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| **Circular Motion** | IB Physics Content Guide |

# Big Ideas

* Objects moving in a circle are experiencing acceleration since the direction of the velocity is constantly changing
* Centripetal acceleration and centripetal force are always directed toward the center of the circle
* The net force for a body in circular motion is equal to the centripetal force
* It is useful to draw a free body diagram to determine what forces are present at a given position

# Content Objectives

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 – Defining Circular Motion |  | | | |
| I can convert between angular displacement in revolutions and radians | |  |  |  |
| I can describe and calculate the properties of period and frequency | |  |  |  |
| I can calculate angular velocity | |  |  |  |
| I can describe and calculate tangential velocity based on the angular velocity and radius | |  |  |  |
| I can determine the direction and magnitude of centripetal acceleration and centripetal force | |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 2 – Vertical Circular Motion |  | | | |
| I can draw correctly proportioned free body diagrams for horizontal and vertical circular motion | |  |  |  |
| I can compare the forces on an object at different positions in vertical circular motion | |  |  |  |
| I can identify the combination of forces that make up the net force that results in circular motion. | |  |  |  |
| I can determine the magnitude and direction of the forces needed to move in a vertical circle | |  |  |  |

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| 3 – Circular Motion, Friction, and Angles |  | | | |
| I can draw a free body diagram when circular motion is produced by a reaction or friction force | |  |  |  |
| I can solve problems that involve friction to create circular motion | |  |  |  |
| I can solve circular motion problems that incorporate components of an angled force | |  |  |  |

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| **Circular Motion** | Shelving Guide |

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| --- | --- | --- | --- | --- | --- |
|  | Variable Symbol | Unit |  | *Draw in*  *vectors*  *for v, ac,*  *and Fc 🡪* |  |
| Distance | d | m |  |
| Angular Distance | θ | rad |  |
| Angular Velocity | ω | rad s-1 |  | *Data Booklet Equations:* | |
| Linear Velocity | v | m s-1 |  |  | |
| Centripetal Acceleration | *a* | m s-2 |  |  | |
| Centripetal Force | Fc | N |  |  | |

## Defining Circular Motion

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Period | T | s | Angular Velocity | ω | rad s-1 |
| Time per revolution | | |  | | |

## Vertical Circular Motion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Top: | | Bottom: | |
| Fnet = Fc = FT + Fg | | Fnet = Fc = FT - Fg | |
|  | | |  | |  |
| Top: | | | Bottom: | | |
|  |  | |  | |  |
| Fnet = Fc = Fg - R | Fnet = Fc = R - Fg | |

## Circular Motion with Friction and Angles

|  |  |  |
| --- | --- | --- |
|  |  | Relationships between variables: |

|  |  |  |
| --- | --- | --- |
|  |  | Relationships between variables: |

|  |  |  |
| --- | --- | --- |
| Image result for pendulum circle |  | Relationships between variables: |