental verification of the law with well diagram.

- a. define term phase difference and path difference of a wave.
- b. what is progressive wave. write the progressive wave equation.

- a. what is stationary wave.
- b. show that distance between two consecutive nodes or antinodes is  $\lambda/2$  in stationary wave.

- a. discuss about depending factors of velocity of longitudinal wave in a medium
- b. discuss newtons formula and derive laplace correction of it.
- c. calculate the velocity of sound in air at 500K given molecular mass of air is  $28.8 \times 10^{-3}$  kg

a. what is interference of light ? 1

a. Why don't two independent sources of light produce interference? 1

b. What is the effect on the interference fringes in Young's double slit experiment due to each of the following operations ? Justify your answers.

(i) The screen is moved away from the plane of the slits. 1

(ii) The separation between slits is increased. 1

(iii) The source slit is moved closer to the plane of double slit. 1

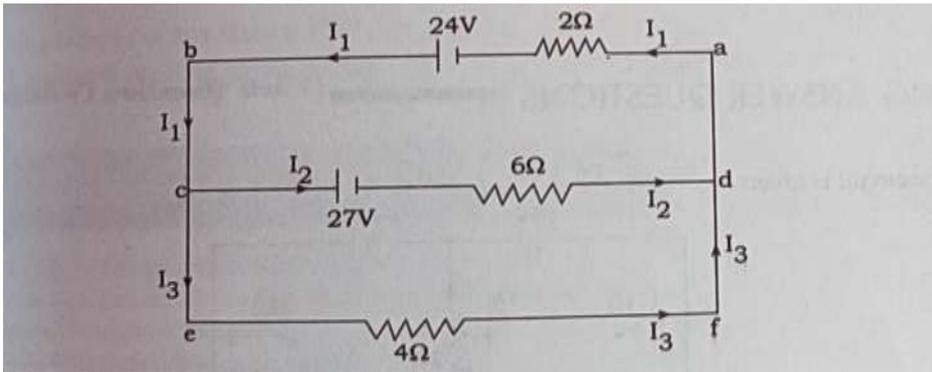
- a. define adiabatic process .
- b. Derive the relation  $PV^\gamma = \text{constant}$ .
- a. what is isothermal process
- b. derive work done in isothermal process.
- c. five moles of an ideal gas are kept at constant temperature of 530c while the pressure of the gas is increased from 1atm to 3atm. calculate work done by the gas.

- a. Ammeters are always connected in series in an electric circuit. Why? 2
- b. How can you convert galvanometer into ammeter? 3

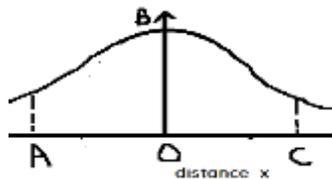
- a. What is the importance of Millikan's Oil drop experiment? 1
- b. How can mass of an electron be determined? 2
- c. A cathode ray tube is operating at 10 kV. Calculate the speed of electron. 2

- a. What is photoelectric effect? 2
- b. Alkali metals are preferred in photoelectric effect. Why? 2
- c. Electrons with maximum kinetic energy of 3 eV are ejected from a metal surface by ultra-violet radiation of wavelength  $1.5 \times 10^{-7}$  m. Determine work function, threshold wavelength and the stopping potential for the metal (Planck's constant,  $h = 6.62 \times 10^{-34}$  Js)

- a. State Kirchhoff's laws. 2
- b. Using Kirchhoff's laws obtain the balanced condition of Wheatstone's bridge circuit. 3
- c. using following figure find currents  $I_1$   $I_2$   $I_3$  3

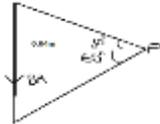


- a. state Ampere circuital law. 1
- b. The graph represents the variation of magnetic field B along the axis of a circular loop of radius R. Write the appropriate equation at point O for which  $x = 0$  and at point C of distance x from O..



- c. A closely wound coil has a radius of 6.00 cm and carries a current of 2.50 A. How many turns must it have, if at a point on the coil axis 6.00cm from the center of the coil, the magnetic field is  $6.39 \times 10^{-4} \text{ T}$  2

- a. state and explain Biot-savart law.[2]  
 b. use it to find out the magnetic field at a point due to a current carrying straight conductor [3]  
 c. calculate magnetic field at point P in the figure [3]



(a)State briefly the processes involved in the formation of p-n junction explaining clearly how the depletion region is formed. 2

(b) Using the necessary circuit diagrams, show how the V-I characteristics of a p-n junction are obtained in 2

(i)Forward biasing

(ii) Reverse biasing

© How these characteristics are made use of in rectification? 1

In latest electronic devices, there is no need of external Voltage Stabilizer.

- a) Does it means that these devices works in a.c? (1)  
 b) How the Zener Diode differs from normal p-n junction diode? (1)  
 c) How does the Zener diode work to stabilize the d.c output? (3)

- a) Can one photon eject more than one electron at a time? Explain. 1  
 b) Copper and sodium have work function 4.5eV and 2.0eV respectively. Radiation of Wavelength 4000A falls on the two surfaces. Can there be photoelectric emission in both metals? 2  
 c) Explain, how photoelectric effect is used in fire alarms. 2

