First Terminal Examination - 2081

Subject: Physics **Set:B** **Grade: XII**

Time: 3 hrs. **F.M = 75 marks**

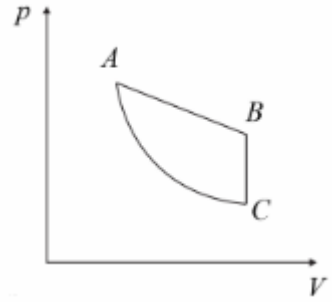
Attempt All Questions.

Group A

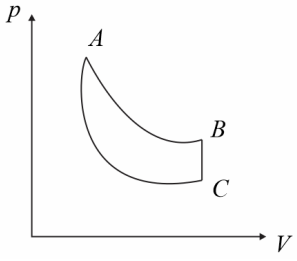
Write the best alternative to the following questions. **(11×1 = 11)**

1. If the rotational kinetic energy of the body is and moment of inertia is , then the angular momentum is
   (a) (b) (c) 2 (d)
2. In thermodynamics, which of the following statements are true?
   (i) Work is path independent function
   (ii) Work is a path dependent function
   (iii) Work is the area under the curve in an indicator diagram
   (iv) Work and heat energy are completely interchangeable
   (a) I and IV (b) I and II (c) III and IV (d) II and III
3. If AB = isothermal, BC = isochoric, AC = adiabatic. Which of the following graph correctly represents them?

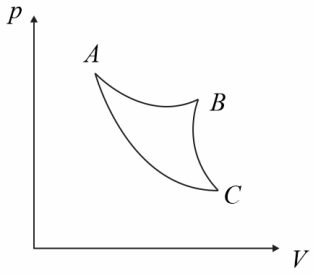
(a)



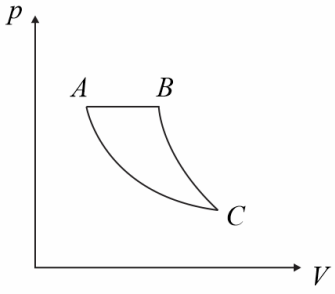
(b)



(c)

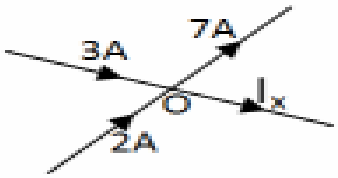


(d)

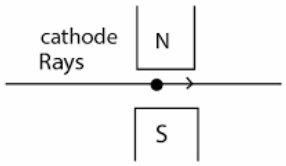


4. The displacement of a particle is given by the equation where x and y is in metre. velocity of propagation of the wave is
   a. 2 m/s b. 150 m/s c. 500 m/s d. 2500 m/s

5. What is the effect of humidity on the sound waves when humidity increases ?
   (a) Speed of sound waves is more.
   (b) Speed of sound waves is more.
   (c) Speed of sound waves remains the same.
   (d) Speed of sound waves becomes zero.
6. A cylindrical tube open at both ends have a fundamental frequency in air. The tube is dipped vertically in water, so that half of it is in water. The fundamental frequency of air column is
   (a) (b) (c) (d)
7. From the given diagram, using Kirchhoff's law, the value and actual dire
   (a) -2A and towards O (b) 2A and towards O
   (c) 2A and same as in figure (d) 12A and same as in figure



8. If thermoemf of a thermocouple whose one junction is kept at 0 is given by the relation , then the neutral temperature will be
   (a) (b) (c) (c)
9. An electron is injected perpendicular to the direction of magnetic field. Inside the field its
   (a) Both kinetic energy and linear momentum changes
   (b) Kinetic energy changes but linear momentum remains same
   (c) Kinetic energy remains same but linear momentum changes
   (d) Both kinetic energy and linear momentum remain same
10. Cathode rays are made to pass between the poles of a magnet as shown in fig. The effect of magnetic field is



   a. To deflect them towards the north pole.
   b. To deflect them towards the South pole.
   c. To increase the velocities of rays
   d. To deflect them upwards above the plane of paper.
11. Light of frequency 3/2 times the threshold frequency is incident on the metal surface. If the intensity is halved and frequency is doubled, the photoelectric current becomes
   (a) zero (b) halved (c) doubled (d) quadrupled

Group 'B'

12. Gases have two molar heat capacities. Molar heat capacities at constant volume (C_v) and molar heat capacity at constant pressure (C_p).
   (a) C_p is greater than C_v. Why? [2]
   (b) Derive the relation between them. [3]

OR

(a) What is indicator diagram. [1]

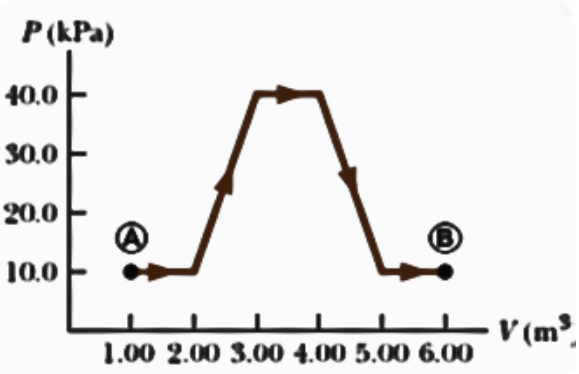
(b) A cylinder containing 10 moles of mono-atomic ideal gas expands from A to B along the path as shown in the figure.

(i) Find the temperature of gas at point A and B. [1]

(ii) How much work is done by the gas during this expansion? [1]

(iii) What is the change in internal energy of the gas? [1]

(iv) Find the energy transferred to the gas by heat in this process. [1]



13. (a) How can you show experimentally that there is a transfer of energy by the wave? [2]

(b) Show that the distance between two successive nodes in a stationary wave is half of its wavelength. [3]

14. (a) Explain the effect of temperature and pressure on velocity of sound in gases. [2]

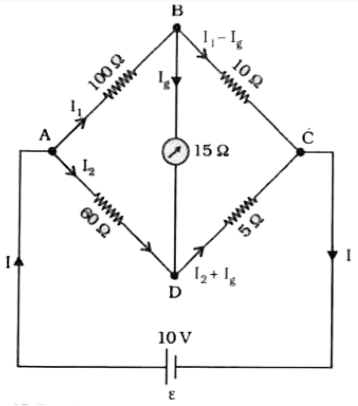
(b) Calculate the temperature at which sound in hydrogen travels with same velocity as in helium at 373K. The density of hydrogen is half of helium. [3]

15. (a) Prove with necessary diagram, that all harmonics can be obtained in an organ pipe closed at both ends. [3]

(b) An organ pipe produces a fundamental frequency of 147 Hz. When blown forcefully, it produces first overtone of 588 Hz. Is the pipe open or closed? Explain. [2]

16. (a) State two basic Kirchhoff's Laws. [2]

(b)The four arms of a Wheatstone bridge have the following resistances . AB= 100Ω, BC= 10Ω, CD= 5Ω, and DA= 60Ω . A galvanometer of 15 Ω resistance is connected across BD. Calculate the current through the galvanometer when a potential of 10 V is across AC. [3]



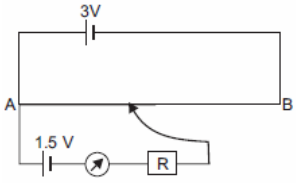
OR

(a) How can you convert a galvanometer into ammeter. Explain [2]

(b) A potentiometer wire of length 1m is connected to a driver cell of emf 3V as shown in the figure. When a cell of 1.5V emf is used in the secondary circuit, the balance point is found to be 60cm. On replacing this cell and using a cell of unknown emf, the balance point shifts to 80cm.

(i) Calculate unknown emf of the cell. [1]

(ii) Explain with reason, whether the circuit works, if the driver cell is replaced with a cell of emf 1V. [1]



(iii) Does the high resistance R, used in the secondary circuit affect the balance point? Justify our answer. [1]

17. (a) Differentiate between Seebeck and Peltier effect. [2]

(b) Thermoelectric effect is a process of generating thermal current in current carrying conductor. Thermo emf of a copper iron thermo couple, on junction of which is kept at 0°c is given by $E = a\theta + b\theta^2$, where a = 16 μV $°C^{-1}$ and b = -0.02 μV $°C^{-2}$. Compute it

i) neutral temperature [1]

ii) temperature of inversion and [1]

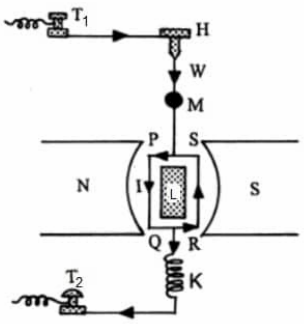
iii) The maximum emf of a copper. [1]

18. The schematic diagram of a moving coil galvanometer is shown in the figure alongside.

(a) On what principle does it depend.? [1]

(b) Show that current through the coil is directly proportional to the deflection of the coil. [2]

(c) "Increasing the current sensitivity of a galvanometer may not necessarily increase its voltage sensitivity". Justify this statement. [2]



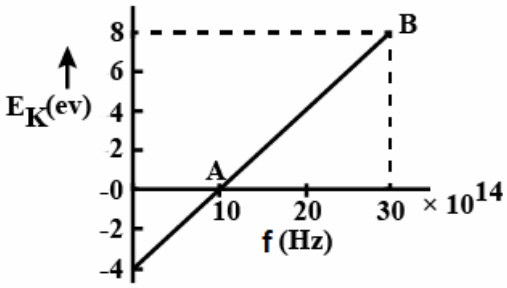
19. (a) Explain the effect of potential on photoelectric current with necessary graph. [2]

(b) In the graph aside,

(i) What does the slope and intercept of versus graph give? [1]

(ii) Find the Plank's constant (h). [1]

(iii) Calculate the work function of a metal analyzing the graph. [1]



Group 'C'

10.

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

(b) If the earth were to shrink suddenly, what would happen to the length of the day? Give reason. [2]

(c) A wheel of moment of inertia 20Kgm^{2}about and axis is rotated from rest about its center by a constant torque and the energy gained in 10s is 360J. Calculate

(i) The angular velocity at the end of 10s. [1]

(ii) Torque . [1]

(iii) The number of revolutions made by the wheel before coming to rest if torque is removed at 10s and a constant opposing torque of 4Nm is then applied to the wheel. [2]

11. (a) State and explain Biot- Savart law of in magnetism. [2]

(b) Using Biot – Savart find the magnetic field intensity due to a long current carrying conductors. [3]

(c)A straight horizontal rod of length 20 cm and mass 30 gm is placed in a uniform horizontal magnetic field of flux density of 0.6T. If the resistances per unit length of the wire is 3.8Ω m^{-1}, calculate the p.d that has to be applied between the ends of the wire to make just self - supporting. [3]

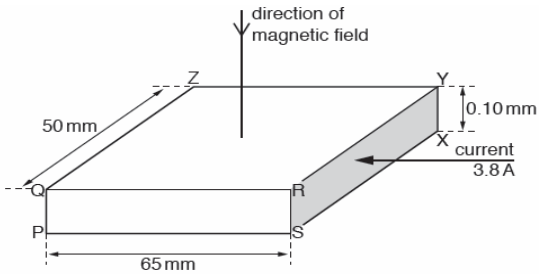
OR

(a) What is hall effect. [1]

(b) Deduce an expression for hall voltage. [3]

(c) Hall voltages are much larger for semiconductors than for conductors of comparable dimensions, current and fields. Why? [2]

(d) A thin rectangular slice of aluminium has sides of length 65 mm, 50 mm and 0.10 mm as shown in figure.

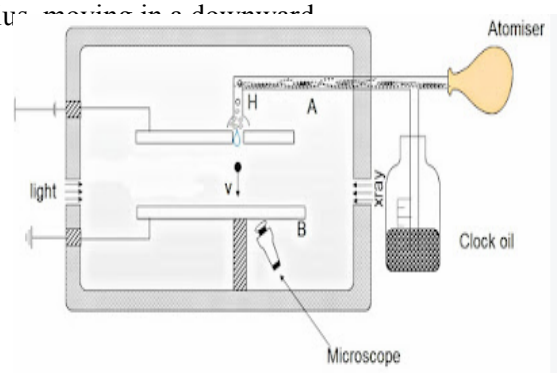


A current I of 3.8 A is normal to face RSXY of the slice. In Aluminium, the number of free electrons per unit volume is . A uniform magnetic field of magnetic flux density B equal to 0.13T is normal to face QRYZ of the Aluminium slice in the direction from Q to P. Calculate the magnitude of Hall voltage. [2]

12. Figure represents the experimental arrangement for Millikan's oil drop experiment.

(a) What happen if water is used instead of clock oil in this experiment. [2]

(b) Find the expression for the charge of an oil drop of radius moving in a downward direction with constant velocity using free body diagram. [2]



(c) Write down the expression for the charge of an oil drop if electrostatic fore is greater than its weight. [1]

(d) In a Millikan's oil drop experiment, a drop is observed to fall with a terminal speed 1.4 mm/s in the absence of electric field, when the vertical electric field of is applied, the droplet is observed to continue to move downward at a lower terminal speed 1.21 mm/s. calculate the charge on the drop. () [3]

Best of luck