Energy Formulas B-F

B. $W = Fs\cos\theta$

1. Fred O'Dadark exerts 34.0 N on a rope that makes a 28.0^{o} angle with the ground, sliding a sled 227 m along the ground. What work did he do? (6814.6 ≈ 6810 J)
2. Jenny Rator does 450 J of work dragging a crate across the floor 14 m. What force parallel to the floor did she exert to move the crate? (32.14 ≈ 32 N)
3. Bobbie Sachs lifts a 5.00 kg mass straight up doing 103 J of work. What distance did she lift the mass? (Use g = 9.81 N/kg) (2.0998 ≈ 2.10 m)
4. Helena Handbasket brings a 16 kg box down from a 2.1 m tall shelf. What work does she do? (-329.6 ≈ -330 J – notice it is negative)
5. An elevator motor can do 7500 J of work in a second. What distance can it raise a 1400 kg elevator in one minute? (32.77 ≈ 33 m)
6. A 6.0 kg object is sped up from 4.0 m/s to 5.0 m/s over a horizontal distance of 10. m. How much work was done on the object? (find the acceleration, then the force) (27 J)

Also try problems 1-5 from chapter 6

C. $\Delta E_p = mg\Delta h$ (use 9.81 N/kg for g)

1. A 65 kg hiker gains about 2030 m from the Cold Springs campground to the summit of Mt. Adams. What is their change in potential energy? (1294429.5 ≈ 1.3E6 J)
2. How high is a 25 kg mass if it possesses 6500 J of gravitational potential energy? (26.5 ≈ 27 m)
3. An elevator motor does 165 kJ (165,000 J) of work lifting an elevator 13.5 m. What is the mass of the elevator? (1245.89 ≈ 1250 kg)

Also try problems 27, 28, 30, 31 from chapter 6

D. $E_k = {}^1/_2mv^2$

1. What is the kinetic energy of a .895 kg ball going 2.7 m/s? (3.26 ≈ 3.3 J)
2. A 145 g baseball must go how fast to have a kinetic energy of 120 J? (40.68 ≈ 41 m/s – that's 91 mph)
3. A hammer has 15 J of kinetic energy when it is going 7.0 m/s. What is its mass? (0.6122 ≈ 0.61 kg)
4. What energy does it take to speed a 6.0 kg object up from 4.0 m/s to 5.0 m/s? (27 J – now look at problem 6 from B)
5. A 1240 kg car going 12.0 m/s accelerates at 3.50 m/s/s for 80.0 m. What is its change in kinetic energy? (347200 ≈ 347 kJ)

Also try problems 15-18 from chapter 6

E. $F = kx$

1. What is the spring constant of a spring (in N/m) if it takes 60. N of force to increase its length by 15 cm? (400 ≈ 4.0E2 N/m)
2. What force would stretch a 31 N/m spring 1.4 m? (43.4 ≈ 43 N)

Also try problem 32 from chapter 6

F. $E_p = {}^1/_2kx^2$

1. What is the energy stored in a 154 N/m spring that is compressed 13.5 cm? (1.403 ≈ 1.4 J)
2. How much do you have to stretch a 262 N/m spring to store 94.6 J of energy? (0.8497 ≈ 0.850 m)
3. A spring must store 0.380 J of energy being compressed only 8.5 mm (1 mm = $1x10^{-3}$ m). What is its spring constant?(10,519 ≈ 11,000 N/m)
4. How much work is released if a 45 N/m spring is stretched from a stretch distance of 1.3 m to 1.8 m? (34.875 ≈ 35 J)

Also try problem 26 from chapter 6