

Name: _____

Date: _____

Kinetic and Potential Energy – in-class assignment

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1. The kinetic energy of a boat is calculated at 52,000 J. If the boat has a mass of 39,000 kg, with what velocity is it moving?

2. A 30 kg child climbs 15 meters up a tree. When he stops to have a look around, what is the child's potential energy?

3. A rocket of mass $1.5 \times 10^4 \text{ kg}$ accelerates at 220 m/s^2 for 29s from an initial speed of 5200m/s.

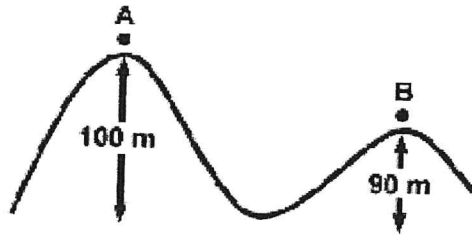
(a) How fast will the rocket be travelling after the 29s?

b) How much Kinetic Energy has the rocket gained?

c) If the rocket is in space and the engine is then switched off, what will happen to the rocket speed? Explain your answer.

4. A lump of ice falls from an aeroplane as it comes in to land. If the ice hits the ground with a vertical speed of 85m/s , what was the height of the plane when the ice fell off? (Assume that friction can be ignored and solve using the Law of conservation of total mechanical energy.

5. A skier glides down a frictionless hill of 100 meters then he ascends another hill, of height 90 meters, as shown in the figure below. What is the speed of the skier when it reaches the top of the second hill?



The skier moves from point A to point B

6. What was the change in potential energy in the last problem, given that the mass of the skier is 50 kg?

7. A student lifts his 2.0 kg pet rock 2.8 m straight up. He then lets it drop to the ground. Use the Law of Conservation of Energy to calculate how fast the rock will be moving (a) half way down and (b) just before it hits the ground.

8. A 65 kg girl is running with a speed of 2.5 m/s. How much kinetic energy does she have? She grabs on to a rope that is hanging from the ceiling, and swings from the end of the rope. How high off the ground will she swing?

9. How much kinetic energy will an 80.0 kg skier sliding down a frictionless slope (vertical height = 60.0 m) have when he $\frac{2}{3}$ of the way down?

10. A golfer wishes to hit his drives further by increasing the kinetic energy of the golf club when it strikes the ball. Which would have the greater effect on the energy transferred to the ball by the driver --- doubling the mass of the club head or doubling the speed of the club head? Explain.

11. 5. How much work must be done to increase the speed of a 12 kg bicycle ridden by a 68 kg rider from 8.2 m/s to 12.7 m/s?

12. A truck moving with a speed of 90 km/h loses its brakes but sees a “runaway” hill near the highway. If the driver steers his vehicle into the runaway hill, how far up the hill (vertically) will the vehicle travel before it comes to a stop? (Ignore friction.) If friction is taken into account, will the vertical distance the vehicle moves be less or greater than the ‘ideal’ distance you just solved for, neglecting friction? Explain.

13. A rubber ball falls from a height of 2.0 m, bounces off the floor and goes back up to a height of 1.6 m.

a) What percentage of its initial gravitational potential energy has been lost?

b) Where does this energy go?

c) Has the Law of Conservation of Energy been ‘violated’?