1. Given the following conversion factors, convert between the following units:

   a) \(32.5 \text{ ft} = \underline{\text{________}} \text{ m}\) if \(1 \text{ ft} = 0.305\text{ m}\)
   b) \(32 \text{ m} = \underline{\text{________}} \text{ miles}\) if \(1 \text{ km} = 0.6 \text{ miles}\)
   c) \(23 \text{ m/s} = \underline{\text{________}} \text{ km/h}\) if \(1 \text{ h} = 3600 \text{ sec}\) and \(1 \text{ km}=1000\text{ m}\)

2. A) A material point moves from A (5 m) to B (-4m). What is the displacement?
   B) A material point moves from A (3m) to B (-2m) and finally to C (7m). What is the displacement and what is the total distance covered.

3. A recording timer makes 125 dots in 2.5 sec. What is it’s a) period and b) frequency?

4. Identify each of the following as either a vector (V) or a scalar (S).

   a) Force _____  b) Time _____  c) Acceleration _____  d) Speed _____  e) Displacement_
   f) Mass _____  g) Velocity _____  h) Distance _____  i) Temperature _____  j) Heat _____

5. A car travels 30 km [N] then 40 km [E]. Draw the displacement vector and find the magnitude of that displacement.

6. A car enters a tunnel at 24m/s and accelerates steadily at \(2.0 \text{ m/s}^2\). At what velocity does it leave the tunnel, 8.0 s later?

7. What does the slope of a position-time graph give? What does the slope of a velocity-time graph give? What does the slope of an acceleration-time graph give.

8. Referring to the following position-time graph, answer the following questions.

   a) What is the instantaneous velocity at 8 seconds?
   b) What is the average velocity between 1 and 4 seconds?
   c) When is the velocity positive, negative, and zero?
   d) When is the acceleration positive, negative, and zero?

9. A soccer player warming up for a game jogs along a track. He jogs 50m [N] and then jogs 30 m back toward his starting point before stopping to talk to his coach. If he jogged for 20s, then determine his i) average velocity, and ii) his average speed.
10. A bowler is practicing his game on a railway flatcar traveling at 50km/h [N] relative to the ground. If the ball’s velocity relative to the flatcar is 60km/h [S], what is the ball’s velocity relative to the ground?

11. Dave throws a rock straight down from a bridge at 15m/s. 
   a) How fast is it going 3 seconds later?
   b) How much distance has it fallen from the top of the bridge after these 3 seconds?

12. A prankster drops a water-filled balloon from the balcony of a high-rise. How long does it take for the balloon to fall 44.1m?

13. a) What is the force of gravity on a 1250 kg automobile?
    b) What is the force of attraction between 2 apples, each with a mass of 0.5 kg, held so that their centers are 10cm apart?

14. What is the acceleration of a 70kg skater, acted upon by an unbalanced force of 161 N [W]?


**CONCEPTUAL QUESTIONS:**

1. If the net force on an object is zero, then the object must be at rest (T/F, why?)
2. A car can accelerate even with a constant speed (T/F, why?)
3. An object can have a non-zero distance and a zero displacement (T/F, why?)
4. Under what condition(s) will the magnitude of the displacement for a moving object be the same as the distance it travels?
5. Which of the following are examples of uniform motion? Justify your answers:
   a) A feather drifts downward at a constant speed in a quiet room
   b) A car travels along a straight section of an expressway with its cruise control set at 100km/h.
   c) A leaf falls from a tree
6. Is it possible for an object to have a velocity of zero at the same instant that it has an acceleration that is not zero? Justify your answer with an example.
7. When an elevator accelerates upward, your weight will decrease? (T/F and why).
8. According to Newton’s third law, when a horse pulls on a cart, the cart pulls back with an equal force on the horse. If, in fact, the cart pulls back on the horse as hard as the horse pulls forward on the cart, how is it possible for the horse to move the cart?
9. A little boy is pushing a sled on an icy pavement. State all the forces acting on the sled.
10. At the upper most point in a typical projectile trajectory, the vertical velocity becomes zero and the acceleration changes direction? (T/F and why)
11. Wet roads have a smaller coefficient of friction than dry roads? (T/F)
12. Projectile motion combines a vertically ________ motion with a horizontally ________ velocity.
   (a) constant; accelerating
   (b) accelerating; zero
   (c) accelerating; constant
   (d) constant; zero