On-level 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, and acceleration by the units only
3. state all three of 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, and acceleration
8. explain inertia using examples
9. relate uniform motion to inertia
10. construct and interpret force v. mass and force v. acceleration graphs
11. explain the fundamental cause of accelerated motion
12. identify action-reaction force pairs
13. differentiate between balanced forces and force pairs
14. perform calculations using proper problem solving techniques to determine acceleration, force, mass, and net force
15. define and differentiate between static and dynamic equilibrium

Textbook Reference – Physics: Principles and Problems

Chapter 4 – Forces in One Dimension; Chapter 5 - Forces in Two Dimensions (Sections 2 & 3);

Key Terms – *write the definitions of the boldface terms on your own paper, definitions are available at theteterszone.net*

inertia, mass, force, net force, balanced forces, static equilibrium, dynamic equilibrium, weight, Newton's First law of motion, Newton's Second law of motion, Newton's Third law of motion

Newton's Laws of Motion Review – answer completely on a separate sheet of paper.

A. What is Newton's first law of motion? Does it apply to objects at rest, moving objects, or both?
B. Once an object is moving through frictionless space, how much force is needed to keep it going?
C. How do you calculate the net force on an object if multiple forces are acting on the object?
D. What is equilibrium and what causes an object to be in equilibrium?
E. A woman hangs from a bar using both of her arms. If she weighs 700 N, how much force does each arm support? Is she accelerating?
F. What produces acceleration?
G. How is an object's acceleration related to net force? to mass?
H. If an object moves with a constant velocity, what is the acceleration of the object? What is the net force acting on the object?
I. If you push with 25 N on a 5 kg box across a frictionless surface, how fast will the box accelerate?
J. If you push with 25 N on a 5 kg box and there is a 10 N friction force between the box and the floor, how fast will the box accelerate?
K. 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?
L. A bug splatters against the windshield of a moving car. Compare the <u>force</u> of the bug on the car to the <u>force</u> of the car on the bug.
M. A bug splatters against the windshield of a moving car. Compare the <u>acceleration</u> of the bug to the <u>acceleration</u> of the car.
N. What is the minimum number of objects required for a force to exist? What is the least number (not zero) of forces that can exist at any time?
O. You are standing on a skateboard and push against a massive crate. You move away from the crate, but the crate remains stationary. Identify all the action-reaction force pairs. Explain why you move away from the crate, but the crate does not move.
P. What propels a rocket in the vacuum of space?
Q. What is the difference between mass and weight?
R. An object weighs 25 N on the earth. A second object weighs 25 N on the moon. Which has the greater mass?
S. How much (in Newton's) does a 55 kg box of books weigh?