True/False

Indicate whether the statement is true or false.

___ 1. A speed that does not vary is called average speed.
___ 2. Acceleration is defined as the rate of change of position.
___ 3. Velocity changes when the direction of motion changes.
___ 4. An object’s position is defined in relation to the speed of another object.
___ 5. When an object’s speed changes, its velocity also changes.
___ 6. If a bicycle moves in a straight line, its velocity cannot change.
___ 7. A satellite that moves at a speed of 100 km/min is traveling at the same speed as a satellite that moves at about 1,670 m/s.
___ 8. In making a graph of acceleration, speed is shown on the x-axis and distance is shown on the y-axis.
___ 9. In order to find the average speed of an object, you must know its mass and direction.

Multiple Choice

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

___ 10. A soccer ball takes 20 s to roll 10 m. What is the average speed of the soccer ball?
   a. 200 m/s    c. 2 m/s
   b. 5 m/s      d. 0.5 m/s

___ 11. When an object is at rest, what is its speed?
   a. 2 m/s    c. 1 m/s
   b. 3 m/s    d. 0 m/s

___ 12. Which describes how velocity changes with time?
   a. acceleration    c. gravity
   b. average speed    d. inertia

___ 13. If you want to calculate the acceleration of a car, you should ____ the change in speed of the car by the time interval.
   a. add    c. divide
   b. decrease    d. multiply

___ 14. What is the term for speed at any instant in time?
   a. instantaneous speed    c. constant speed
   b. variable speed    d. average speed

___ 15. When you graph the motion of an object, you put ____ on the horizontal axis and ____ on the vertical axis.
   a. speed, time    c. time, speed
   b. distance, time    d. time, distance

___ 16. Acceleration involves a change in ____.
   a. time    c. speed
   b. direction    d. both b and c

___ 17. On a speed-time graph, a horizontal line shows the change in speed is ____.
   a. $-10$    c. $1$
   b. $10$    d. $0$
18. Motion is change in ____.
   a. speed  
   b. velocity  
   c. force  
   d. position

19. You travel 200 km in 2 h. Your ____ speed is 100 km/h.
   a. constant  
   b. average  
   c. instantaneous  
   d. initial

20. You hear that a storm is moving 15 km/h north. You have been given the storm's ____.
   a. constant speed  
   b. acceleration  
   c. velocity  
   d. average speed

21. Figure 1 summarizes the motion of an object. During which time interval was the object moving fastest?
   a. 0 to 1 s  
   b. 1 s to 2 s  
   c. 2 s to 3 s  
   d. 3 s to 4 s

22. Figure 2 summarizes the motion of an object. Which of the following statements best describes the motion of the object?
   a. The object moved at a constant speed.
   b. The object accelerated at a constant rate.
   c. The average speed of the object was less than 1 m/s.
   d. The instantaneous speed of the object was greater than 1 m/s.
23. Figure 2 describes the motion of an object. According to the graph, about how long did the object take to move 40 m?
   a. 2 s  
   b. 3 s  
   c. 4 s  
   d. 5 s

![Figure 2] r = 50 km/h

24. Figure 4 summarizes the motion of a car. Which term best describes the velocity of the car?
   a. 0.2 h  
   b. 10 km East  
   c. 50 km/h East  
   d. 500 km/h

25. Figure 4 summarizes the motion of a car. If the car’s speed is an average speed, what is the least amount of time the car will need to cover the distance given?
   a. 0.2 h  
   b. 5.0 h  
   c. 40 min  
   d. 60 min

![Figure 4] W d = 10 km E

26. Figure 5 shows two different graphs of motion. Which of the following statements is the best comparison of the graphs?
   a. Both graphs show motion at a constant speed.
   b. Both graphs show motion that is accelerating.
   c. Both graphs are distance-time graphs.
   d. Both graphs are speed-time graphs.

![Figure 5] Time

27. When you interpret a distance-time graph, the speed of the object is determined by _____.
   a. looking at the values on the x-axis
   b. looking at the values on the y-axis
   c. finding the length of the graph line
   d. finding the slope of the graph line

28. Forces that are equal in size but opposite in direction are ____.
   a. balanced forces  
   b. frictional forces  
   c. inertial forces  
   d. net forces

29. If gravity did not affect the path of a horizontally thrown ball, the ball would ____.
   a. go straight up  
   b. travel horizontally
   c. fall straight down  
   d. follow a curved path

30. The force you have to overcome to start an object moving is ____.
   a. rolling friction  
   b. static friction
   c. sliding friction  
   d. air resistance
31. A 300-N force acts on a 25-kg object. The acceleration of the object is ____.
   a. 7,500 m/s²  
   b. 300 m/s²  
   c. 25 m/s²  
   d. 12 m/s²

32. An unbalanced force acting on an object causes it to ____.
   a. move at constant speed  
   b. continue in a straight line  
   c. not change its velocity  
   d. accelerate

33. A student has a set of masses to use in an experiment about force. Which of the following masses would require the least amount of force to be lifted from the lab table?
   a. 1-g mass  
   b. 5-g mass  
   c. 25-g mass  
   d. 100-g mass

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34. Figure 1 shows the path of a ball that was thrown up into the air. At which point in the path of the ball are all the forces on the ball balanced?
   a. point 1  
   b. point 2  
   c. point 3  
   d. point 4

35. Figure 1 shows the path of a ball that was thrown up into the air. Which of the following is not acting on the ball in the diagram?
   a. air resistance  
   b. gravity  
   c. momentum  
   d. static friction

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36. Refer to Figure 2. Which pair of force vectors represents an object that is accelerating to the right?
   a. pair A  
   b. pair B  
   c. pair C  
   d. pair D
37. Refer to Figure 2. Which pair of force vectors represents balanced forces?
   a. pair A  b. pair B  c. pair C  d. pair D

38. Refer to Figure 2. Which pair of force vectors represents an object that is falling?
   a. pair A  b. pair B  c. pair C  d. pair D

39. Refer to Figure 2. Which pair of force vectors represents acceleration to the left?
   a. pair A  b. pair B  c. pair C  d. pair D

40. Figure 3 shows forces acting on a car. Which statement best predicts the motion of the car?
   a. The car will move backward.  b. The car will move forward.  c. The car will move down.  d. The car will move sideways.

Short Answer

41. Can an object’s acceleration be a negative number? Why or why not?

42. Which one of the graphs in Figure 5-1 represents a car moving at a constant speed?
43. Which one of the graphs in Figure 5-1 represents a car whose speed is increasing?
44. Which one of the graphs in Figure 5-1 represents a car whose speed is decreasing?
45. You are in a car going 70 km/h and another car passes you going in the opposite direction at 70 km/h. Do both cars have the same velocity? Explain.
46. A car is traveling from town A to town B, which are shown in Figure 9. What will be the overall direction of the car’s motion?

Figure 9

47. The axes of a graph are shown in Figure 10. Describe how you would label the axes to make the graph a position-time graph. Be sure to include appropriate units for each axis.

48. The axes of a graph are provided in Figure 10. Label the axes to make the graph a speed-time graph. Be sure to include appropriate units for each axis.

Figure 10

49. Look at Figure 11. Which line represents travel at the fastest speed? Justify your answer.

Figure 11

50. You push on a crate with a force of 10 N to the right, and your friend pushes on the crate with a force of 25 N to the left. Describe and explain the motion of the crate.

51. Forces of 10 N down, 10 N to the right, and 5 N to the left are acting on a ball. It accelerates horizontally to the right. What other force, if any, is acting on the ball? Explain.
52. Two crates, one heavy and one light, are at rest on a waxed floor. Which crate will need the greater force to give the same change in speed? Explain.

53. A net force of –10 N acts on a wagon moving at a constant velocity to the right. What happens to the wagon?

**Problem**

54. A sports car traveled at an average speed of 100 km/h for 45 min. Remember, average speed = total distance/total time. What was the total distance the sports car covered during the 45-minute period?

55. A train traveled 250 kilometers (km) from its starting point in 5 hours (h). If the train continues at the same average speed for another 4 hours, how far will it have traveled from its starting point? Show your work.

56. A car averages 80 km/h on a flat interstate highway but only 50 km/h on a hilly state highway. If the car travels 60 km on the interstate highway and 75 km on the hilly highway, how long will the trip take? Show your work.

57. Calculate the force on an object that has a mass of 12 kg and an acceleration of 4 m/s².

58. Sue is helping her older brother Tom move a wagon full of soil. Tom is pulling on the wagon with a force of 50 N, and Sue is pushing with a force of 20 N. What is the net force that Tom and Sue are applying to the wagon?

**Essay**

59. Figure 12 shows how the motion of an object changed. Discuss the nature of the motion in each of the four segments of the graph line.
60. Figure 13 shows two different kinds of balls. Discuss the difference in the masses of the two ball. Predict the relative amount of force that will be needed to cause the balls to move.

Multiple Choice

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

____ 1. A force acting on an object does no work if
   a. a machine is used to move the object.
   b. the force is not in the direction of the object’s motion.
   c. the force is greater than the force of friction.
   d. the object accelerates.

____ 2. If you exert a force of 10.0 N to lift a box a distance of 0.75 m, how much work do you do?
   a. 0.075 J  
   b. 7.5 J  
   c. 10.75 J  
   d. 75 J

____ 3. If you exert a force of 500 N to walk 4 m up a flight of stairs in 4 s, how much power do you use?
   a. 31 W  
   b. 500 W  
   c. 2000 W  
   d. 8000 W

____ 4. When a machine does work, it can do all of the following EXCEPT
   a. change the direction of a force.
   b. increase a force and change the distance a force moves.
   c. increase the distance a force moves and change the direction of a force.
   d. increase a force and increase the distance a force moves.

____ 5. If you have to apply 30 N of force on a crowbar to lift an rock that weights 330 N, what is the actual mechanical advantage of the crowbar?
   a. 0.09  
   b. 11  
   c. 300  
   d. 9900

____ 6. Reducing friction in a machine
   a. decreases its actual mechanical advantage.
   b. decreases the work output.
   c. increases its efficiency.
   d. increases its ideal mechanical advantage.

____ 7. A mechanical device requires 400 J of work to do 340 J of work in lifting a crate. What is the efficiency of the device?
   a. 0.9%  
   b. 60%  
   c. 85%  
   d. 118%

____ 8. Transverse and longitudinal waves both
   a. have compressions and rarefactions.
b. transfer energy through a medium.
c. move at right angles to the vibration of the medium.
d. are capable of moving the medium a long distance.

**Figure 17-1**

9. Figure 17-1 shows a wave movement during 1 second. What is the frequency of this wave?
   a. 2 hertz
   b. 2 meters/second
   c. 0.5 second
   d. 1 hertz

10. An electromagnetic wave in a vacuum has a wavelength of 0.032 m. What is its frequency?
    a. \( f = 3.00 \times 10^8 \text{ m/s} \)
    b. \( f = 9.38 \times 10^7 \text{ Hz} \)
    c. \( f = 3.00 \times 10^9 \text{ Hz} \)
    d. \( f = 9.38 \times 10^8 \text{ m/s} \)

11. Infrared rays have a shorter wavelength than
    a. ultraviolet rays.
    b. X-rays.
    c. radar waves.
    d. gamma rays.

12. Blue light and yellow light combine to produce white light because
    a. they absorb each other’s wavelengths.
    b. blue, yellow, and white are primary colors.
    c. they are complementary colors of light.
    d. they are both primary colors of light.

13. The current in a clothes iron measures 5.0 amps. The resistance of the iron is 24 ohms. What is the voltage?
    a. 120 V
    b. 4.8 V
    c. 19 V
    d. 600 V

**Completion**

14. Like charges ________________ and opposite charges ________________.

15. When a pathway through which charges can move forms suddenly, ________________ occurs.
16. A complete path through which charge can flow is an electric __________________. 

Short Answer

17. Why is the work output of a machine never equal to the work input?
18. If a simple machine could be frictionless, how would its IMA and AMA compare?

Problem

19. A force of 12 N is applied to the handle of a screwdriver being used to pry off the lid of a paint can. As the force moves through a distance 0.3 m, the screwdriver does 32 J of work on the lid. What is the efficiency of the screwdriver? Show your work.
20. A communications satellite transmits a radio wave at a frequency of $9.4 \times 10^9$ Hz. What is the signal’s wavelength? Assume the wave travels in a vacuum. Show your work.

Essay

21. Suppose you have one light bulb in a simple circuit. If you add a second identical light bulb in series, what would happen to the brightness of the first bulb? If instead you add the second bulb in parallel, what would happen to the brightness of the first bulb? Explain your answers.

Other

USING SCIENCE SKILLS

![Diagram of a ramp with measurements: 1.0 m height, 3.0 m length]

22. Calculating What is the IMA of the ramp in Figure 14-2? Show your work.
23. Applying Concepts If the ramp shown in Figure 14-2 was coated with a smoother surface, how would the AMA of the ramp change?
24. Applying Concepts If the ramp shown in Figure 14-2 was coated with a smoother surface, how would the ramp’s efficiency change? Explain your answer.
25. Classifying What type of simple machine is the ramp shown in Figure 14-2?
26. **Comparing and Contrasting** In a post office, a 3-m long ramp is used to move carts onto a dock that is higher than 1 m. How does the IMA of this ramp compare with the IMA of the ramp shown in Figure 14-2?

![Figure 17-3](image)

27. **Analyzing Data** What is the difference between wave A and wave B in Figure 17-3?

28. **Predicting** Suppose you add the following panel E to the diagram: a wave pattern with a frequency of four waves per second. How will wavelength in this panel compare with the wavelength in panel D? How will it compare with the wavelength in panel C? Assume all the waves travel at the same speed.

29. **Analyzing Data** What is the difference between wave C and wave D in Figure 17-3?

30. **Drawing Conclusions** Consider both frequency and wavelength in Figure 17-3. How does each variable change between wave C and wave D? What is the relationship between the change? Assume the waves travel at the same speed.
31. **Interpreting Graphics** Figure 18-3 represents white light striking an object. Explain why the beam of white light is also labeled with colors.

32. **Drawing Conclusions** What color is the object in Figure 18-3? Explain your answer.

33. **Applying Concepts** Suppose the light striking the object in Figure 18-3 was a combination of red and green. What color would the object be when viewed in this light? Explain your answer.
Semester 1 Exam
Additional Review