

HISSAN CENTRAL EXAMINATION - 2079 (2022)

Class: XII

PHYSICS (1021 - M1)

F.M : 75

(11 Marks Obj+ 64 Marks Sub)

Time: 3hrs

GROUP A

Multiple Choice Question

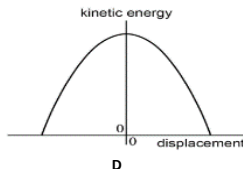
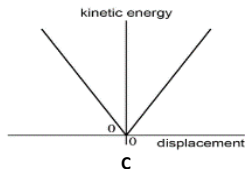
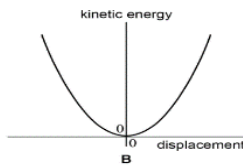
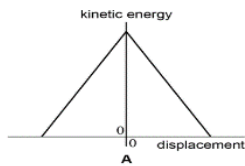
Time: 25 Minutes

Attempts all questions.

Tick the correct answer.

[11 × 1 = 11]

- If a body of moment of inertia I is rotating about an axis with angular acceleration of α then the expression of torque on it is,
a) $\frac{I\alpha^2}{2}$ b) $I\alpha$ c) $2I\alpha$ d) $\frac{\alpha}{I}$
- Which graph best shows how the kinetic energy of a simple pendulum varies with displacement from the equilibrium position?

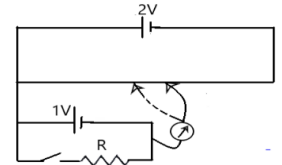


- a. A b. B c. C d. D

- Work done is maximum in
a) Isothermal process b) Adiabatic process
c) Isochoric Process d) Isobaric process
- The intensity of sound ' I ' and amplitude of vibration ' a ' are related as
a) $I \propto a$ b) $I \propto a^2$ c) $I \propto 1/a$ d) $I \propto 1/a^2$

- Diffraction is more prominent in sound as compared to light because
a) $\lambda_{\text{sound}} < \lambda_{\text{light}}$ b) $\lambda_{\text{sound}} > \lambda_{\text{light}}$
c) $V_{\text{sound}} > V_{\text{light}}$ d) $f_{\text{sound}} > f_{\text{light}}$

- Null point with 1 V cell in open circuit comes out to be 55 cm and in closed circuit with $R = 10 \Omega$ is 50 cm. What is the internal resistance of the cell ?
a) 0.5Ω b) 0.4Ω c) 1Ω d) 0.2Ω



- Magnetic field is not caused by
a) stationary Charge b) moving negative charge
c) moving positive charge d) moving positive and negative charges
- The value of thermo-emf is maximum for thermocouple
a) Fe-Cu b) Sb-Bi c) Zn-Pb d) Si-Cu
- What is the relationship between total energy and principal quantum number of an electron in an atom?
a) increases with increasing quantum number
b) decreasing with increasing quantum number
c) no relationship with quantum number
d) depends on the nature of the atom
- When a beam of electrons enters into a uniform magnetic field normally, the path of the electron beam will be
a) spiral b) circular c) straight line d) hyperbolic
- Which wave gives the feeling of most of the shocking during earth-quake?
a) Primary wave b) Secondary wave
c) Love wave d) Rayleigh wave

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GROUP B

Attempt all questions.

Short Answers Question:

[8×5=40]

1. Earth is rotating about its axis with time period of 24 hours.

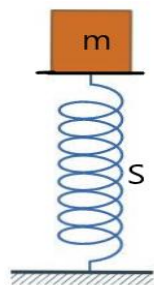
(i) If a massive meteorite hits the earth, how is it affect the time period of the earth? [2]

(ii) If the earth shrinks and decreases the MI by 10%, calculate the new time period of the earth. [3]

2. (i) What are the conditions for a motion to be simple harmonic? [1]

(ii) When the body is executing SHM, where will be the maximum velocity and acceleration (magnitude)? [2]

(iii) Mass of 2 kg is put on a flat Pan attached to a vertical spring fixed on a ground shown in the figure. The mass of the pan and the spring is negligible. When pressed slightly and released the mass executes SHM. The spring constant of the spring is 200 N/m, find the time period of vibration. [2]



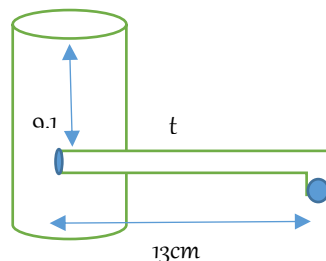
OR

(i) Write the expression of upthrust when a body of volume 'V' is completely immersed in a liquid of density 'ρ'.

[1]

(ii) The volume flow rate V of a viscous liquid undergoing steady flow through a tube of length L and radius r is

$V = \frac{\pi r^4 P}{8\eta L}$ where η is the viscosity of liquid, P is pressure difference between the ends of the tube.



Water of density 1000kg/m^3 flows out of a container through a tube of length 13cm and internal diameter 1.8mm as shown in figure. When the axis of the tube is at a depth of 9.1cm below the water surface, water runs out of the tube at a rate of $1.5 \times 10^{-6}\text{m}^3\text{s}^{-1}$.

a) Calculate the pressure of liquid at the tube. [2]

b) Determine the viscosity of the water. [2]

3. (i) Explain why we feel cold when we blow the air on our hand through small opening of our mouth. [2]

(ii) What is the change of entropy of 2 kg of ice that is melted reversibly at 0°C and converted to ice at 0°C reversibly?

(The heat of fusion of water is $L_f = 3.34 \times 10^5 \text{ J/kg.}$) [2]

(iii) State second law of thermodynamics. [1]

4. (i) When a monochromatic light is incident on two slits of the same width an interference pattern is produced. One slit is then covered with opaque black paper. What is the effect of covering one slit on the resulting interference pattern? [2]

(ii) Monochromatic light from a narrow-slit illuminates two narrow slits 0.3mm apart, producing an interference pattern with bright fringes 1.5mm apart on a screen 75cm away. Find the wavelength of light and how will the fringe-width change if the distance of the screen is double. [3]

OR

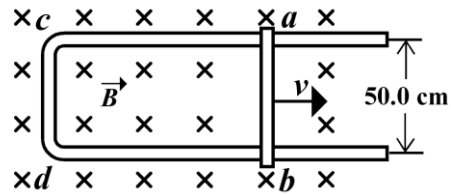
(i) Does the velocity of sound in air depend on pressure or density? Explain. [2]

(ii) Write Newton's formula for velocity of sound and show how Laplace corrected it. [3]

5. Kirchhoff's rules are applied in complex circuits

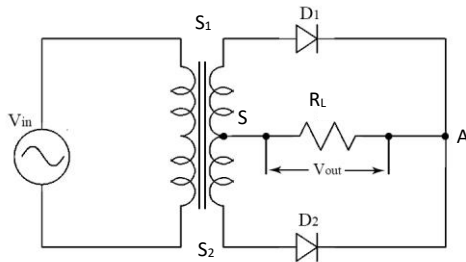
- (i) State Kirchhoff's laws. [2]
- (ii) Use Kirchhoff's rules to find balance condition in Wheatstone bridge circuit. [3]

6. i) The conducting rod ab shown in the adjacent figure makes contact with metal rails ca and db . The apparatus is in a uniform magnetic field of 0.800T , perpendicular to the plane of the figure.



- a) Find the magnitude of the emf induced in the rod when it is moving toward the right with a speed 7.50 m/s . [2]
- b) In what direction does the current flow in the rod? [1]
- (ii) The small coil has cross sectional area $1.0 \times 10^{-4}\text{m}^2$ and contains 75 turns of wire. A constant current in the solenoid produces a uniform magnetic field of flux density 1.4mT through the small coil and direction of current in the solenoid is reversed in 0.12s . Calculate the average emf induced in the small coil. [2]

7. The circuit for full-wave rectifier is shown in fig.



A resistor R_L is connected across output AS .

- (i) Which diode conducts when S_1 is positive with respect to S ? (1)

(ii) What is the direction of current across R_L ? (1)

(iii) Sketch the graph showing nature of input signal, output signal with explanation of working. (3)

8. In a Thomson setup for the determination of e/m , accelerated electrons enter the region of cross field.

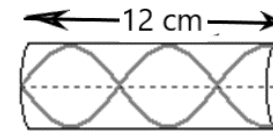
- (i) What do you mean by cross field? [1]
- (ii) How e/m is determined? [3]
- (iii) Write the value of specific charge of electron. [1]

GROUP C

Long Answer Questions.

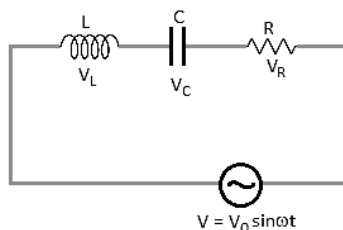
[3 × 8 = 24]

9. (i) An organ pipe is shown in the adjacent figure.



- a) Copy the diagram and write the position of nodes and antinodes formed in the wave. [1]
- b) If length of the tube is 12 cm , find the wavelength of the wave formed in the tube. [2]
- c) If the tube is open at both ends, draw the nature of wave formed in second overtones. [2]
- (ii) Find the apparent frequency of sound wave when source and observer are approaching each other. [3]

10. a) In the given figure, an inductor of inductance L , a capacitor of capacitance C and a resistor of resistance R are connected in series and the combination is then connected to an alternating source of emf.



- i) Draw a phasor diagram for the circuit. [1]
 - ii) Calculate the impedance of the circuit. [2]
 - iii) If $L = 0.5\text{H}$ and $C = 20\ \mu\text{F}$, find the resonant frequency of the circuit. [2]
 - iv) Give and application of resonating a.c. circuit. [1]
- b) Why is 220V ac more dangerous than 220V dc? Explain. [2]

OR

- (i) What is the principle of a moving coil galvanometer? Why do you prefer radial field in the galvanometer? [2]
 - (ii) What do you mean by current sensitivity and voltage sensitivity? [2]
 - (iii) Obtain an expression of magnetic field due to a current straight carrying conductor. [3]
 - (iv) Write mathematical expression of Lorentz force on a charge particle moving in a magnetic field. [1]
11. (i) Can we explain photoelectric effect on the basis of wave theory of light? Justify your answer [2]
- (ii) Describe an experiment to determine Planck constant. [3]
- (iii) LEDs (Light Emitting Diodes) are the most energy-efficient bulbs available, and will save money on your energy bills as they are much cheaper to run. Find the number of photons emitted per second by the LED of 15 W considering the wavelength of visible light as 600 nm. [3]

$$h = 6.62 \times 10^{-34} \text{ Js } c = 3 \times 10^8$$

OR

- (i) A radioactive substance emits α , β particles and γ -rays, show, in diagram, their deflection when they are subjected in an electric field normally. [2]
- (ii) An isotope of potassium ${}_{19}\text{K}^{40}$ is used to date rocks. It decays into an isotope of argon (Ar) mainly by electron capture. The decay is represented by this equation:

$${}_{19}\text{K}^{40} + {}_{-1}\text{e}^0 \rightarrow \text{Ar} + \text{---}$$

Complete the equation to show the decay by filling in the gaps. [2]
- (iii) Write the SI unit of radioactivity. [1]
- (iv) Electrons, each having a kinetic energy of $2.04 \times 10^{-18} \text{ J}$, collide with atoms of hydrogen in their ground state. The H- atoms go to the excited states and photons are emitted when the atoms de-excite.

_____	-0.54eV
_____	-0.85 eV
_____	-1.51 eV
_____	-3.4 eV
_____	-13.6 eV

- a) In which excited state the atoms will be after absorbing the energy of the incident electron? [2]
- b) How many different wavelengths can be observed from the above excited atom? [1]

THE END