Mr. Mack Physics Honors Name:_____ P: _____

Energy Exam Review

1) The largest turtle ever caught was in the US. Suppose the turtle was raised 5.45 m onto the deck of a research ship. It takes 4.60×10^4 J of work to lift the turtle this distance at a constant velocity.

a) Draw and label a force diagram

b) Find the weight of the turtle

2) The largest mincemeat pie ever created had a mass of 1.02×10^3 kg. Suppose that a pie with this mass slides down a *frictionless* ramp that is 18.0 meters *long* and inclined at 10°.

a) Draw and label a force diagram

b) Find the work done by gravity

c) Find work done by normal force

3) Susie Maroney from Australia set a women's record in long-distance swimming by swimming 93.625 km in 24.0 hours.

a) What was Maroney's average speed during this swim?

b) If her mass is 55 kg, what was her kinetic energy when she was traveling her average speed?

4) In 1990, Roger Hickey of California reached a speed of 35.0 m/s on his skateboard. Suppose it took 21 kJ of work for Roger to teach this speed from a speed of 25.0 m/s.
Using the Work-Kinetic Energy Theorem, Calculate Hickey's mass.

5) In 1992, Ukranian Sergei Bubka used a short pole to jump to a height of 6.13 meters. If the maximum potential energy associated with Bubka was 4.80 kJ at the maximum height, then what was his mass. (Assume Bubka is at rest for an instant when he reaches max height)

6) April Moon holds the record for flight shooting in Archery. She fired an arrow that traveled 950 meters (almost 10 football fields, close to half a mile). It left the bow at a speed of 80 m/s. Suppose the arrow had a mass of 65 grams.
a) What was the kinetic energy of the arrow when it left the bow?

b) If the bowstring was pulled back 55 cm from its relaxed position, what was the spring constant of the bowstring? (Assume all energy was transferred and none was lost)

7) One species of eucalyptus tree, *Eucalyptus regnens*, grows to heights similar to those attained by California Redwoods. Suppose a bird sitting on the top of one of these drops an acorn. The speed of the acorn at the moment it is 50 meters above the ground is 42.7 m/s.
a) Is the mass of the acorn required to solve this problem?

b) How tall is that tree?

8) In 1936, Col. Harry Froboess of Switzerland jumped into the ocean from the airship *Graf Hindenburg*, which was 120 meters above the water's surface. Assume Froboess had a mass of 72.0 kg.
a) What was his kinetic energy at the moment he was 30 meters from the water's surface?

b) What was his speed at that moment?

9) The first practical car to use a gasoline engine was built in London in 1826. The power generated by the engine was just 2984 W. How long would this engine have to run to produce 3600 J of work?

10) A 0.60 kg rubber ball has a speed of 2.0 m/s at point A and kinetic energy of 7.5 J at point B. Determine the following:
a) the ball's KE at point A

b) the ball's speed at point B

c) the net work done on the ball from point A to point B

11) A 50 kg pole vaulter running at 10 m/s vaults over the bar. The vaulter's velocity when he is directly over the bar at the peak of his jump is 1.0 m/s.
a) What was his total mechanical energy *before* the jump?

b) How high was the jump? (In other words, how high when he is directly over the bar)

12) For each of the following, indicate whether the work done on the object is positive or negative.
i) The road exerts a friction force on a speeding car.

ii) A rope exerts a force on a bucket as the bucket is raised up a well.

iii) Air exerts a force on a parachute as the parachutist falls to Earth.

13) A spring of a jack-in-the-box is compressed a distance of 9.0 cm from its relaxed length and then released. The mass of the toy head is 50 grams and the spring constant is 80 N/m.
a) Before it is released what is elastic potential energy stored in the spring?

b) After it is released, what is the speed of the toy head the moment it passes through its equilibrium point (in other words, the moment the spring returns to its relaxed length)?

14) Is conservation of mechanical energy likely to hold in these situations? (Yes or No)
i) A hockey puck sliding on frictionless ice

ii) A toy car rolling on a carpeted floor

iii) A baseball being thrown in the air

iv) An object being dropped from an arbitrary height

15) A 50.0 kg student climbs up a 5 meter rope at constant speed. The student's power output during this time is 200 W.
a) Draw a force diagram.

b) Calculate the work done by the student?

c) How long does it take the student to climb the rope?