UNIT V TEST (v2): CONSTANT FORCE MODEL

For questions 1-6, consider the cart on a track below. A force is applied acting to the right. Assume that friction is negligible.

For each question, one or more features of the system has been changed. You are to indicate what effect the change will have on the acceleration.

Use the following answer key.
   a. The acceleration will be greater.
   b. The acceleration will be less.
   c. The acceleration remains the same.
   d. It's not possible to tell.

__1. The towing force is increased to 1.0 N.

__2. The mass of the cart is increased to 2 kg.

__3. Both the mass of the cart and the towing force are doubled.

__4. The 0.5 N towing force is applied at an angle as shown at right.

__5. The 0.5 N force is applied to two 500 g carts hooked together as shown below.

__6. The track is inclined as shown below.
Below is the velocity vs. time graph for a train. Use the graph to answer questions 7 - 10.

7. Draw the position vs. time and acceleration vs. time graphs corresponding to the velocity graph between points c and d.

8. For the interval from a to b the train is:
   a. speeding up.
   b. slowing down.
   c. moving at constant speed.
   d. moving in the negative direction.

9. Is the net force on the train equal to zero at any time? Explain.

10. Where is the net force on the train the largest? Explain.

11. An 800. kg Geo Metro can go from rest to a speed of 36 m/s in 9.0s. What average net force acts on the car?
12. Consider the block on a surface below. The coefficient of friction, $\mu$, is 0.30.

\[ \begin{array}{c}
\text{2 kg} \\
\mu = 0.30
\end{array} \]

a. If a 10. N force is applied to the block, what is its acceleration?

b. How fast will the block be moving if the force is applied for 8.0s?

c. How far will the block have traveled during this 8.0s period?

13. The diagram at left depicts a frictionless apparatus similar to that used for your Newton's 2nd Law experiment. Block A has a mass of 15 kg and block B has a mass of 3.0 kg.

\[ \begin{array}{c}
\text{A} \\
\text{B}
\end{array} \]

a. Draw force diagrams for block A and block B.

b. Determine the acceleration of the system.

c. What is the tension in the string?
14. A 60.0 kg box is pulled across a frictionless surface by a 300. N force at an angle of 30.$^\circ$ to the horizontal.

![Diagram](image)

a. What is the acceleration of the box in the x-direction?

b. What is the normal force on the box?

15. A 20.0 kg block is allowed to accelerate down a ramp with negligible friction.

![Diagram](image)

a. Draw a force diagram for the block.

b. Determine the acceleration of the block. Show work.

Extra Credit: Would the acceleration be different if the mass of the block were 10 kg? Explain.