1 In the Monkey and the Hunter demonstration, the monkey lets go and starts to fall at the instant that it sees the blowgun shoot a dart. The Monkey always gets hit, provided that the hunter aims the blowgun

a. directly at the monkey before it starts to fall.

b. below the monkey before it starts to fall.

c. above the monkey before it starts to fall.

2 A difficulty with passively observing ordinary events is that ordinary events are often

a. too simple to reveal the underlying physical laws.

b. too complicated to reveal the underlying physical laws.

c. subject only to ordinary physical laws.

d. in violation of the underlying physical laws.

3 Which of the following statements is scientific (as defined by Popper)?

a. All of the fish in Lake Nyak are beautiful.

b. All of the fish in Lake Nyak are green.

c. There are fish in Lake Nyak.

4 At 3:30 P.M. a swimming pool contains 2000 gallons of water. At 4:00 P.M. it contains 2500 gallons of water. The *rate* of change in the amount of water in the pool is

a. -1000 gal/hr.

b. +1000 gal/hr.

c. + 500 gal/hr.

d. - 500 gal/hr.

e. + 2000 gal/hr.

5 The assertion that a moving object does not require a force to keep moving was first made by

a. Aristotle.

b. Galileo.

c. Newton.

6 If the velocity vector of an object is unchanging in both length and direction, and does not have zero length, the object must be

a. starting.

b. at rest.

c. moving in a straight line at constant speed.

d. moving in a circle at constant speed.

e. stopping.

7 Mean Manfred is standing watch in the crow's nest of a tall sailing ship. He gets that duty a lot because everyone feels much safer with him as far away as possible. Also he smells bad. Old MM has already tried dropping lead sinkers on fellow crewman on the deck below. The captain told him that he would be shot if he tried that again. This time, a thoroughly bored Mean Manfred decides to engage in a game of "dolphin bonking". The dolphins swim beside the ship because they like to play in the bow wave. As the ship rocks back and forth, the crow's nest sways out over one side of the ship and then out over the other. When MM finds himself directly over a dolphin, he drops a lead sinker. The ship is under full sail and plowing along at 20 knots. By the time the lead sinker reaches the water level,

a. it is still directly over the dolphin and hits the poor creature.

b. the ship and the swimming dolphin have left the falling sinker behind and it misses the dolphin.

c. the falling sinker leaves the ship and dolphin behind and lands ahead of the dolphin.

8 The speed of a rocket will increase whenever the rocket's acceleration vector

a. is in the same direction as the rocket's velocity vector.

b. is zero.

c. is not zero.

d. is in the opposite direction to the rocket's velocity vector.

9 You start driving your car at 5:00pm. At 6:00pm you have driven 60 miles and stop to rest. At 6:05pm you get back onto the highway and drive an additional 60 miles to your destination where you arrive at 7:00pm. What was the instantaneous rate of change of the distance from your starting point at 6:03pm?

a. 120 miles/hour.

b. 0 miles/hour.

c. 30 miles/hour.

d. 60 miles/hour.

10 A ball is thrown straight up with an initial velocity of 5m/s. The ball is fairly heavy, so air resistance can be neglected. How fast will it be going when it falls back to the level at which it was thrown?

a. $5\,\mathrm{m/s}$.

b. $0\,\mathrm{m/s}$.

c. $10\,\mathrm{m/s}$.

d. $50\,\mathrm{m/s}$.

e. $0.2\,\mathrm{m/s}$.

11 An airplane buzzes an airfield. As it flies over, its distance from the ground at various times (measured in seconds from the start of its maneuver) are

400 feet	at 2 seconds	25 feet	at 7 seconds
200 feet	at 4 seconds	50 feet	at 8 seconds
50 feet	at 6 seconds	100 feet	at 9 seconds

Which of the following expressions gives the *best* approximation to the *instantaneous rate of change* of the distance from the ground at 5 seconds from the start of the maneuver?

a. (25-200)/(7-4) ft/s.

b. (50-200)/(8-4) ft/s.

c. (50-400)/(8-2) ft/s.

d. (50-200)/(6-4) ft/s.

e. (50-400)/(6-2) ft/s.

12 Suppose that there is a cannon that can fire shells at any speed. If this cannon is located on the earth's surface, its shells

a. could go into earth orbit if fired at a high enough speed.

b. could never go into earth orbit.

c. always return to the earth.

13 A cannon shoots a shell straight up at an initial velocity of 300m/s. If air resistance can be neglected, how long will it take the shell to go up and come back down?

a. $30\,\mathrm{s}$.

b. $300\,\mathrm{s}$.

c. $20\,\mathrm{s}$.

d. $500\,\mathrm{s}$.

e. $60\,\mathrm{s}$.

14 Suppose that a baseball is thrown with a horizontal velocity component of 30 m/s (about 66 miles per hour which is not too difficult) and a vertical velocity component of 5m/s. How far will it travel before coming back down to the level at which it was thrown?

a. 80m.

b. 10m.

c. 60m.

d. 30m.

e. 20m.

15 Suppose that your car turns a corner without slowing down. Which way does the acceleration vector of your car point?

a. upwards.

b. sideways.

c. backwards.

d. forwards.

16 You fall off a cliff on the Moon, where the acceleration due to gravity is $1.7\,\mathrm{m/s^2}$. How fast will you be falling after three seconds?

a. $5.1\,\mathrm{m/s}$.

b. $0.567\,\mathrm{m/s}$.

c. $30\,\mathrm{m/s}$.

d. $60\,\mathrm{m/s}$.

e. $1.7\,\mathrm{m/s}$.

17 Sam the snail travels 50 mm in 100 minutes. Sam's speed is

a. 0.5 mm/min.

b. 2min/mm.

c. $1/100$min/mmi.

d. 100mm/min.

e. 50mm/ min.

18 An arrow is shot straight up and rises for four seconds before stopping and beginning to fall back down. Neglect air friction and estimate how fast the arrow was moving when it left the bow.

a. $40\,\mathrm{m/s}$.

b. $20\,\mathrm{m/s}$.

c. $2\,\mathrm{m/s}$.

d. $4\,\mathrm{m/s}$.

e. $30\,\mathrm{m/s}$.

19 Galileo's approach to finding the laws that govern falling objects was to

a. prove the superiority of his own theory.

b. test the predictions of the established theory.

c. find logical contradictions in the established theory.

d. accept the established theory.

20 A car drives off a cliff. As it leaves the cliff, its horizontal velocity component is 5m/s and its vertical velocity component is 0m/s. One second later, its horizontal velocity component is still 5m/s and its vertical velocity component is -10m/s. What is its *vertical component* of acceleration?

a. $+10\text{m/s}^2$.

b. $+5\text{m/s}^2$.

c. 0m/s^2.

d. -10m/s^2.

21 The acceleration of an object is defined to be the rate of change of the object's

a. speed.

b. upward velocity component.

c. position.

d. velocity vector.

e. altitude.

22 Aristotle reasoned that the amount of time it takes for an object to fall is always

a. more for heavier objects..

b. more for larger size objects.

c. less for heavier objects.

d. less for larger size objects.

e. the same for all objects.

23 According to Galileo's Law of Inertia, an object is acting as if it is not under any outside influence if it is moving

a. around a circle at constant speed.

b. in a straight line at changing speed.

c. around a circle at changing speed.

d. in a straight line at constant speed.

24 At 5:00 p.m., a truck is 120 miles from Richmond. At 7:00 p.m., the truck is 30 miles from Richmond. Calculate the truck's average velocity component away from Richmond.

a. +75 mi/hr.

b. +90 mi/hr.

c. -45 mi/hr.

d. -75 mi/hr.

e. +45 mi/hr.

25 All of the tests performed on a suspect's DNA show it to be the same as DNA from the scene of a crime. Which of the following conclusions is correct?

a. The suspect could not have been at the scene.

b. The lab messed up the tests.

c. The suspect was definitely at the scene.

d. The suspect was probably at the scene.

26 Fred, the intrepid motorcycle maniac, wants to jump his motorcycle across the largest possible distance. To the extent that he can ignore air resistance, the best angle for his take-off ramp is

a. fifty-five degrees from the horizontal.

b. 20 degrees from the horizontal.

c. thirty degrees from the horizontal.

d. forty-five degrees from the horizontal.

27 At 2:00 P.M. a swimming pool contains 5500 gallons of water. At 4:00 P.M. it contains 3500 gallons of water. The *rate* of change in the amount of water in the pool is

a. - 2000 gal/hr.

b. +3500 gal/hr.

c. +1000 gal/hr.

d. -1000 gal/hr.

e. + 2000 gal/hr.

28 You are throwing a ball upward from the top of a ten story building. After one second, the ball is at the top of its trajectory and its position, measured upwards from the top of the building is $+5\,\mathrm{m}$. After three seconds, the ball has dropped below the top of the building. At that time, its position measured upwards from the top of the building could be

a. $h = -15\,\mathrm{m}$.

b. $h = +45\,\mathrm{m}$.

c. $h = 0$.

Answers

1 Choice a. (directly at the monkey before it starts to fall.)

2 Choice b. (too complicated to reveal the underlying physical laws.)

3 Choice b. (All of the fish in Lake Nyak are green.)

4 Choice b. (+1000 gal/hr.)

5 Choice b. (Galileo.)

6 Choice c. (moving in a straight line at constant speed.)

7 Choice a. (it is still directly over the dolphin and hits the poor creature.)

8 Choice a. (is in the same direction as the rocket's velocity vector.)

9 Choice b. (0 miles/hour.)

10 Choice a. ($5\,\mathrm{m/s}$.)

11 Choice d. ((50-200)/(6-4) ft/s.)

12 Choice b. (could never go into earth orbit.)

13 Choice e. ($60\,\mathrm{s}$.)

14 Choice d. (30m.)

15 Choice b. (sideways.)

16 Choice a. ($5.1\,\mathrm{m/s}$.)

17 Choice a. (0.5 mm/min.)

18 Choice a. ($40\,\mathrm{m/s}$.)

19 Choice b. (test the predictions of the established theory.)

20 Choice d. ($-10\mathrm{m/s}^2$.)

21 Choice d. (velocity vector.)

22 Choice c. (less for heavier objects.)

23 Choice d. (in a straight line at constant speed.)

24 Choice c. (-45 mi/hr.)

25 Choice d. (The suspect was probably at the scene.)

26 Choice d. (forty-five degrees from the horizontal.)

27 Choice d. (-1000 gal/hr.)

28 Choice a. ($h = -15\,\mathrm{m}$.)

Where to look in the notes

1 Module 013 Projectile Motion: Question 2.4
2 Module 005 Passive observation is not enough : Question 1A
3 Module 001 How to test a statement : Question 2.3
4 Module 007 Average Rate of Change Question 3N
5 Module 005 The law of inertia.: Question 3.3
6 Module 008 The Velocity Vector: Question 2.4
7 Module 013 Projectile Motion: Question 1.2
8 Module 009 Acceleration and Speed: Linear Motion: Question 3.3
9 Module 007 Instantaneous Rate of Change: Question 5.3
10 Module 012 Constant Acceleration: Question 3.3
11 Module 007 Instantaneous Rate of Change: Question 51N
12 Module 013 Projectile Motion: Question 5.1
13 Module 012 Constant Acceleration: Question 4.1
14 Module 013 Projectile Motion: Question 4.3
15 Module 009 Acceleration and Speed: Circular Motion: Question 4A
16 Module 012 Constant Acceleration: Question 1.5
17 Module 008 Speed: Question 3.6
18 Module 012 Constant Acceleration: Question 2.5
19 Module 010 Universality of Free-fall: Question 3.1
20 Module 009 Components of Acceleration: Question 1.3
21 Module 009 The Acceleration Vector: Question 2.3
22 Module 010 Universality of Free-fall: Question 1.6
23 Module 009 Components of Acceleration: Question 5N
24 Module 008 Components of Velocity: Question 1.5
25 Module 001 Scientific Proof: Question 1A
26 Module 013 Projectile Motion: Question 3.1
27 Module 007 Negative Rate of Change Question 4A
28 Module 006 Negative distances are needed. Question 2.5