

UNIT 1 TEST REVIEW

Motion Basics: Chapters 2-4

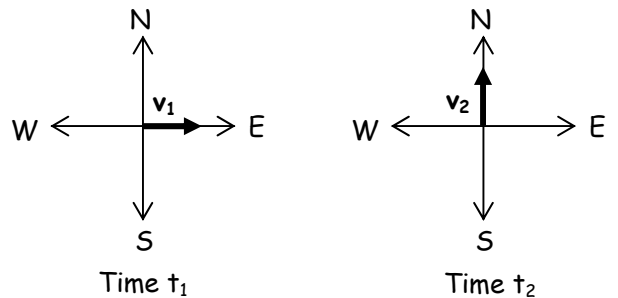
*** In studying for your test, make sure to study this review sheet along with your quizzes and homework assignments.**

Multiple Choice Review: On this portion of the test, you will not be allowed to use your calculator or AP formula sheet. (You may, however, use your AP table of information.) Approximate $g=10\text{m/s}^2$ for simplicity of calculations. No partial credit will be given.

1. What is the magnitude of the velocity after 1.5 seconds of a ball thrown upward from a height of 5m at 40m/s?
a. 15m/s b. 20m/s c. 25m/s d. 30m/s e. 35m/s
2. An object released from rest at time $t=0$ slides down a frictionless incline a distance of 1 meter during the first second. The distance traveled by the object during the time interval from $t=1\text{s}$ to $t=2\text{s}$ is...
a. 1m b. 2m c. 3m d. 4m e. 5m
3. An object is thrown with a horizontal velocity of 20m/s from a cliff that is 125m above ground level. If air resistance is negligible, the time that it takes the object to fall to the ground from the cliff is most nearly...
a. 3s b. 5s c. 6s d. 12s e. 25s
4. The rate of change of velocity is the...
a. displacement d. acceleration
b. velocity e. integral of acceleration
c. derivative of position
5. A child has a toy tied to the end of a string and whirls the toy above his head at a constant speed in a horizontal circular path of radius R . The toy completes each revolution of its motion in a time period T . What is the magnitude of the acceleration of the toy?
a. Zero b. $\frac{4\pi^2R}{T^2}$ c. $\frac{\pi R}{T^2}$ d. g e. $2\pi g$

6. Three balls are projected from the edge of a cliff. Ball I is fired horizontally, ball II is fired at an angle of 30° above the horizontal with the same speed as ball I, and ball III is released from rest. Which one of the following is true?
- I and II hit at the same time, and III hits later.
 - I and II hit at the same time, and III hits earlier.
 - I and III hit at the same time, and II hits later.
 - I and III hit at the same time, and II hits earlier.
 - All three balls hit at the same time.

7. Vectors v_1 and v_2 shown below have equal magnitudes. The vectors represent the velocities of an object at times t_1 and t_2 , respectively. The average acceleration of the object between time t_1 and t_2 was...
- zero.
 - directed north.
 - directed west.
 - directed north of east.
 - directed north of west.



8. A particle moves along the x-axis with a non-constant acceleration described by $a=12t$, where a is in m/s^2 . If the particle starts from rest so that its speed v and position x are zero when $t=0$, where is it located when $t=2$ seconds?
- $x=12m$
 - $x=16m$
 - $x=24m$
 - $x=32m$
 - $x=48m$

9. An object is thrown straight upward. Which of the following are the correct signs of the velocity and acceleration vectors at the moment the object is at its highest point?

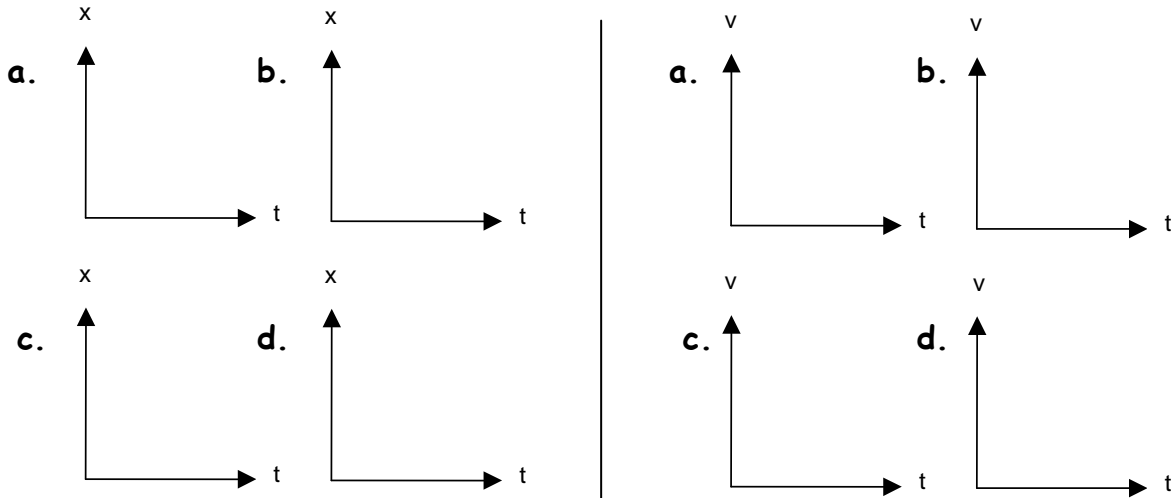
	<u>Velocity</u>	<u>Acceleration</u>
a.	+	-
b.	+	0
c.	-	0
d.	0	-
e.	0	0

10. A particle moves in the xy plane with a constant velocity of $-5\hat{i} + 3\hat{j}$. Which one of the following is closest to the angle at which the particle is moving, relative to the positive x-axis?
- 30°
 - 120°
 - 150°
 - 300°
 - 330°

Free-Response: On this portion of the test, you may use your calculator, AP formula sheet, and AP table of information. Partial credit will be given on these problems.

11. Sketch graphs of the following situations, first on position-time graphs and then on velocity-time graphs.

- a. Slowing down at a constant rate. b. Speeding up at a constant rate.
 c. Sitting still at a positive position. d. Moving at a constant pos. velocity.



12. A particle's velocity as a function of time is given by $v(t) = 4t - 3t^2$ (measured in m/s), and its position at time $t=0$ is $x=4\text{m}$.

- a. Find the particle's acceleration as a function of time.
- b. Find the particle's position as a function of time.
- c. Find the particle's position as it reaches its maximum velocity.

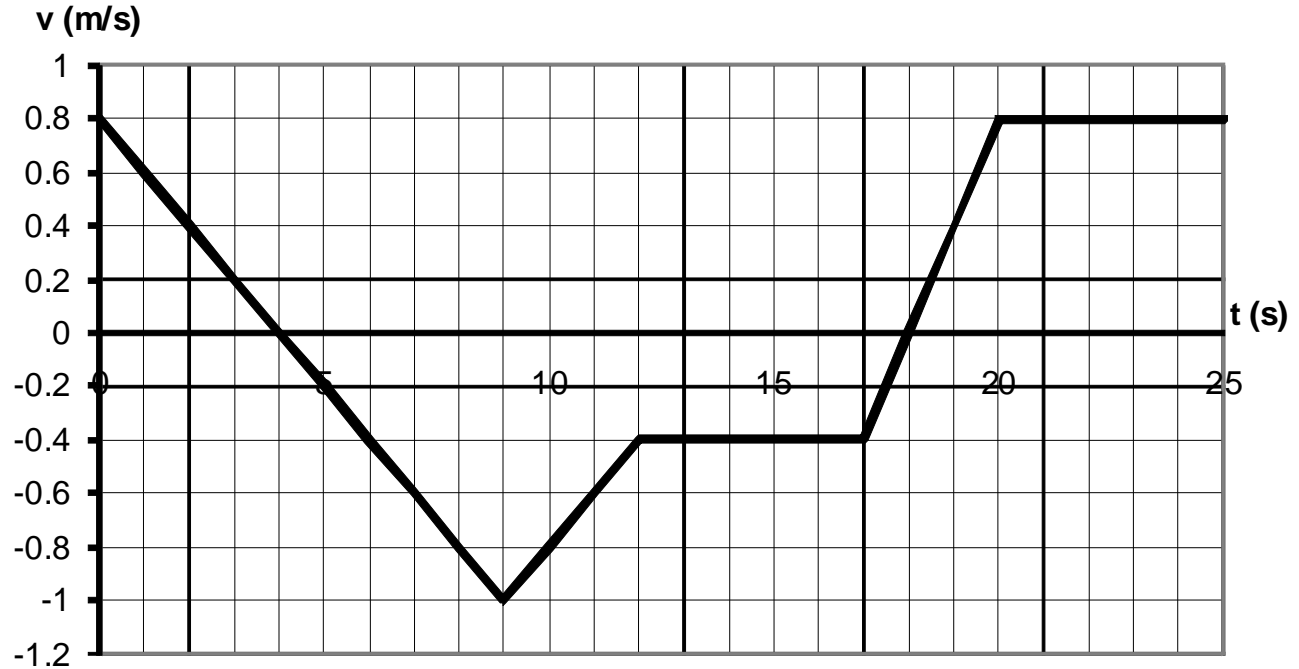
13. A truck on a straight road starts from rest accelerating at 3.0m/s^2 until it reaches a speed of 30.0 m/s . It then applies its brakes and comes to a stop in 8.0 s . What total distance does the truck cover during the total period of motion described here?
14. A car's velocity v_1 at one moment is $(15\hat{i} - 13\hat{j})\text{m/s}$, and then 3.5 seconds later its velocity v_2 is $(9\hat{i} + 12\hat{j})\text{m/s}$.
- Calculate the car's change in velocity $v_2 - v_1$ in unit vector notation.
 - Calculate the magnitude and angle of the car's average acceleration during the 3.5 second interval.
15. A stone is kicked horizontally from the edge of a cliff with an initial velocity of 30m/s , and it lands on a flat, horizontal beach 70 m (measured horizontally) from the cliff wall. How far above the beach is the cliff?

16. A ball is thrown upward from ground level at an angle of 25° above the horizontal. It passes its maximum height, and then lands back on the ground 30m away from its starting position.
- a. What was the ball's initial velocity?

b. What was the maximum height reached by the ball?

17. A particle is moving clockwise with uniform circular motion in a horizontal xy plane. Its acceleration at $t_1=3\text{s}$ is $(5\hat{i} - 8\hat{j})\text{m/s}^2$, and at $t_2=6\text{s}$ it is $(-8\hat{i} - 5\hat{j})\text{m/s}^2$. Calculate the radius of the particle's circular path.

18. A particle moves on a straight horizontal track. The graph of velocity v versus time t for the particle is given below.



- Indicate every time t for which the particle is at rest.
- Indicate every time interval for which the speed (magnitude of velocity) of the particle is increasing.
- Determine the displacement of the particle during the time interval from $t=18$ s to $t=25$ s.
- Sketch an acceleration versus time graph for the motion of the cart from $t=0$ to $t=25$ s.