Study Guide for Physics Final

1. In the Inertia demonstration with the eggs and glasses use the idea of inertia to explain why the eggs fell into the glasses of water.
2. How does mass affect the inertia of an object? Does speed affect the inertia of an object?
3. In space, in the absence of air resistance and gravity, use Newton’s 1st law of motion to explain why spacecraft move at a constant speed and direction when no force is applied to it.
4. Use the ideas of inertia and Newton’s 2nd Law of motion to explain why when traveling in car a ball will not hit the back of the windshield when thrown straight up.
5. When Troy Tulowitzki hits a baseball with 100 Newtons of force and Carlos Gonzalez hits a baseball with 80 Newtons of force which baseball will experience greater acceleration?
6. If every force has an opposite but equal force, why does the Earth move with less acceleration than the Moon?



1. Is the mathematical relationship of force on acceleration directly proportional (acceleration increases: force increases) or inversely proportional (acceleration increases : force decreases)?
2. Is the mathematical relationship between acceleration and mass directly proportional (mass increases: acceleration increases) or inversely proportional (mass increases : acceleration decreases)?
3. At what time interval is a force being applied to the cart?
4. What is the acceleration of the cart between 2 and 5 seconds?
5. What is the acceleration of the cart between 0 and 2 seconds?
6. Is the force being applied to the cart between 2 and 3 seconds in the opposite direction of the cart or in the direction of the cart?
7. Is the force being applied to the cart between 3 and 5 seconds in the opposite direction of the cart or in the direction of the cart?
8. If the cart has a mass of 0.5 kg, how much kinetic energy does the cart have at t=4s?(KE=1/2mv2)
9. If a car is moving at a constant speed are the forces acting on the car in equilibrium? What about a car that is speeding up?
10. The graph above shows the velocity of a cart with a fan exerting a force to speed the cart up. The cart and fan together have a mass of 2 kg. What is the net force on the cart? (F = ma) (a = change in velocity/change in time)
11. What is the acceleration of the cart between 3 and 6 seconds?
12. What is acceleration of the cart between 0 and 3 seconds?



1. The graph above shows the velocity of a cart with a fan exerting a force to speed the cart up. The cart and fan together have a mass of 2 kg. What is the net force on the cart? (F = ma) (a = change in velocity/change in time)
2. What is the acceleration of the cart between 2 and 6 seconds?
3. What is the acceleration of the cart between 6and 8 seconds?
4. At what time interval is the force being applied to the cart?
5. Is the direction of the force opposite the direction of the cart or in the same direction?
6. What is the kinetic energy of the cart at 2 seconds? (KE = ½ mv2)



1. The graph above shows a cart that has had two different forces applies to it. Which line represents the greater amount of force applied?
2. When traveling in a train use the concept of inertia to explain why your body wants to continue to move forward when the train stops quickly.



1. According to Newton’s 3rd law of motion each football player is hitting each other with the same amount of force. Why does the smaller player experience greater acceleration? (Hint: Newton’s 2nd law of motion F =ma)

Use the Velocity vs. Time graph below to answer questions 21-36. The following graph shows the velocity of a cart on a frictionless surface. The cart is initially pushed by a hand then later comes into contact with an elastic band. There may be more than one correct answer.

1. Where on the graph did the cart change direction?
2. Where on the graph was cart moving at a constant velocity to the right? To the left?
3. Where on the graph was the cart slowing down?
4. Where on the graph was the cart speeding up and moving in the negative direction?
5. Where on the graph was an energy transfer is taking place?
6. Identify where on the graph the hand was in contact with the cart.
7. Identify where the cart was in contact with the elastic band.
8. If the mass of the cart is 2 kg; what would the Kinetic Energy of the cart be at the point where the hand releases the cart?
9. Where on the graph was the elastic band stretched the furthest?
10. What was the Elastic Potential Energy of the Band/Cart system at point F of the graph if the cart’s mass is 3 kg?
11. At points C and F of the graph is the energy equal, greater at C or greater at F?
12. Identify the where on the graph the forces acting on the cart were unbalanced.
13. Identify the where on the graph the net force acting in the cart was zero. (the forces are balanced)
14. How much force was applied to the cart during the 2 second to 5 second time span? The cart’s mass is 3 kg.
15. How much force was applied to the cart during the 7 second to 13 second time span? The cart’s mass is 3 kg.
16. Draw an Elastic Potential Energy graph that best represents the Elastic Potential Energy of the Cart/Band.
17. Which of the following force diagrams represent objects that are in equilibrium?
18. Draw free body diagrams for each of the following force pairs

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| * 1. Two cars in in a car crash
 | * 1. A person pushes on a wall
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1. For each of the situations below, identify the force pairs:
	1. Snowball hits a girl in the back
	2. A baseball player catches a ball
	3. A swimmer pushes off of the wall of a pool
	4. A soccer player kicks a ball
	5. What force pair is responsible for pushing a car forward?