Key

Physics

Period _____

Date _____

Review #1 (Kinematics)

1) The displacment of an object for a round trip between two locations

A) can be greater or less than zero but not equal to zero.
B) is zero.
C) is always less than zero.
D) is always greater than zero.
E) can have any value.

2) A rock is dropped from the top of a 45-meter tower, and at the same time a ball is thrown from the top of the tower in a horizontal direction. Air resistance is negligible. The ball and the rock hit the level ground a distance of 30 meters apart. The horizontal velocity of the thrown ball was most nearly

A) 20 m/s
B) 28.3 m/s
C) 5 m/s
D) 14.1 m/s
E) 10 m/s

① $t = \sqrt{\frac{2y}{g}} = \sqrt{\frac{2(45)}{10}} = 3s$

② $v = \frac{x}{t} = \frac{30m}{3s} = 10 m/s$

3) An object is released from rest on a planet that has no atmosphere. The object falls freely for 3.0 meters in the first second. What is the magnitude of the acceleration due to gravity on the planet?

A) 1.5 m/s^2
B) 12.0 m/s^2
C) 3.0 m/s^2
D) 6.0 m/s^2
E) 10.0 m/s^2

$a = \frac{2y}{t^2} = \frac{2(3)}{1^2} = 6$

4) 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 second to t = 2 seconds is

A) 4 m
B) 3 m
C) 8 m
D) 2 m
E) 1 m

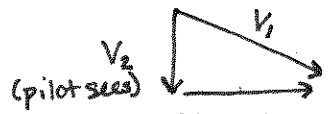
① $a = \frac{2d}{t^2} = \frac{2(1)}{(1)^2} = 2 m/s^2$

② $d = \frac{1}{2}at^2 = \frac{1}{2}(2)(2)^2 = 4m$ total

③ $d_2 = d_{tot} - d_1$
$= 4m - 1m$

5) At a particular instant, a stationary observer on the ground sees a package falling with speed v_1 at an angle to the vertical. To a pilot flying horizontally at constant speed relative to the ground, the package appears to be falling vertically with a speed v_2 at that instant. What is the speed of the pilot relative to the ground?

A) $\sqrt{(v_1^2 + v_2^2)}$
B) $\sqrt{(v_1^2 - v_2^2)}$
C) $v_1 + v_2$
D) $v_1 - v_2$
E) $v_2 - v_1$



$V_x = V_{pilot} = ?$

$V_1^2 = V_p^2 + V_2^2$ $\quad V_p = \sqrt{V_1^2 - V_2^2}$

6) A car traveling at 30 mph is able to stop in a distance *d*. What distance does the car require to stop, assuming the same braking force, when it is traveling twice as fast?

A) 2*d*
B) $\sqrt{2}d$
C) 8*d*
D) 4*d*
E) *d*

$V^2 = V_0^2 + 2ad$

$d = \frac{-V_0^2}{2a} = \frac{(2)^2}{} = 4x$ the distance

$V_0 = 0 - b$

7) A ball is dropped from the top of a building. In the absence of air resistance, the ball will hit the ground with a speed of 49 m/s. The height of the building is

A) 120 m
B) 5 m
C) 240 m
D) 10 m
E) 25 m

V_f $\quad y = ?$ $\quad a = g$

$V_f^2 = V_0^2 + 2ay$

$y = \frac{V_f^2 - V_0^2}{2a} = \frac{(49)^2}{2(10)}$

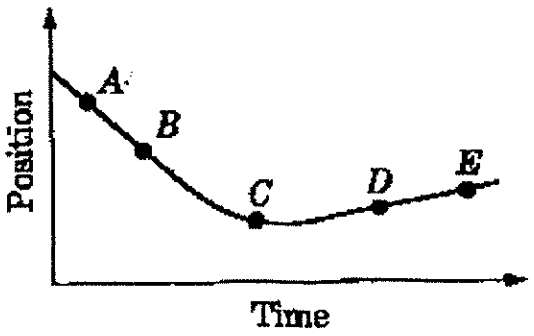
8) A diver initially moving horizontally with speed *v* dives off the edge of a vertical cliff and lands in the water a distance *d* from the base of cliff. How far from the base of the cliff would the diver have landed if the diver initially had been moving horizontally with speed 2*v*?

A) It cannot be determined without knowing the height of the cliff.
B) *d*
C) $\sqrt{2}d$
D) 2*d*
E) 4*d*

$x = V_0 t$
$= (2)(1)$
$= 2$

t stays same

9) The motion of a particle along a straight line is represented by the position *versus* time graph below.



At which of the labeled points on the graph is the magnitude of the acceleration of the particle greatest?

(A) C
B) E
C) A
D) B
E) D

$a = \frac{\Delta v}{t}$ When slope changes quickly

t v

10) A person drives for 30 minutes at 100 km/hr then stops for 15 minutes. The person then drives for 45 minutes at 80 km/hr. The average speed for the entire trip is

t_{stop}

A) 90 km/hr
(B) 73 km/hr
C) 97 km/hr
D) 83 km/hr
E) 88 km/hr

$d_1 = 50$ km $t_1 = .5$h
$d_2 = 0$ km $t_2 = .25$h
$d_3 = 60$ km $t_3 = .75$h

$v = \frac{d}{t} = \frac{110\text{km}}{1.5\text{h}}$

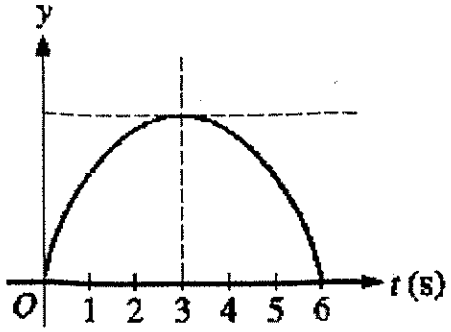
11) An object is thrown with a horizontal velocity of 20 m/s V_x from a cliff that is 125 m above level ground. If air resistance is negligible, the time that it takes the object to fall to the ground from the cliff is most nearly

y

(A) 5 s
B) 25 s
C) 3 s
D) 12 s
E) 6 s

$t = \sqrt{\frac{2y}{a}} = \sqrt{\frac{2(125)}{-10}}$

Questions 12 through 15 refer to the following:



A ball is thrown straight up by a student at rest on the surface of Earth. A graph of the position *y* as a function of time *t*, in seconds, is shown above. Air resistance is negligible.

12) At which of the following times is the speed of the ball the least?

at top

Shallow slope

A) 4 s
(B) 3 s
C) 5 s
D) 1 s
E) 2 s

13) Which of the following best describes the acceleration of the ball?

$a = \frac{\Delta v}{t} = -10\ m/s^2$

A) ~~It is upward~~ and ~~increases in magnitude~~ from 0 to 3 s, then decreases.
(B) It is downward and constant from 0 to 6 s.
C) ~~It is upward~~ and decreases in magnitude from 0 to 3 s, then increases.
D) It is downward and ~~decreases in magnitude~~ from 0 to 3 s, then increases.
E) It is downward and ~~increases in magnitude~~ from 0 to 3 s, then decreases.

14) What is the initial speed of the ball?

A) 45 m/s
B) 60 m/s
C) 180 m/s
(D) 30 m/s
E) 90 m/s

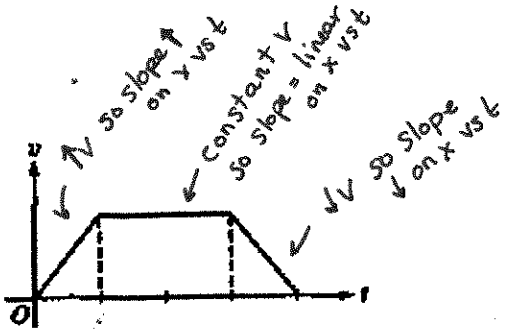
$v_0 = v_f - at_{top}$
$= -(-10)(3)$

15) At which of the following times is the ball farthest from the student?

at top

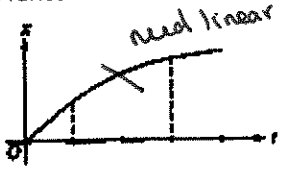
A) 2 s
B) 1 s
(C) 3 s
D) 4 s
E) 5 s

16)

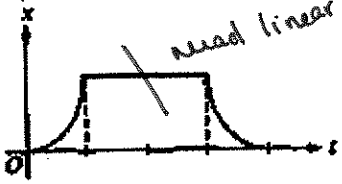


The graph above shows the velocity v as a function of time t for an object moving in a straight line. Which of the following graphs shows the corresponding displacement x as a function of time t for the same time interval?

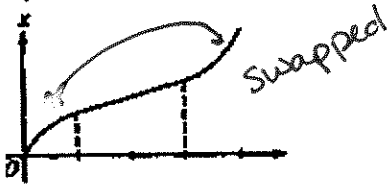
A)



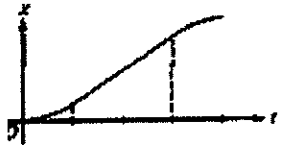
B)



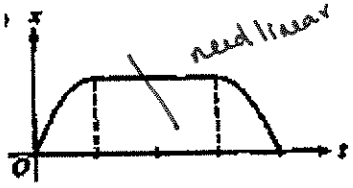
C)



D)



E)



17) Which one of the following statements is correct for an object released from rest, in the absence of air resistance?

A) The ~~acceleration changes~~ by 9.8 m/s every second.
B) The ~~acceleration of the object is proportional~~ to its weight.
C) The object falls 9.8 m during the first second of time.
D) During each second the object falls 9.8 m.
E) The average velocity during the first second of time is 4.9 m/s.

$y = \frac{1}{2}(a)t^2 = \frac{1}{2}(-10)(1)^2$ 5m

$\bar{V} = \frac{V_0 + V_f}{2} = \frac{0 + 10\ m/s}{2} = 5\ m/s$

18) Which of the following situations is impossible?

A) A body having constant velocity and variable acceleration.
B) A body having velocity east and acceleration west. slowing
C) A body having velocity east and acceleration east. speed up
D) A body having constant acceleration and variable velocity. turning
E) A body having zero velocity and non-zero acceleration. stop to change direction

19) A car and a truck, starting from rest, have the same acceleration, but the truck accelerates for twice the length of time. Compared with the car, the truck will travel

A) four times as far.
B) twice as far.
C) one-half as far.
D) 1.4 times as far.
E) three times as far.

$d = \frac{1}{2}at^2$
$= (1)(1)(2)^2$
$= 4$
double t then square

20) In the absence of air friction, an object dropped near the surface of the Earth experiences a constant acceleration of about 9.8 m/s^2. This means that the

A) derivative of the distance with respect to time for the object equals 9.8 m/s^2
B) object falls 9.8 meters during the first second
C) speed of the object increases 9.8 m/s during each second
D) object falls 9.8 meters during each second
E) speed of the object as it falls is 9.8 m/s

21) A 2-kilogram rock rests at the edge of a platform that is 10 meters above level ground. The block is launched horizontally from the edge of the platform with an initial speed of 3 meters per second. Air resistance is negligible. The time it will take for the block to reach the ground is most nearly

V_x y

A) 1.4 s
B) 2.0 s
C) 0.3 s
D) 3.0 s
E) 1.0 s

$t = \sqrt{\frac{2y}{a}} = \sqrt{\frac{2(10)}{-10}}$

22) A 500-kilogram sports car accelerates uniformly from rest, reaching a speed of 30 meters per second in 6 seconds. During the 6 seconds, the car has traveled a distance of

V_f t x

A) 30 m
B) 90 m
C) 15 m
D) 180 m
E) 60 m

$x = x_0 + V_0t + \frac{1}{2}at^2$
$= \frac{1}{2}(5)(6)^2$

① $a = \frac{\Delta V}{t}$
$= \frac{30 - 0}{6}$
$= 5\ m/s^2$

23) A projectile is fired from the surface of the Earth with a speed of 200 meters per second at an angle of 30° above the horizontal. If the ground is level, what is the maximum height reached by the projectile?

A) 2,000 m
B) 1,000 m
(C) 500 m
D) 5 m
E) 10 m

① $V_y = V_0 \sin\theta$
$= 200 \sin 30$
$= 100$ m/s

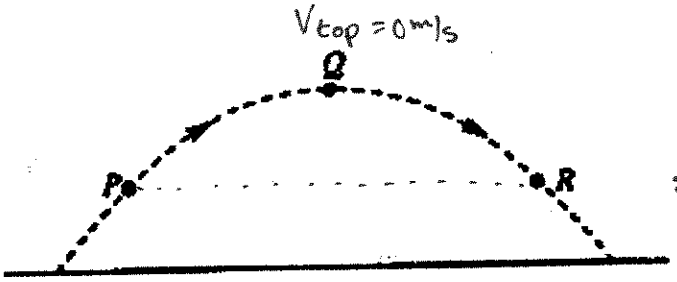
② $y = \frac{-V_0^2}{2a} = \frac{-(100)^2}{2(-10)}$

24) An object is shot vertically upward into the air with positive initial velocity. Which of the following correctly describes the velocity and acceleration of the object at its maximum elevation?

A) ~~velocity: positive~~ acceleration: negative
B) ~~velocity: positive~~ ~~acceleration: positive~~
C) ~~velocity: negative~~ acceleration: negative
(D) velocity: zero acceleration: negative
E) velocity: zero ~~acceleration: zero~~

$a = g = -10$
$V_{top} = 0$ m/s

25)



$V_{top} = 0$ m/s

symmetric path $V_P = V_R$

A ball is thrown and follows the parabolic path shown above. Air friction is negligible. Point Q is the highest point on the path. Points P and R are the same height above the ground.

How do the speeds of the ball at the three points compare?

A) ~~$v_P < v_Q < v_R$~~
B) $v_P = v_R < v_Q$
C) ~~$v_Q < v_R < v_P$~~
D) ~~$v_R < v_Q < v_P$~~
(E) $v_Q < v_P = v_R$

↑ Zero ↑ equal & non zero

1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	16)	17)	18)	19)	20)	21)	22)	23)	24)	25)
B	E	D	B	B	D	A	D	A	B	A	B	B	D	C	D	E	A	A	C	A	B	C	D	E