

Name _____ date _____ period _____

Midterm Exam Study Guide 2013 Introduction / Motion & Forces

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

- _____ 1. How is 0.00069 written in scientific notation?
a. 69×10^{-5} b. 6.9×10^4 c. 0.69×10^{-3} d. 6.9×10^{-4}
- _____ 2. What are 6 centimeters equal to?
a. 600 meters b. $\frac{6}{10}$ of a millimeter c. 60 millimeters d. 600 millimeters
- _____ 3. How many meters are there in 1,865 cm?
a. 0.1865 b. 1.865 c. 18.65 d. 186.5
- _____ 4. The best type of graph to use to show how some fixed quantity is broken down into parts is _____.
a. bar graph b. line graph c. circle graph d. scatter graph
- _____ 5. When designing an experiment, the first step is to _____.
a. analyze the data b. list a procedure c. state a hypothesis d. state the problem
- _____ 6. What is a scientific law?
a. It is the same as a hypothesis. c. It is an explanation of a scientific observation.
b. It is a description of a natural event. d. It is the conclusion of a scientific experiment.
- _____ 7. Scientific theories can be changed or replaced when
a. new technology is invented.
b. new discoveries are made.
c. scientists decide to work on different problems.
d. scientists make models of events or objects.
- _____ 8. The decimal equivalent of 10^{-2} is
a. 100. b. 10. c. 0.1. d. 0.01.
- _____ 9. What is 78,900,000,000 expressed in scientific notation?
a. 789×10^9 b. 7.89×10^9 c. 7.89×10^{10} d. 7.89×10^{11}
- _____ 10. The speed of light is approximately 3×10^8 m/s. How would this be written in conventional notation?
a. 300,000 m/s b. 3,000,000 m/s c. 30,000,000 m/s d. 300,000,000 m/s
- _____ 11. The difference between speed and velocity is that velocity includes
a. direction. c. time.
b. distance. d. weight.
- _____ 12. Friction is defined as
a. force that opposes motion between two surfaces that are touching.
b. rate at which velocity changes.
c. resistance of an object to a change in its velocity.
d. speed of an object in a particular direction.
- _____ 13. Weight is best described as
a. an object's resistance to acceleration.
b. what causes an object to fall.
c. the downward force exerted on objects due to gravity.
d. a force solely dependent on an object's mass.
- _____ 14. When objects are moved further apart from each other, the force of gravity
a. increases. c. decreases.
b. stays the same. d. decreases at first and then increases.
- _____ 15. The law that states that every object maintains constant velocity unless acted on by an unbalanced force is
a. Newton's first law of motion. c. Newton's third law of motion.
b. Newton's second law of motion. d. the law of conservation of momentum.
- _____ 16. The law that states that for every action force there is an equal and opposite reaction force is
a. Newton's first law of motion. c. Newton's third law of motion.
b. Newton's second law of motion. d. the law of conservation of momentum.

- ____ 17. The law that states that the unbalanced force acting on an object equals the object's mass times its acceleration is
- Newton's first law of motion.
 - Newton's second law of motion.
 - Newton's third law of motion.
 - the law of conservation of momentum.
- ____ 18. Which of the following is true?
- Weight and mass are proportional but not equal.
 - Weight is the gravitational force an object experiences due to its mass.
 - The weight of an object on Earth is greater than the weight of the same object on the surface of the moon, but the object's mass stays the same.
 - all of the above.
- ____ 19. A merry-go-round horse moves at a constant speed but at a changing ____.
- velocity
 - balanced force
 - inertia
 - unbalanced force
- ____ 20. A horizontal line on a velocity/time graph shows ____ acceleration.
- positive
 - negative
 - changing
 - zero
- ____ 21. Inertia varies depending on ____.
- force
 - mass
 - velocity
 - motion
- ____ 22. A ball is rolled uphill a distance of 5 meters before it slows, stops, and begins to roll back. The ball rolls downhill 9 meters before coming to rest against a tree. What is the magnitude of the ball's displacement?
- 4 meters
 - 9 meters
 - 14 meters
 - 45 meters
- ____ 23. The slope of a line on a distance-time graph is
- distance.
 - time.
 - speed.
 - displacement.
- ____ 24. What is the speed of a bobsled whose distance-time graph indicates that it traveled 100 m in 25 s?
- 4 m/s
 - 2500 m/s
 - 0.25 mph
 - 100 m/s
- ____ 25. Suppose you increase your walking speed from 1 m/s to 3 m/s in a period of 1 s. What is your acceleration?
- 2 m/s^2
 - 5 m/s^2
 - 4 m/s^2
 - 3 m/s^2
- ____ 26. The slope of a speed-time graph indicates
- direction.
 - acceleration.
 - velocity.
 - speed.
- ____ 27. When a pair of balanced forces acts on an object, the net force that results is
- greater in size than both forces combined.
 - greater in size than one of the forces.
 - equal in size to one of the forces.
 - equal to zero.
- ____ 28. As you push a cereal box across a tabletop, the sliding friction acting on the cereal box
- acts in the direction of motion.
 - equals the weight of the box.
 - is usually greater than static friction.
 - acts in the direction opposite of motion.
- ____ 29. The forces acting on a falling leaf are
- air resistance and fluid friction.
 - gravity and air resistance.
 - gravity and static friction.
 - weight and rolling friction.
- ____ 30. The property of matter that resists changes in motion is called
- friction.
 - gravity.
 - inertia.
 - weight.
- ____ 31. An orange might roll off your cafeteria tray when you stop suddenly because of
- the balanced forces acting on the orange.
 - the centripetal force acting on the orange.
 - the friction forces acting on the orange.
 - the orange's inertia.
- ____ 32. If a force of 12 N is applied to an object with a mass of 2 kg, the object will accelerate at
- 0.17 m/s^2 .
 - 24 m/s^2 .
 - 6 m/s^2 .
 - 12 m/s^2 .
- ____ 33. Your weight equals your
- mass.
 - mass divided by the net force acting on you.
 - mass times the acceleration due to gravity.
 - mass times your speed.
- ____ 34. Newton's third law of motion describes
- action and reaction forces.
 - balanced forces.
 - centripetal forces.
 - net force.
- ____ 35. In which of the following are action and reaction forces involved?
- when a tennis racket strikes a tennis ball
 - when stepping from a curb
 - when rowing a boat
 - all of the above

- ____ 36. What force is responsible for the repulsion between two positively-charged particles?
a. centripetal b. electric c. gravitational d. nuclear
- ____ 37. When opposite poles of two magnets are brought together, the poles
a. attract each other. c. cancel each other.
b. repel each other. d. cause a net force of zero.
- ____ 38. Which universal force acts only on the protons and neutrons in a nucleus?
a. electric b. gravitational c. magnetic d. strong nuclear
- ____ 39. With which of the following is the weak nuclear force associated?
a. lightning b. nuclear decay c. ocean tides d. static cling
- ____ 40. Which of the following universal forces is the weakest?
a. electric b. gravitational c. magnetic d. strong nuclear
- ____ 41. The gravitational force between two objects increases as mass
a. decreases or distance decreases. c. increases or distance decreases.
b. decreases or distance increases. d. increases or distance increases.

Completion *Complete each statement.*

42. An organized plan for gathering, organizing, and communicating information is called a(an) _____.
43. A(An) _____ is a way of organizing data that is used to show changes that occur in related variables.
44. A(An) _____ is a statement that summarizes a pattern found in nature.
45. A(An) _____ explains a pattern found in nature.
46. A scientific _____ describes a natural event but does not explain why the event happens.
47. 375 cm equals _____ m.
48. In scientific notation, the number 46,500,000 would be written _____.
49. The number 56,780,000,000 would be written in scientific notation as _____.
50. According to Newton's second law of motion, force is the product of _____ and _____.
51. Acceleration occurs when an object changes its _____ or _____ or both.
52. At the same speed, a bowling ball is harder to stop than a soccer ball because the bowling ball has greater _____.
53. A distance-time graph indicates an object moves 20 km in 4 h. The average speed of the object is _____ km/h.
54. Freely falling objects accelerate at 9.8 m/s^2 because the force of _____ acts on them.
55. Accelerated motion is represented by a(an) _____ line on a distance-time graph.
56. The force that opposes the motion of objects that touch as they move past each other is called _____.
57. It usually takes more force to start an object sliding than it does to keep an object sliding because static friction is usually _____ than sliding friction.
58. The two forces acting on a falling object are gravity and _____.
59. When a falling object reaches terminal velocity, the net force acting on it is _____.
60. The tendency of an object to resist any change in its motion is called _____.
61. During a head-on auto collision, _____ causes a passenger in the front seat to continue moving _____.

62. The force of gravity acting on an object is the object's _____.

Short Answer

63. Define acceleration.
64. State Newton's first law.
65. State Newton's second law.
66. What is the difference between mass and weight?

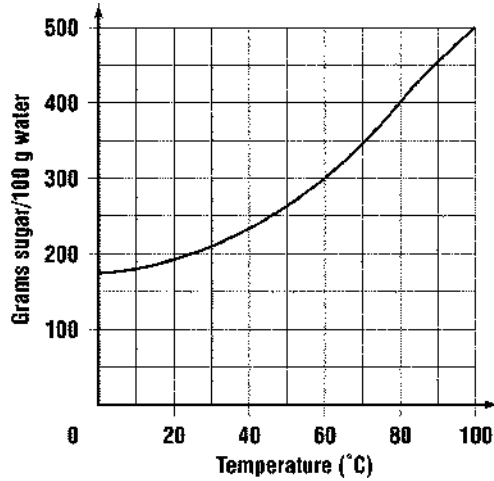


Figure 1-3

67. Use the graph in Figure 1-3 to find the number of grams of sugar that will dissolve in 100 grams of water at 80°C.
68. Use the graph in Figure 1-3 to find the temperature, in Celsius, that will dissolve 300 g of sugar in 100 g of water.

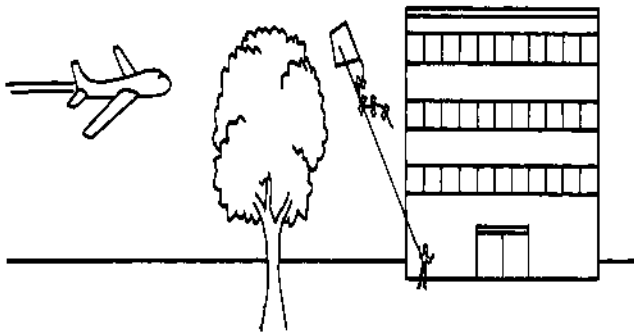


Figure 11-1

69. From which frame of reference in Figure 11-1 does the tree appear to be in motion?

Problem

70. A cross-country runner runs 10 km in 40 minutes. What is his average speed?
71. A high speed train travels with an average speed of 227 km/h. The train travels for 2 h. How far does the train travel?
72. A tow truck exerts a net horizontal force of 1050 N on an 760-kilogram car. What is the acceleration of the car during this time? Show your work.
73. A small engine causes a 0.3-kg model airplane to accelerate at a rate of 11 m/s². What is the net force on the model airplane? Show your work.

Essay

74. Figure 1-1 shows how a steel ball moved during an experiment. Average speed is calculated by dividing total distance by time. Did the steel ball speed up, slow down, or remain at the same speed throughout the experiment?
75. What is the difference between a scientific law and a scientific theory?
76. Describe a possible order of steps of a scientific method used in an investigation.

Other

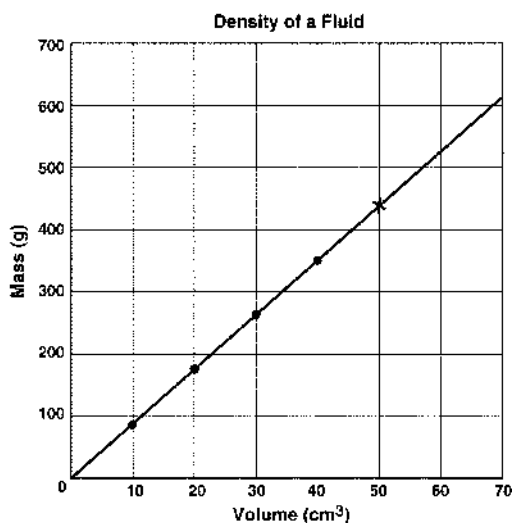


Figure 1-2

77. **Analyzing Data** What is the slope of the line shown in Figure 1-2?
78. **Using Tables and Graphs** In Figure 1-2, what quantity does the slope represent?
79. **Analyzing Data** What unit should be used when expressing the slope of the line in Figure 1-2?

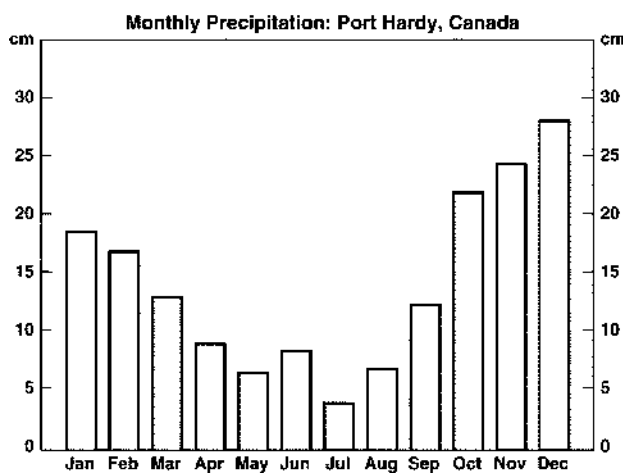


Figure 1-3

80. **Using Tables and Graphs** What measurements are compared in Figure 1-3?
81. **Analyzing Data** In Figure 1-3, which month had the lowest amount of precipitation?
82. **Analyzing Data** In Figure 1-3, how many meters of precipitation were recorded during June?

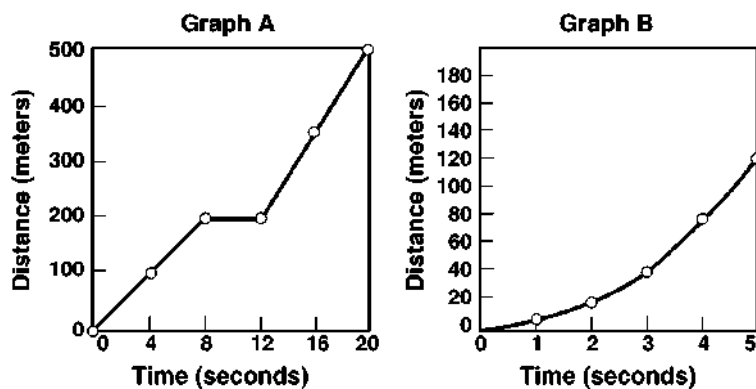


Figure 11-2

83. **Using Tables and Graphs** Which graph in Figure 11-2 shows periods of constant speed? Explain your answer.
84. **Interpreting Graphics** Look at Figure 11-2. Describe the motion of the object in Graph A.
85. **Using Models** Which graph in Figure 11-2 shows acceleration? How do you know?
86. **Calculating** Using Graph A in Figure 11-2, calculate the average speed of the object in motion from 12 s to 20 s. Explain your calculation.

Physical Science 1st Semester Exam Study Guide 2010 Introduction / Motion & Forces
Answer Section

MULTIPLE CHOICE

1. ANS: D
2. ANS: C
3. ANS: C
4. ANS: C
5. ANS: D
6. ANS: B
7. ANS: B
8. ANS: D
9. ANS: C
10. ANS: D
11. ANS: A
12. ANS: A
13. ANS: C
14. ANS: C
15. ANS: A
16. ANS: C
17. ANS: B
18. ANS: D
19. ANS: A
20. ANS: D
21. ANS: B
22. ANS: A
23. ANS: C
24. ANS: A
25. ANS: A
26. ANS: B
27. ANS: D
28. ANS: D
29. ANS: B
30. ANS: C
31. ANS: D
32. ANS: C

33. ANS: C
34. ANS: A
35. ANS: D
36. ANS: B
37. ANS: A
38. ANS: D
39. ANS: B
40. ANS: B
41. ANS: C

COMPLETION

42. ANS: scientific method
43. ANS: line graph
44. ANS: scientific law
45. ANS: scientific theory or theory
46. ANS: law
47. ANS: 3.75
48. ANS: 46.5×10^6
49. ANS: 5.678×10^{10}
50. ANS: mass, acceleration
51. ANS: speed, direction
52. ANS: inertia / mass
53. ANS: 5
54. ANS: gravity
55. ANS: curved
56. ANS: friction
57. ANS: greater or larger
58. ANS: air resistance or drag
59. ANS: zero
60. ANS: inertia
61. ANS: inertia, forward
62. ANS: weight

SHORT ANSWER

63. ANS: Acceleration is the rate at which velocity changes.
64. ANS: An object at rest remains at rest and an object in motion maintains its velocity unless it experiences an unbalanced force.
65. ANS: The unbalanced force acting on an object equals the object's mass times its acceleration.
66. ANS: Mass is a measure of the amount of matter in an object. Weight is the gravitational force an object experiences due to its mass.
67. ANS: 400 g
68. ANS: 60°C
69. ANS: the airplane

PROBLEM

70. ANS:

$$s = d/t = 10 \text{ km}/40 \text{ min} = 0.25 \text{ km/min}$$

71. ANS:

$$d = s \times t = 227 \text{ km/h} \times (2.00 \text{ h}) = 454 \text{ km}$$

72. ANS:

$$\text{Acceleration} = \frac{\text{Net Force}}{\text{Mass}}, a = \frac{F}{m}$$

$$a = \frac{1050 \text{ N}}{760 \text{ kg}} = \frac{1.4 \text{ kgm/s}^2}{\text{kg}} = 1.4 \text{ m/s}^2$$

$$a = 1.4 \text{ m/s}^2 \text{ horizontally}$$

73. ANS:

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

$$F = m \times a = 0.3 \text{ kg} \times 11 \text{ m/s}^2 = 3.3 \text{ kg} \cdot \text{m/s}^2$$

$$F = 3.3 \text{ N}$$

ESSAY

74. ANS:

The steel ball started out slowly. Then it continued to speed up throughout the experiment.

75. ANS:

A scientific law is a statement that summarizes a pattern found in nature, without attempting to explain it. A scientific theory explains the pattern.

76. ANS:

Possible answer: (1) make observations, (2) ask questions, (3) develop a hypothesis, (4) test the hypothesis, (5) analyze data, (6) draw conclusions, and (7) revise hypothesis.

OTHER

77. ANS: 8.8 g/cm^3

78. ANS: the density of the fluid

79. ANS: g/cm^3

80. ANS: monthly precipitation in centimeters

81. ANS: July

82. ANS: about 8.5 cm,

83. ANS: Graph A shows periods of constant speed (0–8 s, 8–12 s, 12–20 s).

84. ANS: The object moves at constant speed for 8 seconds, is at rest for the next 4 seconds, and then moves at constant speed for the next 8 seconds.

85. ANS: Graph B shows acceleration. The upward curve of the line indicates that an increasing distance is covered each second.

86. ANS: The object moved a distance of 300 m in 8 s. The object's average speed is 37.5 m/s.

$$\bar{v} = 300 \text{ m} \div 8 \text{ s} = 37.5 \text{ m/s}$$