KU: /10 **TI:** /20 **C:** /10

Dynamics Evaluation

Name: _____ Date: _____COVID-19 2020_____

List of Potentially Useful Equations:

$$v_2 = v_1 + a\Delta t \qquad \Delta d = v_1\Delta t + \frac{1}{2}a\Delta t^2 \qquad \Delta d = v_2\Delta t - \frac{1}{2}a\Delta t^2 \qquad v_{av} = \frac{\Delta d}{\Delta t} = \frac{(v_1 + v_2)}{2}$$

$$v_2^2 = v_1^2 + 2a\Delta d \qquad a_g = 9.8\frac{m}{s^2} \qquad \Sigma F = F_{net} = ma \qquad F_f = \mu F_N$$

[F.B.D.'s are required for some problems, include units and put a box around the final answer. You must show all work to get full marks.]

Knowledge & Understanding:

1. [4 marks] **True or False:** If the answer is false ***correct it*** so the statement it is true.

    T F The acceleration of an object is proportional to the force.

    T F An object moving towards the left can have a net force on it to the right.

    T F If the net force on an object is doubled the object's acceleration is halved.

    T F The net force on an object is zero when it is not accelerating.

    T F The Frictional Force only depends on the surfaces in contact.

    T F An object moving at constant speed has no forces acting on it.

    T F Weight and mass are equivalent.

    T F PHYSICS IS PHANTASTIC !!!!

2. [2 mark] List the four fundamental forces from **strongest → weakest**.

    _____ , _____ , _____ , _____

3. [4 marks] An object is moving to the right with a constant speed. What is the net force acting on the object in the horizontal direction? Explain.

Thinking, Inquiry, and Problem Solving

4.   [5 marks] A mini-tank of mass 3.5 kg generates a driving force of 35 N to the right. Air resistance (6 N) and friction (3 N) act backwards on the tank.   Calculate the time it would take the tank to accelerate from 7m/s to 18 m/s.

7.   [5 marks] Santa is in his sleigh (total mass is 300kg) and initially at rest. The coefficient of friction between the sleigh and the snow is 0.25. The reindeer are pulling it to the left with 1200N of force and the magical lift force applied 800N up (but did not accelerate it off the ground) – it is simply sliding along the ground.   Calculate the acceleration of Santa's sleigh.

9.   [5 marks] Consider the following situation. A Pizza box is being pushed along the ground and is, in fact, accelerating towards the right. The mass of the box is 1.6 kg. Four independent forces are acting on the box. 5N [up], 50 N [right], 7N [down] and 45.35N [left]. If it was found that the box accelerated from 1 m/s to 6 m/s in a time of 2 seconds, calculate the coefficient of friction.

10. [5 marks] Matrix the Monkey (13 kg) is in an elevator. He is standing on a scale and looks down to sees that the scale is reading 115 N. Is the elevator, stationary, moving at a constant speed, accelerating upward or accelerating downward. Explain. If it is accelerating determine the acceleration of the elevator. Can you tell if it is moving up or down? Explain.

Communication (Answer 2 of the following)

11. [5 marks] Describe the concept of terminal velocity. Explain what terminal velocity is, why it occurs and what factors affect an objects terminal velocity. Why don't objects experience terminal velocity if falling in a vacuum? State relevant laws, etc.

12.   [5 marks] Describe the concept of crumple zones. Include references to Newton's 2nd law, etc. Also, use an example to help you with your description of this concept.

13.   [5 marks] Describe the concept of Inertia and give one well described example of Inertia in action.