Name KEY

Newton' Third Law Problems

1. When applying Newton's 3rd law, why don't action and reaction forces always cancel out? The action Reacton Pairs act ~~of~~ ON different objects

2. A car is hit by a train with a force of 10,000 N, what force does the train experience?

   10,000 N

   a. If the car's mass is 1000 kg and the trains mass is 100,000 kg what acceleration, if any does either experience?

   $a_c = \frac{F}{M} = \frac{10,000}{1000} = 10\ m/s^2$

   $a_T = \frac{F}{M} = \frac{10,000}{100,000} = 0.1\ m/s^2$

3. It is the year 2050 and baseball is played on outer space. A 50 kg pitcher can throw a 1.0 kg ball, toward home plate at a velocity of 50 m/s. It takes the pitcher 1 second to accelerate the ball from rest to 50 m/s.

   $V_i = 0$
   $V_f = 50$
   $d = *$
   $a = ?$
   $t = 1$

   a. What is the acceleration of the ball while it is being thrown?

   $V_f = V_i + at$ $\quad a = 50\ m/s^2$
   $50 = 0 + a(1)$

   b. What is the force on the ball while it is being thrown?

   $F = ma = (50)(1) = 50\ N$

   c. What is the force on the pitcher while the ball is being thrown?

   50 N

   d. What is the acceleration of the pitcher while the ball is being thrown?

   $a = \frac{F}{m} = \frac{50N}{50kg} = 1\ m/s^2$

   e. What are the velocities of the ball and pitcher after 10 seconds?

   $V_i = 0$
   $V_f = ?$
   $d = x$
   $a = 1$
   $t = 1$

   $V_f = V_i + at = (1)(1) = 1\ m/s$ Pitcher

   Ball = 50 m/s