Unit 2 Review
25 - 2 pt questions

164. If an object is moving to the right (positive) and slowing down, the acceleration is

A) positive (B) negative
C) zero

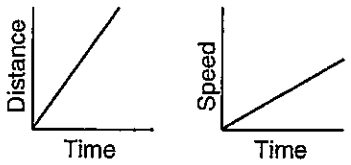
165. An object in equilibrium CANNOT be

A) moving
B) at rest
C) experiencing any forces
(D) experiencing a net force

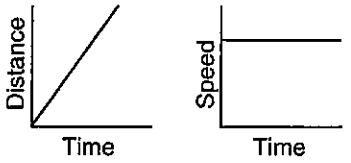
Constant V or rest

166. Which two graphs represent the motion of an object on which a uniform net force is present?

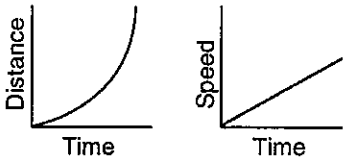
A)



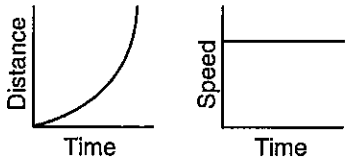
B)



(C)



D)



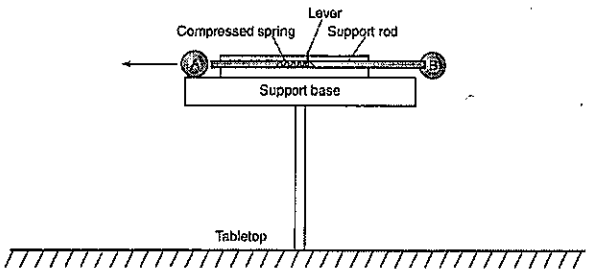
Uniform net force means uniform acceleration

167. For an object launched upward, the velocity at the high point of the path is equal to

A) 9.81m/s (B) zero
C) 4.9 m/s D) 19.6 m/s

Vertical Velocity at high pt is zero

168. The diagram below represents a setup for demonstrating motion.



When the lever is released, the support rod withdraws from ball *B*, allowing it to fall. At the same instant, the rod contacts ball *A*, propelling it horizontally to the left. Which statement describes the motion that is observed after the lever is released and the balls fall? [Neglect friction.]

A) Ball *A* travels at constant velocity.
B) Ball *A* hits the tabletop at the same time as ball *B*.
C) Ball *B* hits the tabletop before ball *A*.
D) Ball *B* travels with an increasing acceleration.

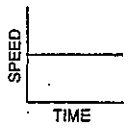
Same height
Same time

169. An object is dropped from rest and falls freely 20. meters to Earth. When is the speed of the object 9.8 meters per second?

A) during the entire first second of its fall
B) at the end of its first second of fall
C) during its entire time of fall
D) after it has fallen 9.8 meters

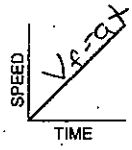
$V_f = V_i + at$
$9.8\,m/s = V_i + (9.8\,m/s)t$
$t = 1s$

170. Which graph best represents the motion of a freely falling body near the Earth's surface?

A) 

B) 

C) 

D) 

171. If the mass of an object were doubled, its acceleration due to gravity would be

A) halved
B) doubled
C) unchanged
D) quadrupled

Mass has no impact on acceleration due to gravity

172. Determine the magnitude of the average velocity of an object that starts from rest and reaches a speed of 12 m/s.

A) 12 m/s
B) 9.81 m/s
C) 0 m/x
D) 6 m/s

$\bar{V} = \frac{V_i + V_f}{2} = 6\,m/s$

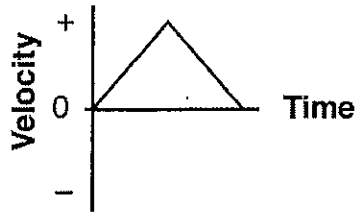
173. The slope of a velocity versus time graph is equal to

(A) acceleration
B) displacement
C) average velocity
D) net force

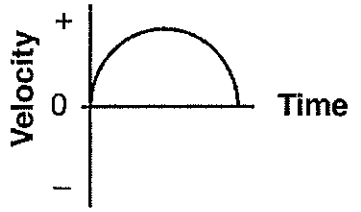
$a = \frac{\Delta V}{t}$

174. A student throws a baseball vertically upward and then catches it. If vertically upward is considered to be the positive direction, which graph best represents the relationship between velocity and time for the baseball? [Neglect friction.]

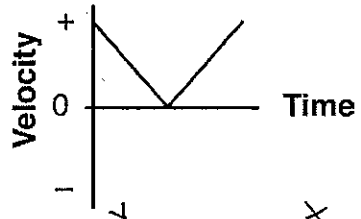
A)



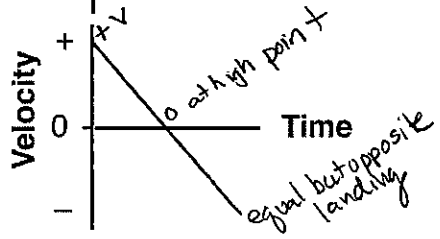
B)



C)



(D)



175. For an object launched at an angle, the vertical acceleration of the object throughout the entire time of flight is

(A) 9.8 m/s^2 downward
B) 9.8 m/s^2 upward
C) zero
D) 4.9 m/s^2

176. An cannon ball is launched vertically upward with a velocity of 20 m/s from a truck that is moving with a velocity of 20 m/s east. If the truck continues with a constant velocity, where with the cannon ball land?

(A) In the same location as the cannon/truck
B) In front of the truck
C) Behind the truck

177. Melissa accelerates down a slide at 3 m/s^2. If she starts from rest, her distance traveled each second will

(A) increase
B) remain the same
C) decrease

178. Which of the following is not a vector quantity?

A) velocity
B) acceleration
C) time
D) displacement

time is scalar

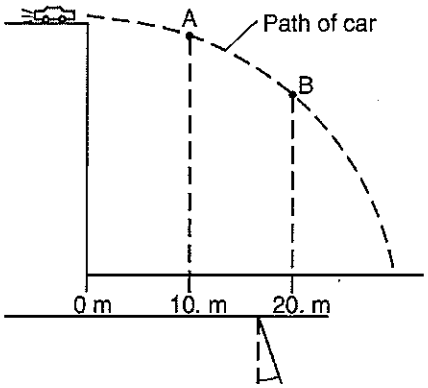
179. For an object launched at a 30 degree angle

A) the inital horizontal and initial vertical velocity will be equal
B) the initial horizontal and initial vertical acceleration will be equal
C) the initial horizontal velocity will be greater than the initial vertical velocity
D) the initial horizontal velocity will be less than the initial vertical velocity

for 30° x>y

180. **Note that the question below only has three choices.**

The diagram below represents the path of a stunt car that is driven off a cliff, neglecting friction.



Compared to the horizontal component of the car's velocity at point A, the horizontal component of the car's velocity at point B is

A) smaller
B) greater
C) the same

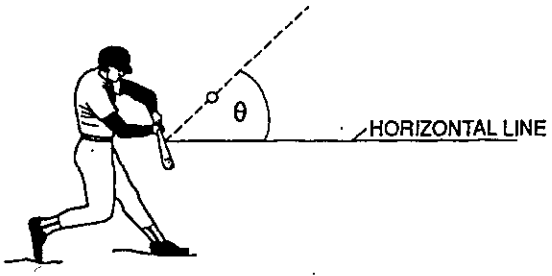
V_x does not change

181. A red ball and a green ball are simultaneously thrown horizontally from the same height. The red ball has an initial speed of 40. meters per second and the green ball has an initial speed of 20. meters per second. Compared to the time it takes the red ball to reach the ground, the time it takes the green ball to reach the ground will be

A) the same
B) twice as much
C) half as much
D) four times as much

time is dependent on height (dy)

182. The diagram below shows a baseball being hit with a bat. Angle θ represents the angle between the horizontal and the ball's initial direction of motion.

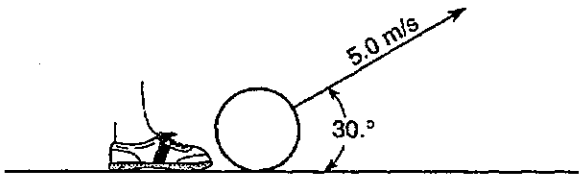


Which value of θ would result in the ball traveling the longest horizontal distance? [Neglect air resistance.]

A) 30° B) 45° C) 60° D) 75°

max range = 45°

183. Base your answer to the following question on the diagram below which represents a ball being kicked by a foot and rising at an angle of 30.° from the horizontal. The ball has an initial velocity of 5.0 meters per second. [Neglect friction.]



If the angle between the horizontal and the direction of the 5.0-meters-per-second velocity decreases from 30.° to 20.°, the horizontal distance the ball travels will

A) decrease B) increase
C) remain the same

max angle for range is 45°
or closest to 45°
20° is further so dx ↓

184. A machine launches a tennis ball at an angle of 25° above the horizontal at a speed of 14 meters per second. The ball returns to level ground. Which combination of changes *must* produce an increase in time of flight of a second launch?

A) decrease the launch angle and decrease the ball's initial speed
B) decrease the launch angle and increase the ball's initial speed
C) increase the launch angle and decrease the ball's initial speed
D) increase the launch angle and increase the ball's initial speed

both create greater v_{iy}

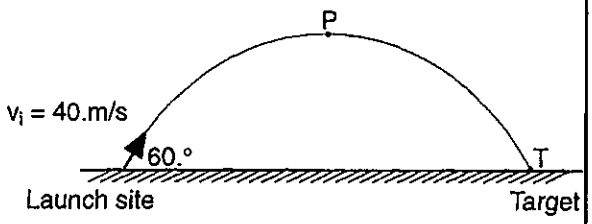
185. An archer uses a bow to fire two similar arrows with the same string force. One arrow is fired at an angle of 60.° with the horizontal, and the other is fired at an angle of 45° with the horizontal. Compared to the arrow fired at 60.°, the arrow fired at 45° has a

A) longer flight time and longer horizontal range
B) longer flight time and shorter horizontal range
C) shorter flight time and longer horizontal range
D) shorter flight time and shorter horizontal range

60°	45°
higher t higher max height	max dx

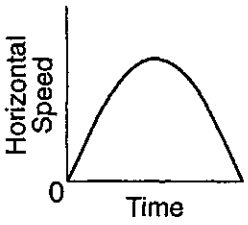
186. Base your answer to the following question on the information and diagram below.

A projectile is launched at an angle of 60.° above the horizontal at an initial speed of 40. meters per second, as shown in the diagram below. The projectile reaches its highest altitude at point *P* and strikes a target at point *T*. [Neglect air resistance.]

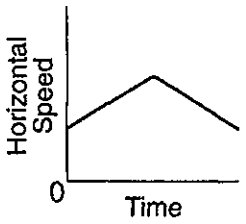


Which graph best represents the horizontal speed of the projectile as a function of time? [Neglect air resistance.]

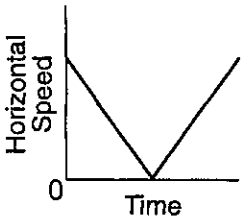
A)



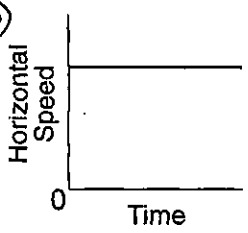
B)



C)



(D)



V_x does not change

187. A ball is fired vertically upward at 5.0 meters per second from a cart moving horizontally to the right at 2.0 meters per second. Which vector best represents the resultant velocity of the ball when fired?

A) 

B) 

C) 

(D) 

$V_{iy} > V_{ix}$ so θ must be greater than 45°

188. An "Angry Bird" is launched with the same initial velocity at several different angles. The bird lands at the same height from which it was launched. Which pair of launch angles will result in the same horizontal displacement?

(A) 20 degrees and 70 degrees
B) 45 degrees and 60 degrees
C) 10 degrees and 70 degrees
D) 50 degrees and 30 degrees

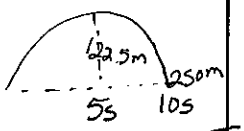
Both are 25° away from 45° which is the max range angle

Unit 2 Review

3 pt questions - show work for partial credit

189. A rocket launched from the ground reaches a maximum height of 122.5. The rocket lands a horizontal range of 250 meters away from the launch point. What are the horizontal and vertical components of the balls initial velocity?

(A) v_{ix}=25 m/s; v_{iy}=49 m/s
B) v_{ix}=50m/s ; v_{iy}=49 m/s
C) v_{ix}=0 ; v_{iy}=12.5 m/s
D) v_{ix}=49 m/s ; v_{iy}=25m/s



x	y
d_x=250m	$d_{y\,max}$=5s
whole → t=10s	a=-9.81m/s²
time V_x=25m/s	t=5s ← ½ time

falls for 122.5m so $t_{½}=\sqrt{\frac{2d}{a}}=\sqrt{\frac{2(122.5m)}{9.81m/s^2}}=5s$

190. November 10, 2014 a rocket powered bicycle set the world speed record by accelerating from rest to 92 m/s over a distance of 250m. Determine the acceleration of the rocket powered bike.

(A) 17 m/s²
B) 2.7 m/s²
C) 34 m/s²
D) 0.37m/s²

191. A soccer ball is launched with a velocity of 10 m/s at an angle of 20 degrees. What is the total time of flight for the ball?

(A) 0.7 seconds
B) 3.4 seconds
C) 2 seconds
D) 1 second

192. The Klipspringer is a small antelope with incredible jumping power. These little mammals are capable of reaching a height of 7 meters. What is the total time in the air for a jump to that height?

(A) 2.4 s
B) 1.2 s
C) 7 s
D) 1.43 s

7m → high pt
V=0

$t_{½}=\sqrt{\frac{2d}{a}}=\sqrt{\frac{2(7m)}{9.81m/s^2}}=1.2s$

$t_{all}=2.4s$

193. An owl flying horizontally at 4 m/s drops a branch from a height of 5m. What is the horizontal velocity of the branch just before it hits the ground?

A) 9.9 m/s
B) 1.01 m/s
C) 20 m/s
(D) 4 m/s

V_x does not change

194. A child riding on a bike at 5 m/s east tosses an apple directly upward at 3 m/s. What is the angle of the initial (resultant) velocity of the apple?

A) 59 degrees
(B) 31 degrees
C) 8 degrees
D) 45 degrees

$V_x=5m/s$
$V_y=3m/s$

$\theta=\tan^{-1}\left(\frac{V_{iy}}{V_x}\right)$
$\theta=31°$

Unit 2 Review

195. A projectile fired horizontally at 3 m/s from a cliff, lands a horizontal distance of 3m from the base. What is the height of the cliff?

A) 30m B) 3m
C) 4.9 m D) 49 m

x	y
$V_x = 3\,m/s$	$V_i = 0$
$d = 3m$	$a = 9.8\,m/s^2$
$t = ?$	$t = 1s$
	$d = ?$

$t = \frac{d_x}{V_x} = \frac{3m}{3\,m/s} = 1s$

$d_y = \frac{1}{2}at^2 = \frac{1}{2}(9.8\,m/s^2)(1s)^2$

196. A projectile is launched with a velocity of 40 m/s. For which launch angle is initial horizontal velocity 20 m/s?

A) 60 degrees B) 30 degrees
C) 45 degrees D) 25 degrees

$V_i = 40\,m/s$
$V_x = 20\,m/s$
$\theta = ?$

$V_{ix} = V_i \cos\theta$
$20\,m/s = 40\,m/s \cos\theta$
$\theta = 60°$

197. A space probe dropped onto Jupiter's Moon, Ganymede, reaches a final velocity of 10 m/s when dropped from a height of 36m. What will be the final velocity when dropped from a height of 18m?

A) 20 m/s B) 5 m/s
C) 14 m/s D) 7 m/s

$V_f = 10\,m/s$
$d = 36m$
$V_i = 0$
$a = ?$

$V_f^2 = V_i^2 + 2ad$
$10\,m/s^2 = 2(a)(36m)$
$a = 1.39\,m/s^2$

$V_f = ?$
$d = 18\,m$
$a = 1.39\,m/s^2$
$V_i = 0$

$V_f = \sqrt{2ad}$
$V_f = 7.07\,m/s$

or when d is ÷ 2, V_f is ÷ $\sqrt{2}$

198. On November 24, 2015 the Blue Origins team successfully launched and landed the first reusable rocket intended for space travel. On decent, the rocket used engine uniformly slowed the rocket from 175m/s downward to a safe landing speed of 2 m/s in distance of 1500m. What is the acceleration of the rocket?

A) 10.2 m/s² upward
B) 9.8 m/s² downward
C) 10.2 m/s² downward
D) 0 m/s²

$V_i = 175\,m/s$ down
$V_f = 2\,m/s$ down
$a = ?$ up
$d = 1500m$ down

$V_f^2 = V_i^2 + 2ad$
$(2\,m/s)^2 = (-175\,m/s)^2 + 2a(1500m)$
$4\,m^2/s^2 = 30625\,m^2/s^2 + (3000m)a$
$a = 10.2\,m/s^2$

199. An object falls freely from rest near the surface of Earth. What is the speed of the object after having fallen a distance at 4.90 meters?

A) 4.90 m/s B) 9.80 m/s
C) 24.0 m/s D) 96.1 m/s

$V_i = 0$
$V_f = ?$
$d = 4.9\,m$
$a = 9.81\,m/s^2$

$V_f^2 = V_i^2 + 2ad$
$V_f^2 = 2(9.81\,m/s^2)(4.9m)$
$V_f = 9.8\,m/s$

200. A bottle rocket is launched vertically and has a total flight time of 7 seconds before returning to level ground. What is the approximate launch velocity of the bottle rocket?

A) 70 m/s B) 61 m/s
C) 245 m/s D) 35 m/s

$t = 7s$

$\Delta V = at = (-9.81\,m/s^2)(7s) = -68.67\,m/s$

split ½ ΔV on way up ; ½ ΔV on way down

$V_i = 34.3\,m/s$

Unit 2 Review

201. How much time does it take an i-phone to hit the ground if it falls from a height of 35m?

A) 3.5 s
B) 17.5 s
C) 2.6 s
D) 7.0 s

Falling From rest $t = \sqrt{\frac{2d}{a}} = \sqrt{\frac{2(35m)}{9.81 m/s^2}}$

202. A stuntman runs horizontally off of a roof and catches a railing of a porch 10m across an alley and 15 m below his departure location. What is the stuntman's initial horizontal velocity?

A) 10 m/s
B) 3.3 m/s
C) 5.9 m/s
D) 1.5 m/s

x	y
$d = 10m$	$d_y = 15m$
	$v_i = 0$
	$a = 9.8 m/s^2$
	$t = ?$

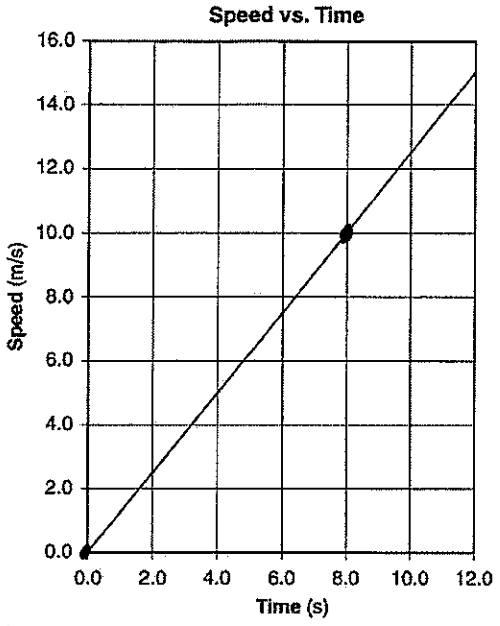
$t = \sqrt{\frac{2d_y}{a}} = 1.75s$

$v_x = \frac{d_x}{t} = \frac{10m}{1.75s}$

$v_x = 5.7 m/s$

Unit 2 Review
Long Answer

203. The graph below represents the motion of a penguin as it slides down an icy hill.



a) Determine the acceleration of the penguin. (2 pts)

$a = \text{slope} = \frac{\Delta v}{t} = \frac{10\ m/s}{8\ s} = 1.25\ m/s^2$

b) What is the distance covered by the penguin after 8 seconds? (2 pts)

$d = \text{area} = \frac{1}{2}(10\ m/s)(8\ s)$ 40m

204. A skateboarder moving to the right with a velocity of 15 m/s hits a rough patch of gravel and slows uniformly to rest over a distance of 5m.

a) Sketch the graph of position vs time for this motion assuming the right is positive. [2 pts]

b) How much time is required for the skateboarder to come to a rest? (Show all work including equation and substitution with units) [2 pts]

$v_i = 15\ m/s$
$v_f = 0$
$d = 5m$
$t = ?$

$\bar{v} = \frac{v_i + v_f}{2}$
$\bar{v} = 7.5\ m/s$
$t = d/v = \frac{5m}{7.5\ m/s} = .67s$

.67s

c) What is the acceleration of the skateboarder? (Show all work including equation and substitution with units) [2pts]

$a = \frac{\Delta v}{t} = \frac{15\ m/s}{.67s} = 22.4\ m/s^2$

OR $v_f^2 = v_i^2 + 2ad$
$0 = (15\ m/s)^2 + 2a(5m)$
$a = 22.4\ m/s^2$

$a = 22.4\ m/s^2$