

Physics 211 Pre-Class Questionbanks and Topics

MC designates a pool of multiple choice questions, one of which is selected randomly. Questionbanks are labeled 1, 2, .. and topics within questionbanks are labeled a), b),.....

1displace_ave_velocity

Calculate the displacement and average velocity between 2 times given $x(t)$.

1Ave_inst_velocity

- a) Calculate the average velocity between 2 times and the instantaneous velocity at a given time from $x(t)$.
- b) MC(algorithmic):determine average acceleration between 2 times of tennis ball bouncing off a wall.

2falling_object

- a) Calculate time it takes for ball to drop from building and speed it will have when it reaches bottom given height.
- b) Same as (a) except ball is thrown down with given speed.

3add_vectors

Calculate length of vector and angle it makes with x axis from components.

3horizproj

Calculate time of flight and horizontal distance covered by a horizontal projectile.

3projectile

- a) Calculate time of flight and range for projectile given launch angle and speed.
- b) Calculate range and maximum height for projectile given launch angle and speed.

4Uniform_circ_motion

Calculate radial component of acceleration and angle of displacement for particle in circular motion given speed and radius.

5Block_slides_on_truck

Calculate maximum acceleration of truck in order that a block on it not slide; calculate block's acceleration when block slides, given coefficients of kinetic and static friction.

5pullblock_w/wo_friction

- a) Calculate various quantities when a block is pulled at a given angle by a string with and without kinetic friction.
- b) Calculate component of acceleration of block moving on horizontal surface and connected to a falling block, given friction force.

6conical_pendulum

Calculate various quantities (such as speed, etc.) of conical pendulum given other quantities (such as tension, radius, etc.).

7dotproducts

Calculate dot product of two vectors and the angle between them given their components.

7Skidding_car

Calculate work done by friction force on skidding car and final speed afterwards.

8blockupplane

Calculate speed of moving block after it travels a certain distance up an inclined plane and determine how high it goes.

9blockspringplane

Calculate speed of block at bottom of inclined plane and determine how much it subsequently compresses a spring (all surfaces frictionless).

9blockplanefricspring

Calculate speed of block at bottom of inclined plane and determine how much it subsequently compresses a spring (plane has friction, horizontal surface is frictionless).

9PotentialEnergyGraph

- a) Calculate, given $U(x)$, the value of the x-component of force at specified x ; the value of x where force vanishes; algebraic expression for x-component of force.
- b) Calculate, given $U(x)$ and total energy, the value of the kinetic energy at a specified x ; the value of x where force vanishes; algebraic expression for x-component of force.

10Center_of_Mass

Calculate x and y components of the center of mass for four point masses.

11runner_and_plank

Calculate various quantities with sprinter running on a plank on ice pond: speed of plank; location of system center of mass; distance plank and sprinter move.

12BlocksColliding

Calculate common speed and energy loss after inelastic collision of two blocks

13rotationalkinemtics

- a) Calculate, given the angular acceleration and initial angular velocity, the angular velocity of a rotating wheel at a specified time and elapsed time before it stops.
- b) Calculate, given the angular acceleration and initial angular velocity, the elapsed time before a rotating wheel stops and the total angle through which it turns.

14calculatetorque

Calculate magnitude of the torque and the lever arm for a force acting at a specified point and in a specified direction.

14BlockPulley

Calculate angular acceleration of a rotating pulley attached to a falling block and the mass of the block, given string tension.

14BlockPulleyv2

Calculate angular acceleration of a rotating pulley attached to a falling block and the string tension.

15KEofsphere

Calculate the kinetic energy of a sphere about a fixed axis through its center and one tangent to its surface.

15CylinderdownRamp

Calculate the speed of the center of mass and the magnitude of the angular velocity of a cylinder at the bottom of an inclined plane it has rolled down it without slipping.

16Ang_MomentumCons

Calculate the angular velocity of a merry-go-round after a cat drops onto its edge from a tree and also after the cat has walk halfway towards its center.

17statics

Calculate the string tension and vertical pivot force for a pivoted plank on which a flower pot sits with a string holding the plank in a horizontal position.

18FindMass_EnergyofSatellite

Calculate mass of the planet and total energy of a satellite, given the satellite mass and radius of motion.

18SpeedperiodSatellite

Calculate the speed and period of an earth satellite, given its radius of motion.

18FallingSatellite

Calculate the speed of an earth satellite before it strikes the earth assuming it falls from rest from a given radius; calculate the same speed assuming the acceleration was a constant value g .

19cube_submerged_influid

Calculate pressure in fluid at a given depth and buoyant force on a submerged cube.

19Bernoulli

Calculate the speed and pressure of water at point 2 in a pipe, given values of these quantities at point 1, cross sections, and change in height.

20HarmonicOscillator

Calculate the maximum speed and period of motion for a block at the end of a spring.

20HarmonicOscEquation

Calculate, given $x(t)$ for an object undergoing simple harmonic motion, the value of the frequency and the magnitude of the maximum acceleration of the object.

20PhysicalPendulum

Calculate the period of a physical pendulum (rod) when pivoted about its end and halfway between its midpoint and end.

21traveling_wave

Calculate, given the form of a sinusoidal traveling wave on a string, its wavelength, speed, and direction.

22standing_waves

- a) Calculate the wavelength and frequency of a standing wave on a string, given string tension, string length, and number of nodes.
- b) Calculate properties (such as ratio of tensions) of two strings having standing waves of different modes but same frequency and mass/length.

23FirstLawofThermo_Pvdiagram

Calculate how much work is done by a gas on part of a cyclic reversible process and how much heat is absorbed by the gas during the whole process.

24TempConversion_IdealGasLaw

Calculate the Kelvin temperature of an ideal gas from the Fahrenheit temperature and the new temperature if it expands at constant pressure to a new volume.

24IdealGasLaw_2gases

Calculate the partial pressure of one gas in a mixture of two gases, given the pressure of the other gas and number of moles of each; also calculate the volume of the mixture.

25 Kinetic Theory of Gases

Calculate the root-mean-square speed of Helium molecules in a gas at a given temperature; calculate the temperature if the speed is doubled.