Honors. Physics Final Exam Study Sheet 11 **Name:**_____ **#:**_____
We are having "BIG" Fun Now! Answer ALL Problems in PROPER Number of Sig Fig's.

1) An automobile started from rest and underwent constant acceleration of _____ **m/s^2** until it was traveling _____ **m/s**. **How many seconds did it take** the automobile to reach this speed?
Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

2) A rowboat starts across river. If the average speed of the boat is _____ **m/s** and the river is flowing at a speed of _____ **m/s, what is the resultant speed and resultant angle of the boat**?
Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

3) A _____**-kg** crate initially at rest on a horizontal surface requires a _____**-N** horizontal force to set it in motion. **Find the coefficient of static friction** between the crate and the floor.
Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

4) A walnut falls from a tree. It takes _____ **s** to reach the ground.
a) Ignoring air resistance, **how far did the walnut fall**?
Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

b) **What was the walnut's final velocity** just before it struck the ground?
Given Info **Formula** **Set-Up (with Units)**

Answer _____

5) A _____**-kg** student climbs _____ **m** up a rope at a constant speed. If the student's power output is _____ **W, how long does it take** the student to climb the rope?
Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

6) A _____**-kg** car traveling to the west is slowed down uniformly from _____ **m/s** to _____ **m/s. What constant force** acted on the car during this time of _____ **s**?
Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

7) A farmer throws a _____**-kg** bale of hay onto a stationary _____**-kg** cart. The cart and the hay begin moving at _____ **m/s** to the right. **Find the velocity** of the bale of hay before the collision.

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

8) A girl sits on a meny-go-round at a distance of _____ **m** from the center. If the girl moves through an arc length of _____ **m**, through **what angular displacement** does-she move?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

9) When the shuttle bus comes to a sudden stop to avoid hitting a squirrel, it slows from _____ **m/s** to **0.00 m/s** in _____ **s. Find the average acceleration** of the bus.

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

10) Calculate the Kinetic Energy of an _____ **kg** airliner flying at _____**m/s**.

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

11) A _____**-kg** rifle fires a ___**-g** bullet at a muzzle velocity of ____**m/s**. **What is the recoil velocity** of the rifle?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

12) An _____**-kg** pilot is flying a small plane at _____ **m/s** in a circular path with a radius of _____**m**. **Find the magnitude of the force** that maintains the circular motion of the pilot.

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

13) A load of _____ **N** attached to a spring that is hanging vertically stretches the spring a distance of _____ **m. What is the spring constant**?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

14) A pitcher claims he can throw a _____-g baseball with as much momentum as a speeding bullet. Assume that a _____-g bullet moves at a speed of _____m/s. What must the baseball's speed be if the pitcher's claim is valid?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

15) A _____-kg luxury sedan stopped at a traffic light is struck from the rear by a compact car with a mass of _____kg. The two cars become entangled as a result of the collision. If the compact car was moving at a velocity of _____m/s to the north before the collision, what is the velocity of the entangled mass after the collision?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

16) In 1993, a generator with a mass of _____-kg was flown from Germany to a power plant in India on a Ukranian-built plane. This constituted the heaviest single piece of cargo ever carried by a plane. Suppose the plane took off with a speed of _____m/s toward the southeast, then accelerated to its final cruising speed during the next _____s. During this acceleration, a force of _____N in the southeast direction was exerted on the generator. Calculate the final cruising velocity based on the information provided.

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

17) A _____-g toy car traveling to the east is slowed down uniformly from _____ m/s to _____m/s in _____s. What constant force acted on the car during this time?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

How far did the car travel during the acceleration time?

Given Info **Formula** **Set-Up (with Units)**

Answer _____

18) A _____-kg astronaut is on a space walk when the tether line to the shuttle breaks. The astronaut is able to throw a _____- kg oxygen tank in a direction away from the shuttle with a speed of _____m/s, propelling the astronaut back to the shuttle. Assuming that the astronaut starts from rest, find the final speed of the astronaut back to the shuttle. **Becareful of your signs!!!**

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

19) An object _____cm high is _____cm from a concave mirror. The radius of curvature of the mirror is _____cm. What is the location of the image?

On a seperate sheet of graph paper, construct a ray diagram that illustrates where the image would be located.

Given Info **Formula** **Set-Up (with Units)**

Answer _____

What is the size of the image?

Given Info **Formula** **Set-Up (with Units)**

Answer _____

20) Lord Rosse, who lived in Ireland in the nineteenth century, built a reflecting telescope called the Leviathan. Lord Rosse used it for astronomical observations and discovered the spiral form of galaxies. Suppose the Leviathan's concave mirror had a focal length of _____m. What would be the image distance and magnification of an object placed _____m from the mirror. Calculated image distance?

On a seperate sheet of graph paper, construct a ray diagram that illustrates where the image would be located.

Given Info **Formula** **Set-Up (with Units)**

Answer _____

Calculated magnification?

Given Info **Formula** **Set-Up (with Units)**

Answer _____

21) The smallest ridable tandem bicycle was built in France and had a length of less than _____cm. Suppose this bicycle is accelerated from rest so that the angular acceleration of the wheels is _____ rad/s^2. What is the angular speed of the wheels after _____s?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

22) **Fill in the unknown quantities in the follow table. Place the formula and Set-up on the line.**

Given Info **Formula** **Set-Up with Units**

a) _____

b) _____

c) _____

d) _____

23) A test car moves at a constant speed of _____m/s around a circular track. If the distance from the car to the center of the track is _____m, what is the centripetal acceleration of the car?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

24) A coin with a diameter of _____cm is dropped onto a hor- izontal surface. The coin starts out with an initial angular speed of _____rad/s and rolls in a straight line without slipping. If the rotation slows with an angular acceleration of magnitude _____rad/s^2, how far does the coin roll before coming to rest?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

25) A mass attached to a _____cm string starts from rest and is rotated in a circular path exactly_____ revolutions in _____min before reaching a final angular speed. What is the angular speed of the mass after _____min?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

26) The largest salami in the world, made in Norway, was more that _____m long and had a diameter of _____cm. If a hungry mouse runs around the salami at a constant speed and completes the circle in _____s, how large is the centripetal acceleration acting on the mouse?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

27) As Halley's comet orbits the sun, its distance from the sun changes dramatically, from _____ m to _____ m. If the comet's speed at closest approach is _____ m/s, what is its speed when it is farthest from the sun if angular momentum is conserved?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

28) A simple pendulum consists of a _____kg point mass hang- ing at the end of a _____-m long light string that is connected to a pivot point. Calculate the magnitude of the torque (due to the force of gravity) around this pivot point when the string makes a _____angle with the vertical.

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

29) A potter's wheel of radius _____cm and mass _____kg is freely rotating at _____rev/min. The potter can stop the wheel in _____s by pressing a wet rag against the rim and exerting a radially inward force of _____N. What is the angular acceleration of the wheel?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

How much torque does the potter apply to the wheel? **Answer** _____

Given Info **Formula** **Set-Up (with Units)**

Answer _____

30) A window washer weighing _____N is standing on a scaffold supported by a vertical rope at each end. The scaffold weighs _____N and is _____m long. What is the force in each rope when the window washer stands _____m from one end?

Force in Rope 2 (Rope farthest from window washer.) =

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

Force in Rope 1 (Rope closest to window washer.)=

Given Info **Formula** **Set-Up (with Units)**

Answer _____

31) A bowling ball with a mass of _____kg and a radius of _____m starts from rest at a height of _____m and rolls down a _____slope. What is the translational speed of the ball when it leaves the incline?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

32) Tim is flying a helicopter when he drops a rescue raft. After the raft has fallen _____s: What is the raft velocity?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

How far has the raft fallen during this time?

Given Info **Formula** **Set-Up (with Units)**

Answer _____

If Tim's helicopter was rising at _____m/s when the raft was released. After _____s, what is the raft's new velocity be?

Given Info **Formula** **Set-Up (with Units)**

Answer _____

33) In 1978, Geoff Capes of the United Kingdom won a competition for throwing _____lb bricks; he threw a brick a distance of _____m. Suppose the brick left Capes' hand at an angle of _____with respect to the horizontal and the bricks land at the same height he threw them from.
Find the initial speed of the brick.

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

If Capes threw the brick straight up with the speed found in (a), what is the maximum height the brick could achieve? (Ignore air resistance.)

Given Info **Formula** **Set-Up (with Units)**

Answer _____

34) Kangaroos can easily jump as far as _____m. Suppose a kangaroo made _____ such jumps due South and then _____ such jumps due West. What is its displacement from its starting position?
Part 1 - What is the magnitude of the displacement of the kangaroos from its starting position?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

Part 2 - What is the direction of the displacement of the kangaroos from its starting position relative to the SOUTHERN axis?

Answer _____

35) If Syd is a softball pitcher (a really good one, just ask her) and Rachael is the hitter with Morgan playing centerfield. Rachael thinks moving closer to the pitcher will make it easier to hit the change-up Syd throws. If Syd throws a pitch with with a velocity of _____miles per hour. The plate is _____ ft away.
A. How much time does it take for a pitch to reach the plate?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____

Rachael misses the first pitch by swinging early on the pitch. Rachael moves to the front of the batters box which _____ inches closer to try to hit the ball sooner.
B. How much time does she gain by moving to the front of the box?

Drawing **Given Info** **Formula** **Set-Up (with Units)**

Answer _____