PHYSICS 11 WORK ETC. WORKSHEET 1

1. A 50.0 kg mass is lifted 10.0 m up from a height of 3.20 m to a new height of 13.2 m.
   a) What potential energy does the mass have at its new height?
   b) How much work was required to lift the mass up to this new height?

2. How much work was done by a bulldozer pushing a large rock with a force of 5.0×10^4 N at a constant speed of 2.0 m/s for 20.0 s?

3. Calculate:
   a) the work done by a 48 N force pushing a 0.025 kg pencil 0.25 m against a force of friction of 23 N.
   b) the work done against inertia.
   c) the work done against friction.

4. A horse pulls a carriage filled with people around a *circular* park road of radius 500 m. How much work does the horse do if he exerts an average force of 800 N in the round trip?

5. A girl pushes her little brother on his sled with a force of 300 N for 750 m. How much work does she do if the force of friction is 200 N?

6. A 1.20×10^3 kg block starting from rest is accelerated by a 2.20×10^3 N force for a distance of 50.0 m along a horizontal surface.
   a) How much work was done on the mass?
   b) What is the final velocity of the mass?

7. A 90.0 kg basketball player carries about 720 J of KE when running down the court. If the coefficient of kinetic friction between good runners and the floor is 0.60, how far does the player skid when trying to stop? Hint: what work was done by friction in bringing the player to a stop?

8. A 60.0 kg girl is running at a constant speed of 5.0 m/s for 400 m.
   a) How much kinetic energy does she have?
   b) How much work was done against inertia over this distance?

9. A 62.0 kg cyclist changes the speed of a 12 kg bicycle from 8.2 m/s to 12.7 m/s. Determine the work done.

10. A force of 1.0×10^4 N is exerted on a 50 g bullet throughout the 10.0 cm length of a gun barrel.
    a) How much work was done on the bullet?
    b) How much kinetic energy did the bullet have when it left the gun barrel?
    c) What was the speed of the bullet when it left the gun barrel?

11. A crane does 3.00 x 10⁴ J of work on a crate in order to lift it 20.0 m to the roof of a construction site.
a) What is the potential energy of the crate with respect to the ground?
b) What is the mass of the crate?

12. How much work can a 500 Watt electric mixer do in 2.5 minutes?

13. How long will it take a 50 kg girl that can generate 935 W to run up a flight of stairs that are 4.5 m high?

14. A car engine exerts a force of 4000 N to accelerate the car over a displacement of 100 m in 8.0 s. Calculate the power of the engine.

15. A car of mass 2000 kg is travelling at 45.0 m/s when the driver spots a policeman ahead. The driver applies the brakes lightly for 3.0 s until he slows down below the speed limit. If the average force applied by the brakes was 1.4 x 10⁴ N, by how much did the kinetic energy of the car change?

16. A 1400 kg car is accelerating up a hill. The hill is 150 m long and the total rise of the hill is 6.0 m. The car accelerates from a speed of 7.0 m/s at the bottom to 15 m/s at the top in 12 s. If the average retarding force of friction is 700 N, find the average power of the car.

1. a) 6470 J b) 4900 J   2. 2.0 x 10⁶ J   3.a) 12 J b) 6.25 J c) 5.75 J   4. 2.5 x 10⁶ J   5. 2.25 x 10⁵ J
6. a) 1.10 x 10⁵ J b) 13.5 m/s   7. 1.4 m   8. a) 750 J b) 0 J   9. 3.5 x 10³ J   10. a) 1.0 x 10³ J b) 1.0 x 10³ J
c) 200 m/s   11. a) 3.0 x 10⁴ J b) 153 kg   12. 75 000 J   13. 2200 J   14. 50 000 W   15. decreased by 1.45 x 10⁶ J
16. 26 000 W