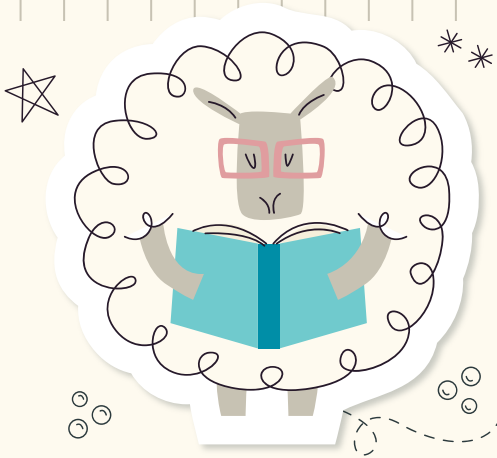
DAY 2



PHYSICS: KINEMATICS

AYO ACADEMY / Alysia Makmur

TABLE OF CONTENTS

01

KINEMATICS

What's kinematics?

02

MOTION IN A STRAIGHT LINE

constant velocity

03

MOTION IN A STRAIGHT LINE

constant acceleration

04

FREE-FALL MOTION

Initial Velocity = 0

WHAT'S KINEMATICS?

Physics

Motion of point object(s)

Focus on the motion

Without reference to the causes of motion (i.e. Force)

MOTION IN A STRAIGHT LINE

CONSTANT VELOCITY

CONSTANT VELOCITY MEANS **ACCELERATION=0**

$$S = v.t$$

MOTION IN A STRAIGHT LINE

CONSTANT ACCELERATION

$$\vec{a} = \frac{d\vec{v}}{dt}$$

$$\vec{a}.dt = d\vec{v}$$

$$\int \vec{a}.dt = \int d\vec{v}$$

$$\vec{a}.t = \Delta\vec{v}$$

$$\vec{v}_f = \vec{v}_i + \vec{a}.t$$

MOTION IN A STRAIGHT LINE

CONSTANT ACCELERATION

$$\vec{v} = \frac{d\vec{x}}{dt}$$

$$\vec{v}.dt = d\vec{x}$$

$$\int \vec{v}.dt = \int d\vec{x} \leftrightarrow \vec{v} = \overrightarrow{v_f}$$

$$\int \overrightarrow{v_i} + \vec{a}.t\,dt = \int d\vec{x}$$

$$\overrightarrow{v_i}.t + \frac{1}{2}\vec{a}.t^2 = \Delta\vec{x}$$

$$\boldsymbol{\overrightarrow{x_t} = \overrightarrow{x_i} + \overrightarrow{v_i}.t + \frac{1}{2}\vec{a}.t^2}$$

If we substitute t from the first equation into second equation, we will get:

$$\boldsymbol{\overrightarrow{v_t}^2 = \vec{v}_o{}^2 + 2.\vec{a}.\Delta\vec{x}}$$

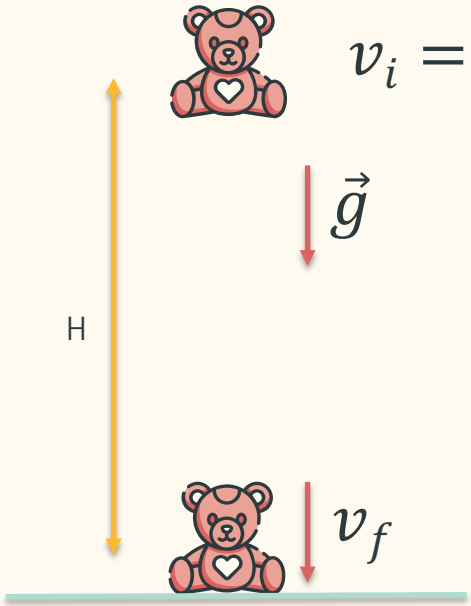
GIVE A TRY! ANYONE?

DO YOU REMEMBER APPLE FELL DOWN FROM THE TREE AND HIT NEWTON'S HEAD?

Newton Picture Source: https://www.pinterest.com/pin/604186106233792527/

FREE FALL MOTION

FREE-FALL MOTION



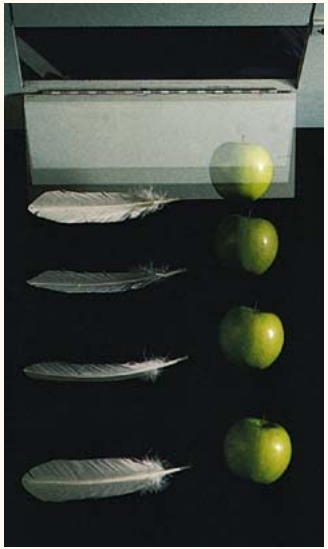
$$\vec{v}_f = \vec{g}.t$$

$$\overrightarrow{\Delta h} = \frac{1}{2}\vec{g}.t^2$$

$$\vec{v_t}^2 = 2.\vec{g}.\Delta\vec{h}$$

GIVE ME A GUESS

I have an apple and a feather. Then, I make them fall down in vacuum. Which one will hit the ground first?



Picture source:
http://demo.webassign.net/ebooks/hrw7demo/pc/c02/read/main/c02x2_9.htm?__cf_chl_jschl_tk__=GALOU7ZYwEoUnB3R17QXR9jdtm6B35JI47EvQj18xPg-1636212078-0-gaNycGzNA30

EXAMPLES

An electric vehicle starts from rest and accelerates at a rate of 2.0 $^{m}/_{s^2}$ in a straight line until it reaches a speed of 20 $^{m}/_{s}$. The vehicle then slows at a constant rate of 1.0 $^{m}/_{s^2}$ until it stops.

(a) How much time elapses from start to stop?

(b) How far does the vehicle travel from start to stop?

EXAMPLES

A black car and a white car, identical except for the color, move toward each other in adjacent lanes and parallel to an x axis. At time $t = 0$, the black car is at $x_r = 0$ and the white car is at $x_g = 220$ m. If the black car has a constant velocity of 20 $^{km}/_{h}$, the cars pass each other at $x = 44.5$ m, and if it has a constant velocity of 40 km/h, they pass each other at $x = 76.6$ m.

(a) What are the initial velocity of the white car?

(b) What are the constant acceleration of the white car?

EXAMPLES

A hot-air balloon is ascending at the rate of 12 $^{m}/_{s}$ and is 80 m above the ground when a package is dropped over the side.

(a) How long does the package take to reach the ground?

(b) With what speed does it hit the ground?

THANKS!