

Chapter 02 - Motion

Chapter 02
Motion

1. A snail travels 45 cm in 20 min. Its average speed is

- A. 2.25 cm/h.
- B. 15 cm/h.
- C. 90 cm/h.
- D.** 135 cm/h.

Bloom's Level: 5. Evaluate
Section: 02.01
Topic: Kinematics

2. The time needed for a car whose speed is 60 km/h to travel 800 m is

- A. 0.48 min.
- B.** 0.8 min.
- C. 4.5 min.
- D. 13 min.

Bloom's Level: 5. Evaluate
Section: 02.01
Topic: Kinematics

3. In 6 min a person running at 10 km/h covers a distance of

- A. 167 m.
- B. 600 m.
- C.** 1000 m.
- D. 1667 m.

Bloom's Level: 5. Evaluate
Section: 02.01
Topic: Kinematics

Chapter 02 - Motion

4. The minimum number of unequal forces whose vector sum can equal zero is

- A. 2.
- B.** 3.
- C. 4.
- D. 5.

Bloom's Level: 4. Analyze

Section: 02.02

Topic: Vectors

5. Which of the following units could be associated with a vector quantity?

- A.** km/s^2 .
- B. kg/s .
- C. hours.
- D. m^3 .

Bloom's Level: 2. Understand

Bloom's Level: 3. Apply

Section: 02.02

Topic: Vectors

6. Which one or more of the following pairs of displacements cannot be added to give a resultant displacement of 2 m?

- A. 1 m and 1 m.
- B. 1 m and 2 m.
- C. 1 m and 3 m.
- D.** 1 m and 4 m.

Bloom's Level: 4. Analyze

Bloom's Level: 5. Evaluate

Section: 02.02

Topic: Vectors

7. Which of the following sets of displacements might be able to return a car to its starting point?

- A. 2, 8, 10, and 25 km.
- B. 5, 20, 35, and 65 km.
- C. 60, 120, 180, and 240 km.
- D. 100, 100, 100, and 400 km.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.02
Topic: Vectors

8. The length C of the longest side of a right triangle is related to the lengths A and B of the other sides by the formula

- A. $C = A + B$.
- B. $C = A^2 + B^2$.
- C. $C = \sqrt{A + B}$.
- D. $C = \sqrt{A^2 + B^2}$.

Bloom's Level: 1. Remember
Figure: 02.05
Section: 02.02
Topic: Vectors

9. A boat whose velocity through the water is 20 km/h is moving in a river whose current is 6 km/h relative to the riverbed. The velocity of the boat relative to the riverbed must be between

- A. 6 and 20 km/h.
- B. 6 and 26 km/h.
- C. 12 and 20 km/h.
- D. 12 and 26 km/h.

Bloom's Level: 2. Understand
Bloom's Level: 4. Analyze
Section: 02.02
Topic: Vectors

10. A ship travels 20 km to the south and then 40 km to the west. The ship's displacement from its starting point is

- A. 20 km.
- B. 40 km.
- C. 45 km.
- D. 60 km.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.02
Topic: Vectors

11. A car whose speed is a steady 50 km/h

- A. cannot be accelerated.
- B. is accelerated when it climbs a hill.
- C. is accelerated when it descends a hill.
- D. is accelerated when it climbs a hill, goes over the crest, and descends on the other side.

Bloom's Level: 2. Understand
Section: 02.03
Topic: Kinematics

12. A stone is thrown upward from a roof at the same time as another, identical stone is dropped from there. The two stones

- A. reach the ground at the same time.
- B. have the same speed when they reach the ground.
- C. have the same acceleration when they reach the ground.
- D. None of the choices are correct.

Bloom's Level: 2. Understand
Bloom's Level: 3. Apply
Section: 02.05
Topic: Gravity

13. Ball A is thrown horizontally and ball B is thrown upward.

- A. Ball A has the greater downward acceleration.
- B. Ball B has the greater downward acceleration.
- C.** They have the same downward acceleration.
- D. Neither has any downward acceleration.

Bloom's Level: 2. Understand

Bloom's Level: 3. Apply

Section: 02.05

Topic: Gravity

14. The idea that all conclusions about the natural world must be based upon experiment and observation was first emphasized in the work of

- A. Aristotle.
- B. St. Thomas Aquinas.
- C.** Galileo.
- D. Newton.

Bloom's Level: 1. Remember

Section: 02.05

Topic: Scientific Method

15. A car starts from rest and reaches a speed of 15 m/s in 10s. Its acceleration is

- A. 0.67 m/s^2 .
- B.** 1.5 m/s^2 .
- C. 6.7 m/s^2 .
- D. 15 m/s^2 .

Bloom's Level: 5. Evaluate

Section: 02.03

Topic: Kinematics

Chapter 02 - Motion

16. A car moving at 15 m/s comes to a stop in 3 s. Its acceleration is

- A. -0.2 m/s^2 .
- B. -5 m/s^2 .**
- C. -15 m/s^2 .
- D. -45 m/s^2 .

Bloom's Level: 5. Evaluate

Section: 02.03

Topic: Kinematics

17. A car starts from a speed of 10 m/s with an acceleration of 2 m/s^2 . The time needed for the car to reach 30 m/s is

- A. 10 s.**
- B. 20 s.
- C. 30 s.
- D. 40 s.

Bloom's Level: 5. Evaluate

Section: 02.03

Topic: Kinematics

18. An airplane reaches its takeoff speed of 60 m/s in 30 s starting from rest. The time it spends in going from 40 m/s to 60 m/s is

- A. 10 s.**
- B. 15 s.
- C. 20 s.
- D. 25 s.

Bloom's Level: 5. Evaluate

Section: 02.03

Topic: Kinematics

Chapter 02 - Motion

19. A stone dropped from a cliff reaches the ground in 4 s. The stone's speed is then

- A. 10 m/s.
- B.** 40 m/s.
- C. 196 m/s.
- D. 392 m/s.

Bloom's Level: 5. Evaluate

Section: 02.05

Topic: Kinematics

20. A ball thrown upward at 30 m/s will continue to rise for about

- A. 0.5 s.
- B. 1.0 s.
- C.** 2.0 s.
- D. 4.0 s.

Bloom's Level: 5. Evaluate

Section: 02.05

Topic: Kinematics

21. A ball thrown upward at 30 m/s will reach the ground after about

- A. 1.0 s.
- B. 2.0 s.
- C.** 4.0 s.
- D. 8.0 s.

Bloom's Level: 5. Evaluate

Section: 02.05

Topic: Kinematics

Chapter 02 - Motion

22. In the first 3 s after a car starts from rest with an acceleration of 4 m/s^2 it will travel

- A. 6 m.
- B. 12 m.
- C. 18 m.**
- D. 72 m.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.04
Topic: Kinematics

23. A car that starts from rest with a constant acceleration travels 50 m in the first 5 s. The car's acceleration is

- A. 2 m/s^2 .
- B. 4 m/s^2 .**
- C. 10 m/s^2 .
- D. 20 m/s^2 .

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.04
Topic: Kinematics

24. A car starts from rest with a constant acceleration of 5 m/s^2 . How much time does the car take to cover the first 160 m?

- A. 8 s.**
- B. 16 s.
- C. 32 s.
- D. 64 s.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.04
Topic: Kinematics

25. A car moving at 10 m/s undergoes an acceleration of 1.2 m/s^2 . In the next 5 s the car travels

- A. 15 m.
- B. 25 m.
- C. 55 m.
- D.** 65 m.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.04
Topic: Kinematics

26. When its brakes are applied, a car moving at 10 m/s undergoes an acceleration of -1.2 m/s^2 . In the next 5 s the car travels

- A. 15 m.
- B. 32 m.
- C.** 35 m.
- D. 47 m.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.04
Topic: Kinematics

27. When its brakes are applied, a car moving at 10 m/s undergoes an acceleration of -1.2 m/s^2 . How far does the car travel before it comes to a stop?

- A.** 42 m.
- B. 78 m.
- C. 83 m.
- D. 124 m.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.04
Topic: Kinematics

28. After a stone dropped from a cliff has fallen 20 m, the stone's speed is approximately

- A. 10 m/s.
- B. 20 m/s.**
- C. 196 m/s.
- D. 392 m/s.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.05
Topic: Kinematics

29. A net force of 10 N gives an object an acceleration of 5 m/s^2 . What net force would give the same object an acceleration of 1 m/s^2 ?

- A. 1 N.
- B. 2 N.**
- C. 5 N.
- D. 50 N.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.09
Topic: Newton's Law

30. A force that gives a 2-kg object an acceleration of 1.6 m/s^2 would give an 8-kg object an acceleration of

- A. 0.2 m/s^2 .
- B. 0.4 m/s^2 .**
- C. 1.6 m/s^2 .
- D. 6.4 m/s^2 .

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.09
Topic: Newton's Law

Chapter 02 - Motion

31. A 3000-kg truck accelerates from 10 m/s to 30 m/s in 8 s. The net force on the truck is

- A. 765 N.
- B. 7500 N.**
- C. 11,250 N.
- D. 15,000 N.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.09
Topic: Newton's Law

32. A force of 2 N acts on a 2-kg object, initially at rest, for 2 s. During that time the object moves a distance of

- A. 1 m.
- B. 2 m.**
- C. 4 m.
- D. 8 m.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.09
Topic: Newton's Law

33. A net horizontal force of 2000 N is applied to an 800-kg car at rest. The car's speed after 5 s will be

- A. 1.3 m/s.
- B. 2.5 m/s.
- C. 6.25 m/s.
- D. 12.5 m/s.**

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.09
Topic: Newton's Law

34. A car whose mass is 1600 kg (including the driver) has a maximum acceleration of 1.2 m/s^2 . If three 80-kg passengers are also in the car, its maximum acceleration will be
- A. 0.5 m/s^2 .
 - B. 0.72 m/s^2 .
 - C. 1.04 m/s^2 .**
 - D. 1.2 m/s^2 .

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.09
Topic: Newton's Law

35. The braking force needed to bring a 4000-kg truck to a stop from a speed of 20 m/s in 5 s is
- A. 1000 N.
 - B. 1633 N.
 - C. 9800 N.
 - D. 16,000 N.**

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.09
Topic: Newton's Law

36. A 300-g ball is struck with a bat with a force of 150 N. If the bat was in contact with the ball for 0.02 s, the ball flew off at
- A. 0.01 m/s.
 - B. 0.1 m/s.
 - C. 2.5 m/s.
 - D. 10 m/s.**

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.09
Topic: Newton's Law

37. When a 430-g soccer ball is kicked, the impact lasts for 0.04 s. In order for the ball to fly off at 8 m/s, the force of the kick must be

- A. 86 N.
- B. 138 N.
- C. 178 N.
- D. 86 kN.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.09
Topic: Newton's Law

38. The weight of an object is

- A. the same everywhere on the earth's surface.
- B. greater at the poles than at the equator.
- C. less at the poles than at the equator.
- D. Any of these choices, depending on the phase of the moon.

Bloom's Level: 1. Remember
Bloom's Level: 2. Understand
Section: 02.10
Topic: Weight and Mass

39. Relative to what she weighs on the earth, an astronaut visiting another planet

- A. weighs less.
- B. weighs the same.
- C. weighs more.
- D. Any of these choices, depending on the planet.

Bloom's Level: 2. Understand
Bloom's Level: 3. Apply
Section: 02.10
Topic: Weight and Mass

Chapter 02 - Motion

40. A 50-kg person weighs

A. 5.1 N.

B. 23 N.

C. 110 N.

D. 490 N.

Bloom's Level: 5. Evaluate

Section: 02.10

Topic: Weight and Mass

41. The mass of a sack of potatoes whose weight is 200 N is

A. 20.4 kg.

B. 91 kg.

C. 210 kg.

D. 440 kg.

Bloom's Level: 5. Evaluate

Section: 02.10

Topic: Weight and Mass

42. The mass of a 2,200-lb elephant is

A. 224 kg.

B. 1,000 kg.

C. 4,840 kg.

D. 21,560 kg.

Bloom's Level: 5. Evaluate

Section: 02.10

Topic: Weight and Mass

43. A crane exerts an upward force of 200 N on a 20-kg crate. The crate's upward acceleration is

A. 0.

B. 0.2 m/s².

C. 10 m/s².

D. 98 m/s².

Bloom's Level: 4. Analyze

Bloom's Level: 5. Evaluate

Section: 02.10

Topic: Weight and Mass

44. According to Newton's third law of motion,

A. there is no such thing as a single force acting on an object.

B. for every force there is an equal and opposite reaction force, but each acts on a different object.

C. action and reaction forces need not be equal, but must act in opposite directions.

D. action and reaction forces must be equal, but need not act in opposite directions.

Bloom's Level: 2. Understand

Section: 02.11

Topic: Newton's Law

45. The sun exerts a gravitational force on the earth and the earth exerts a gravitational force on the sun. The force the earth exerts

A. is the action force.

B. is the reaction force.

C. can be considered either as the action or as the reaction force.

D. is not part of an action-reaction pair because the earth and sun are not in contact with each other.

Bloom's Level: 2. Understand

Section: 02.11

Topic: Newton's Law

46. A moose weighing 3 kN is standing still. The force the ground exerts on the moose is
- A. 0.
 - B. more than 0 but less than 3 kN.
 - C. 3 kN.**
 - D. more than 3 kN.

Bloom's Level: 2. Understand

Bloom's Level: 3. Apply

Section: 02.11

Topic: Newton's Law

47. A jumper whose weight is w presses down on the floor with the force F and leaves the floor as a result. The force the floor exerted on the jumper was
- A. equal to w and less than F .
 - B. equal to w and equal to F .
 - C. more than w and equal to F .**
 - D. more than w and more than F .

Bloom's Level: 2. Understand

Bloom's Level: 3. Apply

Section: 02.11

Topic: Newton's Law

48. An object moving in a circle at constant speed is accelerated
- A. in the direction of its motion.
 - B. toward the center of the circle.**
 - C. away from the center of the circle.
 - D. Any of these choices, depending on the circumstances.

Bloom's Level: 1. Remember

Figure: 02.32

Section: 02.12

Topic: Newton's Law

49. The radius of the path of an object moving in a circle at constant speed is halved. If the speed remains the same, the centripetal force needed is

- A. one-quarter as much as before.
- B. half as much as before.
- C. twice as much as before.**
- D. four times as much as before.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.12
Topic: Circular Motion

50. The speed of an object moving in a circle is doubled. The centripetal force needed is

- A. one-quarter as much as before.
- B. half as much as before.
- C. twice as much as before.
- D. four times as much as before.**

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.12
Topic: Circular Motion

51. A 500-g ball moves in a circle 40 cm in radius at a speed of 4 m/s. The centripetal force on the ball is

- A. 10 N.
- B. 20 N.**
- C. 40 N.
- D. 80 N.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.12
Topic: Circular Motion

52. A 1200-kg car is traveling at 10 m/s on a road such that the maximum frictional force between its tires and the road is 4000 N. The minimum turning radius of the car is

- A. 15 m.
- B. 30 m.**
- C. 60 m.
- D. 120 m.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.12
Topic: Circular Motion

53. On a rainy day the maximum frictional force between a car's tires and a certain level road surface is reduced to half its usual value. The maximum safe speed for rounding a curve is

- A. unchanged.
- B. reduced to 25% of its usual value.
- C. reduced to 50% of its usual value.
- D. reduced to 71% of its usual value.**

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.12
Topic: Circular Motion

54. A ball of mass 200 g is whirled in a circle at the end of a string 100 cm long whose breaking strength is 10 N. Neglecting gravity, the maximum speed of the ball is approximately

- A. 2 m/s.
- B. 7 m/s.**
- C. 10 m/s.
- D. 50 m/s.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.12
Topic: Circular Motion

Chapter 02 - Motion

55. A bullet is fired upward. As it rises,
- A. its mass and weight remain the same.
 - B. its mass and weight decrease.
 - C. its mass remains the same while its weight decreases.
 - D. its mass decreases while its weight remains the same.

Bloom's Level: 2. Understand
Section: 02.10
Topic: Weight and Mass

56. A hole is drilled to the center of the earth and a ball is dropped into it. When the ball is at the earth's center, compared with their respective values at the earth's surface,
- A. its mass and weight are the same.
 - B. its mass and weight are both 0.
 - C. its mass is the same and its weight is 0.
 - D. its weight is the same and its mass is 0.

Bloom's Level: 2. Understand
Bloom's Level: 4. Analyze
Section: 02.13
Topic: Gravity

57. If the moon were half as far from the earth as it is now, the gravitational force it exerts on the earth would be
- A. one-quarter its present value.
 - B. half its present value.
 - C. twice its present value.
 - D. four times its present value.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.13
Topic: Gravity

58. Mars is about 1.5 times as far from the sun as the earth and its mass is about 0.1 times the earth's mass. Relative to the gravitational force the sun exerts on the earth, the force it exerts on Mars is about

- A. 0.0044 as much.
- B. 0.0067 as much.
- C. 0.044 as much.**
- D. 0.067 as much.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.13
Topic: Gravity

59. A woman whose mass is 60 kg on the earth's surface is in a spacecraft at a height of 2 earth radii above the earth's surface. Her mass there is

- A. 6.7 kg.
- B. 15 kg.
- C. 20 kg.
- D. 60 kg.**

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.13
Topic: Gravity

60. A man whose mass is 80 kg on the earth's surface is in a spacecraft at a height of 2 earth radii above the earth's surface. His weight there is

- A. 87 N.**
- B. 196 N.
- C. 261 N.
- D. 784 N.

Bloom's Level: 4. Analyze
Bloom's Level: 5. Evaluate
Section: 02.13
Topic: Gravity

Chapter 02 - Motion

61. The escape speed needed for an object to leave the earth permanently
- A. depends on its mass.
 - B. is less than the minimum speed it needs to become an earth satellite.
 - C. is equal to the minimum speed it needs to become an earth satellite.
 - D.** is more than the minimum speed it needs to become an earth satellite.

Bloom's Level: 2. Understand

Figure: 02.43

Section: 02.14

Topic: Gravity