

- 1 Galileo's Law of Inertia implies that the acceleration vector of an object that is not under any outside influence must be
  - a. perpendicular to the velocity vector.
  - b. zero.
  - c. parallel to the velocity vector.
  - d. pointing downward.
  - e. constant.
  
- 2 Suppose that you measure vertical distance upward from the second floor of a building. Which of the following distances might describe the first floor of the building?
  - a.  $h = 0$ .
  - b.  $h = +3$  m.
  - c.  $h = -3$  m.
  
- 3 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 m/s.
  - b. 10 m/s.
  - c. 0.2 m/s.
  - d. 0 m/s.
  - e. 50 m/s.
  
- 4 Which of the following is a scientific statement (as defined by Popper)?
  - a. Isaac Newton was the greatest scientist.
  - b. The Moon is made entirely of blue cheese.
  - c. There is intelligent life on other stars.
  - d. There is beauty in a sunset.
  
- 5 While flying along in their electric dirigible, Tom Swift and his friends notice a touring car roaring along the highway below them. Being full of boyish mischief (etc.), Tom and his friends decide to play a prank on the occupants of the car by dropping a bag of rubbish on them. The highway is long and straight, so it is easy to pilot the airship on a course parallel to the highway and directly over the moving car. Both the airship and the car are moving at forty miles per hour. Tom drops the bag when the car is directly underneath the airship and the speeds are matched. Assuming that the bag is heavy enough to be unaffected by air resistance,
  - a. the bag hits the car.
  - b. The bag leaves the airship and car behind and lands ahead of the car.
  - c. the airship and the car leave the bag behind and it misses.
  
- 6 A remotely operated vehicle 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  $-2$ m/s. What is its *vertical component* of acceleration?
  - a.  $0\text{m/s}^2$ .
  - b.  $+10\text{m/s}^2$ .
  - c.  $-10\text{m/s}^2$ .
  - d.  $-2\text{m/s}^2$ .
  - e.  $+2\text{m/s}^2$ .
  
- 7 At 5:00 p.m., a truck is 30 miles from Richmond. At 7:00 p.m., the truck is 120 miles from Richmond. Calculate the truck's average velocity component away from Richmond.
  - a. -75 mi/hr.

- b. +45 mi/hr.
  - c. +75 mi/hr.
  - d. +90 mi/hr.
  - e. -45 mi/hr.
- 8 Aristotle reasoned that the amount of time it takes for an object to fall is always
- a. more for heavier objects..
  - b. less for larger size objects.
  - c. the same for all objects.
  - d. more for larger size objects.
  - e. less for heavier objects.
- 9 A cannon shoots a shell up with an initial vertical velocity component of 500m/s and an initial horizontal component of 400m/s. Neglecting air resistance and the curvature of the Earth, how far away from the cannon will the shell hit?
- a. 50,000m.
  - b. 40,000m.
  - c. 80,000m.
  - d. 20,000m.
- 10 The speed of a rocket will increase whenever the rocket's acceleration vector
- a. is in the opposite direction to the rocket's velocity vector.
  - b. is in the same direction as the rocket's velocity vector.
  - c. is not zero.
  - d. is zero.
- 11 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. forty-five degrees from the horizontal.
  - b. thirty degrees from the horizontal.
  - c. fifty-five degrees from the horizontal.
  - d. 20 degrees from the horizontal.
- 12 The rate of change of an object's velocity vector is called its
- a. rotation rate.
  - b. deceleration.
  - c. acceleration.
  - d. power level.
- 13 At 3:30 P.M. a swimming pool contains 2500 gallons of water. At 4:00 P.M. it contains 2000 gallons of water. The *rate* of change in the amount of water in the pool is
- a. + 2500 gal/hr.
  - b. - 500 gal/hr.
  - c. + 500 gal/hr.
  - d. -1000 gal/hr.
  - e. +1000 gal/hr.
- 14 Which one of the following statements about the Theory of Evolution is definitely wrong?

- a. The Theory has not yet been disproved.  
b. The Theory is wrong.  
c. The Theory is a proven fact.  
d. The Theory is well-established.
- 15 A ball is thrown straight upward and reaches its highest point (5 meters above its starting point) after one second and then starts to fall back down. What is its instantaneous velocity at the instant it reaches its highest point?
- a. -10 m/s.  
b. +10 m/s.  
c. +5 m/s.  
d. 0 m/s.  
e. -5 m/s.
- 16 A cyclist travels 150 miles in 10 hours. His speed is
- a. 150mi/ hr.  
b. 1/10hr/mi.  
c. 10mi/ hr.  
d. 1/15hr/mi.  
e. 15mi/hr.
- 17 An earth satellite stays in its orbit around the earth because
- a. it is weightless.  
b. the earth curves out from under it as fast as it falls.  
c. its speed weakens the pull of gravity.
- 18 Suppose you know how far your car has traveled at various times:
- |        |            |        |           |
|--------|------------|--------|-----------|
| 10 mi  | at 6:00am  | 250 mi | at 1:00pm |
| 15 mi  | at 8:00am  | 280 mi | at 3:00pm |
| 100 mi | at 10:00am | 500 mi | at 6:00pm |
| 150 mi | at 11:00am | 560 mi | at 7:00pm |
- The best approximation to the instantaneous velocity of the car at 2:00pm is given by the average rate of change of the distance during the interval
- a. from 6:00am to 7:00pm  
b. from 11:00am. to 1:00pm  
c. from 10:00am to 11:00am.  
d. from 10:00am to 3:00pm  
e. from 1:00pm to 3:00pm.
- 19 A clay pigeon is fired straight up and reaches its highest point three seconds later. What was its initial speed?
- a. 3 m/ s.  
b. 30 m/ s.  
c. 300 m/ s.  
d. 10 m/ s.
- 20 The velocity vector of an object that is moving in a straight line always
- a. stays the same in both length and direction.  
b. has the same length.

- c. points in the same direction.
  - d. changes.
- 21 In order to disprove Aristotle's ideas about falling objects, Galileo
- a. found logical contradictions in Aristotle's ideas.
  - b. found a specific situation where Aristotle's ideas lead to a wrong prediction.
  - c. sued Aristotle in Civil Court.
  - d. argued that his ideas were more elegant than Aristotle's.
- 22 A cannon shoots a shell straight up at an initial velocity of 250m/s. If air resistance can be neglected, how long will it take the shell to go up and come back down?
- a. 50 s.
  - b. 250 s.
  - c. 60 s.
  - d. 25 s.
  - e. 30 s.
- 23 A U-control model airplane is propelled by a small gasoline engine and propeller and flies in a circle at the end of its control lines. Its acceleration vector points
- a. in its direction of motion.
  - b. away from the person holding the control lines.
  - c. opposite to its direction of motion.
  - d. in the direction of the person holding the control lines.
- 24 Galileo arrived at conclusions about nature by
- a. active experimentation.
  - b. a combination of reason and passive observation.
  - c. appeal to religious authority.
  - d. pure reason alone.
- 25 Deadeye Denise wishes to impress her friends with her marksmanship. She instructs a companion to throw a bottle straight up in the air and then proceeds to blast away at it with her 357 Magnum. Assuming that it is possible to aim this weapon at all and assuming that she actually needs to hit the bottle (Her friends are already so impressed that they are diving for cover in all directions.) which of the following strategies will work best:
- a. Aim directly at the bottle throughout its flight and fire when it reaches its highest point.
  - b. Aim directly at the bottle and fire while it is on the way up.
  - c. Aim above the bottle and fire at the exact moment it reaches its highest point.
  - d. Aim directly at the bottle and fire while it is on the way down.
  - e. Aim below the bottle and fire at the exact moment it reaches its highest point.
- 26 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. - 500 gal/hr.
  - c. + 2000 gal/hr.
  - d. + 500 gal/hr.
  - e. +1000 gal/hr.
- 27 If an object accelerates from rest at the constant rate of  $10 \text{ m/s}^2$ , what will be its velocity after six seconds?

- a. 10 m/s.
- b. 180 m/s.
- c. 30 m/s.
- d. 60 m/s.

- 28 An bullet that is fired from a gun keeps moving after it leaves the gun barrel because
- a. it is round in the front and flat at the back.
  - b. not enough force acts on it to stop it.
  - c. the force of the gunpowder continues to act on it.
  - d. the air that it pushes aside moves around behind it and pushes it forward.

## Answer Key: Fall 2007 PHX1D

- 1 Choice b. (zero.)
- 2 Choice c. ( $h = -3\text{ m.}$ )
- 3 Choice a. ( $5\text{ m/s.}$ )
- 4 Choice b. (The Moon is made entirely of blue cheese.)
- 5 Choice a. (the bag hits the car.)
- 6 Choice d. ( $-2\text{ m/s}^2.$ )
- 7 Choice b. ( $+45\text{ mi/hr.}$ )
- 8 Choice e. (less for heavier objects.)
- 9 Choice b. ( $40,000\text{ m.}$ )
- 10 Choice b. (is in the same direction as the rocket's velocity vector.)
- 11 Choice a. (forty-five degrees from the horizontal.)
- 12 Choice c. (acceleration.)
- 13 Choice d. ( $-1000\text{ gal/hr.}$ )
- 14 Choice c. (The Theory is a proven fact.)
- 15 Choice d. ( $0\text{ m/s.}$ )
- 16 Choice e. ( $15\text{ mi/hr.}$ )
- 17 Choice b. (the earth curves out from under it as fast as it falls.)
- 18 Choice e. (from 1:00pm to 3:00pm.)
- 19 Choice b. ( $30\text{ m/s.}$ )
- 20 Choice c. (points in the same direction.)
- 21 Choice b. (found a specific situation where Aristotle's ideas lead to a wrong prediction.)
- 22 Choice a. ( $50\text{ s.}$ )
- 23 Choice d. (in the direction of the person holding the control lines.)
- 24 Choice a. (active experimentation.)
- 25 Choice a. (Aim directly at the bottle throughout its flight and fire when it reaches its highest point.)
- 26 Choice e. ( $+1000\text{ gal/hr.}$ )
- 27 Choice d. ( $60\text{ m/s.}$ )
- 28 Choice b. (not enough force acts on it to stop it.)

## Solutions

- 1 Module 009 Components of Acceleration: Question 5A
- 2 Module 006 Negative distances are needed. Question 2.4
- 3 Module 012 Constant Acceleration: Question 3.3
- 4 Module 001 How to test a statement : Question 2N
- 5 Module 013 Projectile Motion: Question 1.3
- 6 Module 009 Components of Acceleration: Question 1.4
- 7 Module 008 Components of Velocity: Question 1.6
- 8 Module 010 Universality of Free-fall: Question 1.6
- 9 Module 013 Projectile Motion: Question 4.1
- 10 Module 009 Acceleration and Speed: Linear Motion: Question 3.3
- 11 Module 013 Projectile Motion: Question 3.1
- 12 Module 009 The Acceleration Vector: Question 2.4
- 13 Module 007 Negative Rate of Change Question 4N
- 14 Module 001 Scientific Proof: Question 1N
- 15 Module 007 Instantaneous Rate of Change: Question 5.4
- 16 Module 008 Speed: Question 3A
- 17 Module 013 Projectile Motion: Question 5.3
- 18 Module 007 Instantaneous Rate of Change: Question 51.5
- 19 Module 012 Constant Acceleration: Question 2.1
- 20 Module 008 The Velocity Vector: Question 2N
- 21 Module 010 Universality of Free-fall: Question 3.2
- 22 Module 012 Constant Acceleration: Question 4.2
- 23 Module 009 Acceleration and Speed: Circular Motion: Question 4.5
- 24 Module 005 Active experiments are needed.: Question 2A
- 25 Module 013 Projectile Motion: Question 2.2
- 26 Module 007 Average Rate of Change Question 3N
- 27 Module 012 Constant Acceleration: Question 1.3
- 28 Module 005 The law of inertia.: Question 3.5