Name: _____

Physical Science Final Exam Study Guide

Vocabulary & Formulas: For the table below, fill in the definition, formula (when it applies) and the units used (when it applies).

Word	Definition	Formula	Unit
Vector			
Velocity			
Potential Energy			
Momentum			
Impulse			
Kinetic Energy			
gravity			
Acceleration			

Lab Safety:

1) List several safety rules you should follow in the lab.

Conversions:

2) Calculate the mass of a student who weighs 155.4 pounds. Remember 1 kg = 2.205 lbs

3) How many seconds are in 10 hours? Remember 1 hour = 3600 seconds

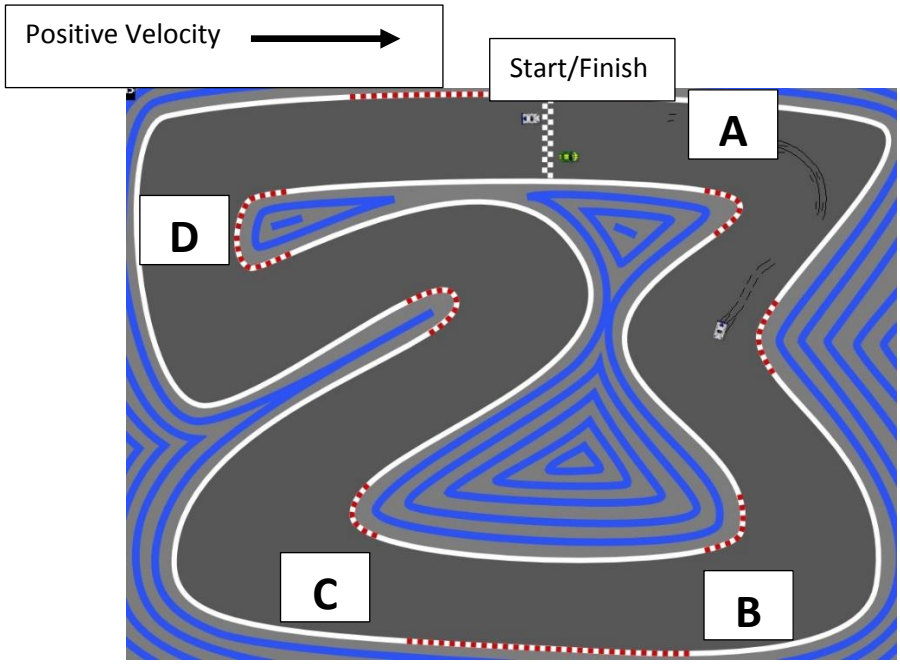
Units:

4) In the lab a student measured a moving object with an acceleration of 7 m/s^2 and a mass of 6 kg. Calculate the force. F = m x a

5) A runner ran 400 meters over a time of 49.6 seconds. What was the runner's velocity? v= d/t

Velocity & Acceleration:

6) Use the image of the race track to answer the questions.



a. When the cars start racing, in which direction should the Net Force vector point?

b. At Point A on the track, the cars start to slow down in order to make the turn. What would the acceleration vector look like for the cars as they slow down?

c. As the cars pass Point D, they turn and head straight for the finish. Which way should the net force point after the turn, in order to get the car to finish the fastest?

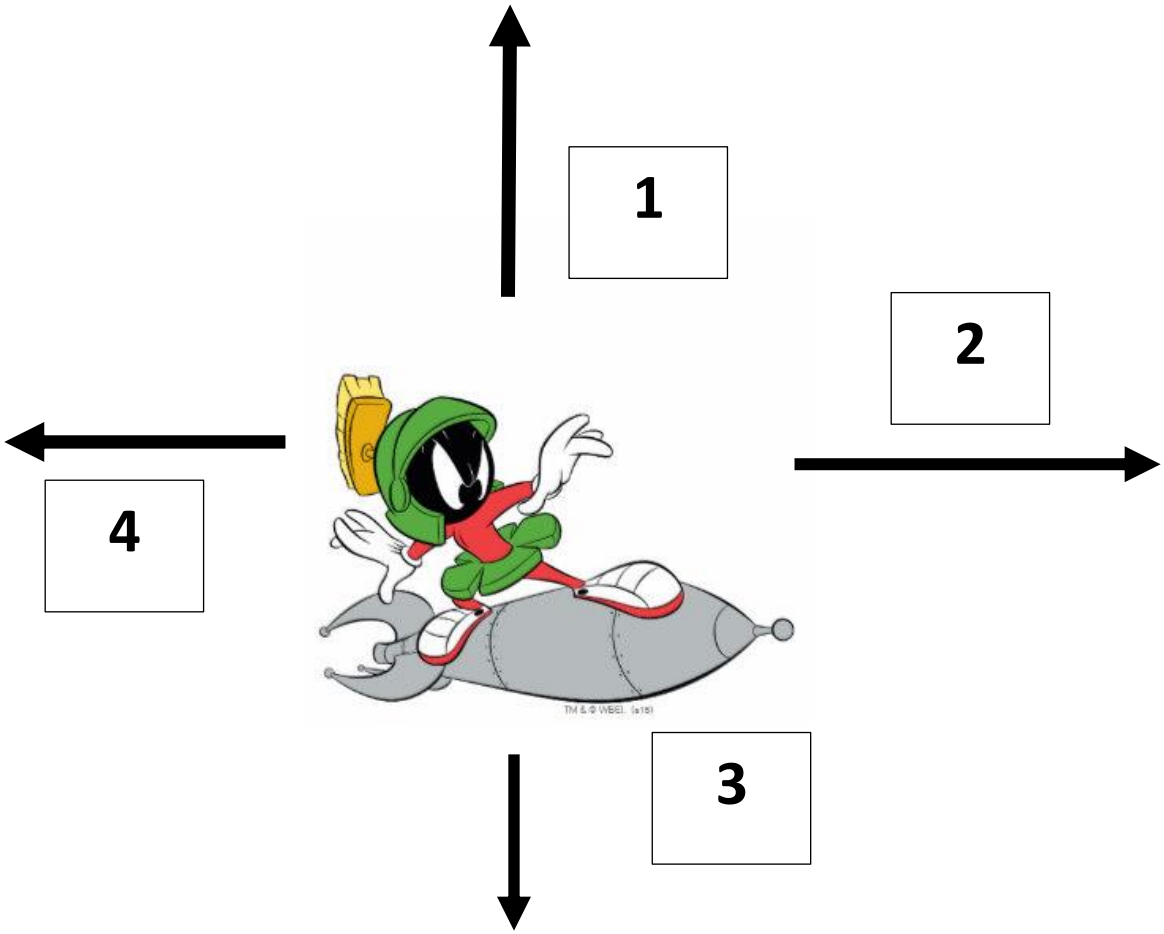
d. The distance between Point B and Point C on the track is measured to be 450 m. If a car can get from Point B to C in 6 seconds, what is the car's average velocity?

e. A car finishes the race with the speed of 25 m/s and it takes 5 seconds to slow down to a stop. What is the car's acceleration?

f. At the end of the race, the cars are not moving. In the space below, draw a force diagram that best represents the cars at this point.

Net Forces:

7) Use the diagram below to answer the questions.



a. What is force 1 in the picture called?
b. What is force 2 in the picture called?
c. What is force 3 in the picture called?
d. What is force 4 in the picture called?
e. Which direction with the rocket accelerate?

Force & Acceleration:

8) Use the data table to answer the questions below:

Item	Mass	Acceleration	Force
Tennis Ball 1	2.2 kg		50 N
Tennis Ball 2	1.5 kg		50 N
Tennis Ball 3	4.2 kg		50 N

a) Which object will roll with the least amount of acceleration?

b) Why?

9) Use the data table to answer the questions below:
4 cars are moving in the positive direction at 7 m/s. A different force begins to act on each car.

Car 1

Time (s)	0	1	2	3	4	5
Velocity	7 m/s	7 m/s	7 m/s	7 m/s	7 m/s	7 m/s

Car 2

Time (s)	0	1	2	3	4	5
Velocity	7 m/s	8 m/s	9 m/s	10 m/s	10 m/s	10 m/s

Car 3

Time (s)	0	1	2	3	4	5
Velocity	10 m/s	9 m/s	8 m/s	7 m/s	6 m/s	5 m/s

Car 4

Time (s)	0	1	2	3	4	5
Velocity	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s

a) Which car is experiencing no net force for the entire time?

b) How do you know?

c) Which car DOES NOT experience a constant net force for the entire time?

d) How do you know?

e) Which car is moving in the positive direction and experiences a positive net force for the entire distance?

f) How do you know?

g) For which car was the additional force removed?

h) How do you know?

i) Which car is most likely to be approaching a stop sign?

j) How do you know?

Free Fall:

10) A) If you drop a penny and a feather off a cliff, which one will hit the ground first? Why?

B) If you drop a penny and a feather in a vacuum chamber, which one hits first? Why?

C) Draw a picture of how the penny appears as it drops.

Momentum:

11) Write the momentum formula in the space below:

12) A student performs an experiment with 2 objects of different masses that collide and continue to glide together- see data table below: (remember: positive velocities mean motion to the right and negative velocities mean motion to the left)

	Object 1	**Object 2**
Mass	3 kg	6 kg
Initial Velocity	5 m/s	0.8 m/s
Final Velocity	2.2 m/s	2.2 m/s
Momentum		

a) What is the momentum of Object 1 before the collision?

b) What is the momentum of Object 2 before the collision?

c) What is the momentum of the combined masses **BEFORE** the collision?

d) What is the momentum of the combined masses **AFTER** the collision?

13) Another student performs an experiment with 2 objects, but this time the objects do not stick together after they collide. The results are shown below. (Remember: positive velocities mean motion to the right and negative velocities mean motion to the left)

	Object 1	**Object 2**
Mass	3 kg	6 kg
Initial Velocity	5 m/s	-0.4 m/s
Final Velocity	-2.2 m/s	3.2 m/s

a) Calculate the momentum of Object 1 **AFTER** the collision.

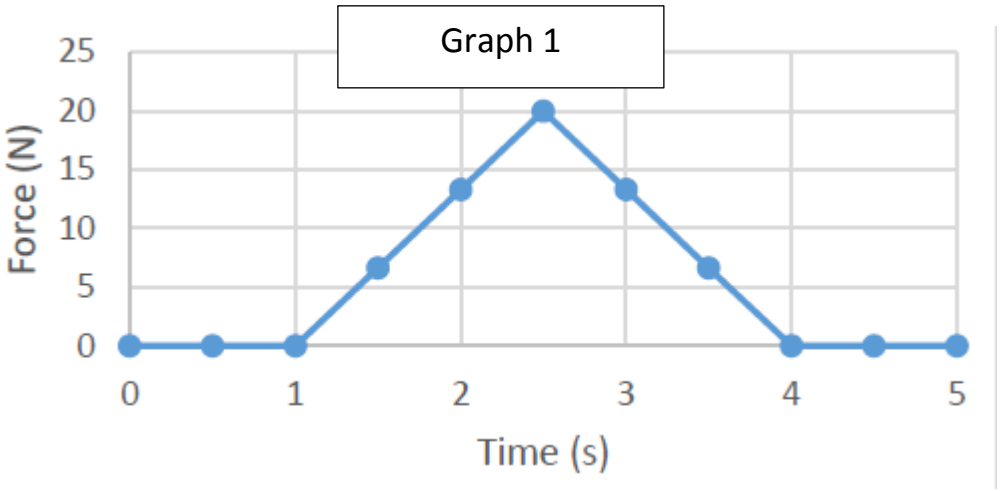
b) Calculate the momentum of Object 2 **AFTER** the collision.

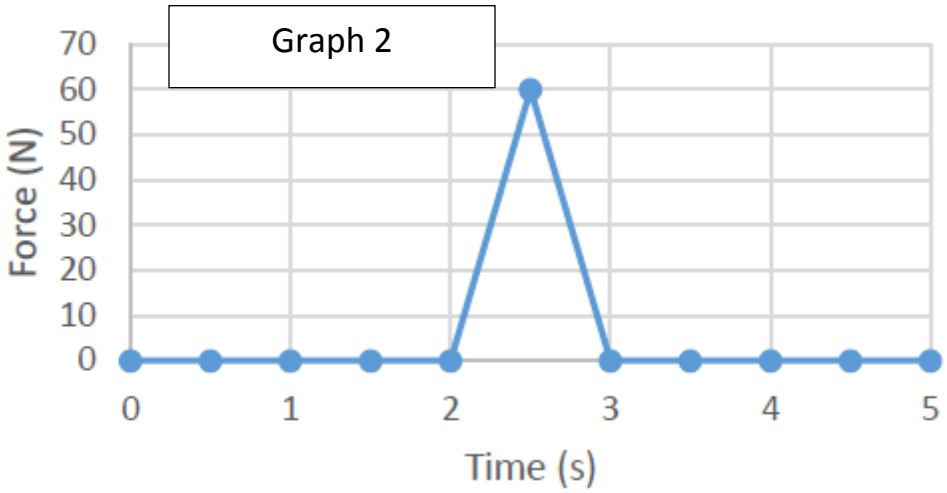
c) Compared to the total momentum before the collision the total momentum after the collision is (greater, smaller, the same) circle one.

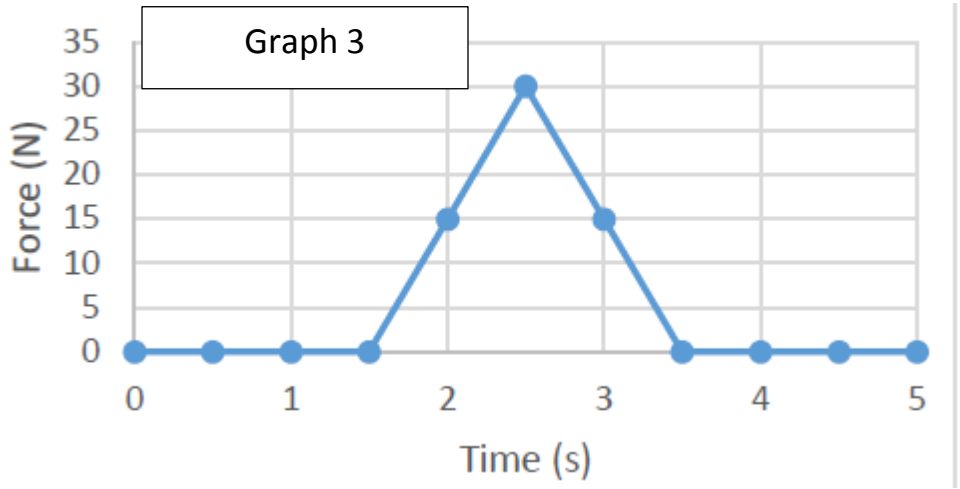
Impulse:

14) Write the Impulse formula in the space below:

15) Look at the 3 graphs below and then answer the questions.







a) Calculate the Impulse on **each** object.

b) If the goal was to keep the object from breaking which of the three graphs show the best option?

c) Which graph shows the object experiencing the biggest impulse?

d) A student is designing a case for a fourth object. What independent variable is the student trying to increase in order for the object to not break?

Gravitational Forces:

16) Look at the pictures below and then answer the questions.



a) The earth and moon experience a gravitational attraction toward each other. Which body experiences a greater pull and why?

b) Which body will the boy in the middle be more attracted to?

Energy:

17) Write the equation for kinetic energy in the space below:

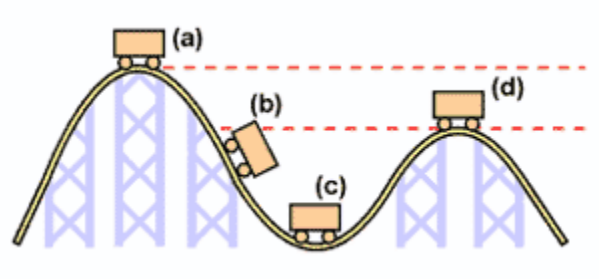
18) Write the equation for potential energy in the space below:

19) If you know the total energy and the potential energy of the roller-coaster, how can you find the kinetic energy?

20) If you know the total energy and the kinetic energy of the roller-coaster, how can you find the potential energy?

21) In the roller coaster picture below, label where the roller coaster has the:

a. Greatest Potential Energy
b. Greatest Kinetic Energy
c. Least Potential Energy
d. Least Kinetic Energy
e. Where the car has the greatest velocity



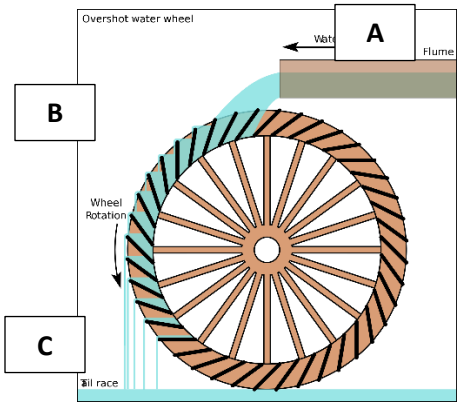
22) Using the roller coaster picture above, answer this question: the total energy at **position a** is measured to be 20, 000 Joules. The KE at **position d** is measured to be 8, 000 Joules. What is the PE at position d?

23) Batman (90 kg) and Robin (70 kg) are at the top of the Gotham City Library. They see the Joker at the door of the bank across the street. They decided to climb up to the top of the antennae tower to catch the zip line down to the bottom. Calculate the speed of Batman and Robin. **Show your work for each calculation**.

Batman (90 kg)		**Robin (70 kg)**	
405 J		315 J	
435 J		375 J	
550 J		350 J	
600 J		275 J	
220 J		100 J	
80 J		50 J	
0 J		0 J	

24)Graph Batman's speed in **black** and Robin's speed in **red**.

25)When the water falls, gravity (acceleration due to gravity is 9.8 m/s^2) helps turn energy of height to electrical energy. Look at the picture below and use it to answer the questions.



a. What is Niagara Falls a good example of?

b. If the height of the wheel were changed to half the height, what would be the change to the potential energy?

c. Rank positions A, B, and C in order of decreasing potential energy.

d. If the height was measured and found to be 3.5 meters tall, what would the potential energy be for 2 L of water weighing 2 kg?