

Unit 1 Sample Questions and Problems

U1Q1

The length of a block was measured to be $11.23 \text{ cm} \pm 0.03 \text{ cm}$ the vernier caliper used to measure the block has an uncertainty of 0.01 cm . Determine the total uncertainty in the measurement.

- A) 0.04 cm B) 0.032 cm C) 0.001 cm D) 0.2 cm

U1Q2

A wooden block was found to have a volume of $357.5 \pm 2.95 \text{ cm}^3$ and a mass of $205.2 \pm 0.03 \text{ grams}$ determine the density and its uncertainty.

- A) $0.574 \pm 0.008 \text{ grams/cm}^3$ B) $1.74 \pm 0.015 \text{ cm}^3/\text{grams}$
C) $0.574 \pm 0.005 \text{ grams/cm}^3$ D) $1.74 \pm 0.008 \text{ cm}^3/\text{grams}$

U1Q3

From a plotted graph a student determined that the best fit line had a slope of 1.27 m/s^2 and a y-intercept of 0.32 m/s . And that the worst fit line has a slope of 1.44 m/s^2 and a y intercept of 0.29 m/s . Determine the uncertainty for the slope of the line.

- A) 0.17 m/s^2 B) 0.03 m/s C) 1.44 m/s D) 0.29 m/s

U1P1

A group of students made the following measurements for the width of a block of wood. 6.52 cm , 6.49 cm , 6.51 cm , 6.52 cm and 6.50 cm . Determine the average width and its standard deviation.

Unit 2 Sample Questions and problems

U2Q1

In the Newton's 2nd Law experiment, a cart and added mass was connected by a string to a hanging mass. When released it accelerated down a track. The hanging mass W_2 was increased by moving mass from the cart to the hanging mass. The accumulated data was then plotted as W_2 vs. acceleration. A best fit straight line was drawn to the data. What does the slope of this line represent?

- A) the mass of the cart
B) the force of friction
C) the hanging mass
D) the total mass of the system.

U2Q2

A group of students determined that the following points were upon the best fit line for a graph of W_2 vs. a , (0, 0.025) and (1.89, 3.01). A cart of unknown mass was used along with an additional 0.75 kg of mass. Determine the total mass of the system.

- A) 0.75 kg B) 0.83 kg C) 1.58 kg D) 2.33 kg

U2Q3

From the information given in the question above determine the mass of the cart.

- A) 0.75 kg B) 0.83 kg C) 1.58 kg D) 2.33 kg

U2P1

Complete the data table and using the least squares fit equations determine the slope and y-intercept for the data.

Run #	y axis value W_2 (N)	x axis value a (m/s^2)	(x axis value) ² a^2 (m/s^2) ²	y *x $(W_2)(a)$
1	2.45	1.18		
2	4.90	2.40		
3	7.35	3.63		
4	9.80	4.85		
Σ				

Slope = _____ (_____) y-intercept = _____ (_____)

Unit 3 Sample Questions and Problems

U3Q1

Determine the magnitude and direction of the **equilibrant** for the following forces
350@35° and 450@145°.

- A) 466@100° B) 466@280° C) 800@110° D) 800@290°

U3Q2

Which of the following set of vectors could not result in a net displacement of zero if you were free to orientate them in any desired direction?

- A) { 45,45,45} C) {25, 35, 60}
B) { 5, 10, 15, 35} D) {90,90,100}

U3P1

Graphically determine the equilibrant of the following vectors.

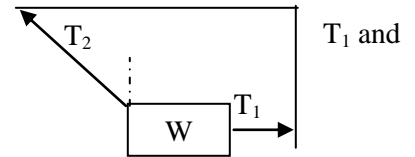
$$V_1 = 250@0^\circ, V_2 = 400@135^\circ \text{ and } V_3 = 300@225^\circ.$$

U3P2

Given the following forces determine the **equilibrant**. 250@0°, 345@55°, 540@200°, and 125@300°.

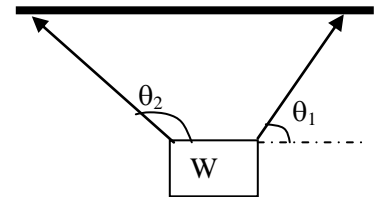
U3P3

For the diagram shown to the right $W = 400 \text{ N}$ and $\theta_2 = 55^\circ$. Determine the tensions T_1 and T_2 .



U3P4

For the figure to the right determine the tensions T_1 and T_2 when $\theta_1 = 28^\circ$
 $\theta_2 = 145^\circ$ and W is 250 N.



U4Q1

In the "Uniform Circular Motion" lab a group of students are to spin a 500 gram mass with a constant centripetal force of 5.88 N at a radius of 17.0 cm, they are to measure the period and then increase the radius and repeat the measurement for 5 different radii. If they plot V^2 vs. r what is the expected slope of the linear line that should result from their plotted data.

- A) 11.76 m/s^2 B) 0.012 m/s^2 C) $11.76 \text{ s}^2/\text{m}$ D) $0.012 \text{ s}^2/\text{m}$

U4Q2

A light car and a heavy SUV round a curve, each traveling at the same velocity. A passenger in the light car would experience _____ centripetal acceleration than the a passenger in the SUV.

- A) lesser B) the same C) greater

U4Q3

A spinning mass is kept at a constant centripetal force and radius and the velocity is measured. If during each trial the mass of the spinning mass is incrementally increased, while the centripetal force and radius is kept constant, what is the expected trend for the velocity of the mass?

- A) decreasing B) remain the same C) increasing

U4P1

A 500 gram mass is connected to a spring and undergoing uniform circular motion. The radius is at 14.5 cm and the applied centripetal force is 5.88N. The velocity of the spinning mass is measured to be 1.31 m/s.

Keeping the force and mass constant the radius of the bob was increased by 1 cm.

What should be the expected velocity of the spinning mass at the new radius/?

If three more data runs were taken with each increasing the radius by 1 cm; what would be the expected slope of the line for a graph of v^2 vs. radius (m)

Unit 5 Sample Questions and Problems

U5Q1

A projectile is fired horizontally from a height of 90cm from the floor and strikes the floor at a horizontal distance of 1.89 meters away from where it was fired. Determine the time it takes for the projectile to strike the floor.

- A) 4.28 s B) 0.184s C) 0.429s D) 0.135s

U5Q2

What would be the initial velocity of the projectile in sample U5Q1.

- A) 0.441 m/s B) 4.41 m/s C) 10.3 m/s D) 14 m/s

U5P1

A 75 gram ball is fired into a 200 gram pendulum and the center of gravity of the pendulum-ball rises to a height of 2.5 cm. The length from the pivot point to the center of gravity of the pendulum-ball is 30cm. Determine the initial velocity of the ball.

U5P2

A projectile is fired horizontally off a table at a height of 95 cm. It lands 2.10 meters away. What is the initial velocity of the projectile?

If the projectile is then fired at an angle of 35° from the horizontal at a height of 1.10 m with the same initial velocity found above, what would be the range of the projectile?

Unit 6 Sample Questions and Problems

U6Q1

A 200 gram mass is placed upon a balance table at (0,3) it would produce a torque about the

- A) x –axis B) y – axis C) z – axis

U6Q2

Where would a 100 gram mass be placed to bring the balance table into equilibrium?

- A) (0,-3) B) (-3,0) C) (0,-6) D) (6,0)

U6P1

Located on a balance table are the following masses and their positions.

100 gm @(0,4), 200gm@(2,-5), 300gm@(3,7) and 400gm(5,0).

Determine the total torque about the x and y axis.

Determine the location of the center of gravity for these masses.

Where would a 1000 gm mass be placed to bring the system into equilibrium?

U6P2

An irregular shaped object has a mass of 325 grams and is placed upon a balance table. The table is brought into equilibrium by placing 2 100 gram masses at (2,0) and (0,3). Where on the balance table is the location of the center of mass for the object?

Sample Problems and Questions

U7Q2

A 550 gram mass is suspended from a spring. The mass is stretched 1 cm and released. A period of 0.50s is measured. What is the spring constant for the spring?

- A) 13.8N/m B) 43.4 N/m C) 27.6 N/m D) 86.9 N/m

U7Q1

In the Hooke's Law experiment the slope of the plotted data for a graph of the Force to stretch the spring vs. the elongation of the spring represents

- A) the initial tension B) the spring constant
C) the work to stretch the spring D) the equilibrant

U7P1

A 1.5 kg mass is attached to a spring with a spring constant of 110N/m. It is stretched 2.5 cm and released. What is the period of the simple harmonic motion?

What is the potential energy stored in the spring prior to its release?

What is the velocity of the object as it passes through the equilibrium position?

Unit 8

This is a new unit and there are not any sample questions or problems available.

Unit 9 Sample Problems and Questions

U9Q1

Within a resonance tube antinodes are measured to be at 3 cm and 14.5 cm using a frequency of 1500Hz. What would be the measured speed of sound?

- A) 172.5 m/s B) 17250 m/s C) 345 m/s D) 34500 m/s

U9Q2

At an air temperature of 27° what is the expected speed of sound.

- A) 347.9 m/s B) 331.7 m/s C) 358.7 m/s D) cannot be determined

U9Q3

A 60 cm long metal bar is clamped at its center. The expected wavelength created when the bar is struck along its length is

- A) 0.6 m B) 0.3 m C) 1.2 m d) 0.9 m

U9P1

A 605 gram aluminum bar has the following dimensions length 0.75 m, width 0.010 m and height 0.030 m. The bar is clamp at its center and struck along its length, the measured frequency is found to be 3333 Hz. Determine the measured speed of sound within the metal bar.

The Young's modulus for aluminum is 6.7×10^{10} .

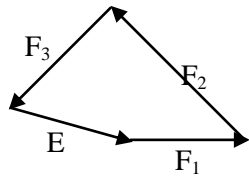
Determine the theoretical speed of sound for the metal bar.

Answers to questions and problems

U1Q1 B
 U1Q2 C
 U1Q3 A
 U1P1 Avg = 6.508 cm
 s.d. = 0.013 cm

U2Q1 D
 U2Q2 C
 U2Q3 B
 U2P1 slope = 2.00 kg
 y-intercept = 0.09 N

U3Q1 B
 U3Q2 B
 U3P1



U3P2 11 @ 106°
 U3P3 $T_1 = 697\text{N}$ $T_2 = 571\text{ N}$
 U3P4 $T_1 = 229\text{ N}$ $T_2 = 247\text{ N}$

U4Q1 A
 U4Q2 B
 U4Q3 A
 U4P1 1.35 m/s, 11.76 m/s²

U5Q1 C
 U5Q2 B
 U5P1 2.57m/s
 U5P2 4.77 m/s 3.239 m

U6Q1 A
 U6Q2 C
 U6P1 $L_x = 1500\text{ gm-in}$, $L_y = 3300\text{ gm-in}$
 $x_{c.g} = 3.3\text{ in}$ $y_{c.g} = 1.5\text{ in}$
 (-3.3, -1.5)
 U6P2 (-0.62,-0.92)

U7Q1 D
 U7Q2 B
 U7P1 $T = 0.734\text{s}$
 $PE = 3.44 \times 10^{-2}\text{J}$
 $v = 0.214\text{m/s}$

U9Q1 C
 U9Q2 A
 U9Q3 C
 U9P1 4999.5 m/s
 4991.6 m/s