Exam 1 Solved

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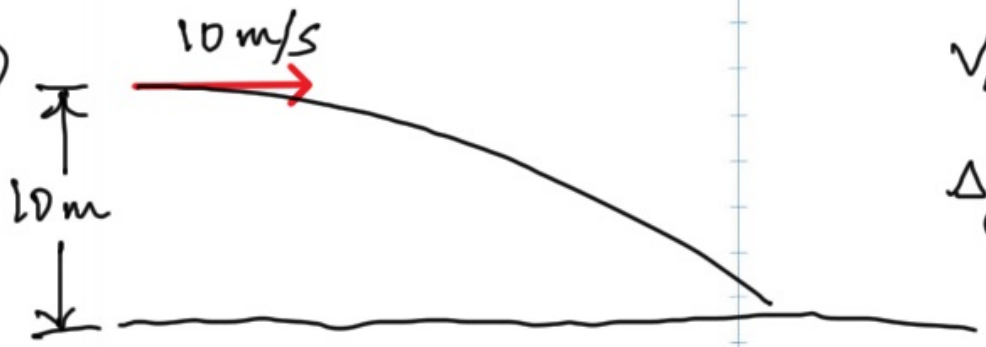


$V_{0y} = 0$

$a = -9.8 \frac{m}{s^2}$

$\Delta y = -10\ m$

$t = ?$

$\Delta y = V_0 t + \frac{1}{2} a t^2$

$-10 = \frac{1}{2}(-9.8) t^2$

$-10 = -4.9 t^2$

$t = 1.43\ s$

$V_{0x} = 10 \frac{m}{s}$

$\Delta x = ?$

$t = 1.43\ s$

$\Delta x = V_{0x} \cdot t$

$= \left(10 \frac{m}{s}\right)(1.43\ s) = 14\ m$

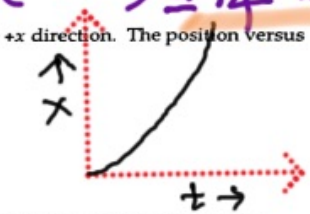
1) An object is moving with constant non-zero acceleration in the $+x$ direction. The position versus time graph of this object is 1) _____

A) a horizontal straight line.

B) a vertical straight line.

C) a straight line making an angle with the time axis.

D) a parabolic curve.



2) A girl throws a rock horizontally, with a velocity of 10 m/s, from a bridge. It falls 20 m to the water below. How far does the rock travel horizontally before striking the water, assuming negligible air resistance? 2) _____

A) 14 m B) 16 m C) 20 m D) 24 m

3) You drive 6.0 km at 50 km/h and then another 6.0 km at 90 km/h. Your average speed over the 12 km drive will be 3) _____

A) equal to 70 km/h.
B) less than 70 km/h.
C) exactly 38 km/h.
D) greater than 70 km/h.
E) It cannot be determined from the information given because we must also know directions traveled.

time $t_1 = \frac{6.0\ km}{50\ km/h}$ $t_2 = \frac{6.0\ km}{90\ km/h}$

total time $= \frac{6}{50} + \frac{6}{90}$

$= 0.18\ h$

4) A weight lifter can bench press 199 kg. How many milligrams (mg) is this? 4) _____

A) 1.99×10^8 mg B) 1.99×10^9 mg C) 1.99×10^7 mg D) 1.99×10^6 mg

4) $199\ kg \times \frac{10^6\ mg}{1\ kg}$

$= 1.99 \times 10^8\ mg$

5) Your motorboat can move at 30 km/h in still water. What is the *minimum* time it will take you to move 12 km downstream in a river flowing at 6.0 km/h? 5) _____

A) 24 min B) 20 min C) 30 min D) 22 min

average Speed $= \frac{\text{total distance}}{\text{total time}}$

$= \frac{12.0\ km}{0.18\ h}$

$= 66.7\ km/h$

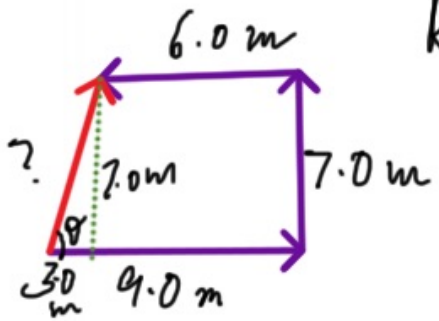
6) For general projectile motion with no air resistance, the horizontal component of a projectile's acceleration 6) _____

A) continuously decreases.
B) continuously increases.
C) is always zero.
D) remains a non-zero constant.
E) first decreases and then increases.

5) time $= \frac{\text{distance}}{\text{speed}} = \frac{12\ km}{(30+6)\ km/h}$

$= 0.33\ h$

$= 20\ min$



$$\text{Resultant} = \sqrt{7.0^2 + 3.0^2} = \sqrt{49+9} = \sqrt{58}$$
$$= 7.6\ m$$
$$\tan\theta = 7.0\,m / 3.0\,m = 2.33$$
$$\theta = \tan^{-1} 2.33$$
$$= 67^\circ \text{ north of East}$$

7) Vector $\vec{A}$ has a magnitude of 9.0 m and points east, vector $\vec{B}$ has a magnitude of 7.0 m and points north, and vector $\vec{C}$ has a magnitude of 6.0 m and points west. The resultant vector $\vec{A} + \vec{B} + \vec{C}$ is given by 7) _____

A) 2.0 m at an angle 67° north of east.
B) 2.0 m at an angle 67° east of north.
C) 7.6 m at an angle 67° north of east.
D) 3.8 m at an angle 67° north of east
E) 7.6 m at an angle 67° east of north.

$$V_0 = 60\ km/h = 60 \times \frac{5}{18} = 16.7\ \frac{m}{s}$$
$$V_f = 90\ km/h = 90 \times \frac{5}{18} = 25\ \frac{m}{s}$$
$$a = 2.0\ m/s^2 \quad t = ?$$

8) A car initially traveling at 60 km/h accelerates at a constant rate of 2.0 m/s^2. How much time is required for the car to reach a speed of 90 km/h? 8) _____

A) 45 s B) 4.2 s C) 15 s D) 30 s

$$\frac{V_f - V_0}{a} = t$$
$$t = \frac{(25 - 16.7)}{2.0} = 4.2\,s$$

9) To determine the height of a bridge above the water, a person drops a stone and measures the time it takes for it to hit the water. If the height of the bridge is 41 m, how long will it take for the stone to hit the water? Neglect air resistance.

A) 2.3 s B) 3.2 s C) 2.6 s D) 2.9 s E) 3.6 s

10) An athlete competing in the long jump leaves the ground with a speed of 9.14 m/s at an angle of 55° with the vertical. What is the length of the athlete's jump if air resistance is of no significance?

A) 4.0 m B) 0.88 m C) 8.0 m D) 17 m E) 12 m

9) ____ $V_0 = 0$ m/s

$a = -9.8$ m/s²

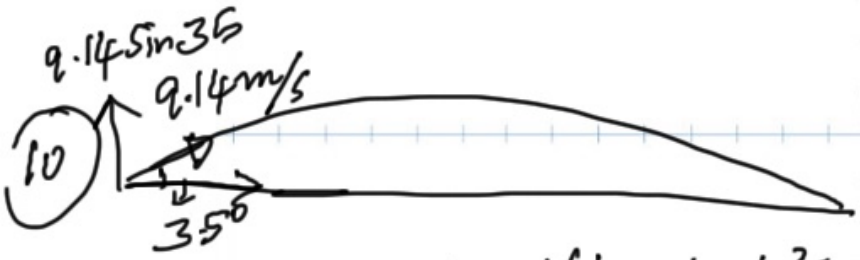
$\Delta y = -41$ m

10) ____ $t = ?$

$\Delta y = V_0 t + \frac{1}{2} a t^2$

$-41 = -4.9 t^2$

$t = 2.9$ s



$V_{0x} = 5.24 \frac{m}{s}$

$a = -9.8 \frac{m}{s^2}$

$\Delta y = 0$

$t = ?$

$\Delta y = V_0 t + \frac{1}{2} a t^2$

$0 = 5.24t - 4.9t^2$

$\frac{4.9t^2}{4.9} = \frac{5.24t}{4.9}$

$t = 1.0$ s

$\Delta x = V_{0y} \cdot t = (9.14 \cos 35)(1.0 s)$

$= 8.82$ m

11) $\frac{1500\ m}{2.0\ \frac{m}{s}} = 750\ s$

12) $V_0 = 14\ \frac{m}{s}$, $t = 2s$, $V_f = 10\ \frac{m}{s}$, $\Delta x = ?$

$V_f^2 = V_0^2 + 2a\Delta x$

but $a = (V_f - V_0)/t$

$a = (10 - 14)/2$

$= -2\ m/s^2$

$100 = 196 \cancel{+(2)\cdot 2}\cdot\Delta x$

11) On a calm day with no wind, you can run a 1500-m race at a velocity of 4.0 m/s. If you run the same race on a day when you have a constant headwind that slows your speed by 2.0 m/s, how much time would it take you to finish the race? 11) ____

A) 250 s B) 1125 s C) 9000 s D) 750 s

$+\frac{96}{4} = \Delta x$

$\Delta x = 24\ m$

12) An object is moving in a straight line with constant acceleration. Initially it is traveling at 14 m/s. Two seconds later it is traveling at 10 m/s. How far does it move during this time? 12) ____

A) 20 m B) 24 m C) 32 m D) 28 m

13) A laser is thrown upward with a speed of 11 m/s on the surface of planet X where the acceleration due to gravity is 5.5 m/s^2 and there is no atmosphere. What is the maximum height reached by the laser?

A) 33 m B) 11 m C) 9 m D) 2.0 m

13) ____

$V_0 = 11$ m/s $\Delta y = ?$

$a = -5.5$ m/s^2

$V_f = 0$

$V_f^2 = V_0^2 + 2a\Delta y$

$0 = 121 - (2)(5.5)\Delta y$

$\Delta y = \frac{121}{11} = 11$ m

14) What is the sum of 1123 and 10.3 written with the correct number of significant figures?

A) 1133.3000 B) 1133 C) 1133.3 D) 1.1×10^3 E) 1.13×10^3

14) ____

15) A projectile is fired at an angle above the horizontal at a location where $g = 9.8$ m/s^2. The initial x and y components of its velocity are 86.6 m/s and 50 m/s respectively. At what angle was the projectile fired above the horizontal?

A) 75° B) 60° C) 30° D) 45° E) 90°

15) ____

$V_{0x} = 86.6$ m/s

$V_{0y} = 50$ m/s

$\tan\theta = \frac{V_{0y}}{V_{0x}} = \frac{50}{86.6} = 0.5773$

$\theta = \tan^{-1}(0.5773) \Rightarrow \theta = 30°$

16) A motorist travels for 3.0 h at 80 km/h and 2.0 h at 100 km/h. What is her average speed for the trip? 16) ____

A) 88 km/h B) 85 km/h C) 92 km/h D) 90 km/h

$d_1 = (80)3 = 240$ km

$d_2 = (100)2 = 200$ km

$\text{Av. Speed} = \frac{\text{Total distance}}{\text{Total time}} = \frac{440 \text{ km}}{5.0 \text{ h}} = 88 \text{ km/h}$

17) What is $\frac{0.558}{0.61}$ to the proper number of significant figures? 17) ____

A) 0.915 B) 0.9148 C) 0.9 D) 0.91

18) A ball is thrown straight up with a speed of 36 m/s. How long does it take to return to its starting point, assuming negligible air resistance? 18) ____

A) 3.7 s B) 11 s C) 7.3 s D) 15 s

$V_0 = 36 \text{ m/s}$, $a = -9.8 \frac{m}{s^2}$, $t = ?$ $\Delta y = 0$

$\Delta y = V_0 t + \frac{1}{2} a t^2$

$0 = 36\cancel{t} - 4.9 t^{\cancel{2}} \Rightarrow t = \frac{36}{4.9} = 7.3 \text{ s}$

19) The number 0.003010 has 19) ____

A) 7 significant figures. B) 6 significant figures.

C) 4 significant figures. D) 2 significant figures.

20) A car travels at 15 m/s for 10 s. It then speeds up with a constant acceleration of 2.0 m/s^2 for 15 s. At the end of this time, what is its velocity? 20) ____

A) 30 m/s B) 15 m/s C) 45 m/s D) 375 m/s

$V_0 = 15 \frac{m}{s}$, $a = 2.0 \frac{m}{s^2}$, $t = 15 \text{ s}$, $V_f = ?$

$V_f = V_0 + at \Rightarrow V_f = 15 + (2.0)(15) = 45 \frac{m}{s}$