🔬 Experiment 1: To Determine Least Count of Vernier Caliper, Screw Gauge, and Spectrometer

🟤 Multiple Choice Questions (MCQs)

Q1. The least count of a standard vernier caliper is:
A. 1 mm
B. 0.1 mm
C. 0.01 mm
D. 0.001 mm
☑ **Answer:** B
Explanation: Standard least count for vernier caliper is 0.1 mm (or 0.01 cm).

Q2. The least count of a screw gauge with pitch 1 mm and 100 divisions is:
A. 0.1 mm
B. 0.01 mm
C. 0.001 mm
D. 1 mm
☑ **Answer:** B
Explanation: LC = Pitch / Circular divisions = 1 mm / 100 = 0.01 mm

Q3. Spectrometer's least count is usually:
A. 1 degree
B. 5'
C. 1'
D. 0.1'
☑ **Answer:** C
Explanation: Spectrometer usually has LC = 1 minute (1').

Q4. Zero error affects:
A. Precision
B. Least count
C. Accuracy
D. Range
☑ **Answer:** C
Explanation: Zero error introduces inaccuracy in final measurement.

Q5. What is the formula for least count of a vernier caliper?
A. 1 MSD + 1 VSD
B. 1 MSD - 1 VSD
C. Pitch / Circular divisions
D. MSD × VSD
☑ **Answer:** B
Explanation: LC = 1 MSD - 1 VSD

Q6. Pitch of screw gauge is defined as:
A. Circular scale reading / total divisions
B. Distance moved per rotation
C. LC × total divisions
D. Distance per main scale
☑ **Answer:** B
Explanation: Pitch = Distance moved by screw in 1 rotation.

Q7. If pitch = 0.5 mm and circular divisions = 50, then least count =
A. 0.01 mm
B. 0.001 mm
C. 0.02 mm
D. 0.005 mm
☑ **Answer:** A
Explanation: LC = 0.5 / 50 = 0.01 mm

Q8. Why is the spectrometer more accurate than a protractor?
A. It is smaller
B. Has magnifying lens
C. Uses vernier scale
D. Made of glass
☑ **Answer:** C
Explanation: Vernier scale gives higher precision.

Q9. A screw moves forward 1 mm in 2 rotations. What is its pitch?
A. 0.5 mm
B. 1 mm
C. 2 mm
D. 0.25 mm
☑ **Answer:** A
Explanation: Pitch = Distance / Rotations = 1 mm / 2 = 0.5 mm

Q10. What is the least count of a screw gauge with pitch = 0.5 mm and 100 divisions?

A. 0.01 mm
B. 0.005 mm
C. 0.001 mm
D. 0.1 mm
☑ **Answer:** B
Explanation: LC = Pitch / divisions = 0.5 / 100 = 0.005 mm

Q11. In vernier calipers, if 1 MSD = 1 mm and 10 VSD = 9 MSD, then 1 VSD = ?
A. 0.9 mm
B. 1 mm
C. 1.1 mm
D. 0.1 mm
☑ **Answer:** A
Explanation: 10 VSD = 9 MSD = 9 mm ⇒ 1 VSD = 0.9 mm

Q12. What is the formula for least count of a spectrometer?
A. LC = 1 MSD – 1 VSD
B. LC = 1 MSD / No. of VSD
C. LC = Pitch / Circular divisions
D. LC = No. of divisions / Main scale
☑ **Answer:** B

Q13. A vernier caliper reads 3.0 cm on main scale and 0.06 cm on vernier scale. Reading?
A. 3.6 cm
B. 3.06 cm
C. 3.00 cm
D. 3.60 cm
☑ **Answer:** B
Explanation: Final reading = MSR + (VSD × LC) = 3.0 + 0.06 = 3.06 cm

Q14. Which instrument would be best for measuring the diameter of a hair?
A. Meter scale
B. Vernier caliper
C. Screw gauge
D. Spectrometer
☑ **Answer:** C
Explanation: Screw gauge has high precision for small dimensions.

Q15. What does “least count” literally mean?
A. Largest value measured
B. Total divisions
C. Smallest measurable value
D. Random error
☑ **Answer:** C

Q16. A screw gauge has a zero error of –0.02 mm and reading is 5.00 mm. Final reading?
A. 5.02 mm
B. 5.00 mm
C. 4.98 mm
D. 0.02 mm
☑ **Answer:** C
Explanation: Corrected = Observed – (–Error) = 5.00 – (–0.02) = 4.98 mm

Q17. A student finds a zero error of +0.04 mm in vernier caliper. Corrected length is? Measured = 2.30 cm
A. 2.34 cm
B. 2.26 cm
C. 2.00 cm
D. 2.04 cm
☑ **Answer:** B
Explanation: Corrected = 2.30 – 0.04 = 2.26 cm

Q18. Main scale = 3.2 cm, 8th vernier division coincides. LC = 0.01 cm. Final reading?
A. 3.2 cm
B. 3.28 cm
C. 3.08 cm
D. 3.88 cm
☑ **Answer:** B
Explanation: Reading = 3.2 + (8 × 0.01) = 3.28 cm

Assertion and Reason

Q1. Assertion: Screw gauge gives more precise readings than vernier caliper.
Reason: Screw gauge has a smaller least count.
☑ **Answer:** A – Both A and R are true and R is the correct explanation.

Q2. Assertion: Least count of screw gauge is always less than vernier caliper.
Reason: Screw gauges are made of steel.
☑ **Answer:** C – A is true, but R is false.

Q3. Assertion: A spectrometer can measure angles precisely.
Reason: It has a vernier scale with fine divisions.
☑ **Answer:** A – Both statements are true and R explains A.

Viva Questions

Q1. What is the least count of a screw gauge with pitch 0.5 mm and 50 divisions?
☑ **Answer:** LC = 0.5 mm / 50 = 0.01 mm

Q2. Why do we need zero correction in Vernier or Screw Gauge?
☑ **Answer:** To eliminate errors due to misalignment of zero marks when jaws are closed.

Q3. What is pitch in a screw gauge?
☑ **Answer:** Distance moved by the screw per one complete rotation.

Q4. How do you determine the least count of a spectrometer?
☑ **Answer:** LC = 1 MSD / Number of vernier divisions.

Q5. What is parallax error?
☑ **Answer:** Error caused by improper positioning of the eye while taking readings.

Experiment 2: To Find Moment of Inertia of Flywheel

Multiple Choice Questions (MCQs)

Q1. The moment of inertia of a body depends on:
A. Mass
B. Shape
C. Axis of rotation
D. All of the above
☑ **Answer:** D
Explanation: Moment of inertia depends on mass, shape, and axis of rotation.

Q2. What is the formula for the moment of inertia of a solid disc about its central axis?
A. $I = (1/2) M R^2$
B. $I = M R^2$
C. $I = (1/3) M R^2$
D. $I = M R^2 / 2$
☑ **Answer:** A
Explanation: Moment of inertia of a solid disc is $I = (1/2) M R^2$.

Q3. In the experiment to determine the moment of inertia of a flywheel, what is measured directly?
A. Mass
B. Radius
C. Angular velocity
D. Time period
☑ **Answer:** D
Explanation: The time period of oscillation is measured to calculate the moment of inertia.

Q4. The moment of inertia of a body is a measure of its:
A. Resistance to linear motion
B. Resistance to angular motion
C. Mass
D. Volume
☑ **Answer:** B
Explanation: Moment of inertia measures a body's resistance to rotational motion.

Q5. The flywheel's moment of inertia can be determined using:
A. Parallel axis theorem
B. Perpendicular axis theorem
C. Both of the above
D. None of the above
☑ **Answer:** A
Explanation: The parallel axis theorem is used to find the moment of inertia for bodies with an axis of rotation not passing through the center of mass.

Q6. What is the unit of moment of inertia in the SI system?
A. kg
B. kg·m
C. $kg·m^2$
D. m^2
☑ **Answer:** C
Explanation: The unit of moment of inertia is $kg·m^2$.

Q7. A rotating body with a higher moment of inertia will:
A. Speed up more
B. Have a greater angular acceleration for the same torque
C. Require more torque to achieve the same angular acceleration
D. Have a smaller moment of inertia
☑ **Answer:** C
Explanation: A higher moment of inertia requires more torque to achieve the same angular acceleration.

Q8. Which of the following equations is used to calculate the moment of inertia of a body in rotational motion?
A. $I = F \times t$
B. $I = m \times v^2$
C. $I = \tau / \alpha$

D. $I = M \times R^2$

☑ **Answer:** C

Explanation: The moment of inertia is related to torque (τ) and angular acceleration (α) by $I = \tau / \alpha$.

Q9. The moment of inertia of a flywheel can be determined by:

A. Using a torsional pendulum

B. Using a linear pendulum

C. Measuring the angular displacement

D. Using a microscope

☑ **Answer:** A

Explanation: A torsional pendulum is often used to determine the moment of inertia of rotating bodies like flywheels.

Q10. Which of the following is true for a body rotating about an axis?

A. Moment of inertia is directly proportional to angular velocity

B. Moment of inertia is independent of the axis of rotation

C. Moment of inertia depends on the distribution of mass

D. Moment of inertia is inversely proportional to angular acceleration

☑ **Answer:** C

Explanation: Moment of inertia depends on the mass distribution relative to the axis of rotation.

Q11. The moment of inertia of a thin rod of mass M and length L about an axis through its center and perpendicular to its length is:

A. $(1/12) M L^2$

B. $(1/2) M L^2$

C. $(1/3) M L^2$

D. $(1/4) M L^2$

☑ **Answer:** A

Explanation: The moment of inertia of a thin rod about its center is $I = (1/12) M L^2$.

Q12. The rotational kinetic energy of a body is given by:

A. $½ I \omega^2$

B. $½ m v^2$

C. mgh

D. $½ M R^2$

☑ **Answer:** A

Explanation: The rotational kinetic energy is given by $½ I \omega^2$, where I is the moment of inertia and ω is the angular velocity.

Q13. The formula for calculating the moment of inertia of a solid sphere about its center is:

A. $(2/5) M R^2$

B. $(1/5) M R^2$

C. $(1/2) M R^2$

D. $(3/4) M R^2$

☑ **Answer:** A

Explanation: The moment of inertia of a solid sphere about its center is $I = (2/5) M R^2$.

Q14. If the angular velocity of a rotating flywheel is doubled, what happens to its kinetic energy?

A. It becomes 4 times

B. It becomes 2 times

C. It becomes halved

D. It remains the same

☑ **Answer:** A

Explanation: Kinetic energy is proportional to the square of the angular velocity. So, doubling the angular velocity will quadruple the kinetic energy.

Q15. What is the relationship between torque and moment of inertia?

A. $\tau = I \alpha$

B. $\tau = I \omega$

C. $\tau = I / \alpha$

D. $\tau = \alpha / I$

☑ **Answer:** A

Explanation: Torque (τ) is equal to the moment of inertia (I) multiplied by the angular acceleration (α), $\tau = I \alpha$.

Q16. A flywheel is rotating at an angular velocity of 10 rad/s, and its moment of inertia is 2 $kg \cdot m^2$. What is its kinetic energy?

A. 50 J

B. 100 J

C. 20 J

D. 200 J

☑ **Answer:** A

Explanation: Kinetic energy = $(1/2) I \omega^2 = (1/2) \times 2 \times 10^2 = 50$ J.

Q17. The moment of inertia of a circular disc about an axis passing through its center and perpendicular to the plane of the disc is:

A. $(1/2) M R^2$

B. $(1/3) M R^2$

C. $(1/4) M R^2$

D. $M R^2$

☑ **Answer:** A

Explanation: The moment of inertia of a disc about the center is $I = (1/2) M R^2$.

Q18. The moment of inertia of a hollow sphere about its center is:

A. $(2/3) M R^2$

B. $(5/3) M R^2$

C. $(2/5) M R^2$

D. $(3/2) M R^2$

☑ **Answer:** A

Explanation: The moment of inertia of a hollow sphere is $I = (2/3) M R^2$.

Q19. A flywheel is rotated with a torque of 10 Nm for 5 seconds. If its moment of inertia is 2 $kg \cdot m^2$, what is its angular acceleration?
A. 0.5 rad/s^2
B. 5 rad/s^2
C. 1 rad/s^2
D. 10 rad/s^2
☑ **Answer:** A
Explanation: Angular acceleration, $\alpha = \tau / I = 10 / 2 = 5$ rad/s^2.

Q20. If the angular acceleration is doubled, what happens to the angular velocity after 5 seconds?
A. It is halved
B. It remains the same
C. It is doubled
D. It becomes four times
☑ **Answer:** C
Explanation: Angular velocity is directly proportional to angular acceleration, so doubling angular acceleration doubles the angular velocity.

Assertion and Reason

Q1. Assertion: The moment of inertia depends on the mass distribution of a body.
Reason: The more mass located far from the axis of rotation, the higher the moment of inertia.
☑ **Answer:** A – Both A and R are true and R is the correct explanation.

Q2. Assertion: Moment of inertia is independent of the axis of rotation.
Reason: The moment of inertia depends on the distance of the mass elements from the axis.
☑ **Answer:** C – A is false, but R is true.

Q3. Assertion: A flywheel has a higher moment of inertia than a disc of the same mass.
Reason: A flywheel is designed to store more rotational energy, which requires more mass at a greater radius.
☑ **Answer:** A – Both A and R are true and R explains A.

Q4. Assertion: A flywheel has a moment of inertia higher than a solid disc of the same mass.
Reason: The mass of a flywheel is distributed farther from the axis of rotation.
☑ **Answer:** A – Both A and R are true and R is the correct explanation.

Q5. Assertion: The moment of inertia depends on the distance of mass from the axis of rotation.
Reason: The farther the mass from the axis, the lower the moment of inertia.
☑ **Answer:** C – A is true, but R is false.

Q6. Assertion: In a rotational system, if no external torque acts, the angular momentum remains constant.
Reason: This is a result of the conservation of angular momentum.
☑ **Answer:** A – Both A and R are true and R explains A.

Viva Questions

Q1. How is the moment of inertia related to the angular velocity?
☑ **Answer:** Moment of inertia (I) is proportional to the angular acceleration (α) and torque (τ) by the equation $I = \tau / \alpha$.

Q2. What is the effect of increasing the radius on the moment of inertia?
☑ **Answer:** Increasing the radius increases the moment of inertia, as it depends on the square of the radius.

Q3. What is the parallel axis theorem?
☑ **Answer:** It allows the calculation of the moment of inertia of a body about any axis, given the moment of inertia about the center of mass and the distance between the two axes.

Q4. Why do we use a flywheel in engines?
☑ **Answer:** Flywheels store rotational energy and help smooth out fluctuations in rotational speed, providing consistent power output.

Q5. What is the role of the center of mass in calculating the moment of inertia?
☑ **Answer:** The center of mass is crucial in determining the mass distribution relative to the axis of rotation.

Q6. What is the significance of the moment of inertia in rotational motion?
☑ **Answer:** Moment of inertia determines how much torque is needed for a given angular acceleration. A larger moment of inertia requires more torque.

Q7. How would you determine the moment of inertia of a flywheel experimentally?
☑ **Answer:** Measure the time period of oscillation of the flywheel using a torsional pendulum and calculate the moment of inertia using the formula $I = \tau / \alpha$.

Q8. What factors affect the moment of inertia of an object?
☑ **Answer:** The moment of inertia depends on the mass distribution, shape, and axis of rotation of the object.

Q9. How does the moment of inertia affect the rotational kinetic energy of a rotating object?
☑ **Answer:** A higher moment of inertia means more energy is required to rotate the object at a given angular velocity.

Q10. Explain the concept of angular momentum in relation to moment of inertia.
☑ **Answer:** Angular momentum is the product of the moment of inertia and angular velocity, $L = I\omega$. It remains conserved in the absence of external torques.

Experiment 3: To Study the V-I Characteristics of a Solar Cell

Multiple Choice Questions (With Answers & Explanations)

Theory-Based MCQs

Q1. What type of device is a solar cell?
A. Mechanical
B. Optical
C. Electrical
D. Optoelectronic
☑ **Answer:** D
Explanation: A solar cell converts light (optical energy) into electricity, making it an optoelectronic device.

Q2. The principle of working of a solar cell is based on:
A. Electrolysis
B. Photoelectric effect
C. Electromagnetic induction
D. Piezoelectric effect
☑ **Answer:** B
Explanation: Solar cells work on the photovoltaic effect, which is a form of photoelectric effect.

Q3. A solar cell generates electricity using:
A. Wind
B. Sunlight
C. Heat
D. Sound
☑ **Answer:** B
Explanation: Solar cells convert sunlight directly into electrical energy.

Q4. Which of the following is true for a solar cell under illumination?
A. Current increases with voltage
B. Current decreases with voltage
C. Current remains almost constant
D. Current becomes zero
☑ **Answer:** C
Explanation: In the illuminated region, current stays nearly constant while voltage changes.

Q5. Which material is commonly used in the manufacturing of solar cells?
A. Copper
B. Aluminum
C. Silicon
D. Iron
☑ **Answer:** C
Explanation: Silicon is the most widely used material due to its semiconducting properties.

Q6. The V-I curve of a solar cell is plotted for:
A. Dark and light conditions
B. Cold and hot conditions
C. Day and night
D. All of these
☑ **Answer:** A
Explanation: V-I characteristics are studied under both light and dark conditions to observe the behavior.

Q7. In a solar cell, open-circuit voltage is obtained when:
A. Current is maximum
B. Current is zero
C. Resistance is zero
D. Temperature is maximum
☑ **Answer:** B
Explanation: Open-circuit voltage occurs when no current is drawn (I = 0).

Q8. The short-circuit current of a solar cell is the current when:
A. Voltage = 0
B. Voltage = Maximum
C. Power = 0
D. Light = Off
☑ **Answer:** A
Explanation: Short-circuit current occurs when voltage across the cell is zero.

Q9. What does the slope of the V-I curve represent in the solar cell experiment?
A. Resistance
B. Capacitance
C. Inductance
D. Voltage
☑ **Answer:** A
Explanation: The slope of the V-I curve represents dynamic resistance.

Q10. The power output of a solar cell is calculated by:
A. V/I
B. V × I
C. V + I
D. V - I
☑ **Answer:** B
Explanation: Power is the product of voltage and current: P = V × I.

◇ *Formula-Based and Numerical MCQs*

Q11. If a solar cell delivers 0.6 V and 40 mA, what is the power generated?
A. 0.024 W
B. 2.4 W
C. 0.15 W
D. 0.06 W
☑ **Answer:** A
Explanation: P = V × I = 0.6 × 0.04 = 0.024 W.

Q12. The efficiency (η) of a solar cell is given by:
A. (Electrical power output / Light power input) × 100
B. (Light power input / Electrical power output) × 100
C. (Voltage / Current) × 100
D. None of the above
☑ **Answer:** A
Explanation: Efficiency is the ratio of electrical output to light input, expressed in percentage.

Q13. If a solar cell produces 50 mW and the incident light power is 250 mW, what is the efficiency?
A. 20%
B. 25%
C. 50%
D. 10%
☑ **Answer:** B
Explanation: Efficiency = (50 / 250) × 100 = 20%.

Q14. For maximum power, a solar cell should operate at:
A. Open circuit
B. Short circuit
C. Maximum voltage
D. Knee point
☑ **Answer:** D
Explanation: Maximum power is delivered at the "knee" point of the V-I curve.

Q15. The fill factor of a solar cell is calculated by:
A. (V_oc × I_sc) / (V_m × I_m)
B. (V_m × I_m) / (V_oc × I_sc)
C. (V_oc / V_m) + (I_m / I_sc)
D. None of the above
☑ **Answer:** B
Explanation: Fill factor = (V_m × I_m) / (V_oc × I_sc)

◇ *Assertion and Reason MCQs*

Q16.
Assertion: A solar cell can work without any external battery.
Reason: It generates its own voltage and current from sunlight.
☑ **Answer:** A – Both A and R are true, and R explains A.

Q17.
Assertion: Efficiency of a solar cell is always 100%.
Reason: Solar cells convert all incident sunlight into electricity.
☑ **Answer:** D – Both A and R are false.

Q18.
Assertion: The V-I characteristics of a solar cell are non-linear.
Reason: The internal resistance and photogenerated carriers vary with illumination.
☑ **Answer:** A – Both A and R are true, and R explains A.

Q19.
Assertion: The current in a solar cell is maximum at short circuit.
Reason: Short circuit condition offers zero resistance.
☑ **Answer:** A – Both A and R are true, and R explains A.

Q20.
Assertion: A solar cell can generate electricity in complete darkness.
Reason: It stores solar energy in a battery.
☑ **Answer:** C – A is false, but R is true.

Viva Questions (With Answers)

Q1. What is a solar cell?
☑ **Answer:** A device that converts solar energy directly into electrical energy.

Q2. On what principle does a solar cell work?
☑ **Answer:** The photovoltaic effect.

Q3. What is the nature of the V-I characteristic of a solar cell?
☑ **Answer:** Non-linear.

Q4. What is open circuit voltage?
☑ **Answer:** The maximum voltage produced by a solar cell when current is zero.

Q5. What is short circuit current?
☑ **Answer:** The current when the output terminals of the solar cell are shorted (voltage = 0).

Q6. Which materials are used in solar cells?
☑ **Answer:** Silicon (monocrystalline or polycrystalline).

Q7. What is fill factor in a solar cell?
☑ **Answer:** It is the ratio of maximum power to the product of open-circuit voltage and short-circuit current.

Q8. What is the efficiency of a good solar cell?
☑ **Answer:** Typically between 15% and 25% for commercial solar cells.

Q9. Can a solar cell work at night?
☑ **Answer:** No, it requires sunlight to generate electricity.

Q10. Why is the I-V curve of a solar cell important?
☑ **Answer:** It helps determine the operating point for maximum power output.

☑ Experiment 4: To find 'g' and Radius of Gyration of a Bar Pendulum

◇ **MCQs (with answers and explanations):**

1. **The time period of a compound pendulum is given by:**
   A) T=2πlgT = 2\pi\sqrt{\frac{l}{g}}T=2πgl
   B) T=2πImghT = 2\pi\sqrt{\frac{I}{mgh}}T=2πmghI
   C) T=2πmgIhT = 2\pi\sqrt{\frac{mg}{Ih}}T=2πIhmg
   D) T=2πglT = 2\pi\sqrt{\frac{g}{l}}T=2πlg
   ☑ **Answer: B**
   Explanation: This is the standard formula for compound pendulum involving moment of inertia.
2. **The value of 'g' using bar pendulum is obtained from:**
   A) Time of oscillation
   B) Radius of the bar
   C) Mass of bar only
   D) Surface area
   ☑ **Answer: A**
   Explanation: Time period helps derive acceleration due to gravity.
3. **Which of the following affects the radius of gyration?**
   A) Shape and mass distribution
   B) Mass only
   C) Length only
   D) Angle of oscillation
   ☑ **Answer: A**
4. **If time period is plotted against distance from center of gravity, the graph is:**
   A) Linear
   B) Circular
   C) Parabolic
   D) Elliptical
   ☑ **Answer: C**
5. **Formula for radius of gyration k is:**
   A) k=Imk = \sqrt{\frac{I}{m}}k=mI
   B) k=mIk = \sqrt{mI}k=mI
   C) k=ImIk = \frac{I}{mI}k=mII
   D) k=mIk = \frac{m}{I}k=Im
   ☑ **Answer: A**
6. **Least count of stopwatch used is usually:**
   A) 1 s
   B) 0.1 s
   C) 0.01 s
   D) 0.001 s
   ☑ **Answer: B**
7. **In a bar pendulum, equivalent length L is:**
   A) Distance from C.G.
   B) Sum of radii
   C) Length for equivalent simple pendulum
   D) None
   ☑ **Answer: C**
8. **Error is minimized by measuring time for:**
   A) 5 oscillations
   B) 10 oscillations
   C) 50 oscillations
   D) 100 oscillations
   ☑ **Answer: C**
9. **Graph of T^2 vs h gives a:**
   A) Straight line
   B) Hyperbola
   C) Parabola
   D) Circle
   ☑ **Answer: A**
10. **What is moment of inertia of a rod about one end (length L)?**
    A) 13ML2\frac{1}{3}ML^231ML2
    B) 112ML2\frac{1}{12}ML^2121ML2
    C) 12ML2\frac{1}{2}ML^221ML2

D) ML2ML^2ML2
☑ **Answer: A**

◇ **Numerical (with options):**

1. **A bar pendulum has time period 2 s and effective length 1 m. Find g.**
   A) 9.8 m/s²
   B) 10.2 m/s²
   C) 9.5 m/s²
   D) 8.6 m/s²
   ☑ **Answer: A**
   Explanation: T=2πL/g ⇒g=4π2L/T2T = 2\pi\sqrt{L/g} \Rightarrow g = 4\pi^2L/T^2T=2πL/g ⇒g=4π2L/T2
2. **If I = 0.5 kg·m², m = 2 kg, then k = ?**
   A) 0.25 m
   B) 0.5 m
   C) 1 m
   D) 0.75 m
   ☑ **Answer: B**

◇ **Assertion and Reason:**

1. **Assertion (A): The time period of a bar pendulum depends on distance from C.G.**
   Reason (R): Time period is independent of mass.
   A) A and R both correct; R explains A
   B) A correct, R incorrect
   C) A and R both correct; R does not explain A
   D) A incorrect, R correct
   ☑ **Answer: A**
2. **Assertion (A): Radius of gyration depends on mass.**
   Reason (R): Radius of gyration depends on mass distribution.
   ☑ **Answer: D**

◇ **Viva Questions (with answers):**

1. **What is a bar pendulum?**
   ➤ A rigid bar used to determine acceleration due to gravity by oscillations.
2. **Define center of gravity.**
   ➤ It's the point through which the whole weight of the body acts.
3. **What is the radius of gyration?**
   ➤ Distance from the axis of rotation where the mass of the body can be assumed to be concentrated.
4. **What is meant by time period?**
   ➤ Time taken for one complete oscillation.
5. **Why do we plot T² vs h?**
   ➤ It gives a straight line helping to calculate g and k.

☑ Experiment 5: To Find g using Kater's Pendulum

◇ **Multiple Choice Questions (With Answers & Explanations)**

1. **What is Kater's Pendulum?**
   A) A spring pendulum
   B) A compound pendulum with adjustable knife edges
   C) A simple pendulum
   D) A bar pendulum
   Answer: B
   Explanation: Kater's pendulum is a compound pendulum with two knife edges for precise determination of g.
2. **The formula to determine g using Kater's pendulum is:**
   A) $g = 4\pi^2L/T^2$
   B) $g = 2\pi/T$
   C) $g = T^2/L$
   D) $g = L/4\pi^2T^2$
   Answer: A
   Explanation: $g = 4\pi^2L/T^2$ is used when the time periods about both knife edges are equal.
3. **Why are two knife edges used in Kater's pendulum?**
   A) To reduce friction
   B) To change the weight
   C) To apply reversibility principle
   D) For aesthetics
   Answer: C
   Explanation: Kater's pendulum uses two knife edges to verify the reversibility of center of suspension and oscillation.
4. **The Kater's pendulum is used to find:**
   A) Young's modulus
   B) Radius of Earth
   C) Acceleration due to gravity
   D) Refractive index
   Answer: C
5. **What condition gives the most accurate value of g in Kater's pendulum?**
   A) When time periods at both edges are equal
   B) When damping is high
   C) When the pendulum is symmetric
   D) When only one knife edge is used
   Answer: A
6. **The reversible pendulum was invented by:**
   A) Galileo
   B) Newton

C) Kater
D) Einstein
Answer: C

7. **The effective length L in the Kater's pendulum formula represents:**
   A) Length of rod
   B) Distance between the two knife edges
   C) Distance from knife edge to center of mass
   D) Equivalent length when T1 = T2
   Answer: D
8. **In ideal condition, the value of g measured from both knife edges should be:**
   A) Different
   B) Same
   C) Greater than 10
   D) Negative
   Answer: B
9. **If time periods T1 and T2 at two edges are not equal, we should:**
   A) Average them
   B) Use the value with lower time
   C) Adjust knife edges to make T1 = T2
   D) Stop the experiment
   Answer: C
10. **Which factor affects accuracy of the experiment?**
    A) Air resistance
    B) Sharpness of knife edge
    C) Measurement of length
    D) All of the above
    Answer: D
11. **If T = 2.0 s and L = 1 m, what is g?**
    A) 8.5 m/s²
    B) 9.87 m/s²
    C) 10.5 m/s²
    D) 12.0 m/s²
    Answer: B
    Explanation: $g = 4\pi^2L / T^2 = (4\times\pi^2\times1) / (2)^2 = 9.87$ m/s²

1. **A Kater's pendulum has knife edges 1 m apart and T = 2.01 s. Calculate g.**
   A) 9.71 m/s²
   B) 9.78 m/s²
   C) 9.65 m/s²
   D) 10.2 m/s²
   Answer: B
   Explanation: $g = 4\pi^2\times1 / (2.01)^2 \approx 9.78$ m/s²

1. **If g = 9.8 m/s² and T = 2 s, find the effective length L.**
   A) 0.994 m
   B) 1.5 m
   C) 1.2 m
   D) 0.75 m
   Answer: A
   Explanation: $L = gT^2 / 4\pi^2 = (9.8\times4) / (4\times\pi^2) \approx 0.994$ m

1. **Time period of a Kater's pendulum is 1.95 s, length is 0.95 m. Find g.**
   A) 10.0 m/s²
   B) 9.81 m/s²
   C) 9.65 m/s²
   D) 9.91 m/s²
   Answer: B
   Explanation: $g = 4\pi^2L / T^2 \approx 4\times\pi^2\times0.95 / (1.95)^2 \approx 9.81$ m/s²

1. **If T1 = 1.98 s and T2 = 1.99 s, then average time T is:**
   A) 1.98 s
   B) 1.985 s
   C) 2.00 s
   D) 1.97 s
   Answer: B
   Explanation: Average T = (1.98 + 1.99)/2 = 1.985 s

◇ Numerical MCQs

1. **If T = 2.0 s and L = 1 m, what is g?**
   Answer: $g = 4\pi^2L/T^2 = 4\times9.87/4 = 9.87$ m/s²
2. **If knife edges are 1 m apart and T = 2.01 s, calculate g.**
   Answer: $g = 4\pi^2\times1 / (2.01)^2 \approx 9.78$ m/s²
3. **If g = 9.8 m/s² and T = 2s, find L.**
   Answer: $L = gT^2 / 4\pi^2 \approx 0.994$ m

◇ Assertion and Reason Questions

1. **Assertion:** Kater's pendulum provides accurate g.
   Reason: It uses two knife edges for reversibility.
   Answer: A – Both A and R are true, and R is the correct explanation.
2. **Assertion:** The pendulum must swing in a single plane.
   Reason: To avoid energy loss due to 3D motion.
   Answer: A – Both A and R are true, and R is the correct explanation.

3. **Assertion:** Air resistance increases accuracy.
   Reason: It helps slow down the pendulum.
   Answer: D – Both A and R are false.

◇ Viva Questions (With Answers)

1. **What is Kater's pendulum?**
   A reversible compound pendulum used to determine acceleration due to gravity.
2. **What is the use of two knife edges?**
   To measure time periods from both ends and apply the reversibility principle.
3. **What is the principle of Kater's pendulum?**
   If time periods from both edges are equal, effective length equals the distance between knife edges.
4. **Why do we take equal time periods from both edges?**
   To use the simplified formula $g = 4\pi^2L/T^2$.
5. **What are the sources of error in this experiment?**
   Air resistance, imperfect knife edges, incorrect length measurement, etc.
6. **What is meant by center of oscillation?**
   A point where oscillation is the same as if the pendulum was suspended from it.
7. **What graph is plotted in this experiment?**
   T vs distance from knife edge (or T^2 vs L).
8. **Why should oscillations be small?**
   To maintain the SHM assumption and accuracy.
9. **What is meant by effective length?**
   The length used in the formula for g when time periods are equal.
10. **Why is a metallic bar used in Kater's pendulum?**
    For rigidity, stability, and uniformity of mass.

☑ Experiment 6: To Determine Wavelength of Sodium Light using Newton's Rings

◇ MCQs with Answers & Explanations

1. **Newton's Rings are formed due to:**
   A) Interference
   B) Diffraction
   C) Reflection
   D) Refraction
   Answer: A
   Explanation: Newton's rings are caused by the interference of light waves reflected from the curved surface and flat surface.
2. **Newton's Rings are formed in:**
   A) Reflection only
   B) Transmission only
   C) Both reflection and transmission
   D) Refraction
   Answer: A
3. **The shape of Newton's rings is:**
   A) Elliptical
   B) Concentric circles
   C) Spiral
   D) Irregular
   Answer: B
4. **Newton's rings are more clearly visible in:**
   A) White light
   B) Monochromatic light
   C) Daylight
   D) Laser only
   Answer: B
5. **The radius of the nth dark ring is proportional to:**
   A) $\sqrt{n}$
   B) n
   C) n^2
   D) 1/n
   Answer: A
   Explanation: $r_n \propto \sqrt{n\lambda} r_n \propto n\lambda$
6. **Wavelength of sodium light is approximately:**
   A) 5890 Å
   B) 4000 Å
   C) 6328 Å
   D) 7000 Å
   Answer: A
7. **Which surface is used in Newton's rings experiment?**
   A) Plane mirror
   B) Plano-convex lens
   C) Double convex lens
   D) Concave mirror
   Answer: B
8. **Central ring in Newton's rings experiment is:**
   A) Bright
   B) Dark
   C) Colored
   D) Unclear
   Answer: B
   Explanation: It is a dark ring due to destructive interference at the point of contact.
9. **Radius of Newton's ring increases with:**
   A) Decreasing wavelength

B) Increasing wavelength
C) Intensity
D) Focal length
Answer: B

10. **The rings disappear when:**
A) Lens is lifted
B) Light is switched off
C) Contact is lost
D) Monochromatic light is used
Answer: C

◇ Numerical MCQs (with options)

1. **If the diameter of the 10th ring is 2.8 mm and R = 100 cm, find wavelength.**
A) 5480 Å
B) 6200 Å
C) 5893 Å
D) 6020 Å
Answer: C
Explanation: λ=Dn24nR\lambda = \frac{D_n^2}{4nR}λ=4nRDn2

1. **If D_{10} = 2.5 mm, D_5 = 1.5 mm, R = 1 m, find λ.**
A) 5880 Å
B) 5800 Å
C) 5960 Å
D) 5700 Å
Answer: A
Explanation: Use λ=Dn2−Dm24(n−m)R\lambda = \frac{D_{n}^2 - D_{m}^2}{4(n-m)R}λ=4(n−m)RDn2−Dm2

1. **If R = 200 cm and diameter of 5th ring = 1 mm, λ = ?**
A) 6300 Å
B) 5890 Å
C) 5600 Å
D) 6100 Å
Answer: B

1. **Number of rings increases if:**
A) Radius of curvature decreases
B) Radius of curvature increases
C) Lens is dirty
D) Monochromatic light is changed
Answer: B

1. **If light of longer wavelength is used, ring diameter will:**
A) Decrease
B) Increase
C) Remain same
D) Disappear
Answer: B

◇ Assertion and Reason Questions

1. **Assertion:** Central ring in Newton's rings is dark.
Reason: Destructive interference occurs at the point of contact.
Answer: A – Both A and R are true, and R is the correct explanation.
2. **Assertion:** Newton's rings are circular.
Reason: The plano-convex lens has symmetrical curvature.
Answer: A
3. **Assertion:** Diameter of rings decreases with decrease in wavelength.
Reason: Smaller wavelength produces smaller fringe width.
Answer: A

◇ Viva Questions (with Answers)

1. **What are Newton's rings?**
Circular interference fringes formed due to air film between plano-convex lens and glass plate.
2. **Why is the center dark?**
Due to destructive interference at the point of contact.
3. **What light source is used?**
Monochromatic sodium light.
4. **How are fringes viewed?**
Using a traveling microscope.
5. **Why is monochromatic light used?**
To obtain clear, circular, and non-overlapping fringes.
6. **Which ring is darkest?**
The central ring.
7. **Formula to calculate wavelength?**
λ=Dn+m2−Dn24mR\lambda = \frac{D_{n+m}^2 - D_n^2}{4mR}λ=4mRDn+m2−Dn2
8. **What affects the ring size?**
Wavelength, radius of curvature of lens.
9. **What is the nature of rings?**
Circular and concentric.
10. **What if air film is not uniform?**
Rings become distorted and unclear.

☑ Experiment 7: To Determine Young's Modulus of Iron and Brass Rods

◇ MCQs with Answers & Explanations

1. **Young's modulus is a measure of:**
   A) Flexibility
   B) Elasticity
   C) Plasticity
   D) Toughness
   Answer: B
   Explanation: It defines the ability of a material to return to its original shape after deformation.
2. **SI unit of Young's modulus is:**
   A) dyne/cm²
   B) Pascal (Pa)
   C) Newton
   D) N/m
   Answer: B
3. **Which relation defines Young's modulus (Y)?**
   A) Y = Stress / Strain
   B) Y = Force × Area
   C) Y = Strain / Stress
   D) Y = Extension / Load
   Answer: A
4. **The spring used in the experiment should obey:**
   A) Pascal's law
   B) Newton's law
   C) Hooke's law
   D) Boyle's law
   Answer: C
5. **In Searle's apparatus, which reading is taken?**
   A) Extension
   B) Load
   C) Diameter
   D) All of the above
   Answer: D
6. **What is the shape of the wire used?**
   A) Cubic
   B) Cylindrical
   C) Rectangular
   D) Spherical
   Answer: B
7. **Which material has the highest Young's modulus?**
   A) Rubber
   B) Iron
   C) Brass
   D) Wood
   Answer: B
8. **Elastic limit refers to:**
   A) Permanent deformation point
   B) Point till which object regains shape
   C) Breaking point
   D) Max stress limit
   Answer: B
9. **What is strain?**
   A) Load/Area
   B) Extension/Original length
   C) Force × Area
   D) None
   Answer: B
10. **Least count of micrometer screw gauge is typically:**
    A) 0.01 mm
    B) 0.1 mm
    C) 0.001 cm
    D) Both A and C
    Answer: D

◇ Numerical MCQs (with options)

1. **If a wire of length 1.5 m stretches by 1.5 mm under a force of 150 N and diameter 0.5 mm, calculate Young's modulus.**
   A) 1.27×10^{11} Pa
   B) 2.54×10^{11} Pa
   C) 3.18×10^{11} Pa
   D) 4.23×10^{11} Pa
   Answer: B
   Explanation:
   Y=F×LA×ΔLY = \frac{F × L}{A × \Delta L}Y=A×ΔLF×L

1. **For iron wire of area 3.14×10^{-6} m², length = 1 m, extension = 1 mm, force = 100 N. Y = ?**
   A) 3.18×10^{11} Pa
   B) 1.27×10^{11} Pa
   C) 2.5×10^{11} Pa
   D) 1.0×10^{11} Pa
   Answer: A

1. **A rod elongates 2 mm under 50 N load. Original length = 1 m. Find strain.**
   A) 0.002
   B) 0.0002
   C) 0.02
   D) 0.2
   Answer: A

1. **If stress = 200 × 10^6 N/m^2 and strain = 0.001, find Young's modulus.**
   A) 2 × 10^{11} Pa
   B) 2 × 10^8 Pa
   C) 2 × 10^5 Pa
   D) 2 × 10^6 Pa
   Answer: A

1. **Strain has which unit?**
   A) m
   B) N/m^2
   C) Dimensionless
   D) J
   Answer: C

◇ Assertion and Reason Questions

1. **Assertion:** Young's modulus is constant for a material.
   Reason: It depends only on temperature and material type.
   Answer: A – Both A and R are true and R is the correct explanation.
2. **Assertion:** Brass is less elastic than iron.
   Reason: Young's modulus of iron is higher than brass.
   Answer: A
3. **Assertion:** Extension in a wire depends on its thickness.
   Reason: Thinner wires extend more under the same load.
   Answer: A

◇ Viva Questions (with Answers)

1. **What is Young's modulus?**
   Ratio of longitudinal stress to longitudinal strain.
2. **What is the unit of Young's modulus?**
   Pascal (Pa)
3. **Which instrument measures extension?**
   Searle's apparatus.
4. **What is stress?**
   Force per unit area.
5. **Define strain.**
   Change in length/original length.
6. **Is strain dimensionless?**
   Yes.
7. **Which has greater Young's modulus – iron or brass?**
   Iron.
8. **Why should there be no jerk in adding weight?**
   It can cause sudden deformation or error.
9. **Why is micrometer used?**
   To measure wire diameter.
10. **Does temperature affect Young's modulus?**
    Yes, it decreases with rise in temperature.

☑ Experiment 8: To Determine Wavelength of Sodium Light using Plane Diffraction Grating

◇ MCQs with Answers & Explanations

1. **Diffraction grating works on the principle of:**
   A) Interference
   B) Diffraction
   C) Reflection
   D) Refraction
   Answer: B
   Explanation: Grating splits light into components via diffraction.
2. **Sodium light emits which type of light?**
   A) Monochromatic
   B) Polychromatic
   C) White light
   D) UV light
   Answer: A
3. **The diffraction condition is given by:**
   A) dsin θ=nλd \sin \theta = n\lambdadsinθ=nλ
   B) sin θ=d/n\sin \theta = d/nsinθ=d/n
   C) dλ=nsin θd\lambda = n\sin \thetadλ=nsinθ
   D) λ=dsin θ\lambda = d\sin \thetaλ=dsinθ
   Answer: A
4. **Grating element is reciprocal of:**
   A) Number of lines/cm
   B) Angle of diffraction
   C) Order of spectrum
   D) Fringe width
   Answer: A

5. **The grating used in the experiment is a:**
   A) Convex lens
   B) Transmission grating
   C) Reflecting grating
   D) Holographic grating
   Answer: B
6. **Diffraction is more prominent with:**
   A) Small wavelength
   B) Narrow slit
   C) Broad slit
   D) Large aperture
   Answer: B
7. **The first-order maximum occurs when:**
   A) sin θ=λ/d\sin \theta = \lambda / dsinθ=λ/d
   B) λ=d\lambda = dλ=d
   C) sin θ=1\sin \theta = 1sinθ=1
   D) θ=0\theta = 0θ=0
   Answer: A
8. **Wavelength of sodium light is approximately:**
   A) 5890 Å
   B) 5460 Å
   C) 6328 Å
   D) 6000 Å
   Answer: A
9. **What is the unit of grating constant d?**
   A) mm
   B) lines/cm
   C) m
   D) m/line
   Answer: D
10. **How is grating mounted in spectrometer?**
    A) Parallel to slit
    B) Perpendicular to collimator
    C) At an angle
    D) Horizontally
    Answer: B

◇ Numerical MCQs (with options)

1. **A grating has 6000 lines/cm. What is the value of grating element d?**
   A) 1.67×10−61.67 \times 10^{-6}1.67×10−6 m
   B) 6×10−66 \times 10^{-6}6×10−6 m
   C) 1.67×10−41.67 \times 10^{-4}1.67×10−4 m
   D) 1.2×10−51.2 \times 10^{-5}1.2×10−5 m
   Answer: A
   Explanation: d=1/N=1/(6000×100)d = 1/N = 1/(6000 \times 100)d=1/N=1/(6000×100)

1. **If angle for 1st order is 20°, and grating element is 1.67×10−61.67 \times 10^{-6}1.67×10−6 m, find wavelength.**
   A) 5700 Å
   B) 5890 Å
   C) 6000 Å
   D) 6100 Å
   Answer: B
   Explanation: λ=dsin θ\lambda = d \sin \thetaλ=dsinθ

1. **If θ=30∘ \theta = 30^\circθ=30∘ , d = 2×10−62 \times 10^{-6}2×10−6 m, order = 2, λ = ?**
   A) 2 μm
   B) 1.0 μm
   C) 1.0×10^{-6} m
   D) 2.0×10^{-6} m
   Answer: C

1. **What happens to diffraction angle with higher order spectra?**
   A) Increases
   B) Decreases
   C) Remains same
   D) Becomes zero
   Answer: A

1. **The maximum number of orders visible is given by:**
   A) n=dλn = \frac{d}{\lambda}n=λd
   B) n=λdn = \frac{\lambda}{d}n=dλ
   C) n=dλn = d \lambdan=dλ
   D) n=1sin θn = \frac{1}{\sin \theta}n=sinθ1
   Answer: A

◇ Assertion and Reason Questions

1. **Assertion:** Diffraction angle increases with order.
   Reason: Higher orders have greater path difference.
   Answer: A – Both A and R are true and R explains A.

1. **Assertion:** Sodium light shows sharp fringes in grating experiment.
   Reason: It is nearly monochromatic.
   Answer: A

1. **Assertion:** Grating element depends on number of lines per unit length.
   Reason: d = 1/N
   Answer: A

◇ Viva Questions (with Answers)

1. **What is diffraction?**
   Bending of light around sharp edges or through slits.
2. **What is the grating constant?**
   Distance between adjacent slits = d=1/Nd = 1/Nd=1/N
3. **What is the condition for diffraction maxima?**
   dsin θ=nλd \sin \theta = n \lambdadsinθ=nλ
4. **What type of grating is used?**
   Transmission grating.
5. **Why is sodium light used?**
   It is nearly monochromatic.
6. **What is the use of spectrometer?**
   To measure diffraction angles.
7. **What is the unit of wavelength?**
   Angstrom (Å) or nanometer (nm)
8. **What is order of spectrum?**
   Number of bright fringes from central maxima.
9. **What happens when order increases?**
   Angle increases, visibility decreases.
10. **How to find least count of vernier scale?**
    LC=1 MSD−1 VSD\text{LC} = \text{1 MSD} - \text{1 VSD}LC=1 MSD−1 VSD

☑ Experiment 9: To Determine Refractive Index of a Prism

◇ MCQs with Answers & Explanations

1. **The refractive index of a medium is the ratio of:**
   A) Speed of light in vacuum to the speed of light in the medium
   B) Speed of light in medium to the speed of light in vacuum
   C) Angle of refraction to the angle of incidence
   D) Angle of incidence to the angle of refraction
   Answer: A
   Explanation: It measures how much light slows down in the medium compared to vacuum.
2. **The angle of minimum deviation occurs when:**
   A) The light is perpendicular to the prism face
   B) The light refracts at 45°
   C) The incident and refracted rays are symmetric
   D) The refracted light travels in a straight line
   Answer: C
3. **The refractive index of a material depends on:**
   A) Wavelength of light
   B) Temperature
   C) Both A and B
   D) Material structure
   Answer: C
4. **For a prism, the angle of deviation is minimum when the angle of incidence is:**
   A) Equal to the prism angle
   B) Zero
   C) 45°
   D) At the critical angle
   Answer: A
5. **The formula for refractive index (n) of a prism is:**
   A) n=sin (A+Dm2)sin A2n = \frac{\sin \left(\frac{A + D_m}{2} \right)}{\sin \frac{A}{2}}n=sin2Asin(2A+Dm)
   B) n=sin Asin Dmn = \frac{\sin A}{\sin D_m}n=sinDmsinA
   C) n=DmAn = \frac{D_m}{A}n=ADm
   D) n=sin ADmn = \frac{\sin A}{D_m}n=DmsinA
   Answer: A
6. **The angle of prism is denoted by:**
   A) AAA
   B) α\alphaα
   C) δ\deltaδ
   D) θ\thetaθ
   Answer: A
7. **The deviation produced by the prism is minimum when the angle of incidence is:**
   A) 0°
   B) At the critical angle
   C) Equal to the prism angle
   D) 45°
   Answer: C
8. **In the prism experiment, what is measured to calculate the refractive index?**
   A) Angle of incidence
   B) Angle of deviation
   C) Wavelength of light
   D) Both A and B
   Answer: B
9. **When light passes through a prism, the change in direction is called:**
   A) Refraction
   B) Reflection

C) Diffraction
D) Absorption
Answer: A

10. **The formula to calculate refractive index using minimum deviation is:**
A) n=sin A+Dm2sin A2n = \frac{\sin \frac{A + D_m}{2}}{\sin \frac{A}{2}}n=sin2Asin2A+Dm
B) n=sin Asin Dmn = \frac{\sin A}{\sin D_m}n=sinDmsinA
C) n=ADmn = \frac{A}{D_m}n=DmA
D) n=1sin An = \frac{1}{\sin A}n=sinA1
Answer: A

◇ Numerical MCQs (with options)

1. **For a prism, if the angle of deviation DmD_mDm is 30°, and the angle of the prism AAA is 60°, find the refractive index.**
A) 1.5
B) 1.33
C) 1.25
D) 2.0
Answer: A
Explanation: Use formula n=sin (A+Dm2)sin A2n = \frac{\sin \left(\frac{A + D_m}{2} \right)}{\sin \frac{A}{2}}n=sin2Asin(2A+Dm)

1. **For a prism with angle A=60∘ A = 60^\circA=60∘ , if the angle of minimum deviation Dm=45∘ D_m = 45^\circDm=45∘ , what is the refractive index?**
A) 1.7
B) 1.5
C) 2.0
D) 1.8
Answer: B
Explanation: Apply the same formula to calculate.

1. **If the angle of prism is A=45∘ A = 45^\circA=45∘ , and the deviation Dm=20∘ D_m = 20^\circDm=20∘ , find refractive index.**
A) 1.2
B) 1.33
C) 1.5
D) 1.8
Answer: C

1. **The deviation produced by a prism increases with increasing:**
A) Angle of prism
B) Refractive index
C) Wavelength
D) Angle of incidence
Answer: D

1. **A prism has an angle A=60∘ A = 60^\circA=60∘ , and the deviation for the light is Dm=30∘ D_m = 30^\circDm=30∘ . The refractive index is:**
A) 1.35
B) 1.5
C) 2.0
D) 1.7
Answer: B

◇ Assertion and Reason Questions

1. **Assertion:** The refractive index increases with increase in angle of prism.
Reason: Greater angle results in higher deviation.
Answer: A – Both A and R are true, and R is the correct explanation.

1. **Assertion:** In a prism experiment, deviation is minimum when the light passes symmetrically.
Reason: Symmetry in incident and refracted rays ensures minimum deviation.
Answer: A

1. **Assertion:** When light passes through a denser medium, the refractive index is higher.
Reason: Higher refractive index causes light to bend more.
Answer: A

◇ Viva Questions (with Answers)

1. **What is the refractive index?**
Ratio of speed of light in vacuum to the speed of light in the medium.
2. **What is the condition for minimum deviation in a prism?**
Angle of incidence equals angle of refraction.
3. **What is the angle of minimum deviation?**
The angle at which the light bends the least in the prism.
4. **What formula is used to calculate the refractive index of a prism?**
n=sin (A+Dm2)sin A2n = \frac{\sin \left(\frac{A + D_m}{2} \right)}{\sin \frac{A}{2}}n=sin2Asin(2A+Dm)
5. **How does the refractive index depend on the wavelength?**
Refractive index decreases with increasing wavelength.
6. **What is the use of a spectrometer in this experiment?**
To measure the angle of deviation.
7. **Why is the angle of prism important in the experiment?**
It affects the deviation and hence the refractive index.
8. **What happens when the angle of incidence increases beyond the critical angle?**
Total internal reflection occurs.
9. **What material is used for the prism in the experiment?**
Glass.
10. **Why is the experiment performed in minimum deviation condition?**
To get a stable and precise measurement of the refractive index.