Classical Physics

Year 10 Pathway C

Mr. D. Patterson

Outcomes

- Calculate unknown variables of an accelerating object using:

$$s = ut + \frac{1}{2}at^2 \qquad v^2 = u^2 + 2as$$

- Apply equations of motion to problems where objects are falling due to gravity

2 more equations of motion

- There are two more equations of motion which can be used to help determine the motion of objects with constant acceleration.

$$v_{av} = \frac{s}{t} \qquad v = u + at$$

$$v^2 = u^2 + 2as \qquad s = ut + \frac{1}{2}at^2$$

What goes up....

- The pull of the Earth (gravity) will cause objects to accelerate towards the surface.

- ALL objects when free falling on Earth, fall with an acceleration of $9.8ms^{-2}$ towards the floor.

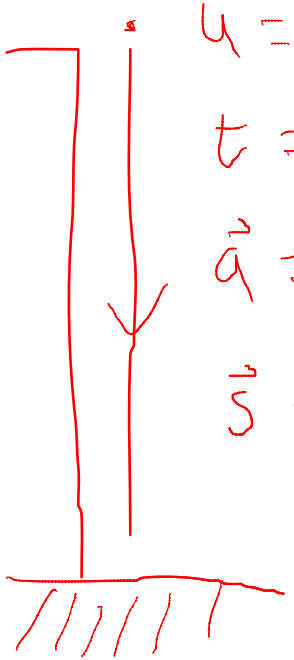
$$a = g = 9.8ms^{-2}$$

Example problems

- Smithy drops his favourite camera off a cliff. If it takes 5 s to hit the floor below, how tall is the cliff?

Example problems

Declare ↓ down as the +ve direction



$\vec{u} = 0$

$t = 5\,s$

$\vec{a} = g = 9.8\,m/s^2$

$\vec{s} = ?$

$\vec{s} = \vec{u}t + \frac{1}{2}\vec{a}t^2$

$= 0(5) + \frac{1}{2}(9.8)(5^2)$

$= 122.5\,m$

Example Problems

- A hot balloon is rising at a rate of 1 m/s when one of the sand bags is dropped. If it takes 7.5 s to hit the floor, how high was the balloon when the sand bag was dropped?

- What was the average velocity of the fall?

Example Problems

Declare ↓ down as the +ve direction

$\vec{u} = -1 m/s$

$t = 7.5 s$

$\vec{a} = g = 9.8 m/s^2$

$\vec{s} = ?$

$$\vec{s} = \vec{u}t + \frac{1}{2}\vec{a}t^2$$

$$= -1(7.5) + \frac{1}{2}(9.8)(7.5^2)$$

$$= \underline{\underline{26.8 m}}$$

$$\vec{v}_{av} = \vec{s}/t$$

$$= 26.8/7.5 = 35.7 m/s$$

Tips for gravity problems

- Always remember a=g= $9.8ms^{-2}$ for falling objects

- If an object is thrown up:
  - the velocity at the highest point is 0.
  - The initial velocity has the same magnitude as the final velocity (but in opposite direction)
  - The time taken to go up is the same as the time taken to come down

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- Matthews and Winter Set 10, 11, 12, 13