

- 1 The rate of change of an object's velocity vector is called its
 - a. power level.
 - b. deceleration.
 - c. rotation rate.
 - d. acceleration.
- 2 An earth satellite stays in its orbit around the earth because
 - a. it is weightless.
 - b. its speed weakens the pull of gravity.
 - c. the earth curves out from under it as fast as it falls.
- 3 A cyclist travels 150 miles in 10 hours. His speed is
 - a. 15mi/hr.
 - b. 150mi/ hr.
 - c. 1/10hr/mi.
 - d. 1/15hr/mi.
 - e. 10mi/ hr.
- 4 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. fifty-five degrees from the horizontal.
 - c. 20 degrees from the horizontal.
 - d. thirty degrees from the horizontal.
- 5 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. 10 m/ s.
 - b. 0 m/ s.
 - c. 0.2 m/ s.
 - d. 5 m/ s.
 - e. 50 m/ s.
- 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 -2m/s . What is its *vertical component* of acceleration?
 - a. $+2\text{m/s}^2$.
 - b. $+10\text{m/s}^2$.
 - c. -10m/s^2 .
 - d. 0m/s^2 .
 - e. -2m/s^2 .
- 7 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. + 2000 gal/hr.
 - c. + 500 gal/hr.
 - d. - 500 gal/hr.
 - e. -1000 gal/hr.

- 8 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?
- +10 m/s.
 - 5 m/s.
 - 10 m/s.
 - 0 m/s.
 - +5 m/s.
- 9 The speed of a rocket will increase whenever the rocket's acceleration vector
- is in the opposite direction to the rocket's velocity vector.
 - is not zero.
 - is in the same direction as the rocket's velocity vector.
 - is zero.
- 10 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
- in the direction of the person holding the control lines.
 - away from the person holding the control lines.
 - opposite to its direction of motion.
 - in its direction of motion.
- 11 In order to disprove Aristotle's ideas about falling objects, Galileo
- found logical contradictions in Aristotle's ideas.
 - found a specific situation where Aristotle's ideas lead to a wrong prediction.
 - sued Aristotle in Civil Court.
 - argued that his ideas were more elegant than Aristotle's.
- 12 An bullet that is fired from a gun keeps moving after it leaves the gun barrel because
- it is round in the front and flat at the back.
 - the air that it pushes aside moves around behind it and pushes it forward.
 - the force of the gunpowder continues to act on it.
 - not enough force acts on it to stop it.
- 13 Galileo's Law of Inertia implies that the acceleration vector of an object that is not under any outside influence must be
- pointing downward.
 - zero.
 - perpendicular to the velocity vector.
 - parallel to the velocity vector.
 - constant.
- 14 Which one of the following statements about the Theory of Evolution is definitely wrong?
- The Theory has not yet been disproved.
 - The Theory is a proven fact.
 - The Theory is wrong.
 - The Theory is well-established.

15 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. -45 mi/hr.
- b. +45 mi/hr.
- c. +75 mi/hr.
- d. -75 mi/hr.
- e. +90 mi/hr.

16 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 11:00am. to 1:00pm
- b. from 1:00pm to 3:00pm.
- c. from 6:00am to 7:00pm
- d. from 10:00am to 3:00pm
- e. from 10:00am to 11:00am.

17 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 and fire while it is on the way up.
- b. Aim directly at the bottle throughout its flight and fire when it reaches its highest point.
- c. Aim directly at the bottle and fire while it is on the way down.
- d. Aim below the bottle and fire at the exact moment it reaches its highest point.
- e. Aim above the bottle and fire at the exact moment it reaches its highest point.

18 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. 250 s.
- b. 60 s.
- c. 30 s.
- d. 25 s.
- e. 50 s.

19 Which of the following is a scientific statement (as defined by Popper)?

- a. The Moon is made entirely of blue cheese.
- b. There is beauty in a sunset.
- c. There is intelligent life on other stars.
- d. Isaac Newton was the greatest scientist.

- 20 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
- + 500 gal/hr.
 - 500 gal/hr.
 - +1000 gal/hr.
 - + 2500 gal/hr.
 - 1000 gal/hr.
- 21 The velocity vector of an object that is moving in a straight line always
- stays the same in both length and direction.
 - changes.
 - has the same length.
 - points in the same direction.
- 22 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,
- The bag leaves the airship and car behind and lands ahead of the car.
 - the airship and the car leave the bag behind and it misses.
 - the bag hits the car.
- 23 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?
- $h = +3\text{ m}$.
 - $h = 0$.
 - $h = -3\text{ m}$.
- 24 Aristotle reasoned that the amount of time it takes for an object to fall is always
- more for heavier objects..
 - more for larger size objects.
 - less for heavier objects.
 - less for larger size objects.
 - the same for all objects.
- 25 Galileo arrived at conclusions about nature by
- a combination of reason and passive observation.
 - pure reason alone.
 - active experimentation.
 - appeal to religious authority.
- 26 A clay pigeon is fired straight up and reaches its highest point three seconds later. What was its initial speed?
- 10 m/s.
 - 300 m/s.
 - 30 m/s.
 - 3 m/s.

- 27 If an object accelerates from rest at the constant rate of 10 m/s^2 , what will be its velocity after six seconds?
- a. 10 m/s .
 - b. 30 m/s .
 - c. 180 m/s .
 - d. 60 m/s .
- 28 A cannon shoots a shell up with an initial vertical velocity component of 500 m/s and an initial horizontal component of 400 m/s . Neglecting air resistance and the curvature of the Earth, how far away from the cannon will the shell hit?
- a. $20,000 \text{ m}$.
 - b. $40,000 \text{ m}$.
 - c. $80,000 \text{ m}$.
 - d. $50,000 \text{ m}$.

Answer Key: Fall 2007 PHX1A

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

Solutions

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