

# Energy Questions

## Equations:

$$\text{Work} = F_{\parallel} \times d.$$

$$\text{Potential Energy PE} = mgh.$$

$$\text{Kinetic Energy KE} = \frac{1}{2}mv^2.$$

- Be able to say when positive, negative, or zero work is done by a force.
  - Know that sliding friction does negative work.
  - Be able to say when the gravitational potential energy of a particle increases, decreases, or remains constant, and by what factor, if its mass and/or height change by a given factor.
  - Be able to say what happens to the kinetic energy of an object if its mass and/or velocity change by a given factor.
  - For an object released and allowed to slide on a track with hills and valleys, be able to say when the PE and KE are greatest and least.
  - Be able to compare the kinetic energies of different objects given their respective masses and velocities (like in the H.W. problem in the text).
  - Know the work-energy principle: “The work done by all forces on a system equals the change in kinetic energy of that system.”
  - Know the conditions for which the mechanical energy of a system is conserved: The energy of a system is conserved only if all work done on that system is by gravity (no other forces doing work).
12. When does a force do no mechanical work on an object?
  13. When does a force do positive mechanical work on an object?
  14. When does a force do negative mechanical work on an object?
  15. What are the conditions for which the mechanical energy of a system is conserved?
  16. State the work-energy principle.
  17. When an object slides on a stationary frictional surface, does the force of friction do positive, negative, or no work? Explain your answer.
  18. When the mass of an object moving with fixed speed doubles, by what factor does its KE change?
  19. When the velocity of an object moving with fixed mass doubles, by what factor does its KE change?
  20. When the height of an object of fixed mass doubles, by what factor does its PE change?
  21. When the mass of an object of fixed height doubles, by what factor does its PE change?

## Answers

12. Either when the object is stationary or when the force is perpendicular to the object's motion.
13. When the force is parallel to the direction of the motion.
14. When the force is opposite to the direction of the motion.
15. The energy of a system is conserved only if all work done on that system is by gravity (no other forces doing work).
16. The work done by all forces on a system equals the change in kinetic energy of that system.
17. Negative work because the force of sliding friction is always opposite to the direction of the motion.
18. 2
19. 4
20. 2
21. 2