Chapter 02
Motion

Multiple Choice Questions

1. An airplane travels at constant speed for a distance of 120 km in a time of 15 min. Its speed is
A. 30 km/h.
B. 120 km/in.
C. 480 km/in.
D. 1800 km/h.

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.

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.

4. Which of the following statements is incorrect?
A. All vector quantities have directions.
B. All vector quantities have magnitudes.
C. All scalar quantities have directions.
D. All scalar quantities have magnitudes.

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

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

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

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

9. A boat whose velocity through the water is 20 km/h is moving in a river whose current is 6 km/in 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.

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.

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.

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.

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.

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.

15. A car starts from rest and reaches a speed of 12 m/s in 20 s. Its acceleration is
A. 0.6 m/s^2.
B. 4 m/s^2.
C. 6 m/s^2.
D. 240 m/s^2.

16. A car moving at 15 m/s comes to a stop in 10 s. Its acceleration is
A. -1.5 m/s^2.
B. -0.67 m/s^2.
C. 0.67 m/s^2.
D. 1.5 m/s^2.

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.

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.

19. A wheel falls off an airplane and takes 8 s to reach the ground. If there were no air resistance, the wheel's final speed would be
A. 9.8 m/s.
B. 39 m/s.
C. 78 m/s.
D. 314 m/s.

20. A ball is thrown upward with a speed of 30 m/s. It will continue to rise for about
A. 0.33 s.
B. 1.5 s.
C. 3.1 s.
D. 6.1 s.

21. A ball is thrown upward with a speed of 30 m/s. About how long after it was thrown will the ball reach the ground?
A. 1.5 s
B. 3.1 s
C. 6.1 s
D. 12.2 s

22. A car starts from rest with a constant acceleration of 3 m/s^2. In the first 4 s the car travels
A. 6 m.
B. 18 m.
C. 36 m.
D. 72 m.

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.

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

25. A car whose initial speed is 30 m/s undergoes a constant acceleration of 5 m/s^2. In the first 6 s after the acceleration starts, the car travels
A. 90 m.
B. 120 m.
C. 195 m.
D. 270 m.

26. A car whose initial speed is 40 m/s undergoes a constant acceleration of -5 m/s^2 when its brakes are applied. In the first 6 s after the brakes are applied, the car travels
A. 150 m.
B. 180 m.
C. 210 m.
D. 330 m.

27. A car whose initial speed is 40 m/s undergoes a constant acceleration of -5 m/s^2 when its brakes are applied. How much time does the car take to come to a stop?
A. 8 s
B. 16 s
C. 30 s
D. 200 s

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.

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

30. A certain force gives a 5-kg object an acceleration of 2.0 m/s^2. The same force would give a 20-kg object an acceleration of
A. 0.5 m/s^2.
B. 2.0 m/s^2.
C. 4.9 m/s^2.
D. 8.0 m/s^2.

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.

32. A force gives a 100-kg mass an acceleration of 2 m/s^2. The same force would give a mass of 1000 kg an acceleration of
A. 0.2 m/s^2.
B. 2 m/s^2.
C. 20 m/s^2.
D. 200 m/s^2.

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.

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.

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.

36. A 430-g soccer ball lying on the ground is kicked with a force of 800 N. If the kick lasts 0.01 s, the ball flies off with a speed of
A. 0.0186 m/s.
B. 0.182 m/s.
C. 1.90 m/s.
D. 18.6 m/s.

37. The weight of an object
A. is less than its mass.
B. is equal to its mass.
C. is greater than its mass.
D. None of the choices are correct.

38. A crane exerts an upward force of 600 N on a 50-kg crate. The crate's acceleration is
A. 0.82 m/s^2.
B. 2.2 m/s^2.
C. 11 m/s^2.
D. 12 m/s^2.

39. The weight of an object
A. is the same everywhere in the universe.
B. depends only upon its mass.
C. depends only upon the acceleration of gravity.
D. depends upon both its mass and the acceleration of gravity.

40. The weight of a 60-kg person is
A. 6.1 N.
B. 60 N.
C. 69.8 N.
D. 588 N.

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.

42. The mass of a 2000-lb elephant is
A. 204 kg.
B. 909 kg.
C. 449 kg.
D. 19,600 kg.

43. The acceleration of gravity on the surface of Mars is 3.7 m/s^2. Compared with his or her mass and weight on Earth, an astronaut on Mars has
A. less mass and less weight.
B. less mass and more weight.
C. the same mass and less weight.
D. less mass and the same weight.

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.

45. The earth and the moon exert equal and opposite forces on each other. The force the earth exerts on the moon
A. is the action force.
B. is the reaction force.
C. can be considered either as the action or as the reaction force.
D. cannot be considered as part of an action-reaction pair because the forces act in opposite directions.

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.

47. A jumper who weighs 600 N presses down on the ground with a force of 700 N and rises into the air as a result. The magnitude of the force the ground exerted on the jumper was
A. 100 N.
B. 600 N.
C. 700 N.
D. 1300 N.

48. An object is moving in a circle with a constant speed. Its acceleration is constant in
A. magnitude only.
B. direction only.
C. both magnitude and direction.
D. neither magnitude nor direction.

49. 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.

50. 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.

51. 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.

52. 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.

53. 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.

54. 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.

55. As a spacecraft moves upward,
A. its mass decreases.
B. its mass increases.
C. its weight decreases.
D. its weight increases.

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.

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.

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.

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.

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.