FORCE AND MOTION UNIT TEST

Name Key Date

MULTIPLE CHOICE: Write the letter of the answer that best completes each statement.

B 1. Two different forces acting on an object are causing an unbalanced force on a ball. Which of the following sets of forces could be the forces acting on that same ball?

a. 5N up and 5N down
c. ON up and ON down
b. 31N left and 32N right
d. 9N left and 9N right

A 2. What is required to change the direction of a moving object?

a. An unbalanced net force on the object
c. Several forces acting in the same direction
b. A balanced net force on the object
d. No force on the object

B 3. A student moves 15 N bricks from one side of the football field to the other side (about 75 meters). Each brick has a mass of 10 kg. Which formula below will explain how to solve this problem.

a. Force = Mass x Acceleration
c. Weight = Mass x Acceleration due to gravity
b. Work = Force x Distance
d. Speed = Distance / Time

B 4. Mr. Smith's class is playing tug-of-war against Mrs. Thompson's class. Mr. Smith's class is exerting 120N of force and Mrs. Thompson's class is exerting 125N of force. What is their net force?

a. ON; there is no motion
c. 5N; in the direction of Mr. Smith's class
b. 5N; in the direction of Mrs. Thompson's class
d. 245N; in the direction of Mrs. Thompson's class

A 5. Which of the following situations is an example of unbalanced forces?

a. a rock accelerating as it rolls down a hill
c. a car on cruise control moving 30 miles per hour
b. a book sitting on a desk
d. a crayon laying on the floor

D 6. An object is moving to the right with a force of 20 Newton's. What would happen if a frictional force of 20 Newton's starts acting on the object?

a. The object's velocity increases.
c. The object comes to a stop.
b. The object's velocity decreases.
(d.) The object will continue to move with constant velocity

C 7. Victor kicked a 0.40 kg soccer ball with a force of 8 N, and Jose kicked a 0.20 kg soccer ball with a force of 4 N. Whose ball had the greater acceleration?

a. Victor b. Jose (c.) Their accelerations were the same d. None of the above

C 8. A car is moving at a speed of 35 km/hr and suddenly hits a tree. How fast will the passenger be moving as he flies out of the car if he is not wearing a seatbelt?

a. 70 km/hr b. 15.25 km/hr (c.) 35 km/hr d. 70 m/s

D 9. An object's inertia is its tendency to keep doing what it is doing. Which object would have the greatest inertia?

a. 1 g rock b. 25 g rock c. 500 g rock (d.) 2000g rock

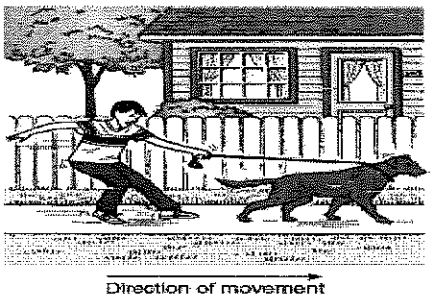
C 10. What force needs to be applied to a 20 kg bowling ball to give it an acceleration of 5 m/s2?

a. 4 N b. 25N (c.) 100 N d. 250 N

B 11. Newton's First Law is also called the Law of Inertia. Which of these scenarios is best explained by this law?

a. A rocket that is propelled upward into space by gases pushing downward on the earth
(b.) Stopping a roller coaster cart suddenly can cause the passengers to be thrust forward into their seatbelts
c. A television was harder to move than a refrigerator because it had a smaller mass
d. All of the above

C 12. In the picture above, a boy is trying to pull a dog on a leash, but the dog and the boy are moving in the same direction. Which of the following best describes the forces in this situation?

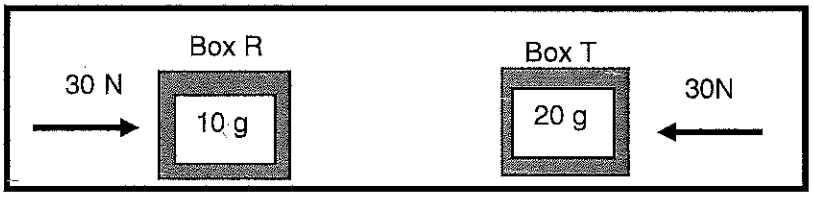


a. The forces are balanced, and the net force is zero.

b. The forces are unbalanced, and the boy's force is greater.

(c.) The forces are unbalanced, and the dog's force is greater.

d. The forces are balanced, and the dog is stronger than the boy.

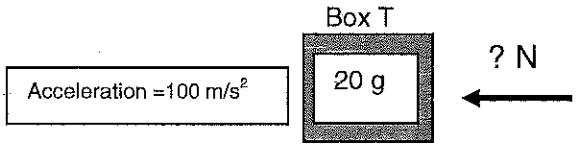


$3000 \frac{m}{s^2}$

D 13. Which would be the acceleration of Box R? **Remember that the unit N/g is equal to m/sec².**

a. 3m/sec² b. 10 m/sec² c. 40 m/sec² (d.) 300 m/sec²

Typo → $3000 \frac{m}{sec^2}$



14. If box T moved at an acceleration of 100 m/sec², what force would have to be applied?

a. 0.2 N b. 5 N c. 60 N d. 2000 N

Typo → (2N)

A 15. Which of the following objects would have the greatest acceleration if they each have 15 Newtons of force acting upon it?

(a.) Pencil, 5g b. Rock, 10g c. Shoe, 15g d. Book, 20g

B 16. A toy car is wound up and released on a tile floor. The car travels at 0.5 m/s. Which could make the car travel faster?

a. Turn the car around.

(b.) Apply an additional force.

c. Add a mass to the car.

d. Put the car on a very rough surface.

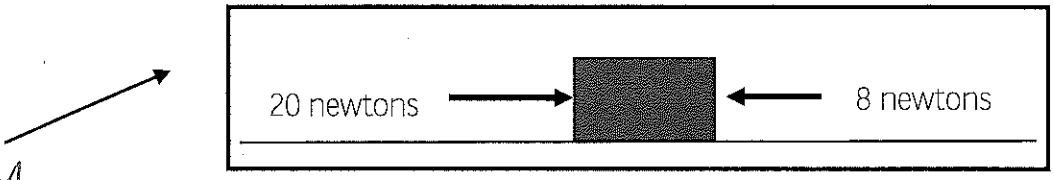
C 17. The picture shows a ball moving in the direction of the arrow. What must happen in order to make the ball move faster?

a. Forces acting in all directions must remain the same.

b. All of the forces acting on the ball must be removed.

(c.) The force acting in the direction the ball is moving must be increased.

d. A force opposite the direction the ball is moving must be added.



A 18. The picture shows a box at rest on a flat surface. A force of 20 N acts toward the right while 8N acts to the left. Ignoring friction, which statement best describes the motion of the box?

(a.) The 12 N of net force will move the box right.

b. 28N of net force will crush the box.

c. The box will not move due to the flat surface.

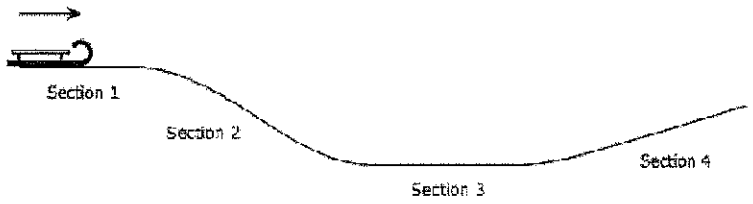
d. The friction force will stop motion in either direction.

A 19. The boy is skateboarding in the direction shown by the arrow and hits a rock. The skateboard stops. Which best describes what happens to the boy when the skateboard stops?

(a.) He will continue in the direction of the arrow. c. He will fall straight down.

b. The boy will stop with the skateboard. d. The boy will fall in the opposite direction.

C 20. The diagram below shows a sled moving along a smooth, frictionless track. In which sections of the track will the sled experience an unbalanced force?



A Sections 1 and 3 B Sections 2 and 3 C Sections 2 and 4 D Sections 3 and 4

B 21. The masses of four vehicles and the net forces acting on them as they enter a highway are recorded in the table below. Which vehicle has the greatest acceleration as it enters the highway?

Vehicles Entering a Highway

Vehicle	Mass (kg)	Force (N)	
Sedan	1500	4500	3
Coupe	1200	4500	3.75
SUV	1800	4500	2.5
Truck	2000	4500	2.25

$a = \frac{F}{m}$

A. Sedan C. SUV

B. Coupe D. Truck

Of course all 3 Laws can be applied to any motion, but read each statement below and decide to which law it best applies. Place a "**1**" in the blank if it applies to Newton's First Law, a "**2**" in the blank if it applies to Newton's Second Law, a "**3**" in the blank if it applies to Newton's Third Law.

3 22. You are on roller blades and you throw a football as hard as you can to your friend. You move backward after your throw.

1 23. A driver is traveling at 70 mph and slams on the car's brakes. Before being stopped by the seat belt, the driver lunges forward.

2 24. You are helping your parents move. You have two different boxes to slide across the room. One box is full of textbooks, and the other box is full of towels. You push with more force on the box full of textbooks more than you do on the box full of towels.

2 25. You are doing an experiment with tennis balls. You roll the tennis ball on the tile floor and it travels a greater distance than the tennis ball rolling on the carpeted floor.

3 26. You are adrift in the ocean, when you hear someone shout, "SHARK!!" You quickly paddle your kayak safely to shore!

6,25 kg·m/s 27. What is the momentum of a 250-kg motorcycle traveling at 25 m/s?

250 kg x 25 m/s = 6,250 kg m/s

A 28. Whenever an object exerts a force on another object, the second object exerts a force of the same magnitude, but in the _____ direction to that of the first object.

(a.) Opposite
b. Same
c. Right angle
d. Vertical

A 29. Two toy cars that have the same mass and same speed move toward each other, collide, and stick together. After the collision, the momentum of the cars is _____.

(a.) twice the original momentum
b. half the original momentum
c. the same as the original momentum
d. ten times the original momentum

C 30. A student hits a nail with a hammer. During the collision, there is ____.

a. a force on the hammer but not on the nail
b. a force on the nail but not on the hammer
(c.) a force on the nail and also on the hammer
d. no force on either object in the collision

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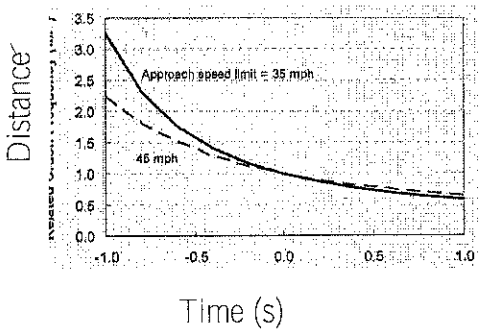
Speed, Velocity and Acceleration Unit Test

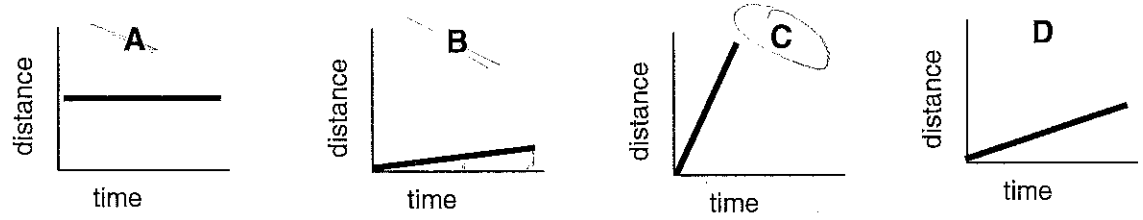
MULTIPLE CHOICE: Write the letter of the answer that best completes each statement.

D 1. The graph to the right would represent what?

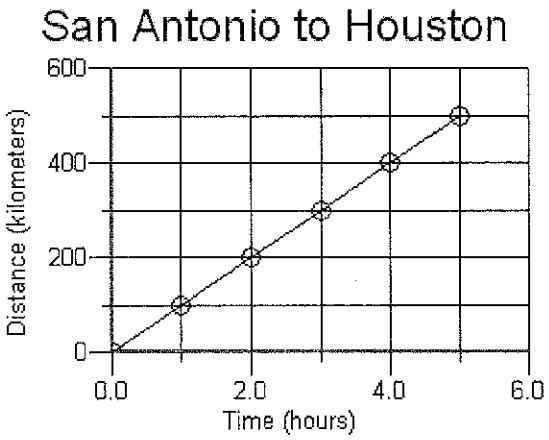
a. deceleration
c. a stopped vehicle
b. constant speed.
d. velocity



C 2. Which graph shows a skateboarder with the fastest speed?



D 3. The graph shows time and distances to travel between San Antonio and Houston. At the end of 4 hours, what **distance** has the car traveled?



a. 100 km
c. 300 km
b. 200 km
d. 400 km

B 4. What was the average speed of the car between 0 and 5 hours?

a. km/hr
b. 100 km/hr
c. 500 km/hr
d. 2500 km/hr

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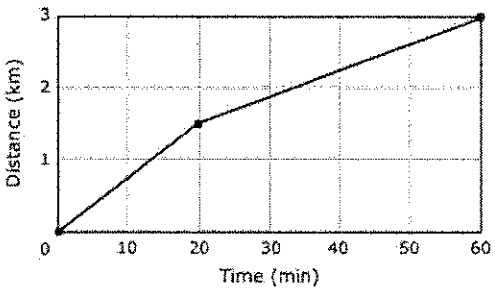
B 5. The graph below shows distance over time. Which of these situations could be represented by this graph?



A. A student walks 1.5 km to a friend's house in 40 minutes. The two students then walk another 1.5 km to school in 20 minutes.

B. A student walks 1.5 km to a friend's house in 20 minutes. The two students then walk another 1.5 km to school in 40 minutes.

C. A student walks 1.5 km to a friend's house in 30 minutes. The two students then walk another 1.5 km to school in 30 minutes.

D. A student walks 1.5 km to a friend's house in 20 minutes. The two students then walk another 1.5 km to school in 60 minutes.

6. Some students were investigating the speed of a toy car they built. They performed two trials and recorded their data in the table below.

Toy-Car Trials

Trial 1		Trial 2	
Time (s)	Distance (m)	Time (s)	Distance (m)
4.0	5.6	5.0	7.0

What was the average speed of the toy car during the two trials to the nearest tenth of a m/s?

Trial 1: $\frac{\Delta d}{\Delta t} = \frac{5.6\text{m}}{4\text{s}} = 1.4\text{ m/s}$

Trial 2 $\frac{\Delta d}{\Delta t} = \frac{7\text{m}}{5\text{s}} = 1.4\text{ m/s}$

$\frac{1.4\text{m/s} + 1.4\text{m/s}}{2} = 1.4\text{m/s}$

D 7. Which best describes the velocity of a person on a merry-go-round?

a. Constant b. increasing c. zero d. continuously changing

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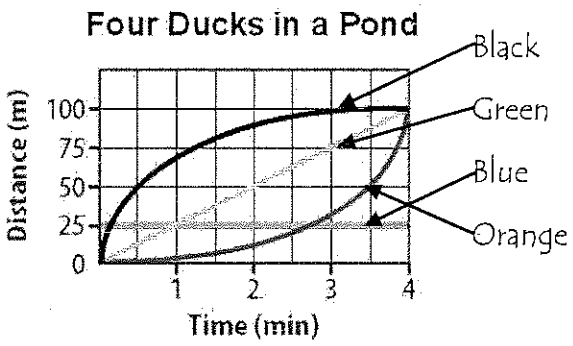


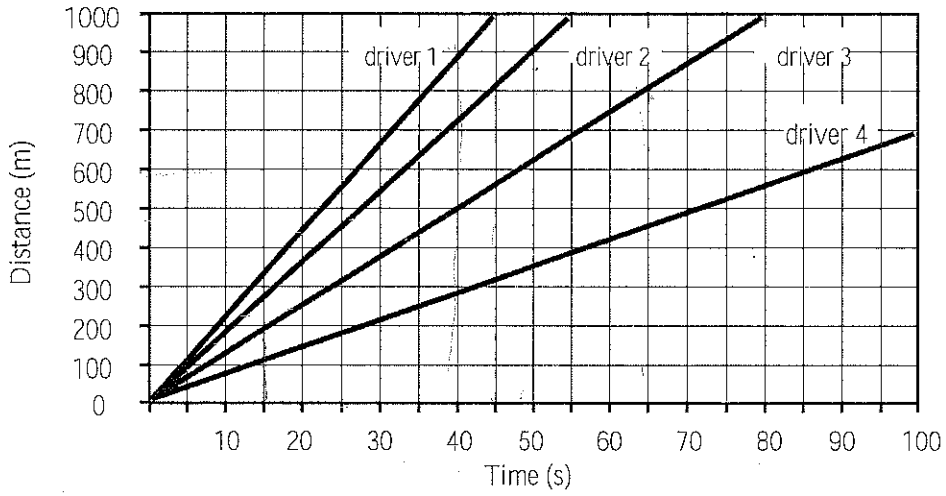
D 8. Which line on this graph represents a duck that starts out swimming slowly, then speeds up?

a. the blue line b. the black line c. the green line d. the orange line

B 9. When does something accelerate in the direction opposite to its direction of motion?

a. when it speeds up
c. when it has stopped
b. when it slows down
d. when it travels backwards

C 10. On Thursday afternoons, Marissa takes a taxi to visit her grandmother. She has noticed that some drivers reach their destinations quicker than others. Since Marissa has been learning about average speed in school, she decided to record the distance and time of four drivers on four consecutive days. She then plotted the data she recorded on a graph as shown below.



Which driver had an average speed of 12.5 meters per second?

a. Driver 1 b. Driver 2 c. Driver 3 d. Driver 4

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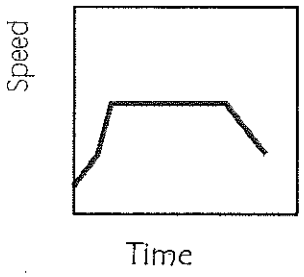
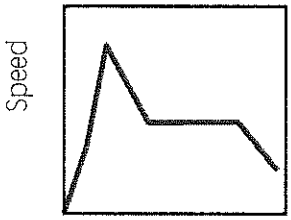
C 11. Which graph matches the motion described by the data?

Time (s)	Speed (km/h)
0	94
1	86
2	75
3	64
4	52
5	52
6	52
7	64
8	82
9	97

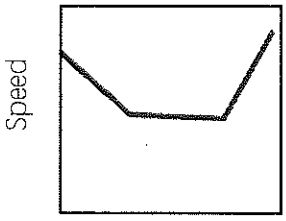
A



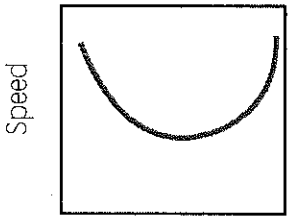
B



C



D



B 12. Miguel rode his bicycle in a northeast direction. He left his house at noon. He traveled a distance of 4.0 kilometers. He stopped for one red light and slowed to avoid hitting a dog crossing the road. When he finished his ride he noticed that the time was 12:30 PM. What would be Miguel's average velocity expressed in the SI unit for velocity?

A 2.2 m/s NE (B) 8 km/hr NE C 8 km/hr^2 NE D 2.2 m/s^2 NE

A 13. During a laboratory activity a cart moves in a straight line and increases its speed by 15 meters per second for 5 seconds. What is the acceleration of the car, expressed in the correct SI units?

(A) 3m/s^2 B 3m^2/s^2 C 5s^2/m D 5s^2/15m^2

$$\frac{\Delta V}{\Delta t} = \frac{15\ m/s}{5\ s} = 3\ m/s^2$$

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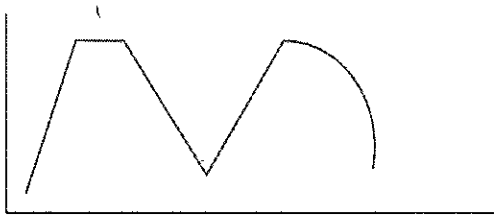
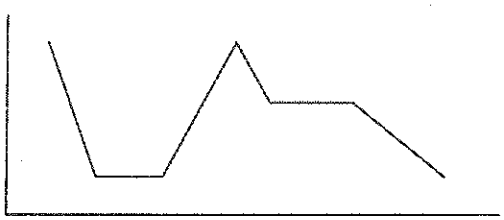
B 14. Elizaboola is skiing with her friends. She skis quickly down the mountain, waits for the ski lift, and rides the ski lift back up to the top of the mountain. On her second run down the mountain she stops halfway to meet up with her friends and drink cocoa in the cafeteria. She then skis, faster and faster all the way down the rest of the mountain. Which of the following graphs best illustrate Elizaboola's skiing?

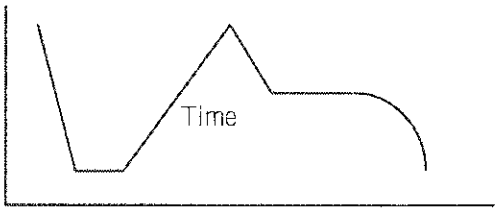
A)



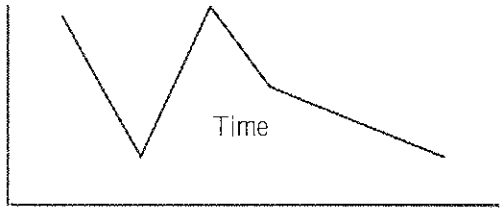
B)



C)



D)



A 15. Tim watched a car moving at a constant acceleration and recorded the data shown in the chart below.

Time (sec)	Velocity (m/sec, N)
4.0	3.0
5.0	4.5
6.0	6.0
7.0	7.5

What is the car's acceleration? $\frac{\Delta v}{\Delta t} = \frac{7.5 - 3}{7 - 4} = \frac{4.5}{3} = 1.5\ m/s^2$

A 1.5 m/sec^2 B 2.0 m/sec^2 C 3.0 m/sec^2 D 4.5 m/sec^2

B 16. If a distance-time graph shows a horizontal line, what is the velocity?

a. constant b. zero c. increasing d. decreasing

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D 17. On a speed-time graph, a straight horizontal line shows the change in speed is _____.

a. -10 b. 10 c. 1 (d.) 0

A 18. Two cars are following each other along a winding road. Car A moves around a curve at a constant rate of 50 km/hr. Car B moves around the same curve at a constant rate or 40 km/hr. As the cars move around the curve the passengers feel the tendency to move in the direction of the outside of the curve. What change is taking place in the two cars?

acceleration is already a change in velocity

(A.) There is a change of velocity in both cars but not acceleration.

B. There is a change of acceleration but not velocity in both cars.

C. There is a change of speed in car A and a change in velocity in car B.

D. There is a change of velocity in car A and a change in speed in car B

C 19. During a family trip to Laura's grandmother's house, the family car traveled a distance of 8 miles in 24 minutes. During the trip they stopped for two red lights. Which statement correctly describes the motion of the car?

$\frac{24 min}{60 min} = .4 hrs$

A The car traveled at an acceleration of 0.83 miles per hour.

B The car traveled at a constant acceleration of 0.83 miles per hour.

$\frac{8 miles}{.4 hr} = 20 \frac{mi}{hr}$

(C) The car traveled at an average speed of 20 miles per hour.

D The car traveled at a constant speed of 20 miles per hour.

D 20. When you graph the motion of an object, _____ goes on the x-axis and _____ goes on the y-axis.

A. speed, time C. distance, time

B. time, speed (D.) time, distance

C 21. Which of the following best describes how constant velocity is shown in a speed-time graph?

a. a line curving down (c.) a straight horizontal line

b. a line curving up d. a straight diagonal line

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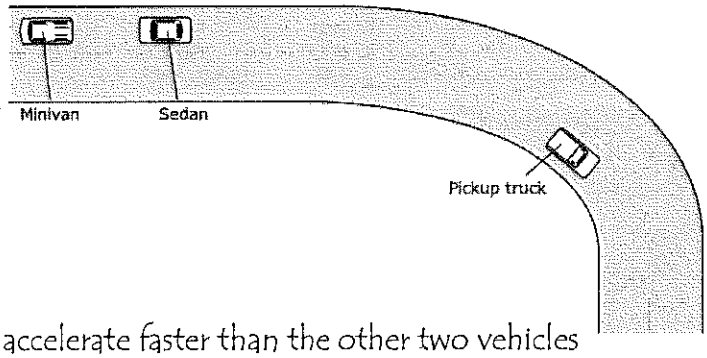
C 22. The three vehicles shown below are all traveling at a speed of 15 m/s, but only the pickup truck has a changing velocity. The pickup truck has a changing velocity because the pickup truck —



A can accelerate faster than the other two vehicles

B is traveling in the opposite direction from the other two vehicles

(C) is traveling on a curve in the road

D needs a large amount of force to move

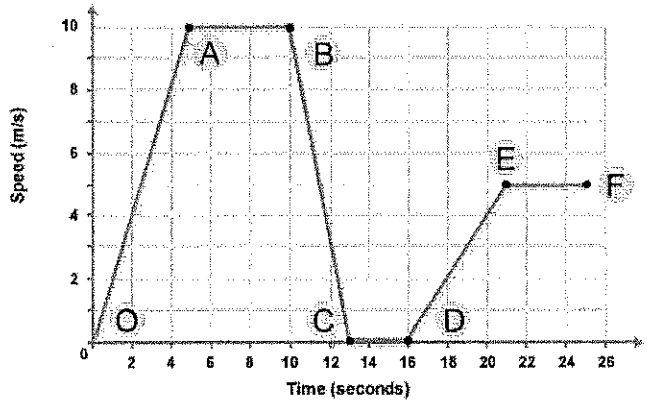
D 23. A soccer ball take 40 seconds to roll 20 meters. What is the average speed of the ball?

a. 200 m/s b. 5 m/s c. 2 m/s (d.) 0.5 m/s

A 24. Sam runs for 20 seconds at 8 m/s before stopping. Find the distance he ran.

(a.) 160 meters b. 220 meters c. 2.5 meters d. 250 meters

_____ 25. Describe what is happening between point A and point C.



object is moving at a constant speed of $10\frac{m}{s}$ for 5 seconds.