

# PHYSICS: CHAPTER 3 STUDY GUIDE

Test Date: \_\_\_\_\_

**TOPICS:** Forces (centripetal, types of friction, gravity), Newton's Laws of Motion, Momentum, Impulse, Projective Motion, Terminal Velocity,  $\mu$ .

## **THINGS TO STUDY:**

### **Your Notes:**

- Forces
- Newton's Laws Foldable
- Projectile Motion/Terminal Velocity
- Momentum/Impulse
- Weight/Gravity

### **Assignments**

- Which Law?
- Force Worksheet
- Newton's Law Quiz
- Momentum Problems
- Key Terms Worksheet

### **Knowledge Questions:**

1. Newton's First Law of Motion is referred to as the \_\_\_\_\_.
2. Momentum depends on what two variables? \_\_\_\_\_
3. What is the Formula associated with Newton's Second Law of Motion? \_\_\_\_\_
4. What is the relationship between force and acceleration?
5. What is the relationship between mass and momentum?
6. Gravitational force between two objects depends on what two things?  
\_\_\_\_\_
7. What is the difference between balanced and unbalanced forces?
8. What is the friction between a rolling object and the surface it rolls on called? \_\_\_\_\_
9. Static friction occurs when two objects are \_\_\_\_\_.
10. When force is increased, what happens to acceleration? \_\_\_\_\_

11. What happens to the gravitational force as objects get farther apart?
12. What is the value of acceleration due to gravity? \_\_\_\_\_
13. How does weight relate to mass?
14. How do you calculate weight?
15. How much does a 10-kg block weigh?
16. When a falling object reaches terminal velocity, the force of gravity \_\_\_\_\_  
\_\_\_\_\_ the force of air resistance.
17. The \_\_\_\_\_ is the combination of all the forces acting on an object.
18. Forces that cancel each other are called \_\_\_\_\_ forces.
19. \_\_\_\_\_ measures an object's tendency to resist changing its motion.
20. When a falling object reaches terminal velocity, the force of gravity \_\_\_\_\_  
the force of air resistance.
21. What causes some objects to fall slower than others?
22. When force is increased, what happens to acceleration?

Application Questions:

23. Two stars move toward each other due to the force of gravitation. Star 1 has *twice the mass* of Star 2. Which, if either, exerts the greater force of gravitation on the other?

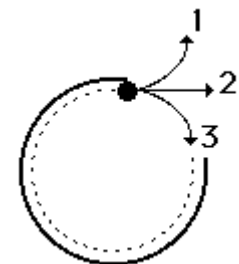


24. As the two stars get closer and closer, the *gravitational force of attraction* on each star will \_\_\_\_\_.

25. A 2 kg cart moves toward a 1 kg cart on a frictionless, horizontal track. Both carts move at a constant speed of 2 m/s. The carts collide and *stick together* after the collision. In which direction do the carts move after the collision ?



26. Find the carts' velocity after the collision:
27. Mac and Tosh are arguing in the cafeteria. Mac says that if he flings the Jell-O with a greater speed it will have a greater inertia. Tosh argues that inertia does not depend upon speed, but rather upon mass. Who do you agree with? Explain why.
28. When a person diets, is their goal to lose mass or to lose weight? Explain.
29. Does a slippery dress shoe or a football cleat have more *MU*? Explain.
30. The group of physics teachers are taking some time off for a little putt-putt golf. The 15th hole at the Hole-In-One Putt-Putt Golf Course has a large metal rim which putters must use to guide their ball towards the hole. Mr. S guides a golf ball around the metal rim. When the ball leaves the rim, which path (1, 2, or 3) will the golf ball follow?



31. You are driving south on I-29 towards Sioux Falls at a speed of 85 mph. Suddenly, you see a highway patrol car parked ahead. You hit your breaks and the full cup of coffee you have setting in the center console flies forward. Which of Newton's Laws explains what is happening with the cup of coffee? Please describe.
32. Just as the highway patrol is about to pull you over, he speeds up and passes you (must have received an urgent call). As the wheels spin backwards, they grip the road and push the road backwards, therefore accelerating. Describe the action-reaction force pairs.
33. As you continue along your journey to Sioux Falls, a grasshopper strikes the windshield of your car and makes an obvious mess. The grasshopper hits the car and the car hits the grasshopper. Which of the two forces is greater: the force on the grasshopper or the force on the car?
34. Many people are familiar with the fact that a rifle recoils when fired. This recoil is the result of action-reaction force pairs. A gunpowder explosion creates hot gases which expand outward allowing the rifle to push forward on the bullet. Consistent with Newton's third law of motion, the bullet pushes backwards upon the rifle. The acceleration of the recoiling rifle is **(greater than, smaller than, or the same size)** as the acceleration of the bullet.
35. Ben Tooclose is being chased through the woods by a bull moose which he was attempting to photograph. The enormous mass of the bull moose is extremely intimidating. Yet, if Ben makes a zigzag pattern through the woods, he will be able to use the large mass of the moose to his own advantage. Explain this in terms of inertia and Newton's 1<sup>st</sup> law of motion.

36. Identify at least six pairs of action-reaction force pairs in the following diagram.



**Practice Problems:**

37. A net force of 15 N is exerted on an encyclopedia to cause it to accelerate at a rate of  $5 \text{ m/s}^2$ . Determine the mass of the encyclopedia.

38. What is the force on a 10 kg object that is accelerating at a rate of  $5 \text{ m/s}^2$ ?

39. Two dogs are fighting over the same chew toy. The husky is pulling the toy with a 10 N force and the terrier is pulling on the toy with a 5 N force. Will the toy move? If so, with how much force and in what direction?

40. Compare the momentums of a 5000 kg truck that is stopped as t the stop sign and the momentum of a 3000 kg car that is parked in front of the grocery store.

41. A 400 N force acts on a 10 kg object. What is the acceleration of the object?

42. What is the momentum of 25 kg object that has a velocity of 15 m/s?

43. Calculate the weight of a person with a 75 kg mass.