Circular Motion Study Guide

Name _____

Period _____

I. Rotation vs. Revolution

a. Rotation is when an object turns about an _____ axis. Example:

b. Revolution is when an object turns about an _____ axis. Example:

II. Tangential vs. Rotational Speed

a. The _____ speed is when the object is moving along a circular path. It is _____ angles to the radius. The direction of motion is always _____ to the circle.

b. A point on the outer edge moves a _____ distance than a point at the center so the tangential speed is _____ on the outer edge than closer to the axis. V_t = _____ Unit: _____

c. The _____ speed is the number of _____ per unit of time. All parts of the object rotate about their axis in the _____ amount of time. Expressed in _____ which stands for revolutions per _____. Other example units would be:

III. Centripetal Force/Acceleration & Centrifugal Force

a. The _____ force is any force that causes an object to follow a circular path. It pulls an object out of its straight-line path and into a _____ path. This _____ force is directed at _____ angles to the path of a moving object. F_c = _____ Unit: _____

b. _____ acceleration measures how quickly the direction of velocity changes. It can be compared to 9.8 m/s^2 or 1 ___. A_c = _____ Unit: _____

c. The _____ force is fictitious force. It is actually your own _____ pressing against the outside of the circle.

IV. Center of Gravity is the point located at the object's _____ position of weight.

a. An object will remain _____ if the CG is above its base support or supported at that point.

b. A block topples when the _____ extends beyond its support base.

c. A projectile rotates about its _____.

V. Torque – produces _____. When a force is applied with "_____".

a. Torque = _____ x _____ Unit: _____

b. When the force is perpendicular, the distance from the turning axis to the point of contact is called the _____ _____.

c. The greater the force or lever arm the greater the _____.

d. A pair of torques can _____ each other. $(Fd)_{ccw} = (Fd)_{cw}$

Example: A 60 kg boy sits on a seesaw 1.0 m from the fulcrum. What is the distance from the fulcrum should the 30 kg girl sit in order to balance the seesaw?

VI. Rotational Inertia

a. Linear inertia (Newton's first law): An object at rest tends to stay at _____, and an object in motion tends to remain _____ in a straight line.

b. Rotational inertia: An object rotating about an axis tends to keep _____ about that axis, while nonrotating object tends to stay _____.

c. Just as it takes a force to change linear state of motion, a _____ is required to change the rotational state of motion of an object.

    1. The greater mass on an object, the _____ the rotational inertia.

    2. With rotation on an object, the greater the distance between the axis and the bulk of the mass, the _____ rotational inertia.

    3. A solid cylinder rolls down an incline _____ than a hollow one, of the same mass and diameter.

    4. A hollow cylinder has _____ rotational inertia and the mass will be more "_____" in gaining speed. So, its acceleration will be _____.

d. Rotational Inertia and Gymnastics

    1. Extending an arm or leg _____ rotational inertia. (ice skaters)

    2. The rotational inertia is _____when arms and legs are drawn inward in the tuck position. (somersault or flip)

VII. Angular Momentum = _____ x _____ x _____ Unit: _____

a. The greater the tangential velocity, _____ its angular momentum.

b. Law of conservation of momentum - if no unbalanced external torque acts on a rotating system, the angular momentum of the system is _____.

Example: When a person pulls his/her arms and the whirling weights inward, he/she _____ their radius, and their tangential speed correspondingly _____ while _____ angular momentum.