SNC2D: Exam Review Questions: MOTION

True/False
Indicate whether each statement is true or false.
Correct each *false* statement by the changing the **bold** part.

T / F 1. **Scalar** quantities have both a magnitude and a direction.
T / F 2. Velocity and speed can have the same **units**.
T / F 3. **Acceleration** can be determined by finding the *slope* of a position-time graph.
T / F 4. If an object's motion is uniform, its average velocity and its **instantaneous velocity** are equal.
T / F 5. If a journey takes you back to your starting point, your displacement and the distance you traveled **equal zero**.

Completion

6. An object's speed doesn't change if the acceleration is _____.
7. The area under the graphed line in a _____ graph is the distance traveled.

Multiple Choice

Circle the letter of the best answer for each of the following questions.

8. If a **distance-time graph** has zero slope, you can infer that the object being observed was
   (a) moving at constant speed (b) moving to the right and accelerating
   (c) moving uniformly to the left (d) moving to the left and accelerating
   (e) not moving at all

9. Which quantity cannot be calculated from a **speed-time graph**?
   (a) the object's initial position (b) the direction of the object's motion
   (c) how fast the object is moving (d) whether the object is accelerating
   (e) the distance traveled by the object.

10. Suppose that you are studying cars travelling across an intersection. You decide to measure each cars initial speed, final speed, and time taken to cross the intersection. Which quantity below could you calculate from this data?
   (a) distance traveled (b) average acceleration (c) none of the above

11. Average speed can best be defined as:
(a) the speed at which an object is travelling at a particular instant;
(b) an object travelling at the same speed over a period of time;
(c) the total distance covered over the total time measured;
(d) the rate of change in speed.

12. Instantaneous speed can be best defined as:
(a) the speed at which an object is travelling at a particular instant;.
(b) an object travelling at the same speed over a period of time;
(c) the total distance covered over the total time measured;
(d) the rate of change in speed.

13. A zero slope on a distance-time graph indicates:
(a) the object is not moving. (b) the object's speed is increasing.
(c) the object has a low speed. (d) the object has a high speed.

14. A long straight line on a distance-time graph indicates:
(a) the object is changing speed. (b) the object is stopped.
(c) the object maintained a uniform speed for a long period of time.
(d) the object maintained a uniform speed for a short period of time.

15. An object covers less and less distance per unit time is an example of :
(a) constant speed (b) speeding up (c) instantaneous speed (d) slowing down

16. A car covers more distance per unit of time is an example of
(a) constant speed (b) speeding up (c) instantaneous speed (d) slowing down

17. Acceleration is defined as:
(a) change in position over a period of time; (b) change in speed over a period of time;
(c) same position over a period of time;
(d) the time it takes for an object to go from position 1 to position 2.

18. Which of the following is a vector quantity?
(a) displacement (b) speed (c) time (d) distance

19. Which of the following is a vector quantity?
(a) distance (b) speed (c) time (d) velocity

20. Which of the following is an example of displacement?
(a) 40 km (b) 20 km/h[E] (c) 1.5 m [right] (d) 15 km/h

21. Thatcha walks to her friend's house 5 blocks east and then walks home again 5 blocks west. Her displacement is
(a) 10 blocks (b) zero (c) 10 blocks [E] (d) 10 blocks [W]

Short Answer

1. Classify each quantity listed below as a **vector** or a **scalar**.
(a) mass (b) speed (c) time (d) velocity (e) position (f) acceleration

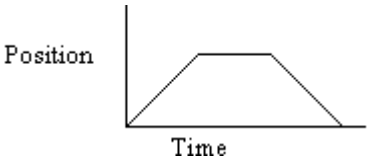
2. How many **significant digits** are in each measurement below?
(a) 4.00 cm (b) 0.0063 s (c) 104 kg (d) 4.60 x 10-3

3. Distinguish, in words, the difference between **position and displacement**.

Answer
Position is the distance and direction from a reference point, and displacement is the change in position.

4. Sketch a position-time graph in which a person walks forward at a constant velocity, stops for a short period of time, and then goes back to where he started.

Answer



5. When adding vector quantities using vector diagrams add them by connecting the _____(a)_____ one vector to the _____(b)_____ end of the next vector.

Answer: (a) head (b) tail

6. (a) State the rule for adding vectors in a vector diagram?
(b) What is the rule for drawing the resultant vector in a vector diagram?

Answer: (a) Join each subsequent vector by connecting the head end of the last vector to the tail end of the next vector.
(b) Find the resultant vector by drawing an arrow from the tail of the first vector to the head of the last vector.

7. Which of the following situations are examples of **uniform motion**, and which are examples of **accelerated motion**?
(a) a runner poised at the starting line
(b) the runner speeding up just after the starting pistol is fired.
(c) the runner travelling at a steady speed around a corner
(d) the runner slowing down after passing the finish line

8. Match the following terms with their descriptions. Place the letter of the description from column B in the blank provided in column A that matches that description.

COLUMN A	COLUMN B
____1. position	A. change in position
____2. displacement	B. distance in a given time
____3. distance	C. location relative to a reference point
____4. speed	D. change in velocity in a given time
____5. velocity	E. length along a path
____6. acceleration	F. displacement in a given time

Answer: The answers are C – 1, A – 2, E – 3, B – 4, F – 5, D – 6

9. The worst recorded elevator disaster occurred in South Africa, when a mine elevator dropped 487 m in 9.7 s before hitting the bottom of the mine shaft. How **fast** would the elevator be traveling at the end of the fall?
   Assume an initial velocity of 0 m/s and the acceleration due to gravity is 9.8 m/s2.

10. High-speed passenger elevators move upward at speeds of up to 7.1 m/s. At this rate, how **long** would an elevator take to climb 37 m (about ten stories)?

11. A motorcycle at a stop sign accelerated uniformly for 4.5 s, and reached 100.0 km/h.

    a) convert 100.0 km/h into m/s b) determine the motorcycle's **acceleration**.

12. A barrel rolls down a road at a constant speed, rolls over a rough patch, and then rolls down a hill until it hits a wall and stops.
    (a) Draw a speed-time graph of the barrel's motion.

    (b) Draw a distance-time graph of the barrel's motion.

13. What is the **displacement** of a person who starts at a position of 2.8 km [N of X], walks 5.0 km [E], then goes 7.4.0 km [S] ?

14. What is the **displacement** of an airplane which maintains a constant velocity of 200 km/h [W] for 45 minutes ?

15. A shark travelling at 2.0 m/s accelerates at 4.3 m/s^2 to a final speed of 15.0 m/s. What is the elapsed time during the acceleration?

16. How can you tell from a speed-time graph if an object is accelerating?

17. The slope of a position-time graph represents the _____ of the object.

Answer: velocity

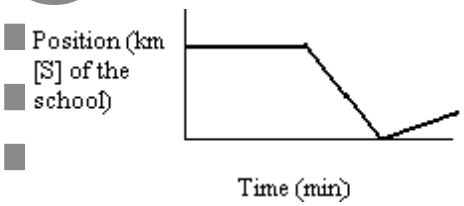
18. Explain the meaning of a negative slope on a position-time graph.

Answer: A negative slope means the object is moving in the direction defined as negative for the graph.

19. Explain the meaning of a zero slope on a position-time graph.

Answer: A horizontal line means that the object is not moving.

20. Write a brief description about the motion of the following object and include the direction and relative size of the different velocities.



Answer:
The object has stopped south of the school for several minutes and then proceeds north at a fast, constant velocity until it reaches the school. The object then goes south away from the school for a few minutes at a slower, constant velocity.

21. You are in a car that is travelling at a velocity of 40 km/h [N]. The car suddenly speeds up to 70 km/h [N] in 4.0 s. Calculate the acceleration of the car in that 4.0s.

Answer

$\vec{v}_1$ = 40 km/h [N]

$\vec{v}_2$ = 70 km/h [N]

Δt = 4.0 s

$$\vec{a}_{av} = \frac{\vec{v}_2 - \vec{v}_1}{\Delta t}$$

$$= \frac{(70 - 40)\ (km/h)/s\ [N]}{4.0\ s}$$

= 7.5 (km/h)/s [N] or +7.5 (km/h)/s

The average acceleration of the car is 7.5 (km/h)/s [N].

22. You throw a penny into a wishing well with a velocity of 10 m/s [down]. The penny accelerates at 10 m/s^2 [down] to a final velocity of 20 m/s [down]. How long did this take in seconds?

Answer

$\vec{v}_1$ = 10 m/s [down] = - 10 m/s

$\vec{v}_2$ = 20 m/s [down] = -10 m/s

$\vec{a}_{av}$ = 10 m/s^2 [down] = - 10 m/s^2

Δt = ?

$$\Delta t = \frac{\vec{v}_2 - \vec{v}_1}{\vec{a}_{av}}$$

$$= \frac{(-20\ m/s) - (-10\ m/s)}{-10\ m/s^2}$$

$$= \frac{-10\ m/s}{-10\ m/s^2}$$

= 1.0 s

It takes 1.0 s for the penny to accelerate from – 10 m/s to –20 m/s.