UNIT IV TEST (v2): INERTIA & INTERACTION

For questions 1-4, draw the force diagram which represents the situation.

<table>
<thead>
<tr>
<th>Question</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A wrecking ball is held motionless by a cable.</td>
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<td>2.</td>
<td>A small child slides down a frictionless slide.</td>
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<td>3.</td>
<td>The weight pulls block A across a frictionless table.</td>
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<tr>
<td>4.</td>
<td>A skydiver falls at constant velocity (include air resistance)</td>
</tr>
</tbody>
</table>

5. As a ball falls, consider one force to be the pull of the earth's mass on the ball. What is the pair to this force?
   - a. non-existent in this case.
   - b. the acceleration of the ball.
   - c. the pull of the ball's mass on the earth.
   - d. air resistance acting against the ball.
   - e. none of these.

6. A horse exerts 500 N of force on a heavy wagon, causing it to accelerate. What force does the wagon exert on the horse?
   - a. 500 N.
   - b. more than 500 N.
   - c. less than 500 N.
   - d. it's not possible to tell.
For questions 7 - 12, it is possible to have MORE THAN ONE correct answer.

For questions 7 - 10 refer to the diagram below. A student attaches a string to the block of dry ice on the table, and pulls steadily on the block.

7. Which of the following forces act on the block?
   a. the force of gravity
   b. kinetic friction
   c. a normal force
   d. the towing force

8. Which of the following describes the motion of the block while it's on the table?
   The block
   a. speeds up for a bit, then moves at constant speed.
   b. accelerates constantly.
   c. slows down gradually to a stop.
   d. moves at constant speed.

9. When the block reaches point B, the string breaks. Which of the following describes the motion of the block?
   The block
   a. begins to slow immediately.
   b. continues to accelerate.
   c. moves at constant speed.
   d. continues at constant speed for a while, then slows down.

10. Eventually, the block reaches the edge of the table. After the block leaves the table, which of the following forces act on the block?
    a. the force of gravity
    b. the force of motion
    c. a normal force
    d. kinetic friction

11. A block of dry ice resting on a table is given a brief push. A moment later, which of the following forces act on the block?
    a. the force of gravity
    b. kinetic friction
    c. the force of the push
    d. a normal force

12. Which of the following describes the motion of the block?
    a. accelerates constantly.
    b. continues at constant speed for a while, then slows down.
    c. slows down gradually to a stop.
    d. moves at constant speed.
13. You’re in the back of a friend’s pickup truck when it stalls on a hill. You jump out, get behind the truck and push with all your might (300 N). Still, the truck slowly rolls back down the hill. The force the truck exerts on you is:
   a. 300 N.
   b. less than 300 N.
   c. greater than 300 N.
   d. it’s not possible to tell.

14. When you first learned how to roller skate, you may have gotten started by pushing off the wall at the skating rink. Draw a force diagram for yourself as you accelerate. Clearly label all the forces acting on you.

15. A 5.0 kg sign hangs from a boom supported by a cable connected to a wall. The cable makes a 30° angle with the boom. Sketch a force diagram.
   
   a. What is the force of tension in the cable?

   b. What force does the boom apply to the sign?
16. The mass of the block on the end of the string is 5.0 kg. If the tension in the horizontal cable is 15.0 N, what is the tension in the string attached to the ceiling? Draw the force diagram.

Determine the measure of the angle.

17. You pull your wagon (mass = 30 kg) across the lawn at constant speed. To do so, you must exert 60 N of force. The handle makes a 25° angle with the horizontal.

a. Sketch a force diagram to represent this situation.

b. What is the x-component of the force you apply?

c. How does this compare to the frictional force which opposes your effort? Explain.

d. What is the value of the normal force?