**PHYS101 Exam 2 study guide**

**Chapter 04**

1. A force of 20 N acts upon a 5 kg block. Calculate the acceleration of the object.

2. An object of mass 300 kg is observed to accelerate at the rate of 4 m/s2. Calculate the force required to produce this acceleration.

3. A 5 kg block is pulled across a table by a horizontal force of 40 N with a frictional force of 8 N opposing the motion. Calculate the acceleration of the object.

4. An object of mass 30 kg is in free fall in a vacuum where there is no air resistance. Determine the acceleration of the object.

5. An object of mass 30 kg is falling in air and experiences a force due to air resistance of 50 newtons.

1. Determine the net force acting on the object and
2. calculate the acceleration of the object.

6. A student pushes on a crate with a force of 100 N directed to the right. What force does the crate exert on the student?   

7. A force of 200 N is exerted on an object of mass 40 kg that is located on a sheet of perfectly smooth ice.

1. Calculate the acceleration of the object.
2. If a second object identical to the first object is placed on top of the first object, what acceleration would the 200 N force produce?

8. Just before opening her parachute a skydiver of mass 50 kg reaches terminal velocity. Calculate the force of air resistance.

9. For a person who has a mass 60 kg, calculate the weight in newtons and in pounds

10. An object of mass 10 kg is accelerated upward at 2 m/s2. What force is required?

**Chapter 05**

1. A rock tied to a string is traveling at a constant speed of 4 m / s in a circle of radius 1.5 m. Calculate the magnitude of the centripetal acceleration of the rock. What is the direction of the acceleration?

2. A 1.3 m long fishing line rated as "10 lb test" that can stand a force of 10 lb (44.48 N) is attached to a rock of mass 0.5 kg. Calculate the maximum speed at which the rock can be rotated without breaking the line.

3. A rock tied to the end of a string moves in a circle at a constant speed of 2.5 m / s and experiences an acceleration of 4.0 m / s2. What is the radius of the circle of its motion?   

4. A rock tied to the end of a string moves in a circle of radius 1.2 m with a constant speed of 3.0 m / s. Calculate the centripetal acceleration of the rock.

5. Calculate the gravitational attraction between a person of mass 60 kg and a building of mass 10,000 kg when the person is 5 m from the building.

6. A satellite of mass 500 kg is placed in an orbit of radius 5 times the radius of the Earth, i.e. the distance between the satellite and the center of the Earth is equal to 5 Earth radii. Calculate the centripetal force experienced by the satellite. The radius of the Earth is 6.37 x 106 m.

7. The distance from the Earth to the Sun is 1.5 x 1011 m (93 million miles), and the time for one complete orbit of the Earth about the Sun is one year. How long would it take for a planet located at twice this distance from the Sun to complete one orbit?

8. A car of mass 1000 kg travels around a level curve of radius 40 m. If the maximum frictional force that can be exerted upon the car by the road (determined by the coefficient of friction between the tires and the road) is 7000 N how fast can the car travel without "spinning out?"   

9. The mass of Mars is 6.37 x 1023 kg and its radius is 3430 km. Calculate the value of g for Mars.

10. The Earth has a mass of 5.98 x 1024 kg, the Moon has a mass of 7.34 x 1022 kg, and the distance from the center of the Earth to the center of the Moon is 3.8 x 105 km. Calculate the gravitational attractive force between the Earth and the Moon.

**Chapter 06**

1. A force of 70 N is applied to a crate parallel to the surface on which the crate rests. If the force moves the crate 6.0 m calculate the work done by the force.   

2. What is the change in the kinetic energy experienced by the crate in the previous problem?

3. If the force in problem 1 was applied for 8.0 seconds how much power was expended

4. An object of mass 3.0 kg has a velocity of 8.0 m / s. What is the object's kinetic energy?

5. A monkey carries a coconut of mass 2.0 kg to a height of 10 m. Calculate the potential energy of the coconut and the work done by the monkey in getting the coconut to that height.

6. If the monkey in the previous problem releases the coconut from the height of 10 m what is the velocity of the coconut just before it reaches the ground?

7. A spring of spring constant 60 N / m is stretched a distance of 0.3 m from its equilibrium position. Calculate the increase in the potential energy of the spring.

8. A ball of mass 0.6 kg is located at the top of a hill of height 8.0 m. If friction can be neglected, calculate the speed of the ball at the bottom of the hill if the ball is released from rest.

9. A pendulum of mass 2.0 kg is raised to a height of 0.4 m above the lowest point in its swing and then is released from rest. If air resistance can be ignored, how high will the pendulum swing on the other side of its motion?

10. For the pendulum in the previous problem, how fast will it move at the lowest point in its swing?

**Chapter 07**

1. An average force of 100 N acts for a time interval of 0.02 second on a golf ball that is initially at rest. Calculate

1. the impulse acting on the golf ball.
2. the change in momentum of the golf ball.

2. A force of 500 N acts for a time interval of 0.001 second on an object of mass 0.20 kg that was initially at rest. Calculate the speed of the object after the force acts.

3. A lump of clay of mass 0.1 kg is thrown with a speed of 9 m / s against a rigid wall where it comes to rest. Calculate the change in momentum of the lump of clay.

4. Calculate the momentum of a golf ball of mass 0.045 kg that moves at a speed of 40 m / s

5. If the golf ball in the previous problem strikes a tree and rebounds with the same speed it had before the collision but in the opposite direction, calculate the change in momentum.   

6. The collision of the golf ball with the tree described in the previous problem occurred over 0.01s. Calculate the force that the tree exerted on the golf ball during the collision.

7. A freight car of mass 120,000 kg rolling down the track at 3 m / s collides with an identical freight car that was initially at rest. The two cars couple together and move off together. Calculate the speed of the combination of two cars.

8. A football player of mass 100 kg with a speed of 3.0 m / s collides head-on with another football player of mass 85 kg who was initially moving in the opposite direction with a speed of 5.0 m / s. The second player tackles the first and they become entangled into the equivalent of a single mass. Determine the direction and the magnitude of the velocity of the two players after the collision.

9. Two persons on roller skates stand facing each other, and then push each other away. One has a mass of 50 kg and is observed to move with a speed of 3 m / s immediately after they separate. If the other person has a mass of 80 kg, determine the direction and magnitude of his velocity.

10. A 2000 kg car collides with a 1500 kg car that was initially at rest. The two cars lock together and move off after the collision at a speed of 6 m / s. Calculate the speed of the 2000 kg car before the collision.