

HISSAN CENTRAL EXAMINATION - 2080 (2023)

Class: XI

PHYSICS (1011 A)

F.M : 75

(11 Marks Obj+ 64 Marks Sub)

Time: 3hrs

GROUP A

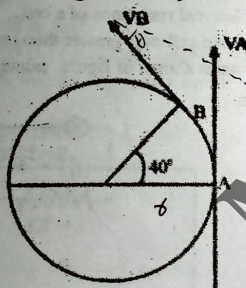
Multiple Choice Question

Attempts all questions.

[11 × 1 = 11]

Rewrite the correct option in your answer sheet.

- The dimensional formula for torque is
a. $[MLT^{-1}]$ b. $[ML^2T^{-2}]$
c. $[M^2LT^{-1}]$ d. $[ML^2T^{-1}]$
- Newton's Second law of motion gives the measurement of
a. force b. acceleration
c. momentum d. energy
- A particle is moving in a circle of radius 'r' centered at O with a constant speed v. The change in velocity in moving from A to B is



- $2v \cos 40^\circ$
 - $2v \sin 40^\circ$
 - $2v \cos 20^\circ$
 - $2v \sin 20^\circ$
- A body starts from rest and covers 120 m in 8th sec. What is the acceleration of the body?
a. 2 m/s² b. 15 m/s² c. 16 m/s² d. 32 m/s²
- Two vectors \vec{a} and \vec{b} are parallel to each other when
a. $\vec{a} \cdot \vec{b} = 0$ b. $|\vec{a} \times \vec{b}| = 0$
c. $\vec{a} + \vec{b} = 0$ d. $\vec{a} - \vec{b} = 0$

- The impurity atom with which pure silicon is doped to make N- type semiconductor is
a. phosphorous b. Indium
c. Aluminum d. Gallium

- If ω_1 and ω_2 are dispersive power of lenses of focal lengths f_1 and f_2 respectively. What is the condition for achromatism for two lenses in contact?
 $\frac{\omega_1}{\omega_2} = -\frac{f_1}{f_2}$ b. $\frac{\omega_1}{\omega_2} = \frac{f_1}{f_2}$
c. $\frac{\omega_1}{\omega_2} = -\frac{f_2}{f_1}$ d. $\frac{\omega_1}{\omega_2} = \frac{f_2}{f_1}$

- Which of the following remains constant during refraction?
a. velocity b. wavelength
c. amplitude d. frequency

- A convex lens produces a real image m times the size of the object. What is the distance of object from the lens?

- $(m+1)f$
 - $\frac{m-1}{m}f$
 - $(m-1)f$
 - $\frac{m+1}{m}f$

- Which mirror is used in a car?

- Convex mirror
 - Concave mirror
 - plane mirror
 - Cylindrical mirror

- When 10^{14} electrons are removed from a neutral metal sphere, the charge on the sphere is

- 16 μC
 - 16 μC
 - 32 μC
 - 32 μC

GROUP B

Attempt ALL questions.

[8 × 5 = 40]

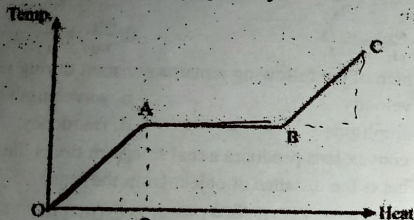
- Define work energy theorem. [1]
- Frictional force is non conservative force. Justify. [1]
c. A machine gun fires 1000 bullets per minute with a velocity of 200 m/s. If each bullets has mass of 40gm. Calculate the power developed by the machine gun. [3]

OR

- Define Young's modulus of elasticity. [1]
- Steel is more elastic than rubber. Justify. [1]

- c. Calculate the deforming force necessary to cause a wire of cross sectional area 1mm^2 to increase in length by one-tenth of one percent if the Young's modulus for the wire is $12 \times 10^{10} \text{ N/m}^2$. [3]

13. a. State and explain Newton's law of cooling. [2]
b. A solid is heated at constant rate. The variation of temperature with heat input is shown graphically.



- (i) What do OA and AB indicates in the figure? [1]
(ii) What is represented by the slope of BC? What is the reason behind the zero slope during the change of state? [2]

14. a. What is the value of coefficient of Cubical expansivity of a liquid while freezing? How? [2]

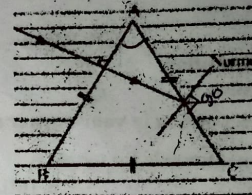
- b. Nepali Five-rupee coin has a diameter 2.5 cm at 20°C . The coin is made of a metal alloy (mostly Zinc) for which coefficient of linear expansion is $2.6 \times 10^{-5} \text{ K}^{-1}$. What would be its diameter on a hot day in Bharatpur at 40°C ? [3]

15. a. Two identical sized rods made with different materials are kept in same environment.
(i) What can be the ratio of rate of heat flow by Conduction? [1]
(ii) Sketch the nature of graph between rate of heat flow and thermal Conductivity? [1]

- b. Calculate the temperature at which the root mean square of nitrogen molecules will be equal to 8 kms^{-1} . [3]
[Molecular weight of nitrogen=28, $R = 8.31 \text{ J/kgK}$]

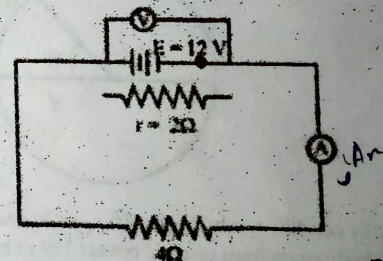
16. a. What is minimum deviation? How can you achieve this condition? [2]

- b. A ray of light is incident on one face of equilateral prism normally. Prism is immersed in water as shown in figure. Predict whether the light ray refract or reflect on the face AC with calculation. (refractive index of water and glass are 1.33 and 1.5 respectively) [3]



OR

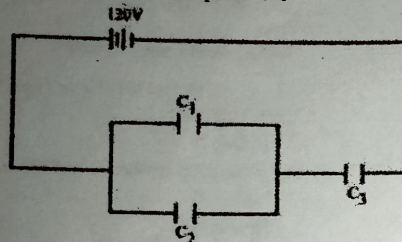
- a. Define lateral shift. Write its expression. [2]
b. Sketch a graph for the variation of lateral shift with the angle of incident in a rectangular glass slab. [1]
c. Calculate the critical angle for water – glass surface. (Refractive indices of water and glass are 1.3 and 1.5 respectively). [2]
17. a. Define Internal resistance of a cell. [1]
b. Can p.d of a cell ever greater than emf? Justify [2]
c. For a circuit shown in figure, calculate the voltmeter and ammeter reading. [3]



18. a. Define one electron volt. [1]
b. The potential difference between two points is 10 volts. What does it mean? [1]

$$\alpha = \frac{\beta}{2}$$

- c. A charged oil drop remains stationary when situated between two parallel horizontal metal plates 25 mm apart and a potential difference of 1000 V is applied to the plates. Find the charge on the drop if it has a mass of 5×10^{-15} kg. [3]
19. a. State and explain Gauss theorem. [2]
- b. In the figure $C_1 = 10 \mu\text{F}$, $C_2 = 20 \mu\text{F}$ and $C_3 = 15 \mu\text{F}$. Find the potential difference across capacitor C_3 . [3]



Group C

Attempt all questions.

20. a. Define projectile motion. [3×8=24] [1]
- b. Show that the path of projectile fired horizontally from the top is parabolic. Also, find the expression for velocity of projectile at any instant. [3]
- c. At what point velocity and acceleration of above mentioned projectile are perpendicular? [1]
- d. A projectile is fired with a speed of 30 m/s in a direction 30° above horizontal. Calculate:
- Position of projectile after time $t=3\text{sec}$
 - the horizontal range

OR

- a. Define impulse. How it is related with linear momentum? [1+1=2]
- b. State and prove the principle of conservation of linear momentum. [3]
- c. An elevator has a mass of 4000 kg, if the tension in the supporting cable passing through frictionless pulley is $4.8 \times 10^5 \text{ N}$ then find the

acceleration. Starting from rest, how far does it move in 3 second? [3]

21. a. Which force provides required centripetal force for a satellite to revolve around the earth? [1]
- b. Derive an expression for variation of acceleration due to gravity with depth from the surface of earth. [3]
- c. Sketch a graph showing the variation of acceleration due to gravity inside and outside of earth. [1]
- d. An artificial satellite revolves round the earth in 2.5 hours in a circular orbit. Find the height of the satellite above the earth assuming earth as a sphere of radius 6370 km. [3]
22. a. Define isotopes. Give any two examples of it. [2]
- b. All the nuclei have nearly the same density. Justify. [2]
- c. A fusion reaction is more energetic than fission reaction. Justify. [1]
- d. Calculate the binding energy per nucleon of ${}^7_3\text{Li}$ from the given data below.
- (mass of ${}^7_3\text{Li} = 7.01435 \text{ amu}$, mass of ${}_1^1\text{H} = 1.007825 \text{ amu}$ and mass of ${}_0^1\text{n} = 1.00867 \text{ amu}$) [3]

Proton

THE END

3+3