1. **C** The number \(34,200,000,000\) may be expressed in scientific notation as:
   (a) \(3.42 \times 10^8\)  (b) \(3.42 \times 10^9\)  (c) \(3.42 \times 10^{10}\)

2. **B** The number \(1.23 \times 10^{-10}\) may be expressed in ordinary notation as:
   (a) \(0.0000000123\)  (b) \(0.00000000123\)  (c) \(0.0000000000123\)

3. **C** A regulation basketball hoop is ten feet off the ground. There are twelve inches in one foot. What is the height of a basketball hoop expressed in centimeters?
   (a) 47 (b) 470 (c) 305 (d) 31

4. **A** What is the height of a basketball hoop expressed in kilometers?
   (a) 0.00305 (b) \(4.7 \times 10^6\) (c) 0.0305 (d) 0.0047

5. **B** A golfer strikes a ball on the moon, where there is no air resistance. The ball follows the parabolic trajectory shown in the figure below. Which arrow best represents the ball's velocity at the instant shown?
   (a) (b) (c) (d)

6. **C** Which arrow best represents the ball's acceleration at the instant shown?
   (a) (b) (c) (d)
7. **c** A rocket moving with constant speed has
   (a) zero acceleration
   (b) nonzero acceleration
   (c) can't tell from the information given

8. **a** A rocket moving with constant velocity is being acted on by
   (a) zero net force
   (b) a nonzero net force
   (c) can't tell from the information given

9. **a** Which of the following quantities is not a vector?
   (a) mass (b) force (c) velocity (d) acceleration

10. **c** Which of the following is TRUE for a skydiver at terminal velocity?
    (a) yes no forces are acting on her
    (b) yes she is decelerating
    (c) yes the vector sum of forces on her body equals zero
    (d) yes her velocity is zero, but her speed remains constant

11. **a** In 2.5 seconds, a car increases its speed from 60 km/h to 65 km/h while a bicycle goes from rest to 10 km/h. Which experiences the greater acceleration?
    (a) the bicycle
    (b) the car
    (c) the accelerations are the same
    (d) impossible to tell from the information given

12. **b** A rock is dropped from the top of a cliff on another planet, which has no atmosphere. The ball falls 16 meters in 2.5 seconds. What is the rock's acceleration?
    (a) 2.12 m/s² (b) 5.12 m/s² (c) 6.40 m/s² (d) 9.81 m/s²

13. **b** What is the rock's speed after 2.5 seconds?
    (a) 32 m/s (b) 12.8 m/s (c) 16.0 m/s (d) 5.12 m/s

14. **a** What is the rock's average downward velocity during the 2.5 seconds?
    (a) 6.40 m/s (b) 12.80 m/s (c) 5.12 m/s (d) 2.12 m/s
15. a. An object with zero net force acting on it cannot
   (a) accelerate  (b) move  (c) remain at rest

16. b. A cannon fires a ball horizontally from the top of a 150 meter tall cliff, as
   shown in the figure below. The cannonball’s initial velocity is 50 meters/second to the right.
   Assuming air resistance is negligible, how long does the ball take to reach the ground?
   (a) 2.05 sec  (b) 5.53 sec  (c) 15.3 sec  (d) 30.6 sec

17. a. How far does the ball travel horizontally?
   (a) 277 meters  (b) 150 meters  (c) 90.4 meters  (d) 9.04 meters

![](image)

18. d. How many times further will a dropped object fall in 6 seconds than it will fall
   in 2 seconds?
   (a) three  (b) four  (c) eight  (d) nine

19. a. A rock is dropped on the Earth, and a rock is dropped on a planet with accel-
   eration due to gravity that is 1/2 of Earth’s. In 5 seconds, the ball on earth falls
   (a) twice as far  (b) 1/2 as far  (c) 4× as far  (d) 1/4 as far

20. c. A car, initially moving at a constant 30 meters/second, accelerates at 2.5 meters/second²
   for 6 seconds. What is the car’s final speed?
   (a) 15 meters/sec  (b) 30 meters/sec  (c) 45 meters/sec  (d) 60 meters/sec
21. The following 4 questions pertain to the graph shown below, which represents the position versus time for a moving train. During which segment is the train's speed greatest?
(a) AB (b) BC (c) CD (d) DE

22. During which segment is the train at rest?
(a) AB (b) BC (c) CD (d) DE

23. Calculate the speed during segment DE.
(a) 1 meter/sec (b) 2 meter/sec (c) 4 meter/sec (d) 5 meter/sec

24. Calculate the average velocity over the entire trip from A to E.
(a) +0.4 meter/sec (b) -0.6 meter/sec (c) -0.8 meter/sec (d) -1.0 meter/sec

25. A hockey puck is slid towards a wall, which it strikes and then bounces back at the same speed. Which of the following is TRUE?
(a) the puck's velocity is unchanged
(b) a nonzero net force acted on the puck when it struck the wall
(c) The puck cannot have the same speed, since its direction has changed.
26. The following four questions pertain to the position versus time plot below, of a train moving in a straight line. At which of the four points is the train's speed the greatest?

(a) (b) (c) (d)

27. At which of the four points is the train's speed the smallest?

(a) (b) (c) (d)

28. According to this plot the train is

(a) accelerating (b) decelerating (c) moving with constant speed

29. There is a nonzero force acting on the train:

(a) at all points (b) at no point (c) at point d only

30. Two metal balls are dropped from a cliff at the same time. They are the same size, but one weighs twice as much as the other. Assuming no air resistance, the time to reach the ground will be

(a) About twice as long for the heavy ball.
(b) About twice as long for the light ball
(c) About the same for both
(d) Longer for the heavy ball, but not twice as long
(e) Longer for the light ball, but not twice as long
31. Which of the following is FALSE for a freely falling object?
   (a) The distance fallen each second keeps increasing.
   (b) The speed keeps increasing each second.
   (c) The change in speed each second keeps increasing.
   (d) The acceleration remains constant each second.

32. A tortoise runs a race at a steady speed of 10 meters per hour for twelve hours. A hare runs 1,200 meters per hour for 6 minutes, then takes a nap until the tortoise catches up. The racer with the greatest average speed is
   (a) The tortoise
   (b) The hare
   (c) The average speeds are the same.

33. Now, suppose the tortoise and hare are running on an oval track and they end the race where they started. The racer with the greatest average velocity is
   (a) The tortoise
   (b) The hare
   (c) The average velocities are both 10 meters per hour
   (d) The average velocities are both zero.