Honors Physics
Newton's Laws

This unit will allow each student to:

a. gain a better understanding of Newton's three laws of motion and forces in explaining motion
b. continue making proper scientific measurements and calculations
c. define and properly use all vocabulary
d. properly apply all terms and concepts in describing/explaining real world examples
e. continue making and interpreting scientific graphs
f. teach someone else the concepts discussed
g. practice proper laboratory safety

This will be accomplished by each student that is able to:

1. recognize and relate SI and USCS units of force, and mass, acceleration
2. recognize a force, mass, acceleration, and momentum by the units only
3. state Newton's laws of motion
4. apply Newton's laws of motion to an actual situation
5. distinguish between mass and weight
6. recognize and provide examples of forces
7. identify cause and effect relationships between force, mass, acceleration, and momentum
8. explain inertia using examples
9. relate uniform motion to inertia
10. relate gravitational force to object mass and distance between objects
11. identify the difference in gravity on earth and on the moon
12. construct and interpret force v. mass and force v. acceleration graphs
13. explain the fundamental cause of accelerated motion
14. identify action-reaction force pairs
15. differentiate between balanced forces and force pairs
16. perform calculations using proper problem solving techniques to determine acceleration, force, mass, and net force
17. identify the different forms of friction
18. define and differentiate between static and dynamic equilibrium
19. distinguish between pressure and force
20. distinguish between freefall and non-freefall
21. relate terminal velocity to the effect of air resistance and balanced forces

Textbook Reference – Physics

Chapter 4 – Forces and the Laws of Motion

Key Terms

inertia, mass, force, net force, balanced forces, friction, static equilibrium, dynamic equilibrium, gravity, weight, Newton's First law of motion, Newton's Second law of motion, Newton's Third law of motion, air resistance, weightlessness, terminal velocity, normal force, fluid, action force, reaction force

Which law? First, Second, or Third?

____ 1. A frog leaping upward off his lily pad is pulled downward by gravity and lands on another lily pad instead of continuing on in a straight line.

____ 2. As the fuel in a rocket ignites, the force of the gas expansion and explosion pushes out the back of the rocket and pushes the rocket forward.

____ 3. When you are standing up in a subway train and the train suddenly stops, your body continues forward.

____ 4. After you start up your motorcycle, as you give it more gas, it goes faster.

____ 5. A pitched baseball goes faster than one that is gently thrown.

____ 6. A swimmer pushes water back with her arms, but her body moves forward.

____ 7. As an ice skater pushes harder with his leg muscles, he begins to move faster.

____ 8. When Harry, age 5, and his dad are skipping pebbles on a pond, the pebbles that Harry's dad throws go farther and faster than his do.

____ 9. When you paddle a canoe, the canoe goes forward.

____ 10. When you pull a cloth quickly from under food dishes.

____ 11. A little girl who has been pulling a sled behind her in the snow is crying because when she stopped to tie her hat on, the sled kept moving and hit her on the back of her legs.

____ 12. Under same force the bowling ball moves slower than a marble down incline plane.

____ 13. When you spin a bucket of water the water wants to continue moving.

____ 14. When you spin a bucket of water the water wants to continue moving but the back of the bucket pushes on the water as the water pushes the back.

____ 15. Balloon moves in one direction as the air blows out the opposite direction.

____ 17. Flicking a paper from under a penny and the penny falls down.

____ 18. You standing on the scale and the scale pushes back on you.

Honors Physics Review Sheet for Newton's Laws Unit

1. What is inertia?

2. What is Newton's first law of motion? Does it apply to objects at rest, moving objects, or both?

3. Once an object is moving through frictionless space, how much force is needed to keep it going?

4. How is mass related to inertia?

5. How do you calculate weight?

6. What is the difference between mass and weight?

7. What is the difference between mass and volume?

8. Your mass is 59 Kg, calculate your weight on earth and moon? Would you weigh more on the earth or on the moon?

9. An object weighs 25 N on the earth. A second object weighs 25 N on the moon. Which has the greater mass?

10. What is friction? Explain the difference between sliding and static friction.

11. What is meant by net force? **Draw and label the free body diagram of the four forces.**

12. How do you calculate the net force of two objects acting in the same direction?

13. How do you calculate the net force of two objects acting in opposite directions?

14. What is equilibrium and how does one achieve equilibrium?

15. What produces acceleration?

16. How is acceleration related to net force?

17. How is acceleration related to mass?

18. If an object moves with a constant velocity, what is the acceleration of the object? What is the net force acting on the object?

19. What is terminal velocity? How is it achieved? What is the acceleration of the object that has reached terminal velocity?

20. In the absence of air resistance, which will hit the ground first if dropped from the same height, a feather or a brick?

21. In the presence of air resistance, which will hit the ground first if dropped from the same height, a feather or a brick?

22. A constant force applied to a constant mass produces a constant _____.

23. If an object moves with a constant velocity (_____ acceleration), how is the applied force related to the force of friction?

24. What is pressure?

25. A woman hangs from a bar using both of her arms. If she weighs 3000 N, how much force does each arm support?

26. Forces always occur in _____.

27. A bug splatters against the windshield of a moving car. Compare the force of the bug on the car to the force of the car on the bug.

28. A bug splatters against the windshield of a moving car. Compare the acceleration of the bug to the acceleration of the car.

29. What propels a rocket in the vacuum of space?

30. Two people pull on a rope in a tug-of-war. Each pulls with 600 N of force. What is the tension in the rope?

31. How much (in Newton's) does a 55 kg box of books weigh?

32. A person weighs 300 N. What is the mass of the person?

33. If you push with 25 N on a 5 kg box across a frictionless surface, how fast will the box accelerate?

34. If you push with 25 N on a 5 kg box and there is a 10 N force of friction, how fast will the box accelerate?

35. A certain net force gives a 10 kg object an acceleration of 9 m/s^2. What acceleration would the same force give a 30 kg object?