**PHYX-1800** **Homework 1** **Due: Fri 22 Jan, 2010**

**Name:_____** **(show all your work and any sketches)**

1. The principal reason that scientists use metric units rather than English units is that:
   A. metric units are of more convenient size
   B. conversions between units is easier
   C. metric units are more familiar (Points: 1)

2. Suppose a graph of displacement of a body versus time is constructed. The slope of the graph at any point may be identified with:
   A. Instantaneous velocity
   B. Instantaneous acceleration
   C. Average acceleration (Points: 1)

3. Suppose you are told that the distance a body travels (d) is governed by the product of its speed (v) times the time of travel (t). The mathematical equation for this is:
   A. $d = v + t$
   B. $d = v \cdot t$
   C. $d = v/t$
   D. $d = t/v$ (Points: 1)

4. If your average speed for a 3-hr trip is 60 mi/hr, the distance traveled is
   A. 20 mi.
   B. 60 mi.
   C. 180 mi.
   D. 240 mi. (Points: 1)

5. A speed of 72 km/hr is equivalent to _____ m/s. (Points: 1)

6. Using powers of 10 convert the following numbers into convenient scientific notation:

   (a) 178,000,000,000 km =

   (b) 0.00000125 m =

   (Points: 2)

7. (a) Define acceleration:

   (b) calculate the acceleration of a racing car starting from rest and acceleration up to a speed of 200 km/h in 8 seconds. Give your result in $m/s^2$. (Points: 3)

8. Resolve the following vectors into their east-west and north-south components:
   (a) 60 m/s at 70º E of N

   (b) 90 km/h at 35º S of E

**Name:**_____ **(show all your work and any sketches)**

(Points: 4)

9. Consider an airplane flying due North (relative to the air) with a speed of 600 km/hr. There is a strong wind blowing due West, which causes the aircraft's course (relative to the ground) to deviate to 15 West of North.
Draw a vector diagram and determine the wind speed in m/s. (Points: 3)

10: On a speed-time diagram accurately plot the motion of a car for the following situation: A car traveling initially at a constant speed of 50 mph for 10 mins gradually slows down over a 5 min interval to 25 mph as it enters a town. It takes 15 min to cross the town when it stops very suddenly at a railroad crossing. After waiting 5 mins for a train to pass the car accelerates rapidly up to 60 mph in 1 min and then proceeds at a constant speed for the rest of the journey. Indicate on the diagram when the largest rate of change in speed occurred. (Points: 3)

**Additional (optional) question** (worth up to 5 points).

With the great success of the Mars Rovers "Spirit" and "_____". NASA decided to let Spirit roam on its own to see what it could find. After some time it sent back a picture showing the wreckage of the ill-fated British spacecraft "Beagle. Using information transmitted by Spirit on its journey (a) make a sketch of its path to the wreckage, (b) determine the distance and azimuth of the wreckage from Spirit's starting point. (Hint: use right angle triangles and vector resolution to determine the vector sum.)

Rover Information:

From the landing site Spirit headed due E at 2 km/hr for 15 min, then it turned and headed 40º N of E for 10 min at 3 km/hr and stopped just in front of a crevasse. It then headed due N parallel to the crevasse and traveled at a speed of 1.5 km/hr for 20 min as it made detailed measurements. Finally it turned and headed due West at 4 km/hr for 5 min to wreckage.