Physics
Chapter 6, 7, and 8 Test Review

1. Define the impulse-momentum theorem and give an example of how it is used in the real world.

↑ time ↓ Force   airbag

2. Name and define the 2 types of collisions and tell what happens to the energy in each.

elastic – bounces off
inelastic – sticks together

3. A girl sits in a tire that is attached to an overhanging tree limb by a rope 98 m in length. The girl's father pushes her with a tangential velocity of 8.3 m/s. If the force that maintains her circular motion is 78 N, what is the girl's mass?

Centripetal Force = (mass x Tangential Velocity²) / radius

$78 = \dfrac{(m \cdot 8.3^2)}{98}$ | $98 \cdot 78 = m \cdot 8.3^2$ | $7644 = m \cdot 8.3^2$

$\dfrac{7644}{8.3^2} = m$ $\boxed{m = 110.9 \, kg}$

4. A 2.13 kg child is riding a 3.4 kg bike with a velocity of 8.9 m/s to the northwest.

Momentum = mass * velocity

What is the total momentum of the child and the bike?

$(2.13 + 3.4) \cdot 8.9 = \boxed{49.2 \, kg\frac{m}{s}}$

5. A 1.25 kg football is thrown with an initial velocity of 167 m/s to the right. A stationary (Vf=0) receiver catches the ball and brings it to a rest in 5 seconds. What is the force exerted on the receiver?

Force (time) = Mass (final velocity) – Mass(initial velocity)

$F(5) = 1.25(0) - 1.25(167)$ | $F(5) = -208.75$

$\boxed{F = -41.75 N}$

6. A dog sits 92 m from the center of a merry-go-round. If the dog has a centripetal acceleration of 4.3 m/s², what is the dog's tangential velocity?

Centripetal Acceleration = Tangential Velocity² / radius

$4.3 = \dfrac{V^2}{92}$ | $4.3 \cdot 92 = V^2$ | $395.6 = V^2$ | $V = \sqrt{395.6}$

$\boxed{V = 19.9 \frac{m}{s}}$

7. Define fluid.   Liquid or Gas

8. Define buoyant force.

↑ Force in a fluid

9. What is Archimedes' Principle?

Buoyancy

10. What does the density of an object determine?

if floats or sinks

11. How do you change buoyancy? Give an example.

Change density   Swim bladder - fish
                  Ballast tank - sub
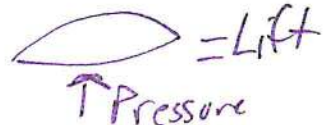
12. What is Pascal's Principle?

Pressure is equal

13. Explain the Kinetic Theory (remember the soap in the microwave?)

↑ temp = ↑ movement of particles

14. Define Bernoulli's Principle.

↑ Pressure on bottom causes lift   = Lift
                                    ↑ Pressure

15. In a car lift, air exerts a force 1 of a piston of 1,960 N. The piston is .34 m in radius. This force causes another piston to react with a force 2 of 5670 N. What is the radius of the second piston?

Force 1 = **Force 2**
π*radius²   **π*radius²**

$$\frac{1960}{3.14 \cdot (.34^2)} = \frac{5670}{3.14(r^2)}$$

$$6154.4 r^2 = 2058.12 \qquad r^2 = \frac{2058.12}{6154.4} = .33 \quad r = \sqrt{.33} = \boxed{.58m}$$

16. A book is .97 m wide and .67 m long and weighs 2.89 N. What is the pressure the book exerts on the floor?
Pressure = Weight / (width x length)

$$P = \frac{2.89}{(.97 \cdot .67)} \qquad \boxed{= 4.4 \, Pa}$$

17. A submarine is submersed in the ocean down -900 m. If the atmospheric pressure at sea level is 1.01 x 10⁵ Pa, how much pressure would be on the submarine? Density of sea water = 1025 kg/m³. Gravity = -9.8
Pressure = Pressure atmospheric + (height x gravity x density)

$$P = 1.01 \times 10^5 + (-900 \cdot -9.8 \cdot 1025) \qquad \boxed{= 9141500 \, Pa}$$

18. A boat is 7 m wide and 3.8 m long. When a crate is lowered onto it, the boat sinks .89 m in the water. What is the combined weight of the boat and the crate? Density = 1000 Gravity = -9.8
Weight = width x length x height x density x gravity

$$W = 7 \cdot 3.8 \cdot -.89 \cdot 1000 \cdot -9.8 = \boxed{232005.2 \, N}$$

19. A piece of silver weighs 9.5 N in the air, 78.5 N in water. Find the density of the metal. Density of water = 1000

Force in air = **Density of object**
Force in water   **Density of water**

$$\frac{9.5}{78.5} = \frac{D}{1000} \qquad D = \boxed{121 \frac{kg}{m^3}}$$