NAME _____ PERIOD ____

UNIT 11 PRACTICE PROBLEMS PHYSICS 1

11.1 POTENTIAL ENERGY AND THE WORK DONE BY CONSERVATIVE FORCES

1. As an Acapulco cliff diver drops to the water from a height of 46 m, his gravitational potential energy decreases by 25,000 J. What is the diver's weight in newtons?
2. Find the gravitational potential energy of an 83-kg person standing atop Mt. Everest at an altitude of 8848 m. Use sea level as the location for y = 0.
3. A vertical spring stores 0.962 J in spring potential energy when a 3.0-kg mass is suspended from it. **(a)** By what multiplicative factor does the spring potential energy change if the mass attached to the spring is doubled? **(b)** Verify your answer to part (a) by calculating the spring potential energy when a 6.0-kg mass is attached to the spring.
4. Pushing on the pump of a soap dispenser compresses a small spring. When the spring is compressed 0.50 cm, its potential energy is 0.0025 J. **(a)** What is the force constant of the spring? **(b)** What compression is required for the spring potential energy to equal 0.0084 J?
5. A force of 4.7 N is required to stretch a certain spring by 1.3 cm. (a) How far must this spring be stretched for its potential energy to be 0.020 J? (b) How much stretch is required for the spring potential energy to be 0.080 J?

11.2 CONSERVATION OF ENERGY

6. A 0.21-kg apple falls from a tree to the ground, 4.0 m below. Ignoring air resistance, determine the apple's kinetic energy, *K*, the gravitational potential energy of the system, *U*, and total mechanical energy of the system, *E*, when the apple's height above the ground is **(a)** 4.0 m, **(b)** 3.0 m, **(c)** 2.0 m, **(d)** 1.0 m, and **(e)** 0 m. Take ground level to be y = 0.
7. At an amusement park, a swimmer uses a water slide to enter the main pool. If the swimmer starts at rest, slides without friction, and descends through a vertical height of 2.61 m, what is her speed at the bottom of the slide?
8. In the previous problem, find the swimmer's speed at the bottom of the slide if she starts with an initial speed of 0.840 m/s.
9. A 2.7-kg block slides with a speed of 1.4 m/s on a frictionless horizontal surface until it encounters a spring. **(a)** If the block compresses the spring 4.8 cm before coming to rest, what is the force constant of the spring? **(b)** What initial speed should the block have to compress the spring by 1.2 cm?
10. A 0.26-kg rock is thrown vertically upward from the top of a cliff that is 32 m high. When it hits the ground at the base of the cliff, the rock has a speed of 29 m/s. Assuming that air resistance can be ignored, find **(a)** the initial speed of the rock and **(b)** the greatest height of the rock as measured from the base of the cliff.

NAME _____ PERIOD ____

UNIT 11 PRACTICE PROBLEMS PHYSICS 1

11.3 WORK DONE BY NONCONSERVATIVE FORCES

11. At a playground, a 19-kg child plays on a slide that drops through a height of 2.1 m. The child starts at rest at the top of the slide. On the way down, the slide does a nonconservative work of -361 J on the child. What is the child's speed at the bottom of the slide?
12. A 17,000-kg airplane lands with a speed of 82 m/s on a stationary aircraft carrier deck that is 115 m long. Find the work done by nonconservative forces in stopping the plane.
13. The driver of a 1100-kg car moving at 17 m/s brakes quickly to 12 m/s when he spots a local garage sale. **(a)** Find the change in the car's kinetic energy. **(b)** Explain where the "missing" kinetic energy has gone.
14. A 42.0-kg seal at an amusement park slides from rest down a ramp into the pool below. The top of the ramp is 1.75 m higher than the surface of the water and the ramp is inclined at an angle of 35.0° above the horizontal. If the seal reaches the water with a speed of 4.40 m/s, what is **(a)** the work done by kinetic friction and **(b)** the coefficient of kinetic friction between the seal and the ramp?