

Exemplar Questions

1. (a) A particle falls from rest from a point P . When it has fallen a distance 19.6 m a second particle is projected vertically downwards from P with initial velocity 39.2 m s^{-1} .
The particles collide at a distance d from P .

Find the value of d .

Exemplar Questions

1. (b) A car, starts from rest at A , and accelerates uniformly at 1 m s^{-2} along a straight level road towards B , where $|AB| = 1914 \text{ m}$. When the car reaches its maximum speed of 32 m s^{-1} , it continues at this speed for the rest of the journey.

At the same time as the car starts from A a bus passes B travelling towards A with a constant speed of 36 m s^{-1} . Twelve seconds later the bus starts to decelerate uniformly at 0.75 m s^{-2} .

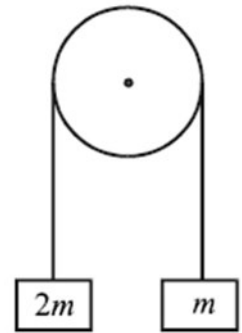
- (i) The car and the bus meet after t seconds. Find the value of t .
- (ii) Find the distance between the car and the bus after 48 seconds.

Exemplar Questions

4. (a) Two particles, of masses $2m$ and m , are attached to the ends of a light inextensible string which passes over a fixed smooth light pulley.

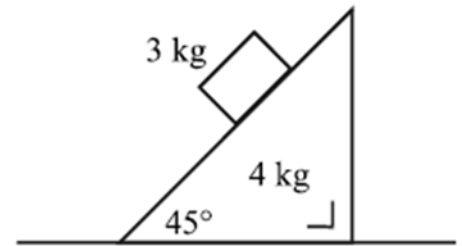
The system is released from rest with both particles at the same horizontal level.

- (i) Find the acceleration of the system, in terms of g .
- (ii) The string breaks when the speed of each particle is v . Find, in terms of v , the vertical distance between the particles when the string breaks.



Exemplar Questions

- (b) A smooth wedge of mass 4 kg and slope 45° rests on a smooth horizontal surface. A particle of mass 3 kg is placed on the smooth inclined face of the wedge. The system is released from rest.



- (i) Show, on separate diagrams, the forces acting on the wedge and on the particle.
- (ii) Find the acceleration of the particle relative to the wedge.
- (iii) Find how far the wedge has travelled when the particle has moved a distance of 1 m down the inclined face of the wedge.

Exemplar Questions

3. (a) A particle is projected from a point P on horizontal ground.
The speed of projection is 35 m s^{-1} at an angle $\tan^{-1} 2$ to the horizontal.
The particle strikes a target whose position vector relative to P is $x\vec{i} + 50\vec{j}$.

- Find (i) the value of x
(ii) a second angle of projection so that the particle strikes the target.

Exemplar Questions

- 3 (b) A particle is projected up an inclined plane with initial speed 80 m s^{-1} . The line of projection makes an angle of 30° with the inclined plane and the plane is inclined at an angle θ to the horizontal. The plane of projection is vertical and contains the line of greatest slope. The particle strikes the plane at an angle of $\tan^{-1} \frac{2}{\sqrt{3}}$.
- Find (i) the value of θ
- (ii) the speed with which the particle strikes the plane.