show understanding that kinetic energy, elastic potential energy, gravitational potential energy, chemical potential energy and thermal energy are examples of different forms of energy

Forms of Energy

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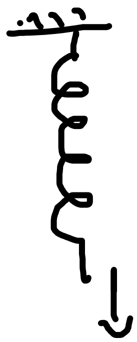
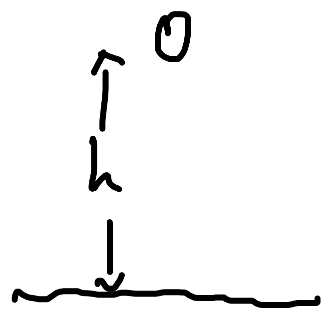
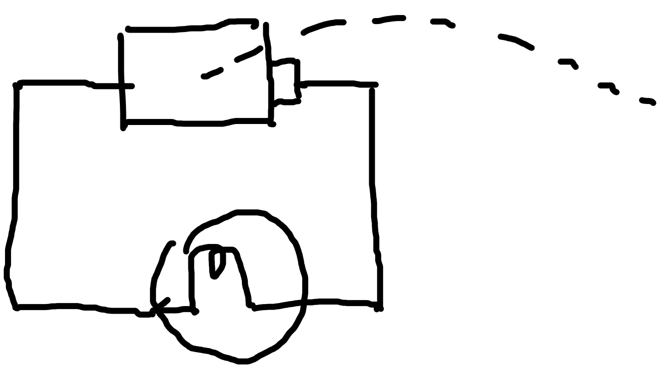
(KE) kinetic energy



elastic potential energy

gravitational potential energy (PE)





chemical potential energy

thermal energy

state the principle of the conservation of energy

Conservation of Energy

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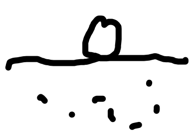
PE high
KE low

PE low
KE high

Total KE + PE no change

hit ground:



warmer

PE = KE = 0 ? ?

→ thermal energy

So total KE + PE + thermal energy no change.

Energy can be converted to one form or another, but cannot be created or destroyed.

Principle of Conservation of Energy

apply the principle of the conservation of energy to new situations or to solve related problems

Conservation of Energy 2

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Energy in units of joule (J).

e.g.

PE = 10 J, KE = 0 J — drop from rest

↓ PE = 2 J, KE = ?

Conservation of energy →

before: 10 J (PE) + 0 J (KE) = 2 J (PE) + ? J (KE) :after

final KE = 8 J

e.g. hit ground:

PE = KE = 0

warmer

thermal energy?

Conservation of energy →

before: 10 J (PE) + 0 J (KE) + 0 J (thermal) = 0 J (PE) + 0 J (KE) + ? J (thermal) state that kinetic energy E_k = ½ mv^2 and gravitational potential energy E_p = mgh (for potential energy changes near the Earth's surface)

Kinetic, Potential Energy

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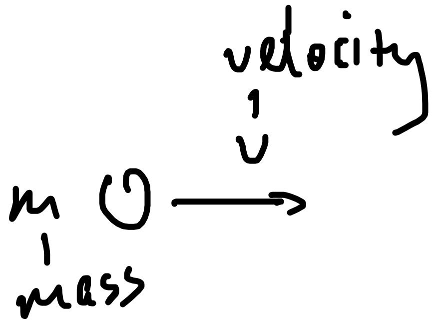


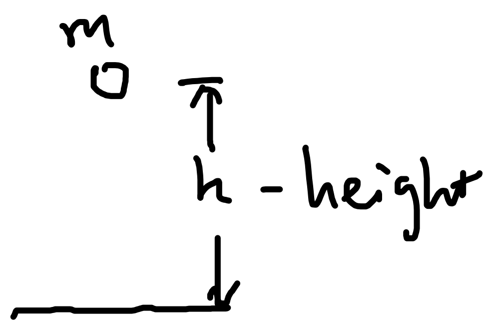
$$KE = \frac{1}{2}mv^2$$

e.g. mass = 1kg, velocity = 3 m/s

$$KE = \frac{1}{2} \times 1 \times 3^2 = 4.5\,J$$

$$PE = mgh$$

$g \sim 10\ m/s^2$



e.g. height = 1 m, mass = 2 kg,

$$PE = 2 \times 10 \times 1 = 20\,J$$

apply the relationships for kinetic energy and potential energy to new situations or to solve related problems

Kinetic, Potential Energy 2

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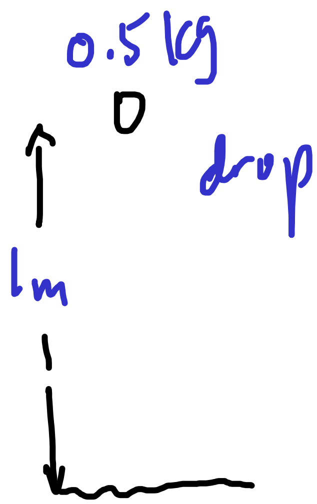
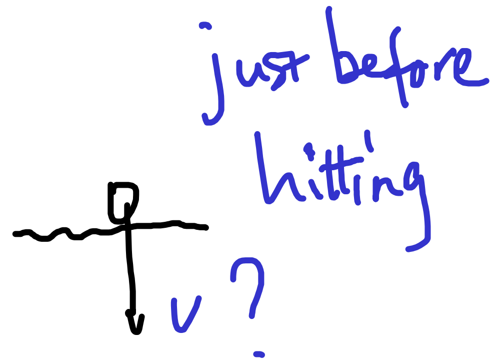
e.g.





Conservation of energy:

total before = total after

$$\overset{PE}{0.5\times10\times1} + \overset{KE}{0} = \overset{PE}{0} + \overset{KE}{\tfrac{1}{2}\times0.5\times v^2}$$

$$v = \sqrt{20}\ \text{m/s}$$

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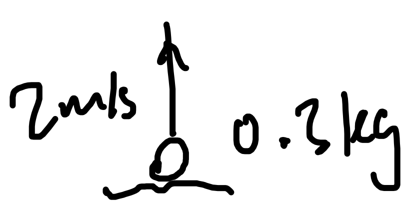
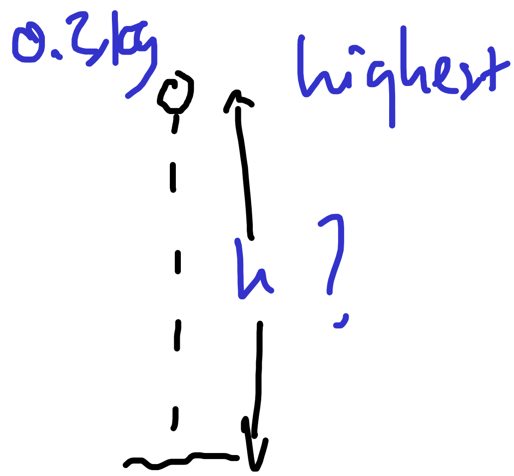
eg.





before

after

$$\overset{PE}{0} + \overset{KE}{\tfrac{1}{2}\times0.3\times2^2} = \overset{PE}{0.3\times10\times h} + \overset{KE}{0}$$

recall and apply the relationship work done = force × distance moved in the direction of the force to new situations or to solve related problems

Work Done

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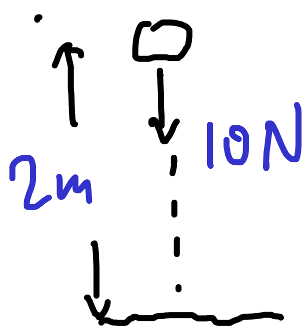
e.g.

Work done = force × distance

= 2×5 = 10 J

e.g.

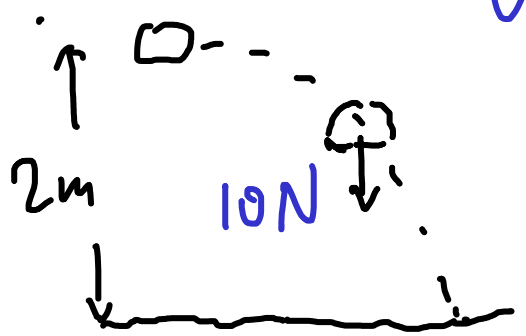


Work done by gravity

= 10 N × 2m

= 20 J.

e.g.



Work done by gravity

= 10 N × 2m

= 20 J.

(2m: distance moved in dirn of force)

Work done = force × distance moved in the direction of the force recall and apply the relationship power = work done / time taken to new situations or to solve related problems

Power

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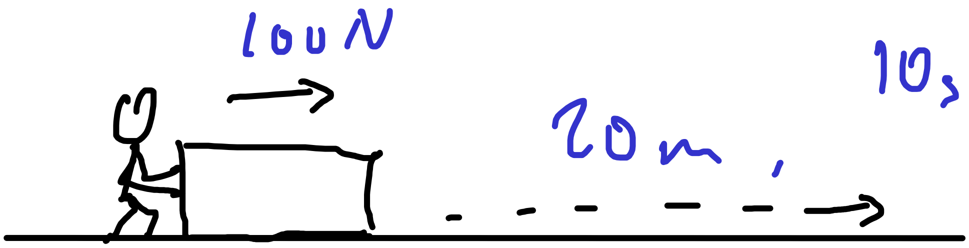
e.g



A man pushes a box with a force of 100 N.
He moves it by 20 m in 10 s.
How much work did he do in 1 s ?

ans. work done in 10 s = 100 N x 20 m
= 2000 J

work done in 1 s = $\frac{2000}{10}$ = 200 J.

Work done per unit time = Power

e.g. work done by man above = 200 J/s
= 200 W

$$\text{Power} = \frac{\text{Work done}}{\text{time taken}}$$

$$P = \frac{W}{t}$$