

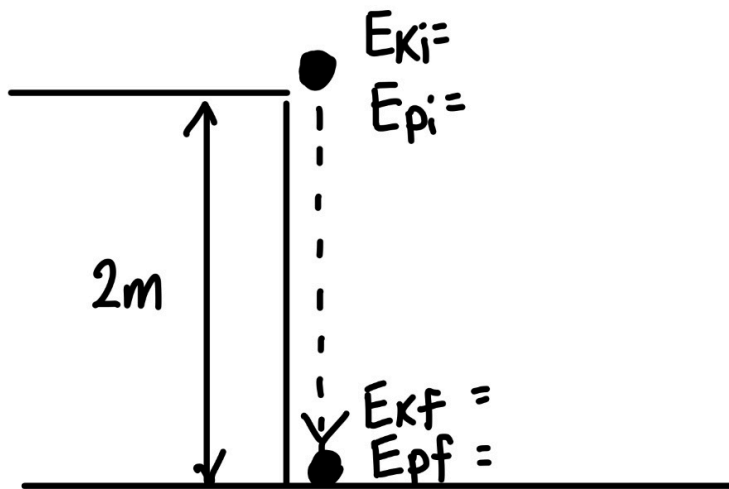
Conservation of Energy

1. For each scenario, write y/n if mechanical energy ($E_k + E_p$) is conserved. Ignore friction unless stated.

- a) A ball falls from a cliff and hits the ground.
- b) A ball is thrown down a cliff with a velocity of 5m/s and hits the ground.
- c) A ball is thrown up a cliff with a velocity of 10m/s and hits the ground.
- d) A ball is dropped off a cliff with air resistance and hits the ground.
- e) A ball is thrown off a cliff and mid fall, superman flies by and hits the ball with a baseball bat, making it fly towards the sun.

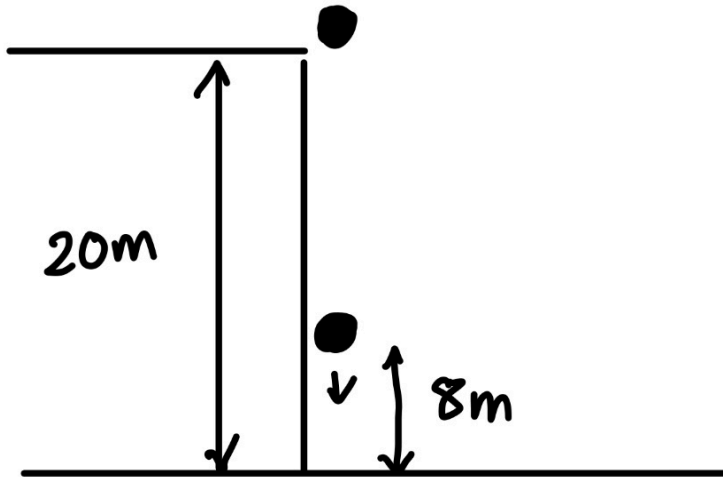
2. A 2kg ball is dropped off a 10m cliff and lands on the ground.

- a) What is the initial potential, kinetic and total energy of the ball?
- b) What is the final potential, kinetic and total energy of the ball (just before it hits the ground)?
- c) Calculate the speed the ball hits the ground using energy conservation



3. An unknown mass is dropped off a 10m cliff. Calculate the speed of the mass using energy conservation.

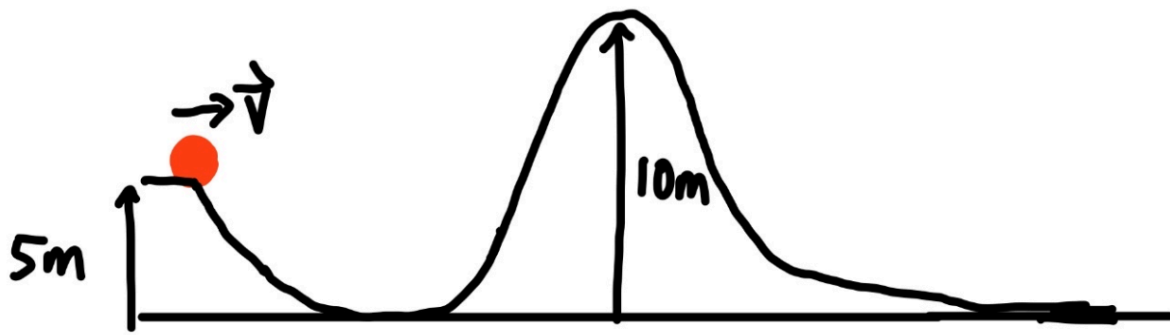
4. A ball is dropped off a 20m cliff. What is the speed of the ball when the ball is 8m above the ground? (use energy conservation).



5. A 2kg ball is thrown off a 12m cliff at 10m/s. Calculate the speed the ball hits the ground at if

- a) The ball is thrown upwards
- b) The ball is thrown downwards
- c) The ball is thrown at a 30 degree angle above the horizontal

6. A 4kg ball is dropped off a 10m cliff. If the ball hits the ground with a speed of 50m/s, with what speed was the ball initially thrown with?



7. A roller coaster ride starts 5m above the ground, with a 10m hill in the middle and ends on the ground.

- What is the minimum initial speed needed to make it to the hill?
- How fast is the coaster moving at the end of the ride?
- If the initial speed was 25m/s, how fast would the coaster be moving at the top of the hill?
- If the initial speed was 25m/s, how fast would the coaster be moving at the end?