

Honors Freshman Physics

Conservation of Energy Worksheets (p. 1)

Show "K-U-E-S" where necessary, otherwise answer completely. All work needs to be done on your own paper to use on the CPQ-quiz

You may not use this worksheet on the CPQ-quiz only your answer sheet.

KE & PE (Oct. 27-28)

1. What are the two main components of mechanical energy?
2. **(a)** Calculate the kinetic energy of a 3.1 kg toy cart that moves at 4.8 m/s. **(b)** Calculate the kinetic energy of the same cart at twice the speed.
 $36 J$ $140 J$
3. Suppose an automobile has 20,000 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?
 $80,000 J$ $180,000 J$
4. If a mouse and an elephant both run with the same kinetic energy, can you say which is running faster? Explain in terms of the equation for KE.
5. A hammer falls off a rooftop and strikes the ground with a certain KE. If it fell from a roof that was four times higher, how would its KE of impact compare? Its speed of impact? (Neglect air resistance.)
6. **(a)** If you do 100 J of work to elevate a bucket of water, what is its gravitational potential energy relative to the starting position? **(b)** What would the gravitational potential energy be if the bucket were raised twice as high? **(c)** How much work would the bucket do on its surroundings as it fell back to its starting position?
7. An astronaut in full space gear climbs a vertical ladder on the earth. Later, the astronaut makes the same climb on the moon. In which locations does the gravitational potential energy of the astronaut change more? Explain.
8. Calculate the change in potential energy of 8.00×10^6 kg of water dropping 50.0 m over Niagara Falls.
 $3.92 \times 10^9 J$

NRG Conservation (Oct. 29-30th)

9. A boulder is raised above the ground so that its potential energy relative to the ground is 20,000 J. It is then dropped. What is its kinetic energy just before it hits the ground?
10. What will be the kinetic energy of an arrow having a potential energy of 50 J after it is shot from a bow?
11. What does it mean to say that in any system, the "total energy score" stays the same?
12. Calculate the work done in lifting a 500.0 N barbell 2.2m above the floor. What is the potential energy of the barbell when it is lifted to this height?
 $1,100 J$
13. If a car traveling at 60 km/h will skid 20 m when its brakes lock-up, how far will it skid if it is traveling at 120 km/h when its brakes lock? (*Hint: Work Energy theorem*)
 $80 m$
14. Most earth satellites follow an oval-shaped (elliptical) path rather than a circular path around the earth. The earth is not at the center of that ellipse so the satellite move closer to and farther from the earth. The PE increases when the satellite moves farther from the earth. According to the law of energy conservation, does a satellite have its greatest speed when it is closest to or farthest from the earth?
15. The energy we require to live comes from the chemically stored potential energy in food, which is transformed into other energy forms during the digestion process. **(a)** What happens to a person whose combined work and heat output is less than the energy consumed? **(b)** What happens when the person's work and heat output is greater than the energy consumed? **(c)** Can an undernourished person perform extra work without extra food? Defend your answers.