The Physics of Everyday Phenomena - 8th Edition solutions

Chapter 1: **Physics**, **the Fundamental Science**

> conceptual questions;

23. The advantages of using the hand as a unit of measurement is that the hand is always available (and is very "handy"). The disadvantage is that people have hands of differing widths.

> exercises;

6. 106 mm = 10.6 cm
7. 9.40 kg = 9,400 g = 9,400,000 mg
8. 4.18 kL = 4,180 L = 4,180,000 ml

Chapter 2: **Describing Motion**

> conceptual questions;

3. Since fingernails grow slowly, one could use mm/month or cm/year.
6. A speedometer in a car measures the speed at that exact moment, which is the instantaneous speed.
12. Because velocity is a "vector quantity," if either the speed or direction changes then it is accelerating. The hockey puck when it bounces off the wall will change its direction, and thus accelerate.
13. a) When the direction changes then the velocity changes, so an object in circular motion is accelerating.
    b) If the velocity changes, then by definition it is accelerating.
15. A dropped ball falling straight down (in a vacuum) is not changing in direction, but is accelerating if it is gaining speed.
16. If the velocity of a body changes, then by definition it is accelerating. In this case if the car is slowing down it is "decelerating."
21. a) Between zero and two seconds the object has a constant velocity.
    b) Between two and four seconds the object has the greatest acceleration.

> exercises;

11. $a = \text{change in velocity} / \text{change in time} = v_f - v_i / \Delta t$
    Note that the initial velocity is zero so (v_i) drops out.
    $v_f = (a) \times (t_2 - t_1) = (4.2\ m/s^2)(5\ s) = 21\ m/s$
13. $a = \text{change in velocity} / \text{change in time} = v_f - v_i / \Delta t$
    Note that the initial velocity is not zero so does <u>not</u> drop out.
    $v_f = (v_i) + (a) \times (\Delta t) = (14\ m/s) + (2.5\ m/s^2)(3\ s) = 21.5\ m/s$

Chapter 3: **Falling Objects and Projectile Motion**

> conceptual questions;

2. Since the distance between each ball (for equal amounts of time) is the same the ball is moving at a constant velocity, and is <u>not</u> accelerating.

3. Since the distance between the ball (for equal amounts of time) is changing, the ball is accelerating. Example A is acceleration, and example B is deceleration.

4. Both balls will fall at the same accelerated rate.

8. The distance the rock falls in the first 0.1 second will be less that the distance it falls in the last 0.1 second because the rock is accelerating.

12. a) If a ball is thrown downward with some intial velocity it will travel further than a ball just dropped in for the same amount of travel time. This can be noted in this equation ----> $d = v_i t + {}^1/_2 at^2$

b) A ball thrown downward or just dropped will accelerate at the same rate.

14. Since the rock is slowing down (decelerating) on its way up, it will be covering less and less distance on its way up. When it is first thrown it will be covering more distance in the first five meters than the five meters just before the top of its flight.

17. Because the ball at the top of its flight is changing its direction, then the velocity is changing and thus is accelerating.

24. Gravity only pulls in the downward direction, so any horizontal motion a body may have will not have any affect on the time it takes to strike the ground.

27. The ball is constantly moving through its path (trajectory) in the x-direction, so its velocity is not zero.

30. For projectiles the horizontal distance traveled (range) will be greater at 45˚ than at 20˚.

> exercises;

1. a) $v_f = (a) \times (\Delta t) = (10\ m/s^2)(0.6\ s) = 6\ m/s$

b) $v_f = (a) \times (\Delta t) = (10\ m/s^2)(1.2\ s) = 12\ m/s$

Chapter 4: **Newton's Laws**: **Explaining Motion**

> conceptual questions;

3. Aristotle believed that once a thrown object left the hand there air rushed in behind it and kept pushing it forward.

10. According to the first law of motion concerning inertia, a bullet fired in space will not change in speed or direction.

14. Newton stated the first and second laws of motion separately because they are two different concepts.

15. Weight is a force and mass is not. In a gravitational field, if the mass of a body increases so will its weight.

> exercises;

1. If F = ma then $a = {}^{F}/_{m} = {}^{40\ N}/_{5\ kg} = 8\ m/s^2$

4. Because 5 N is used to overcome friction, the “net” force acting on the block is 75 N (80 N - 5 N = 75 N).
   $a = {}^{F}/_{m} = {}^{75\ N}/_{3\ kg} = 25\ m/s^2$

8. a) The net horizontal force is 25 N + 5 N - 10 N = 20 N to the right.
   b) $a = {}^{F}/_{m} = {}^{20\ N}/_{4\ kg} = 5\ m/s^2$

10. If F = ma, then W = mg ----> W = (40 kg)(9.8 m/s^2) = 392 N

11. W = mg ----> $m = {}^{W}/_{g} = {}^{196\ N}/_{9.8\ m/s^2} = 20\ N$