

Name: \_\_\_\_\_

DISC: \_\_\_\_\_

Score: \_\_\_\_\_ / 20

## Instructions:

- Do your own work.
- Answer the questions below in the space provided.
- Make sure you show all your work and any equations that you use.
- Please place a box around your answers.
- Remember to give the correct units with all numerical answers.

Q1

Q2

Q3

Q4

5

5

5

5

1. You have just arrived on a new planet and wish to find its acceleration of gravity. You throw a ball vertically upward with an initial velocity,  $v_0 = 18 \text{ m/s}$ . The ball takes  $4\text{s}$  to reach its maximum height.

- a. What happens to the *velocity* of the ball at its maximum height?

Answer (2pts):

- b. Of the following expressions, which would you use to find  $g_{\text{new}}$  the acceleration of gravity on the new planet:

Expression (1 pt):

- i.  $v = v_0 + at$   
 ii.  $y(t) = y_0 + v_0 t + \frac{1}{2} at^2$   
 iii.  $v^2 = v_0^2 + 2 a \Delta y$

- c. Use your result in part a) and your chosen expression in part b) to find  $g_{\text{new}}$  :

 $g_{\text{new}}$  (2 pts):

2. A train leaves a station and undergoes constant acceleration from rest. After traveling  $2.5 \text{ km}$  in a straight line, the train reached a final speed of  $45 \text{ m/s}$ .

- a. Select the equation you would use to find the acceleration of the train?

Choice (2 pts):

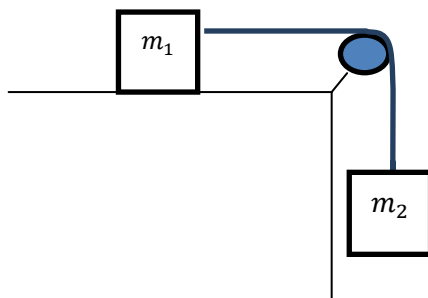
- i.  $x(t) = x_0 + v_0 t + \frac{1}{2} at^2$   
 ii.  $v^2 = v_0^2 + 2 a \Delta x$

- b. Use your chosen equation to find the acceleration (remember acceleration is a vector):

Information (1 pt):  
 Solution (2 pts):

- i. Do you have all the information you need (yes/no)?  
 ii. Solve for  $\vec{a}$ .

3. Two blocks are attached to each other by a massless cord over a pulley as shown in the diagram below. Both the table and pulley are *frictionless*:



Coord. system (1 pt.):  
Forces (2 pts):

- Finish the free-body diagram by including all of the forces which can act on the blocks. *Include a coordinate system.*
- Can this system be in equilibrium? Explain your reasoning.

Answer (1 pt):  
Reasoning (1 pt):

4. You are standing on a scale in an elevator. You read the weight on the scale.
- The scale reads the same as your weight outside the elevator. Which of the following is true:

Answer (2 pts):

- The elevator is slowing down.
- The elevator is speeding up.
- Neither of these is true.
- Both of these are true.

- You look at the scale again. The reading is *less* than your weight outside the elevator. Explain in your own words what has happened.

Explanation (3 pts.):