Class IB$_1$

Physics

February 25 2025

Test 3

Total: / 24 marks

Answers

Problem 1

A object of mass $m_1 = 2\text{kg}$ is sent from position A with a speed $v = 3\text{ms}^{-1}$ in direction of B.
The path ABC is horizontal. There is friction force of $1.8N$ between between An and B, and the distance AB is 2meters.

1) The speed of m_1 at B is given by the relation $v^2 = u^2 + 2as$

with $u = 3\text{ms}^{-1}$ and $a = -\frac{F_f}{m} = \frac{1.8}{2} = -0.9ms^{-2}$

Then $v = \sqrt{9 - 2 \times 2 \times 0,9} = \boxed{3.55s^{-1}}$

2) A other body of mass $m_2 = 3\text{kg}$ is placed at the rest at position B.

We suppose : - these two bodies will continues together is direction of point C,
- there is no more any friction between B and C.

The common speed of m_1 and m_2 at C is given by the *conservation of the momentum* of the system $\{m_1, m_2\}$

Before : $P_{\text{sys}} = m_1 \cdot 3.55 + m_1 \cdot 0$
Aftere : $P_{\text{sys}} = m_1 \cdot v_f + m_1 \cdot v_f = (m_1 + m_2)v_f$ $\Rightarrow v_f = \frac{2 \cdot 3.55}{2+3} = \boxed{1.4\text{ms}^{-1}}$

3) The maximal distance moved by the two masse along the plane CD ($\theta = 12^0$, no friction afer C)

is given by $v^2 = (1.4)^2 - 2 \times 9,81 \sin(12^0)d$ with $v = 0$

then $d = \frac{1.4^2}{19.62 \sin(12)} = \boxed{48\text{cm}}$