General Physics I
2010 Spring
Prof Richard Ignace

HOMEWORK #1

- *This homework is due by the beginning of class on February 2. It covers material in chapters 1, 2, and 3.*
- *You will need a calculator and lots of scrap paper.*
- *Answers are to be recorded on a scantron that you will turn in. You may keep the questions (i.e., these sheets).*
- *You may (should) use your book. You may even work with other students. However, you should not copy the answers of other students. Since the exams are multiple choice, the homeworks are also exam prep, and so you need to be able to work these problems yourself. If you do not apply yourself to the homework and do your own work, you are not likely to perform well on the exams.*

1. In mechanics, physicists use three basic quantities to derive additional quantities. Mass is one of the three quantities. What are the other two?

    a. length and force
    b. power and force
    c. length and time
    d. force and time

2. The ratio M/m of the metric prefixes "M" and "m" has what value?

    a. 10^3
    b. 10^6
    c. 10^9
    d. 10^{18}

3. If the displacement of an object, x, is related to velocity, v, according to the relation $x = Av$, the constant, A, has the dimension of which of the following?

    a. acceleration
    b. length
    c. time
    d. area

4. On planet Q the standard unit of volume is called the guppy. Space travelers from Earth have determined that one liter = 38.2 guppies. How many guppies are in 150 liters?

    a. 5 730 guppies
    b. 0.255 guppies
    c. 3.93 guppies
    d. 188 guppies

5. A cement truck can pour 20 cubic yards of cement per hour. Express this in ft^3/min.

    a. 1/3 ft^3/min
    b. 1.0 ft^3/min
    c. 3 ft^3/min
    d. 9 ft^3/min

6. Assume everyone in the United States consumes one soft drink in an aluminum can every two days. If there are 270 million Americans, how many tons of aluminum need to be recycled each year if each can weighs 1/16 pound and one ton = 2000 pounds?

    a. 750 000 tons
    b. 1.5 million tons
    c. 1.75 million tons
    d. 3 million tons

7. Which point is nearest the *x* axis?

    a. (−3, 4)
    b. (4, 5)
    c. (−5, 3)
    d. (5, −2)

8. An object moves 20 m east in 30 s and then returns to its starting point taking an additional 50 s. If west is chosen as the positive direction, what is the average speed of the object?

    a. 0.50 m/s
    b. –0.50 m/s
    c. 0.73 m/s
    d. 0 m/s

9. A 50-g ball traveling at 25.0 m/s is bounced off a brick wall and rebounds at 22.0 m/s. A high-speed camera records this event. If the ball is in contact with the wall for 3.50 ms, what is the average acceleration of the ball during this time interval?

    a. 13 400 m/s^2
    b. 6 720 m/s^2
    c. 857 m/s^2
    d. 20 m/s^2

10. Vector $\vec{\mathbf{A}}$ is 3 m long and vector $\vec{\mathbf{B}}$ is 4 m long. The length of the sum of the vectors must be:

    a. 5 m.
    b. 7 m.
    c. 12 m.
    d. some value from 1 m to 7 m.

11. The following force vectors act on an object: *i*) 50.0 newtons at 45.0° north of east and *ii*) 25.0 newtons at 30.0° south of east. Which of the following represents the magnitude of the resultant and its angle relative to the easterly direction?

    a. 75.0 newtons 7.50°
    b. 61.4 newtons 21.8°
    c. 23.4 newtons 18.3°
    d. 12.8 newtons 37.5°

12. A baseball is thrown by the center fielder (from shoulder level) to home plate where it is caught (on the fly at an equal shoulder level) by the catcher. At what point is the ball's speed at a minimum? (air resistance is negligible)

    a. just after leaving the center fielder's hand
    b. just before arriving at the catcher's mitt
    c. at the top of the trajectory
    d. speed is constant during entire trajectory

13. A stone is thrown with an initial speed of 15 m/s at an angle of 53° above the horizontal from the top of a 35 m building. If $g = 9.8$ m/s^2 and air resistance is negligible, then what is the magnitude of the vertical velocity component of the rock as it hits the ground?

    a. 9.0 m/s
    b. 18 m/s
    c. 26 m/s
    d. 29 m/s

14. The highest mountain on Mars is Olympus Mons, rising 22 000 meters above the Martian surface. If we were to throw an object horizontally off the mountain top, how long would it take to reach the surface? (Ignore atmospheric drag forces and use $g_{\text{Mars}} = 3.72$ m/s^2.)

    a. 1.8 minutes
    b. 2.4 minutes
    c. 3.0 minutes
    d. 0.79 minute