

Free Fall

IB PHYSICS | MOTION

What is Free Fall?



The only force acting on the object is gravity

No Air Resistance

Acceleration due to Gravity

-9.81 m s^{-2}



What if you drop something?

What do you know? S 0 m s⁻¹ \mathcal{U} \bigcirc \mathcal{V} -9.81 m s⁻² a t

What if you throw something up?

• •	0 m s⁻¹			What do you know?		
Lalf	S		Half	S		
st	u		Znd F	u	0 m s⁻¹	
	υ	0 m s ⁻¹		υ		
	а	-9.81 m s ⁻²		а	-9.81 m s ⁻²	
\land	t			t		

What if you throw something down?

 \bigcirc

What do you know?



Reminder of our Equations

Units	т	т s ⁻¹	т s ⁻¹	т s ⁻²	S
v = u + at		u	v	а	t
$s = ut + \frac{1}{2}at^2$	S	и		а	t
$v^2 = u^2 + 2as$	S	и	v	а	
$s = \frac{(v+u)t}{2}$	S	u	ν		t

Dropping a marble

If you drop a marble off of the Empire State Building (~380 m), how fast will it be going once it reaches the ground?

 $v^2 = u^2 + 2as$

$$v = \sqrt{0^2 + 2(-9.81)(-380)}$$

$$v = -86.3 \text{ m s}^{-1}$$

*The negative indicates a downward direction

S	-380 m		
и	0 m s ⁻¹		
v	?		
а	-9.81 m s ⁻²		
t			

Shooting a Basket

0 m s⁻¹ What is the vertical velocity of a basketball required to reach the rim of the basketball hoop? (~3.0 m high)

0

0

 \bigcirc

3 m

 $v^2 = u^2 + 2as$

$$0^2 = u^2 + 2(-9.81)(3)$$

$$u = 7.67 \text{ m s}^{-1}$$

S	3 m		
u	?		
v	0 m s ⁻¹		
а	-9.81 m s ⁻²		
t			

Flipping a Coin



Lesson Takeaways

□ I can identify the constant acceleration due to gravity neglecting air resistance

- I can interpret a free fall problem to identify hidden values and understand when to look at only half of the problem
- I can use the kinematic equations to solve a free fall problems