Honors Physics
Work and energy

This unit will allow each student to:

a. gain a better understanding of momentum and energy in the interactions of objects around us
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, work, energy, and power
2. recognize a force, momentum, work, energy, and power by the units only
3. recognize energy as the root cause of change in the universe
4. list various forms of energy
5. distinguish between work, potential energy , gravitational potential energy, and kinetic energy
6. state the law of conservation of energy
7. apply the law of conservation of energy to a real object interacting with its environment
8. state the work-energy theorem
9. apply the work energy theorem to real situations in conjunction with energy conservation
10. relate actual units of power and energy to those used on your home's electric bill
11. perform calculations using proper problem solving techniques to determine: (a) gravitational potential energy, (b) kinetic energy, (c) work (d) power,

Textbook Reference – Physics: Principles and Problems

Chapters 10 and 11 –Work and Energy

Key Terms

energy, kinetic energy, potential energy, gravitational potential energy, Hooke's Law, elastic potential energy, work, power, mechanical energy, law of conservation of energy

Work and energy review questions

1. A force sets an object in motion. When the force is multiplied by the time of its application, we call the quantity *impulse,* which changes the *momentum* of that object. What do we call the quantity *(force)(distance)* and what quantity can this change?

2. Work is required to lift a barbell. How many times more work is required to lift the barbell three times as high?

3. Which requires more work, lifting a 10 kg load a vertical distance of 2 m or lifting a 5 kg load a vertical distance of 4 m?

4. How many joules of work are done on an object when a force of 10 N pushes it a distance of 10 m?

5. How is power increased?

6. In which situation is more power required: Slowly lifting a book bag full of books up the stairs or quickly lifting the same book bag full of books up the same stairs?

7. How much power is required to do 100 J of work on an object in a time of 0.5 sec? How much power is required if the same work is done in 1 sec?

8. What are the two main forms of mechanical energy?

9. a. If you do 100 J of work to elevate a bucket of water, what is the gravitational potential energy relative to its starting position?

   b. What would the gravitational potential energy be if the bucket were raised twice as high?

10. A boulder is raised above the ground so that its potential energy relative to the ground is 200 J. Then it is dropped. What is its kinetic energy just before it hits the ground?

11. Suppose an automobile has 2000 J of kinetic energy. When it moves at twice the speed, what will be its kinetic energy? What's its kinetic energy at three times the speed?

12. What will be the kinetic energy of an arrow having a potential energy of 50 J after it is shot from a bow?

13. What does it mean to say that in any system, the total energy score stays the same?

14. In what sense is energy from coal actually solar energy?

15. How does the amount of work done on an automobile by its engine relate to the energy content of the gasoline?