

UNIT 4 REVIEW: MORE PRACTICE WITH FORCES AND NEWTON'S LAWS

INSTRUCTIONS: Answer each question thoroughly. Use complete sentences where appropriate and remember to show your work completely (including the equation in variable form and a FBD)! This unit corresponds to Chapter 4 in your textbook.

MULTIPLE CHOICE CONCEPTS:

1. Define each of Newton's 3 Laws of Motion.
2. What is inertia? How is it quantified for an object?
3. What is the difference between mass and weight? Which can change with location?
4. If a refrigerator weighs 1250 N, what is its mass?
5. Define static and dynamic equilibrium.
6. What are the rules for drawing a FBD? How are forces' magnitudes and directions indicated?
7. A 20 N force and a 75 N force act on an object. What is the net force on the object if the forces act in the same direction? What is the magnitude of net force if the forces act in the opposite directions?
8. A net force acting on a cart will cause it to accelerate. If the same force is applied to a cart causes **three times** the acceleration, how do the masses compare?
9. A child exerts a force of 62 N on a sled, accelerating it at 2.0 m/s^2 . What is the mass of the sled?
10. How much net force is needed to accelerate a 17 kg box to 5.0 m/s^2 ?
11. What is terminal velocity? What is the acceleration at terminal velocity?
12. In an elevator, when do you feel heavier, lighter, and the same as when you are standing still?
13. Do normal force (F_N) and weight (F_g) make up a 3rd law pair? Why or why not?
14. How do the magnitudes and directions of 3rd law pair forces compare?
15. Does the Earth accelerate towards you when you accelerate towards the Earth? How do you know? How does the magnitude of the acceleration compare to your acceleration?

Continued on the back →

WRITTEN RESPONSE REVIEW:

16. A 7.0 kg bowling ball is pushed in such a way that it accelerates at 4.0 m/s^2 . Draw a quantitative free body diagram (using FBD rules!) for the bowling ball. Label all of the forces, with magnitudes, and determine the net force.
17. A horizontal net force of 25 N is applied to a child on a bike. Assuming the child and bike have a mass of 55 kg, draw a quantitative FBD and determine the acceleration of the child in this situation.
18. Pat is going on a bicycle ride! If the forward force provided by Pat's pedaling is 100N, and the combined force of friction and air drag is 30N, calculate:
 - a. Pat's acceleration if his mass = 75kg.
 - b. Pat's velocity after 10 seconds if Pat started from rest.
19. A tow truck accelerates a car from rest to reach a speed of 25 m/s in 11 seconds. If the applied force on the car is 870 N, what is the mass of the car?
20. A rain drop falls from the sky. The mass of the rain drop is 9.0 grams. Initially it accelerates at a rate of 8.0 m/s^2 .
 - a. What is the **force of air drag** on the rain drop at that moment? Sketch a FBD.
 - b. The rain drop has reached terminal (constant) velocity by the time it reaches you. What is the **force of air drag** on the rain drop at that moment? Sketch a FBD.
21. Which of the following statements is ALWAYS true of an object at equilibrium?
 - a. The object is at rest.
 - b. The object is maintaining its state of motion.
 - c. The object's velocity is not changing.
 - d. The net force on the object is 0 Newtons.
 - e. The object is NOT accelerating.
 - f. The individual forces acting on the object are balanced.
 - g. The individual forces acting on the object are equal in magnitude.
22. The following statements were made about an object. In which case could you conclude that the object is at equilibrium?
 - a. The object is at rest.
 - b. The object has a constant velocity.
 - c. The object is moving.
 - d. The object has a constant speed.
 - e. The object is stationary.
 - f. The acceleration of the object is 0 m/s/s .
 - g. All individual forces acting on the object are balanced.

There are 5 written questions (with multiple parts) worth 37 points total. The in class review fully covers the material for the written section.

The multiple choice section will have 28 questions covering all 4 units. For a condensed study guide see below:

- Unit 1:
 - *Unit 1 Review #1-4, 8-10*
- Unit 2:
 - *Motion Graph Review p. 8-11*
 - *Motion Practice #4: #1-4, 9, 11-15*
- Unit 3:
 - *Vectors Online Tutorial: Lessons 1b, d-f*
 - *Projectile Online Tutorial: Lessons 2b-d*
- Unit 4:
 - *Unit 4/Final Review (attached) - page 1*
 - *Optional Extra Review - Vectors Online Tutorial: Lessons 3a-d*

In addition, students can review PowerPoints note slides, previously scored online tutorials, review answer keys, and the optional review WebAssign provided on my classroom websites. The answer key to the review, along with the keys for all of our other Semester 1 homework is available on my Connect site under "Physics-Answer Keys."

You will have time on Tuesday to work on the review assignment and ask clarifying questions in class.

Remember that the *OPTIONAL* WebAssign and the PhysicsClassroom.com are both great review resources as well!