**Physics 11 Chapter 1 Exam**

**Use your knowledge that I have tried to instill into your brains to answer the following as best as you can. Remember, some of these are application questions so you need to apply the knowledge not just remember it. Best of luck, feel free to use a formula sheet. Cheating will result in a mark of ZERO and trip down trouble lane! \*\*\* IF A QUESTION REQUIRES A FORMULA/UNIT CONVERSIONS TO SOLVE PLEASE SHOW WORK FOR FULL MARKS\*\*\***

**True/False**

*Indicate whether the statement is true or false.*

\_\_\_\_ 1. In a chosen coordinate system, the position of an object in motion can have negative values.

\_\_\_\_ 2. The slope of a position-time graph of an object gives the speed of the object.

\_\_\_\_ 3. A time interval is a scalar quantity.

\_\_\_\_ 4. The position-time graph of an object moving with a constant average velocity is always a straight line.

\_\_\_\_ 5. Vector measurements have both magnitude and direction.

\_\_\_\_ 6. Scalar measurements have both magnitude and direction.

**Multiple Choice**

*Identify the choice that best completes the statement or answers the question.*

\_\_\_\_ 7. Which of the following is a pair of vector quantities?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | Speed — Distance | c. | Velocity — Displacement |
| b. | Velocity — Distance | d. | Speed — Displacement |

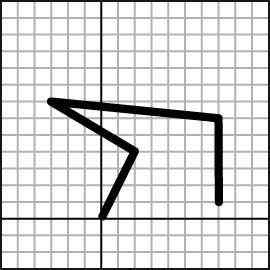
\_\_\_\_ 8. The final position minus the initial position is the

|  |  |  |  |
| --- | --- | --- | --- |
| a. | average velocity. | c. | time interval. |
| b. | motion diagram. | d. | displacement. |

\_\_\_\_ 9. The magnitude of a vector represents its \_\_\_\_\_.

|  |  |  |  |
| --- | --- | --- | --- |
| a. | velocity | c. | size |
| b. | direction | d. | color |

\_\_\_\_ 10. A bird flutters around in a tree in a path described by the dark line:



Which vector represents the average velocity of the bird?

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 11. If a drag racer wins the final round of her race by going an average speed of 198.37 miles per hour in 4.537 seconds, what distance did he cover?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 157,401 miles | c. | 0.2500 miles |
| b. | 2.500 miles | d. | 0.0121 miles |

\_\_\_\_ 12. Construct a position-time graph that shows the forward progress of Sunny The Dog in a straight line for 20 meters over the course of 4 seconds.

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

\_\_\_\_ 13. Duplain St. is 300 m long and runs from west to east between Baron and Burkey. If Keith is strolling east from Baron at an average velocity of 3 km/hr, and Sue is power-walking west from Burkey at an average velocity of 6 km/hr, how long will it take them to meet?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 1 minute | c. | 3 minutes |
| b. | 2 minutes | d. | 6 minutes |

\_\_\_\_ 14. Assuming constant velocities, if a fastball pitch is thrown and travels at 40 m/s toward home plate, 18 m away, and the head of the bat is simultaneously traveling toward the ball at 18.0 m/s, how much time elapses before the bat hits the ball?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | About 0.3 s | c. | About 0.9 s |
| b. | About 0.6 s | d. | About 1.2 s |

\_\_\_\_ 15. A racehorse is running with a uniform speed of 69 km/hr along a straightaway. What is the time it takes for the horse to cover 400 meters?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 21 seconds | c. | 0.35 hours |
| b. | 2.1 minutes | d. | 27.6 hours |

\_\_\_\_ 16. Which of the following is a pair of scalar quantities?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | velocity - distance | c. | time - speed |
| b. | velocity - displacement | d. | time - displacement |

\_\_\_\_ 17. What is the result of two displacement vectors having opposite directions?

|  |  |
| --- | --- |
| a. | The resultant is the sum of the two displacements, having the same direction as the smaller vector. |
| b. | The resultant is the sum of the two displacements, having the same direction as the larger vector. |
| c. | The resultant is the difference of the two displacements, having the same direction as the smaller vector. |
| d. | The resultant is the difference of the two displacements, having the same direction as the larger vector. |

**Completion**

*Complete each statement.*

18. A vector that represents the sum of two vectors is called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

19. The final time minus the initial time equals the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

20. The magnitude of a displacement vector represents the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Short Answer**

21. What is the significance of defining a coordinate system to study the motion of an object? (1 mark)

22. How is displacement different from distance? Under what conditions can an object travel a certain distance and yet its resultant displacement be zero? (2 marks)

23. Define average velocity. (1 mark)

24. The position-time graph of an object is found to be a straight line passing through the origin. What information about the motion of the object is provided by the graph? (1 mark)

25. The position-time graph given below represents the motion of Ted returning home from the market on his bike. What is the similarity between his displacement and the average velocity? (1 mark)



26. Given below is the graph representing the position-time graphs of two swimmers (A and B), swimming in a pool along a straight line. Both the swimmers start from two different positions. Use the graph to find when and where swimmer B passes swimmer A. (1 mark)



27. What information can we find in a position-time graph of an object? (4 marks…remember I told you this would be on here, hopefully you listened the second time around)

28. A boy starts from point A and moves 5 units toward the east, then turns back and moves 3 units toward the west. What is the displacement in the position of the boy? (1 mark)

29. What is the distance traveled by a vehicle in 12 minutes, if its speed is 35 km/h? (3 mark)

30. Given below is the position-time graph representing the motion of two friends, A and B, jogging in a park. Use this graph to find their displacements after 4 s. (2 mark)



31. What is the difference between average velocity and average speed? (1 mark)

32. In 2005, Lance Armstrong won the 92nd Tour de France by riding 3608 km in 86 hours, 15 minutes and 2 seconds. Ivan Bosso came in second, 4 minutes and 41 seconds behind Armstrong. Michael Rasmussen came in 7th place, 11 minutes and 33 seconds behind Armstrong. What was the average velocity for each rider? (9 marks… 1 formula, 1 substitution/work, 1 answer X 3)

33. An Australian Shepherd dog is running in a straight line at an average velocity of 5 m/s. If a Frisbee is **thrown after a 1 second pause**, at an average velocity of 12 m/s, how far will the dog have run before jumping up to catch the Frisbee? (3 mark)

34. Under what circumstances can the average velocity of a moving object be zero when its average speed is 50 km/hr? (1 mark)

35. Fluffy, a greyhound, travels 15 m in 2 seconds while another greyhound, Tiberius, travels 20 m in 3 seconds.

Construct a position-time graph comparing the two dogs. A rough sketch that is reasonable is all I’m looking for here. Remember to label your graph and give it a title. (3 mark, 1 for each dog and 1 for labels etc.)

36. Add the following vectors together. Remember when doing this we always look at the X and Y components of vectors and if your angles are out in your drawing that’s fine because your math will be sound. (5 marks, 2 for drawing the actual vectors, 1 for breaking it down, 1 for resultant vector and 1 for the angle its on)

Vector A: 256 [25o N of E] + Vector B: 313[5o S of W

37. Add the following vectors together to solve for the resultant vector. (3 marks, 2 for labeling the actual vectors, 1 for breaking it down(x,y), 1 for resultant vector and 1 for the angle its on)

1. Has a magnitude of 300N and a direction of due east.
2. Has a magnitude of 400N and a direction of due north.

38. A sailboat is heading 35o East of North at 7.2 knots. The ocean current is 25o South of East at 1.2 knots. What speed and direction is the sailboat tracking? )

39. Linda starts for her school at eight in the morning. There is a straight road that connects her house to the school. She reaches school after 3.5 minutes. Her physics teacher has asked her to note her position after every 30 seconds on her way to school.

The values for her position (distance from her home) are listed with each time interval in the table below:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Time (in seconds)** | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 |
| **Position (in meters)** | 0 | 45 | 90 | 135 | 180 | 225 | 270 | 315 |

Using this position time table,

a. Draw a position-time graph to represent Linda’s motion from home to school. (2 mark, 1 graph, 1 labels)

b. Calculate the average velocity of Linda using the position-time graph. (1 mark)

c. What is the velocity of Linda on a return trip home if she reaches back home in the same time of 3.5 minutes? Assume Linda’s house to be the fixed origin of the graph. (1 mark)

**Physics 11 Chapter 1 Exam**

**Answer Section**

**TRUE/FALSE**

1. ANS: T

The position of a moving object in a selected coordinate system is the position of the object relative to the zero of the coordinate system. The sign depends upon the object’s position relative to zero.

PTS: 1 DIF: Bloom’s Level 2 REF: Page 33

OBJ: 2.2.2 Recognize that the chosen coordinate system affects the sign of objects' positions.

NAT: B.4 | UCP.1

TOP: Recognize that the chosen coordinate system affects the sign of objects' positions.

KEY: Position MSC: 2

NOT: /T/ Correct! /F/ The sign of an object's position depends upon its position with respect to the zero of the coordinate system. The position of an object can also be negative.

2. ANS: F

The slope of the position-time graph of an object indicates the average velocity of the object.

PTS: 1 DIF: Bloom’s Level 1 REF: Page 44

OBJ: 2.4.2 Differentiate between speed and velocity. NAT: B.4

TOP: Differentiate between speed and velocity. KEY: Average velocity, Average speed

MSC: 1

NOT: /T/ The slope of a position-time graph of an object gives the average velocity of the object. /F/ Correct!

3. ANS: T

A time interval is a scalar quantity, because it needs only the magnitude for its complete description.

PTS: 1 DIF: Bloom’s Level 1 REF: Page 36

OBJ: 2.2.4 Determine a time interval. NAT: B.4 TOP: Determine a time interval.

KEY: Time interval MSC: 1

NOT: /T/ Correct! /F/ Time interval is a scalar quantity.

4. ANS: T

The slope of a straight line is a constant quantity. The average velocity of a moving object is the slope of the straight line representing its position-time graph.

PTS: 1 DIF: Bloom’s Level 1 REF: Page 44

OBJ: 2.3.1 Develop position-time graphs for moving objects. NAT: B.4

TOP: Develop position-time graphs for moving objects. KEY: Position-time graph

MSC: 2

NOT: /T/ Correct! /F/ The straight line position-time graph represents the constant average velocity.

5. ANS: T

Any quantity with a magnitude and direction is a vector.

PTS: 1 DIF: Bloom's Level 1 REF: p. 35

NAT: B.4

6. ANS: F

Scalar measurements have magnitude only.

PTS: 1 DIF: Bloom's Level 1 REF: p. 35

NAT: B.4

**MULTIPLE CHOICE**

7. ANS: C

Velocity and displacement are vector quantities.

|  |  |
| --- | --- |
|  | **Feedback** |
| **A** | Speed and distance are scalar quantities. |
| **B** | Velocity is a vector, but distance is scalar. |
| **C** | Correct! |
| **D** | Displacement is a vector, but speed is scalar. |

PTS: 1 DIF: Bloom’s Level 1 REF: Page 35

OBJ: 2.2.3 Define displacement. NAT: B.4 TOP: Define displacement.

KEY: Vectors MSC: 1

NOT: /a/ Speed and distance are scalar quantities. /b/ Velocity is a vector, but distance is scalar. /c/ Correct! /d/ Displacement is a vector, but speed is scalar.

8. ANS: D

Displacement is the vector difference between initial and final positions.

PTS: 1 DIF: Bloom's Level 1 REF: p. 36

NAT: B.4

9. ANS: C

A vector’s magnitude represents the vector’s size.

PTS: 1 DIF: Bloom's Level 1 REF: p. 35

NAT: B.4

10. ANS: A

Choice A represents the head-to-tail sum of the vectors of the bird’s motion.

PTS: 1 DIF: Bloom's Level 3 REF: p. 35

NAT: B.4

11. ANS: C

4.537 seconds/60sec per min = 0 .07562 min

0 .07562 min/60 min per hr = 0.001260 hr

(198.37 mph)(0.001260 hr) = 0.2500 miles

PTS: 1 DIF: Bloom's Level 3 REF: p. 44

NAT: B.4

12. ANS: B

A position-time diagram shows the distance traveled over a time interval. The slope of the line is the distance (20 m) divided by the time (4 s). Answer B shows a line with the slope of 20/4 = 5m/s, in the positive direction.

PTS: 1 DIF: Bloom's Level 4 REF: p. 38

NAT: B.4

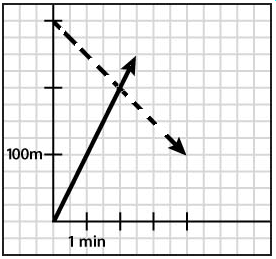
13. ANS: B

Sue is walking west at 6 km/hr = 6000m/60min = 100m/min.

Keith is walking east at 3 km/hr = 3000m/60 min = 50m/min.

By constructing a position-time graph for the two walkers, it can be seen that they will intersect after 2 minutes (Sue will have traveled 200 m, and Keith will have traveled 100 m.)

(Keith is dashed, Sue is solid.)

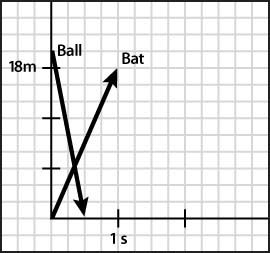


PTS: 1 DIF: Bloom's Level 3 REF: pp. 38-40, 43

NAT: B.4

14. ANS: A

Assume that the bat and ball are traveling on the same line, but in opposite directions. Draw the position-time graph for each and read the time from where the lines cross:



PTS: 1 DIF: Bloom's Level 4 REF: pp. 38-40, 43

NAT: B.4

15. ANS: A

(400 m)(1 km/1000 m) = 0.4 km

(0.4 km)(1 hr/69 km)(60 min/1 hr)(60 s/1 min) = 20.86 s = 21 s

PTS: 1 DIF: Bloom's Level 4 REF: p. 44

NAT: B.4

16. ANS: C

Time and speed are scalar quantities. (Distance is scalar also.) Velocity and displacement are vector quantities.

PTS: 1 DIF: Bloom's Level 2 REF: p. 35

NAT: B.4

17. ANS: D

When two displacement vectors have opposite directions, their resultant has a magnitude equal to the difference between their magnitudes. The direction of the resultant is the same as the direction of the larger original vector.

PTS: 1 DIF: Bloom's Level 3 REF: p. 35

NAT: B.4

**COMPLETION**

18. ANS:

resultant

The resultant is the result of a vector sum.

PTS: 1 DIF: Bloom's Level 2 REF: p. 35

NAT: B.4

19. ANS:

time interval

The time interval is the difference between the initial and final times.

PTS: 1 DIF: Bloom's Level 2 REF: p. 36

NAT: B.4

20. ANS:

distance

The absolute value of the displacement is the distance.

PTS: 1 DIF: Bloom's Level 2 REF: p. 36

NAT: B.4

**SHORT ANSWER**

21. ANS:

A coordinate system tells about the location of the zero point of the variables defining the motion of the object to be studied. The coordinate system also explains the direction in which the values of the variables increase.

PTS: 1 DIF: Bloom’s Level 1 REF: Page 34

OBJ: 2.2.1 Define coordinate systems for motion problems. NAT: B.4 | UCP.1

TOP: Define coordinate systems for motion problems. KEY: Coordinate system, Origin

MSC: 2

22. ANS:

Displacement is a vector quantity, while distance is a scalar quantity. Displacement has both the magnitude and direction. Distance has only magnitude. The displacement of an object is equal to the difference between its final position and initial position. When an object starts moving from a certain point and after covering certain distance returns to its starting position, its displacement becomes zero.

PTS: 1 DIF: Bloom’s Level 2 REF: Page 37

OBJ: 2.2.3 Define displacement. NAT: B.4 TOP: Define displacement.

KEY: Distance, Displacement, Scalars, Vectors MSC: 2

23. ANS:

Average velocity of an object is defined as the change in position of the object moving along a straight line, divided by the time during which the change occurred. In symbolic form, the average velocity

.

PTS: 1 DIF: Bloom’s Level 2 REF: Page 44

OBJ: 2.4.1 Define velocity. NAT: B.4 TOP: Define velocity.

KEY: Average velocity MSC: 2

24. ANS:

The straight line position-time graph of a moving object gives the information about the nature of the motion of the object. It is also used to calculate the average velocity of the object. Since the graph is a straight line, the object is undergoing uniform motion. The slope of this line gives the value of the average velocity of the object.

PTS: 1 DIF: Bloom’s Level 2 REF: Page 43

OBJ: 2.4.1 Define velocity. NAT: B.4 TOP: Define velocity.

KEY: Average velocity MSC: 2

25. ANS:

In this case, motion is in the negative direction. Therefore, displacement and velocity of the bike are negative. Hence, both the displacement and the velocity have a negative sign.

PTS: 1 DIF: Bloom’s Level 1 REF: Page 44

OBJ: 2.4.1 Define velocity. NAT: B.4 TOP: Define velocity.

KEY: Displacement, Average velocity MSC: 1

26. ANS:

The point of intersection of the two graphs is 150 m at about 38 s. Swimmer B passes Swimmer A about 150 m beyond the origin 38 s after A has passed the origin.

PTS: 1 DIF: Bloom’s Level 2 REF: Page 38

OBJ: 2.2.4 Determine a time interval. NAT: B.4 TOP: Determine a time interval.

KEY: Time interval, Origin MSC: 2

27. ANS:

We can find, distance, displacement, average velocity and instantanious velocity.

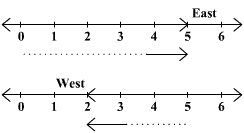
PTS: 1 DIF: Bloom’s Level 2 REF: Page 38

OBJ: 2.3.2 Use a position-time graph to interpret an object's position or displacement.

NAT: B.4 TOP: Use a position-time graph to interpret an object's position or displacement.

KEY: Position-time graph, Position MSC: 1

28. ANS:



The resultant displacement is 2 units toward the east, and his position is at 2.

PTS: 1 DIF: Bloom’s Level 2 REF: Page 34

OBJ: 2.2.5 Use a motion diagram to answer questions about an object's position or displacement.

NAT: B.4

TOP: Use a motion diagram to answer questions about an object's position or displacement.

KEY: Displacement MSC: 2

29. ANS:

Speed is given in km/h, therefore convert time in minutes to hours.



distance traveled = (speed)(time taken) = (35 km/h)(12 min)(1 h/60 min) = 7.0 km

PTS: 1 DIF: Bloom’s Level 2 REF: Page 36

OBJ: 2.2.3 Define displacement. NAT: B.4 TOP: Define displacement.

KEY: Distance MSC: 2

30. ANS:

The displacements of A and B are the coordinates of the vertical line with their respective position-time graphs at 4 s.



The value of displacement of A is approximately 4 m

The value of displacement of B is approximately 3 m.

PTS: 1 DIF: Bloom’s Level 3 REF: Page 36

OBJ: 2.2.3 Define displacement. NAT: B.4 TOP: Define displacement.

KEY: Displacement MSC: 1

31. ANS:

Average velocity shows both the magnitude and the direction of the motion of an object during a time interval. Average speed shows only how fast the object is moving (not the direction of motion).

PTS: 1 DIF: Bloom's Level 2 REF: pp. 43-44

NAT: B.4

32. ANS:

Armstrong = 3608 km/86.2506 hr = 41.83 km/hr

Bosso = 41.79 km/hr (= 3608 km/86.33 hr)

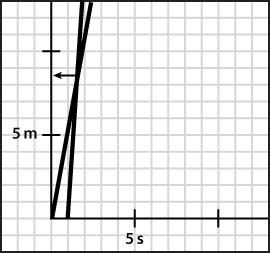
Rasmussen = 41.74 km/hr (= 3608 km/86.44 hr)

PTS: 1 DIF: Bloom's Level 3 REF: p. 43

NAT: B.4

33. ANS:

The dog will have run a little over 8.5 meters before the Frisbee passes overhead.



PTS: 1 DIF: Bloom's Level 3 REF: pp. 38, 43

NAT: B.4

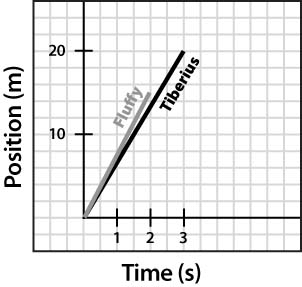
34. ANS:

If the object travels a distance, and then returns to its starting point, the average velocity will be zero because the overall displacement will be zero.

PTS: 1 DIF: Bloom's Level 4 REF: pp. 43-44

NAT: B.4

35. ANS:



PTS: 1 DIF: Bloom's Level 4 REF: pp. 38-40, 43

NAT: B.4

**ESSAY**

36:

37:

38:

39. ANS:

a. The position-time graph of Linda’s motion from home to school is as follows:



b. Average velocity of Linda = Slope of the above graph = 

c. During her return journey from school, the average velocity of Linda is –1.5 m/s.

PTS: 1 DIF: Bloom’s Level 3 REF: Page 43

OBJ: 2.4.1 Define velocity. NAT: B.4 TOP: Define velocity.

KEY: Average velocity MSC: 3

37.