P h y s i c s   name _____ period ____

20pt Inv-5 Expan 1 Mixed Bag of Motion & Vector Problems sheet # ____

Here is how the grading works on this one. For every problem that you put a
good effort into and you neatly show ALL work, you get the 1 point the problem
is worth, plus the bonus points listed with each problem. If you don't work a
problem you lose the point for that problem.

Neatly work as many of these problems as you have time for on a separate piece
of paper. Carefully show all work and box in your answers. Skip a space between
each problem. You do not have to write out the question. Make sure your name
and period are on your paper(s). You may individually check the key if you are
stumped.

THIS SHEET AND YOUR WORK SHEETS ARE DUE: FRIDAY, FEBRUARY 10TH AT 5:00PM

WARNING: I WILL IGNORE ANYTHING WRITTEN ON THIS PAGE

1.) (+1) A jet is traveling at 600 km per hour. How many inches per nanosecond is that? (1 in. = 2.54 cm)

2.) (+2) A race car with an initial velocity of 110 mph begins to accelerate at a constant rate of 2.00 ft / sec^2 for 5.00 seconds. a.) How many feet does the car travel between the 4th and 5th second **after** the driver has begun the acceleration? b.) How fast is the car traveling in mph after the 5.00 seconds of acceleration?

3.) (+2) The nucleus of a helium atom (an alpha particle) travels along the inside of a straight hollow tube 2.0 meters long which forms part of a particle accelerator.   a.) Assuming uniform (constant) acceleration, how long is the particle in the tube if it enters at a speed of 1.0 x 10^4 m / s and leaves at 5.0 x 10^6 m / s?   b.) What is its acceleration during this interval?

4.) (+2) A ball is thrown vertically upward from the ground with a speed of 80.0 ft / s.
a.) How long does it take to reach its highest point?   b.) How high does the ball rise?

5.) (+3) What would the equilibrant be of these vectors combined:
   A = 435.0 N 29° N of W   B = 310.0 N 72° S of E   C = 592.0 N 12° N of E

6.)(+3) A plane flies 350 miles 45° S of W from its home airport, veers right 20° and flies 200 miles, then veers left 35° and flies a 450 miles. If the destination airport is 900 miles 50° S of W of its home airport, what is the description of the final vector the plane needs to travel? You MUST cerfully construct the vectors head-to-tail.

7a.)(+2) With what speed must a ball be thrown upward to rise to a height of exactly 50 ft? b.) How long will it be in the air?

8.) (+4) A lead ball is dropped into a lake from a diving board 16.0 ft above the water. It hits the water with a certain velocity and then sinks to the bottom with this same constant velocity. It reaches the bottom 5.0 seconds after it is first dropped.   a.) How deep is the lake?   b.) What is the **average** velocity of the ball?   c.) Suppose all the water is drained from the lake. The ball is thrown vertically from the diving board so that it again reaches the bottom in 5.0 seconds. What is the initial velocity of the ball?

"You know nothing until you have practiced." -- Richard Feynman

9.) (+1) A balloon is ascending at the rate of 12.0 m / s at a height of 80.0 meters above the ground when a package is dropped. How long does it take the package to reach the ground?

10.) (+1) Tom the cat is chasing Jerry the mouse across a table surface 1.5 m high. Jerry steps out of the way at the last second, and Tom slides straight off the edge of the table at a speed of 5.0 m / s. Where will Tom strike the floor?

11.) (+1) An Alaskan rescue plane drops a package of emergency rations to a stranded party of explorers. If the plane is traveling horizontally at 40.0 m / s at a height of 100.0 m above the ground, where does the package strike the ground relative to where it was released?

12.) (+2) A punter kicks a football at an angle of 35° with the horizontal at an initial speed of 22.0 m / s. Where should a punt returner position himself to catch the ball just before it strikes the ground?

13.) (+2) A ball is thrown straight upward and returns to the thrower's hand after 3.0 seconds in the air. A second ball is thrown at an angle of 30° with the horizontal. What speed must the second ball be thrown so that it reaches the same height as the one thrown vertically?

14.) (+2) A baseball is hit at an angle of 40° to the horizontal from the top of a building with an initial velocity of 20.0 m / s. If the building is 25.0 m tall, how long will the ball be in flight?

15.) (+2) If a person can jump a **horizontal** distance of 3.0 m on the earth, how far can the person jump on the moon where the acceleration due to gravity is g / 6, where g = 9.8 m / s^2. Repeat for Mars where the acceleration due to gravity is 0.38 g.

16.)(+3) A daredevil is shot out of a cannon at 45° to the horizontal with an initial velocity o(f 25 m/s. A net is located at a horizontal distance of 50.0 m from the cannon. At what height above the cannon should the net be placed in order to catch the daredevil?

17.) (+3) A woman is reported to have fallen 44.0 m from the 17th floor of a building and to have landed on a metal ventilator box, which she crushed to a depth of 46.0 cm. She suffered only minor injuries. Neglecting air resistance, calculate   a.) the speed of the woman just before she collided with the box.   b.) her deceleration while in contact with the box, and   c.) the time it took to crush the box.

18.) (+2) A ball is thrown upward from the ground with an initial velocity of 25.0 m/s at the same instant that a ball is dropped from a building 15.0 m high directly above where the ball was thrown upward. How long will it take for the balls to collide?

19.) (+2) A motorcycle daredevil took off on a trajectory that started at 20° above the horizontal. He just cleared 14 school buses, each 3 m wide, parked with sides touching, and landed at the same height from which he became airborne. What was the cyclist's initial air speed?

20.) (+5) Only for the hardiest of Physics student . . . good luck my friends) A baseball is hit in such a way that the ball just clears a wall 3 m tall 130 m from home plate. The ball leaves the bat at an angle of 35° to the horizontal and 1.0 m above the ground. Find its initial velocity.

Answers: 1) 6.65 x 10^{-6}in/ns 2a) 170.3ft 2b) 116.8mph 3a) 798ns 3b)6.25x10^{12}m/s^2 4a) 2.5s 4b) 100ft 5) 297N@7.58SofW

6) YD 7a) 56.6ft/s 7b) 3.54s 8a) 128ft 8b)28.8ft/s 8c) 51.2ft/s 9) 5.45s 10) 2.75m 11) 180.7m 12) 46.4m 13) 29.4m/s 14) 3.92s

15) 18m on Moon; 7.89m on Mars 16)10.9m 17a) 29.4m/s 17b) 939.5m/s^2 17c) 0.031s 18) 0.60s 19) 25.3m/s 20)37.2m/s