Below are **very brief SLO-based notes** from **Unit 2: Kinematics**, followed by **all formulae collected at the end**, as you requested.

UNIT 2 – KINEMATICS (SLO NOTES)

1. Kinematics

- Study of motion **without considering forces**.
- Motion is always described **relative to an observer**.

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2. Rest and Motion

- **Rest:** No change in position w.r.t. observer.
- **Motion:** Change in position w.r.t. observer.
- Rest or motion depends on **reference frame**.

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3. Types of Motion

- **Translatory motion:** Body moves as a whole
  - Rectilinear (straight line)
  - Curvilinear (curved path)
  - Circular (constant radius)
  - Random (no fixed path)
- **Rotatory motion:** Rotation about own axis
- **Vibratory motion:** To and fro motion about mean position

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4. Distance and Displacement

- **Distance:** Total path length (scalar)
- **Displacement:** Shortest straight-line distance with direction (vector)
- Distance ≥ Displacement
- Displacement can be zero while distance is not

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5. Speed

- Rate of change of distance
- Scalar quantity
- Types:
  - Average speed
  - Instantaneous speed
  - Uniform speed
  - Variable speed

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6. Velocity

- Rate of change of displacement
- Vector quantity (magnitude + direction)
- Types:
  - Average velocity
  - Instantaneous velocity
  - Uniform velocity
  - Variable velocity
- In circular motion, speed may be constant but velocity changes

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7. Acceleration

- Rate of change of velocity
- Vector quantity
- Can be due to:
  - Change in speed
  - Change in direction
  - Both
- Uniform and non-uniform acceleration

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8. Motion Due to Gravity

- All freely falling bodies have same acceleration **g**
- Direction of g is **downward**
- Near Earth's surface: $g \approx 9.8\ m/s^2$
- Upward motion → acceleration = −g

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9. Graphical Analysis of Motion

Distance–Time Graph

- Slope → **Speed**
- Horizontal line → body at rest
- Straight sloped line → uniform speed
- Curve → variable speed

Speed–Time Graph

- Slope → **Acceleration**

- Area under graph → **Distance travelled**

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ALL FORMULAE (COLLECTED)

Distance & Displacement

- $\Delta d = d_2 - d_1$
- $\Delta t = t_2 - t_1$

Speed

- $v = s / t$
- v_{av} = total distance / total time
- $s = v \times t$

Velocity

- $v = \Delta d / \Delta t$
- v_{av} = total displacement / total time

Acceleration

- $a = \Delta v / \Delta t$
- $a = (v_2 - v_1) / t$

Gravity

- $g = 9.8\ m/s^2$
- $a = +g$ (downward motion)
- $a = -g$ (upward motion)

Graphs

- Speed = slope of distance–time graph
- Acceleration = slope of speed–time graph
- Distance = area under speed–time graph

If you want, I can **convert this into exam-ready bullet points**, **MCQ key lines**, or **a one-page revision sheet**.

Sources