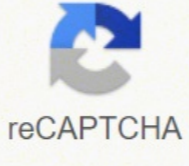




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Type of energy	Description
Kinetic	Energy stored by stretched or compressed objects
Energy potential	Energy carried by the moving electrical charges often through a wire
Light	Energy carried by a kind of vibration that can travel through the air
Mechanical	Energy carried by any moving object
Chemical	Energy that can warm us up
Heat	Energy that comes from the Sun or a light bulb and we can use it to heat using our eyes
Sound	Energy stored by being high up or being moved higher up
Electrical potential	Energy stored in a fuel, for example petrol or in a battery

## POTENTIAL AND KINETIC ENERGY

Name \_\_\_\_\_

Potential energy is stored energy due to position. Kinetic energy is energy that depends on mass and velocity (movement).

**Potential Energy = Weight x Height (P.E. =  $w \times h$ )**  
**Kinetic Energy =  $\frac{1}{2}$  Mass x Velocity<sup>2</sup> (K.E. =  $\frac{1}{2}mv^2$ )**  
**The units used are:** Energy = joules  
 Weight = newtons  
 Height = meters  
 Mass = kilograms  
 Velocity = m/s

For a closed system, the sum of the potential energy and the kinetic energy is a constant. As the potential energy decreases, the kinetic energy increases.

Solve the following problems.

1. What is the potential energy of a rock that weighs 100 newtons that is sitting on top of a hill 300 meters high?  

Answer: \_\_\_\_\_
2. What is the kinetic energy of a bicycle with a mass of 14 kg traveling at a velocity of 3 m/s?  

Answer: \_\_\_\_\_
3. A flower pot weighing 3 newtons is sitting on a windowsill 30 meters from the ground. Is the energy of the flower pot potential or kinetic? How many joules is this?  

Answers: \_\_\_\_\_
4. When the flower pot in Problem 3 is only 10 meters from the ground, what is its potential energy?  

Answer: \_\_\_\_\_
5. How much of the total energy in Problems 3 and 4 has been transformed to kinetic energy?  

Answer: \_\_\_\_\_
6. A 1200 kg automobile is traveling at a velocity of 100 m/s. Is its energy potential or kinetic? How much energy does it possess?  

Answers: \_\_\_\_\_

### Chapter 5: Work, Energy and Power

Teacher: Kenneth O'Rourke Subject: Physical Science  
 Dates: 1-6-06 to 1-7-06 Time: 9 to 12 days Topic: Work/Energy  
 Grade: 9 inclusion classroom  
 Note: Intelligence- Linguistic, logical math, spatial, kinesthetic, musical, interpersonal, intrapersonal, naturalist.  
 Per: Standards- active learning, coherence, critical/creative thinking, real world connections, reflection, fosters understanding of content

**Vocabulary:** Energy, energy transformation, heat, joule, potential energy, kinetic energy, work, power, law of conservation of energy

#### Objectives:

- Students will be able to:
- Calculate the work done by a simple machine 1-3, lab 5-1
  - Calculate the potential and kinetic energy 1-5 to 1-11
  - Apply the law of conservation of energy as it applies to force and distance in simple machines 1-5
  - Calculate power in machines 1-4
  - Calculate the efficiency of a machine 1-4
  - Apply the law of conservation of energy as it applies to perpetual motion machines 1-12

#### Learning topic one: Work Monday 1-2

- 1) Bell Ringer
- 2) Work is the application of a force over a distance
- 3) W=Fd
- 4) Practice worksheets for the formula
- 5) Bowling ball vs Basketball work demonstration. I demonstrate the work formula by lifting a bowling distance- calculate the work (force times distance) the force is the weight of the ball (kilograms) times 9.8 m/s<sup>2</sup>. I then do the same for the basketball. The idea is that they will associate lifting the bowling ball as doing more work than lifting a basketball, and our calculations will support that.
- 6) Formative assessment cards for the lesson

#### Learning topic two: Power Wednesday 1-4

- 1) Bell Ringer
- 2) Power is the speed at which work is done
- 3) P= Work/time
- 4) Power worksheets
- 5) Power demonstration, which with a large cylinder wheel, and a small cylinder wheel. The same work done faster has more power. Students will then brainstorm examples of different power machines.
- 6) Formative assessment cards for the lesson.

### Work, Power and Energy Worksheet

#### Work and Power

1. Calculate the work done by a 47 N force pushing a pencil 0.26 m.
2. Calculate the work done by a 47 N force pushing a 0.025 kg pencil 0.25 m against a force of 23 N.
3. Calculate the work done by a 2.4 N force pushing a 400. g sandwich across a table 0.75 m wide.
4. How far can a mother push a 20.0 kg baby carriage, using a force of 62.0 N at an angle of 30.0° to the horizontal, if she can do 2920 J of work?
5. How much work is it to lift a 20. kg sack of potatoes vertically 6.5 m?
6. If a small motor does 520. J of work to move a toy car 260. m, what force does it exert?
7. A girl pushes her little brother on his sled with a force of 300. N for 750. m. How much work is this if the force of friction acting on the sled is (a) 200. N, (b) 300. N?
8. A 75.0 kg man pushes on a 5.0 x 10<sup>3</sup> ton wall for 250 s but it does not move. How much work does he do on the wall? (2000 lb = 1 ton; 0.454 kg = 1 lb)
9. A boy on a bicycle drags a wagon full of newspapers at 0.800 m/s for 30.0 min using a force of 40.0 N. How much work has the boy done?

Consider a 10 kg mass sitting on the ramp shown to the right. Use the following diagram for questions 10 and 11.



10. If it takes 25 N to slide the box up the ramp, how much work will it take to slide the box up?
11. Instead of sliding, how much work will it take to lift the box to the top of the ramp?
12. How much power does it take to lift 30.0 N 10.0 m high in 5.00 s?
13. How much power does it take to lift 30.0 kg 10.0 m high in 5.00 s?
14. You move a 25 N object 5.0 meters. How much work did you do?
15. You carry a 20. N bag of dog food up a 6.0 m flight of stairs. How much work was done?
16. You push down on a 3.0 N box for 10. minutes. How much work was done?
17. You use 35 J of energy to move a 7.0 N object. How far did you move it?
18. You do 45 J of work in 3.0 seconds. How much power do you use?
19. A car uses 2,500 Joules in 25 seconds. Find power.
20. A 60. watt light bulb runs for 5.0 seconds. How much energy does it use?
21. How much work can a 22 kW car engine do in 60. s if it is 100% efficient?

