Physics
Theory Part 24

Topics: Hydrostatics/ Math Methods

Course: B.Sc/ Physics

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Ref.....

Q A 7kg & 3kg Al ball is dropped through a viscous medium, which will first hit the ground.

Since drag force is there so we have to consider the viscosity of the medium through which ball is falling.

Now aerodynamic drag is given by $F_{drag} = \frac{1}{2} C_d \rho \pi r^2 v^2$ (sphere)

ρ = density of air (medium)

C_d = Drag Coeff. of the medium, r = radius of the sphere

& Downward gravitational force is $F_{grav} = mg$.

Now when $F_{drag} = F_{grav}$ then $v = v_{term}$ (terminal Vel. which is const.)

then $\frac{1}{2} C_d \rho \pi r^2 v_{term} = mg \Rightarrow v_{term} = \sqrt{\frac{2mg}{C_d \rho \pi r^2}}$

$\Rightarrow v_{term} \propto \sqrt{m}$ (& all others factors are constant).

So heavier mass will have higher terminal velocity so will reach the ground first.

So 7kg Al ball will hit the ground first rather than 3kg

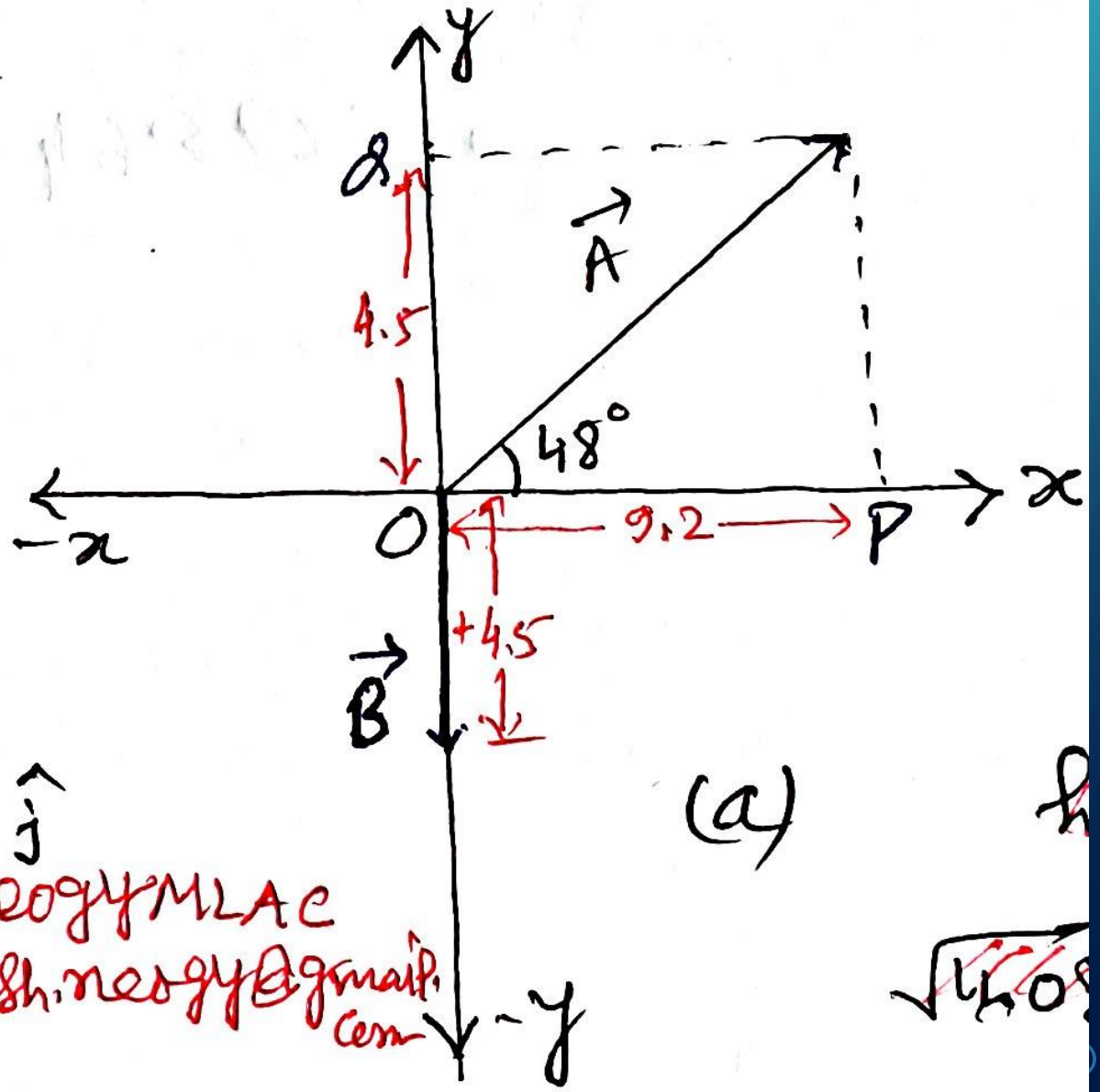
From given figure find the sum $\vec{A}+2\vec{B}$

(b) $\vec{A} = |\vec{A}|\cos 48^\circ \hat{i} + |\vec{A}|\sin 48^\circ \hat{j}$

$= 9.2 \times 0.67 \hat{i} + 4.5 \times 0.74 \hat{j}$

$= \boxed{6.16\hat{i} + 3.33\hat{j}}$

(c) & $\vec{B} = \boxed{0\hat{i} - 4.5\hat{j}}$



(d) $\vec{A}+2\vec{B} = 6.16\hat{i} + 3.33\hat{j} +$

$2(0\hat{i} - 4.5\hat{j})$

$= 6.16\hat{i} + 3.33\hat{j} - 9\hat{j} = 6.16\hat{i} - 5.67\hat{j}$

$\vec{A}+2\vec{B} = \boxed{6.16\hat{i} - 5.67\hat{j}}$

(a)

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Thanksss