PART A: MULTIPLE CHOICE (10 MARKS)

Choose the best response in each case and place your answer in the appropriate space on your answer sheet.

1. A passenger on a bus walks towards the back of the bus at 3.0 km/h relative to the bus, while the bus travels south at 15 km/h. The passenger's velocity relative to the road is:
   (a) 18 km/h[N]  
   (b) 18 km/h[S]  
   (c) 12 km/h[N]  
   (d) 12 km/h[S]

2. Which of the following motions is not uniform?
   (a) A satellite in orbit around the Earth.  
   (b) A ball rolls along a table without changing velocity.  
   (c) A jogger runs 50 m along a straight track at a constant speed.  
   (d) An elevator moves vertically upward at zero acceleration.

3. An athlete completes two laps of a circular track of circumference 100 m. At the end of the run the athlete's total distance travelled is:
   (a) 0 m  
   (b) 50.0 m  
   (c) 100 m  
   (d) 200 m

4. A bear searching for food walks 15 km[E], 5.0 km[S], 3.0 km[W], and 5.0 km[N]. The bear's resultant displacement is:
   (a) 12 km  
   (b) 12 km[E]  
   (c) 28 km  
   (d) 28 km[E]

5. A car travels 4.0 km[N] and then 3.0 km[S]. If the total trip requires 15 min, the average speed of the car for the trip is:
   (a) 4.0 km/h  
   (b) 4.0 km/h[N]  
   (c) 28 km/h  
   (d) 28 km/h[N]

6. Velocity can be obtained from:
   (a) the slope of an velocity-time graph.  
   (b) the slope of a position-time graph.  
   (c) the area under an velocity-time graph.  
   (d) the area under a position-time graph.

Use the graphs below to answer questions 7 and 8.

7. Which graph shows an object speeding up as it moves away from home?

8. Which graph shows an object slowing down as it moves back toward home?

Use the graphs below to answer questions 9 and 10.

9. Which graph represents the motion of an object increasing in velocity?

10. Which graph represents an impossible situation?

PART B: MATCH (5 MARKS)

Match the definition from the 1st column to the best term in the 2nd column and place the matching letter in the appropriate space on your answer sheet.

1. Total displacement of an object per unit time  
   A) acceleration  
   B) acceleration-time graph  
   C) displacement  
   D) distance  
   E) position-time graph  
   F) scalar quantity  
   G) speed  
   H) vector quantity  
   I) velocity  
   J) velocity-time graph

2. The area under this graph is used to construct the corresponding position-time graph.

3. Quantity that has magnitude, but no direction.

4. Total length of path travelled by an object as it moves from one position to another

5. The slope of this graph is used to construct the corresponding velocity-time graph.
PART A: MULTIPLE CHOICE (10 MARKS)

PART B: MATCH (5 MARKS)

PART C: SHORT ANSWER (20 MARKS)
Answer the following questions in the space provided.

1. An object moves as shown on the d-t graph.
   (a) Sketch the graph of velocity vs time.
   (b) Determine the object's:
       ① position at 7.0 s m[N]  
       ② total distance m  
       ③ total displacement m[N]  
       ④ average speed m/s for entire trip  
       ⑤ average velocity m/s[N] for entire trip

2. An object moves as shown on the v-t graph.
   (a) Sketch the graph of position vs time.
   (b) Determine the object's:
       ① velocity at 7.0 s m/s[N]  
       ② total distance m  
       ③ total displacement m[N]  
       ④ average speed m/s for entire trip  
       ⑤ average velocity m/s[N] for entire trip

PART D: PROBLEMS (25 MARKS)
Answer the following questions on a separate sheet of paper. You may use the back of this sheet if you wish.

1. A dog, initially sitting next to its owner, runs first to a position 2.8 m[W] of its owner, and then secondly to a position 12.6 m[E] of its owner.
   (a) Draw a diagram showing the (i) position vectors and (ii) resultant displacement vector in this situation.
   (b) Determine the dog's total distance and total displacement.

2. R.R. Hood is travelling to visit her grandmother. First, she travels at an average speed of 12 km/h for 10 km. Then she travels at 8.0 km/h for another 1.25 h. Calculate her average speed for the entire trip to grandma's house? (Don't worry about the return trip - she catches a ride with B.B. Wolf)

3. A snowboarder starting from rest accelerates uniformly downhill at 2.7 m/s²[fwd]. How long will it take the boarder to reach a point 95 m[fwd] from the starting position?

4. A plane travelling at 63 m/s[S] down a runway begins accelerating uniformly at 2.8 m/s²[S]. How far does it travel in 4.0 s?

5. A flying saucer moving initially at 20 m/s[E] accelerates to 50 m/s[W] in 3.8 s. Find the saucer's average acceleration during the time interval.