



*Physics Assignment for Pre - University
Remedial Program.*



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Physics Department

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- Q1.** A car is travelling 30 m/s and applies its breaks to stop after a distance of 150 m. How fast is the car going after it has travelled $\frac{1}{2}$ the distance?
- Q2.** A car accelerates uniformly from rest. If it travels a distance D in time t then how far will it travel in a time 2t?
- Q3.** Using **Q2** and If the car has speed v at time t then what is the speed at time 2t?
- Q4.** Two boxes are connected by a string over a frictionless pulley. Box 1 has mass 1.5 kg, box 2 has a mass of 2.5 kg. Box 2 starts from rest 0.8 meters above the table, how long does it take to hit the table. Compare the acceleration of boxes 1 and 2.
- Q5.** A 3.0 kg mass undergoes an acceleration given by $\mathbf{a} = (2.0\hat{\mathbf{i}} + 5.0\hat{\mathbf{j}})\text{m/s}^2$. Find the resultant force $\mathbf{F}$ and its magnitude.
- Q6.** While two forces act on it, a particle of mass $m = 3.2$ kg is to move continuously with velocity $\mathbf{v} = (3 \text{ m/s})\hat{\mathbf{i}} - (4 \text{ m/s})\hat{\mathbf{j}}$. One of the forces is $\mathbf{F}_2 = (2 \text{ N})\hat{\mathbf{i}} + (-6 \text{ N})\hat{\mathbf{j}}$. What is the other force?
- Q7.** A jet engine generates 160 kN of force as it propels a 20 000 kg plane down a runway. If 40 kN of friction opposes the motion of the plane, how much time will it take for the plane to reach a speed of 33 m/s from rest.
- Q8.** A spaceship moving at 1000 m/s releases a satellite of mass 1000 kg at a speed of 10000m/s. What is the mass of the spaceship if it slows down to a velocity of 910 m/s?
- Q9.** A toy rocket has a mass of 350 g at launch. The force it produces is 15 N and it is fired at an angle of 65° to the horizontal. What is the initial acceleration of the rocket as a vector?
- Q10.** A bar is 20 cm long. A 100 g mass is placed on one end and a 150 g mass on the other. Where is the balance point of the bar?
- Q11.** A is a sphere that is travelling with a velocity of (3, 7) m/s and had a mass of 5 kg. It collides with sphere B and both particles move together with a velocity of (1, 4) m/s after the collision. Sphere B has a mass of 4 kg. Find the velocity of B before the collision.
- Q12.** A ball of mass 4 kg falls on to the floor with a velocity of [4.9] m/s. It bounces off the floor with a velocity of [4.9] m/s. What is the impulse of the ball? The ball changes direction in 0.15 s. What is the force exerted by the floor on the ball?
- Q13.** A person is dragging a 15 kg box along flat ground using a length of rope. The rope is at angle of 30° to the horizontal and the person is pulling with a force of 58 N. Work out the coefficient of kinetic friction between the box and the ground.



Q14. A truck is facing down a slope of 5° . The truck has a mass of 3000 kg. The driver lets off the brake and the truck accelerates down the slope. What is the acceleration of the truck? What is the acceleration as a vector in component form?

Q15. A car is travelling at 50 km/h. The driver sees a child run out into the road 5 m ahead. She applies the brakes and the car stops in 5 seconds. The driver's thinking time is 1.5 s.

- A) Will the car stop in time?
- B) If the driver's thinking time is increased to 2.5 s, will the car stop in time?
- C) What happens if the thinking time is 1.5 s but the car is travelling at 64 km/h?

Q16. A boy is swinging a toy on a piece of string in a vertical circle. The toy has a mass of 150g and the radius of the circle is 0.8 m.

A) He swings the toy with a linear velocity of 2 m/s. Will the toy move in a circle? Explain your answer.

B) Another boy swings the toy with a linear velocity of 3.5 m/s. Work out the tension in the string at the top of the circle, at the bottom of the circle and halfway between the top and the bottom of the circle.

Q17. Two cars A and B are moving along a straight road in the same direction with velocities of 25 km/h and 30 km/h, respectively. Find the velocity of car B relative to car A.

Q18. Two aircraft P and Q are flying at the same speed, 300 m s^{-1} . The direction along which P is flying is at right angles to the direction along which Q is flying. Find the magnitude of the velocity of the aircraft P relative to aircraft Q.

ENJOY!