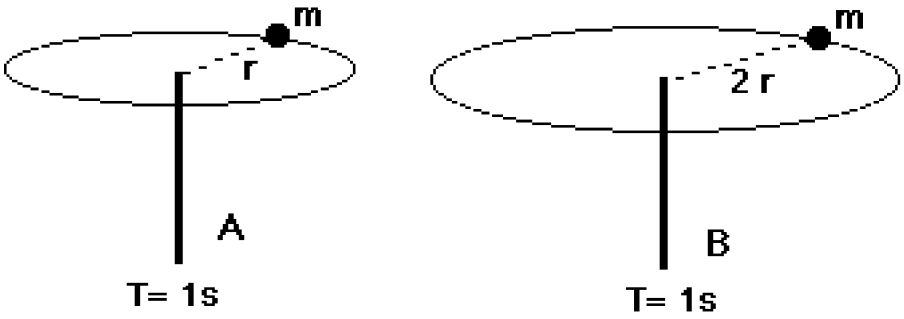
Test Review

In each of the pairs of diagrams below, a sphere attached to a string is swung in a flat circle (similar to the technique used in the lab). Examine each diagram carefully to note which variable has been changed.

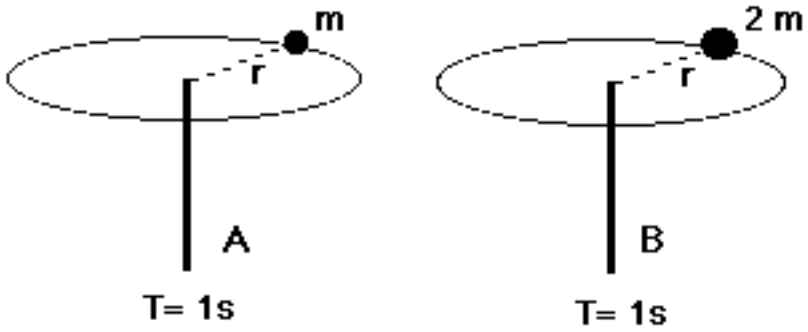


_ 1. How would the F_c of A compare to F_c of B?

a. A < B
b. A > B
c. A = B

__ 2. How would the speed of A compare to that of B?

a. A < B
b. A > B
c. A = B



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__ 3. How would the F_c of A compare to F_c of B?

a. A < B
b. A > B
c. A = B

__ 4 How would the speed of A compare to that of B?

a. A < B
b. A > B
c. A = B

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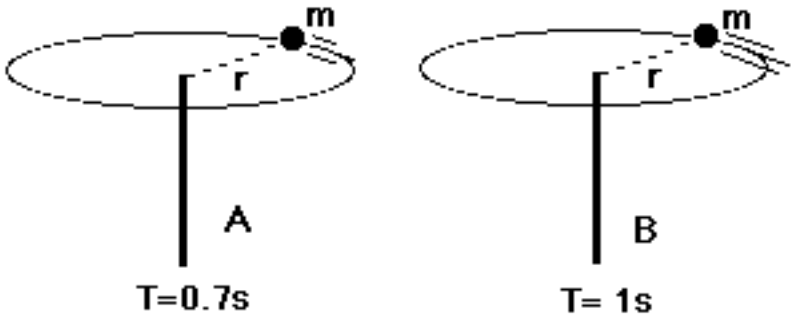
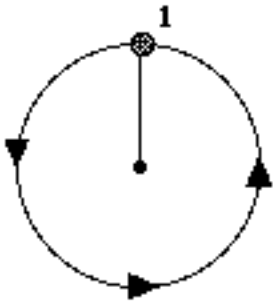


__ 5. How would the F_c of A compare to F_c of B?

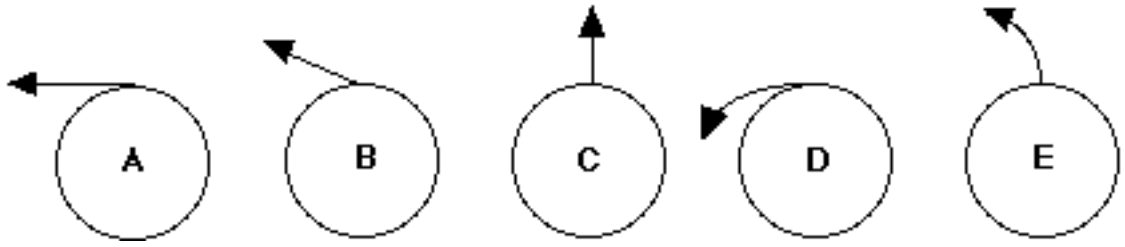
a. A < B
b. A > B
c. A = B

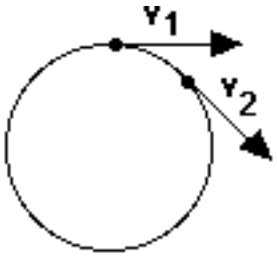
__ 6 How would the speed of A compare to that of B?

a. A < B
b. A > B
c. A=B



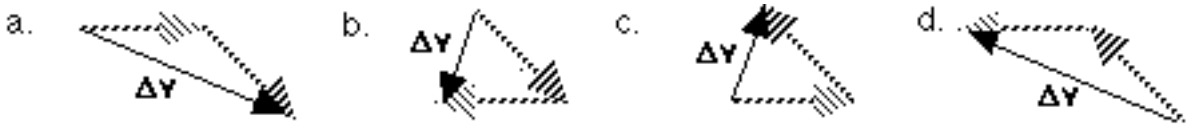
__ 7. At right is an overhead view of a stopper whirling around in a flat circle in the direction indicated by the arrows. At the point marked "1", the string breaks. Which of the diagrams below best describes the path of the stopper?





__ 8. The velocity vectors for an object moving in a circle are shown on the diagram at the right .

Which of the following vector diagrams correctly represents the change in velocity **(Δv)**?



__ 9. Which of the following is true for an object traveling in a circular path at constant speed?

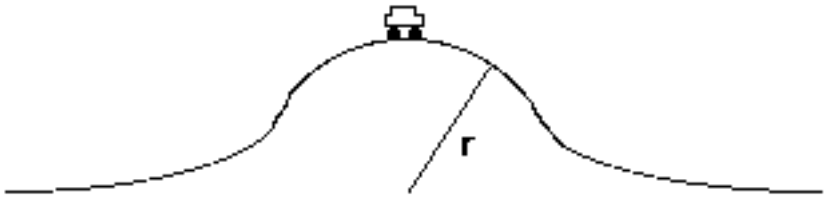
a. both its speed and velocity are constant .
b. its speed is constant, but its velocity is changing.
c. its speed is constant, so its acceleration is zero.
d. both its velocity and acceleration are constant.

10. A child twirls his yo-yo **horizontally** about his head rather than using it properly. The yo-yo has a mass of 0.250 kg and is attached to a string 0.800 m long.

    a. If the yo-yo makes a complete revolution each second, what tension must exist in the string?

    b. If the tension in the string is doubled, what is the speed of the yo-yo?

11. A 400. kg roller coaster car is traveling at a constant speed of 12 m/s over a hill with a radius of curvature of 40. m.



    a. Draw a force diagram for the car on the diagram above.

    b. What is the normal force acting on the car at the top of the hill?

    **Assume that the car is at the intersection of the radius and the hill and that a frictional force exists between the car and the hill. Draw a force diagram showing all forces.

12) A 1.5 kg brick is pushed across a floor with a force of 10 N at a constant speed. What is the acceleration of the brick if I increase the push to 20 N? What is the speed of the brick after 2 seconds of the new push if its initial speed was 5 m/s?

13) A chair with a mass of 5 kg is pulled across a floor at a constant speed. If it is suddenly pulled harder at 30 N, causing it to increase in speed from 2 m/s to 4 m/s in 1 second, how hard was the chair being pulled originally?

14) What is the coefficient of kinetic friction between a 20 kg TV and the floor that is being pushed at a constant speed with a force of 60 N?

15) A 6 kg brick is pushed across a floor with a force of 20 N at a constant speed. What is the acceleration of the brick if I increase the push to 80 N? What is the speed of the brick after 2 seconds of the new push if its initial speed was 5 m/s?

16) A chair with a mass of 15 kg is pulled across a floor at a constant speed. If it is suddenly pulled harder at 50 N, causing it to increase in speed from 5 m/s to 10 m/s in 2 second, how hard was the chair being pulled originally? What is the net force on the chair?

17) What is the coefficient of kinetic friction between a 45 kg TV and the floor that is being pushed at a constant speed with a force of 80 N?

18) A 10 kg box is sliding at constant velocity down a ramp that has an incline of 35^{o}. What is the force of friction if the coefficient of friction is .7?

19) What happens to the force of gravitation between 2 objects when the mass of object 1 is doubled and the mass of object 2 remains the same? What would happen to the force if the masses were held constant and the distance between them is tripled?

20) Draw free body diagrams of the following situations:

- A box sliding down a ramp.

- A hanging box with 2 cables (the cables make 2 different angles with the ceiling)

- A box sliding on a horizontal surface with a constant velocity. (Explain why the applied force and the frictional force must be equal in this case)

- A toy car held by a string moving in a circle:

21) A bat hits a baseball, which one exerts more force, the ball on the bat, the bat on the ball or another answer? Explain your reasoning behind your answer.

22) Use Newton's Laws to explain why is it possible to pull a tablecloth out from under dishes?

23) Explain why a Hummer sustains less damage than a Honda Civic in a collision?

24) Explain the difference between mass and weight.

25) Given 2 forces, (F_1 = 10N @ 90^o, and F_2 = 18N @ 300^o), what is the equilibrium force?

Physics - Unit V Review Topics

1. Use Newton's 2nd Law to qualitatively describe the relationship between **m** and **a**, **F** and **a**, **m** and **F**.

   a. What conclusions did you draw from the lab at the beginning of the unit?

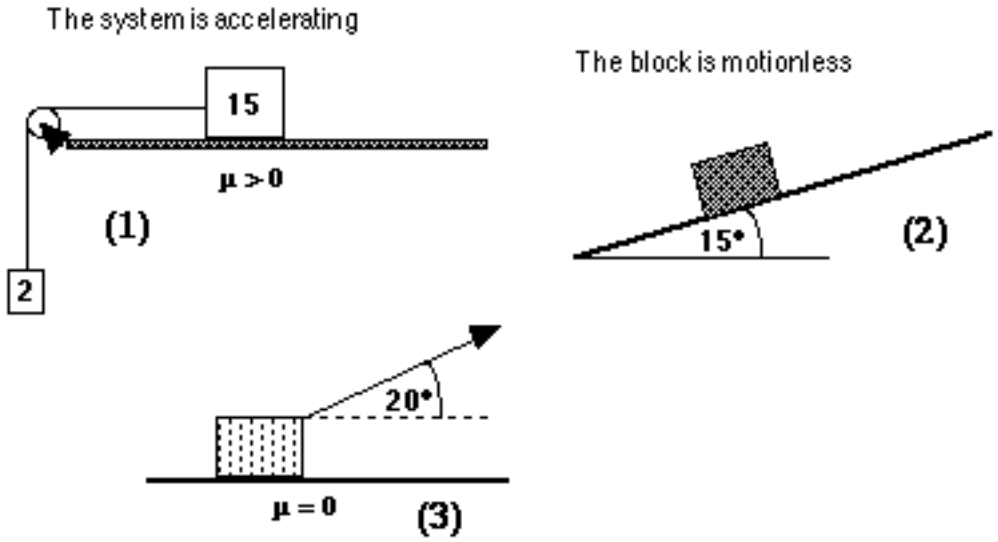
   b. Write statements which demonstrate your understanding of Newton's 2nd law.
   e.g., "If I cut the mass of the system in half, the acceleration would..."

2. Given a **v** vs **t** graph, draw the corresponding **a** vs **t** and **x** vs **t** graphs.

   Sketch a few stacks of kinematics curves. Draw simple **v** vs **t** graphs: constant v, increasing v, decreasing v, then sketch the corresponding **x** vs **t** and **a** vs **t** graphs.

3. Determine the sum of the forces acting on an object

   From dynamics information - If you are given forces, or the physical description of the system and surroundings, draw a force diagram. Ask yourself: "Can I tell if the system is accelerating?" If yes, then the forces do NOT add up to zero. $\Sigma F = ma$. If the system is moving at constant velocity or is motionless, then the forces cancel out. $\Sigma F = 0$.

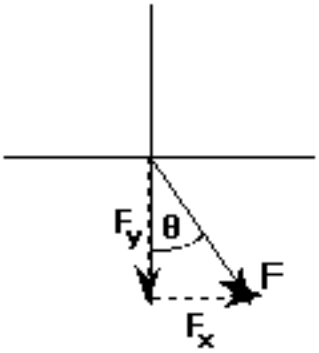


   Sketch a force diagram for each of the objects above.

   Write the equation for the sum of the forces in the x-direction in (2).

   Write the equation for the sum of the forces in the y-direction in (3).

   Treat the masses in (1) as a system and write the Newton 2 equations for the two blocks.



Remember: break any force not on an axis into x and y components.

a) Express F_x and F_y in terms of the F.

What are the signs of F_x and F_y ?

Given kinematic information (Δx, v, t), find the acceleration first, then use $\Sigma F = ma$ to solve for force.

a) A 12, 000 kg bus slows from 30 m/s to 10 m/s in 10 s. What is the net force acting on the bus?

b) What does a scale read for a 75 kg man in an elevator that goes from - 6.0 m/s to zero in 2.0 s ?

Strategy

A 10 kg box is dragged across a horizontal surface ($\mu = 0.20$) by a 100 N force that is applied at a 30° angle from the horizontal. Describe how you would go about finding the acceleration of the box.