

Work Sheet- 05

Date: 12/04/2020

1 Some students investigate a model of the craters produced by meteorite impacts.

They drop balls into a tray filled with sand.

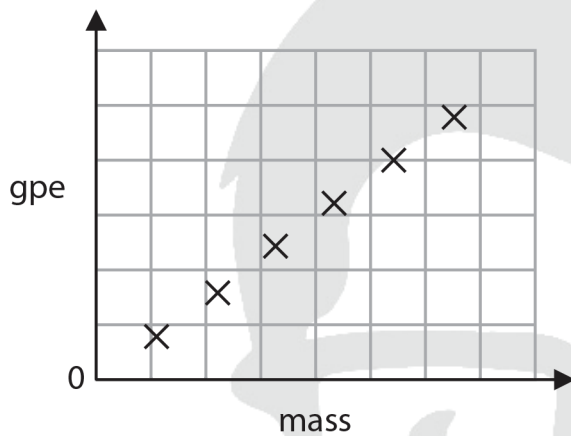
They use six balls with different masses.

They drop each ball from the same height.

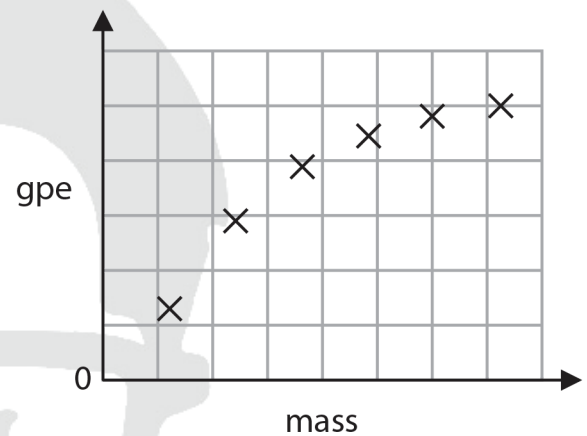
- (a) (i) Which one of these graphs shows the relationship between the gravitational potential energy (gpe) of the balls and their mass when they are all at the same height?

Put a cross (X) in the box next to your answer.

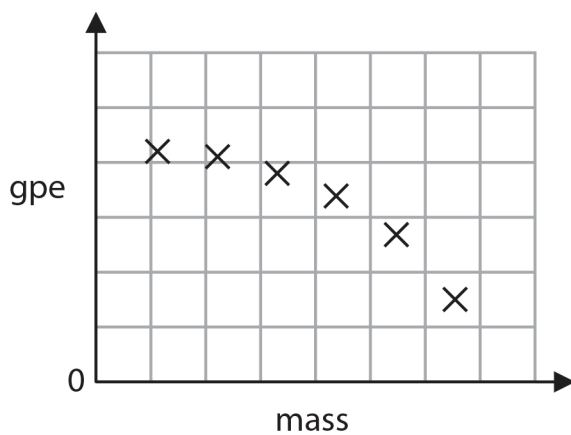
(1)



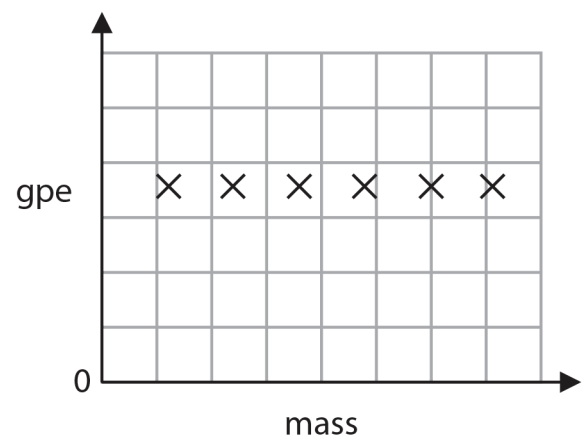
☒ A



☒ B



☒ C



☒ D

(ii) Describe how the energy of a ball changes as it drops towards the sand.

(2)

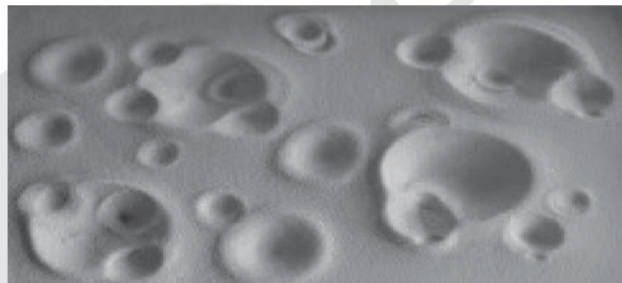
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(b) This photograph shows the sand after several balls have hit it.



The students read this information in a textbook:

‘When work is done, energy is transferred.’

Explain how work is done when the balls impact on the sand.

(2)

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(c) When one ball hits the sand, it has a velocity of 6.2 m/s.

It has a momentum of 0.46 kg m/s.

(i) Calculate the mass of the ball.

(3)

mass of ball = kg

(ii) The ball takes 0.17 s to come to rest after it hits the sand.

Calculate the average impact force.

(2)

average impact force = N

2 (a) A wind generator is used as the source of energy for a remote farmhouse.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

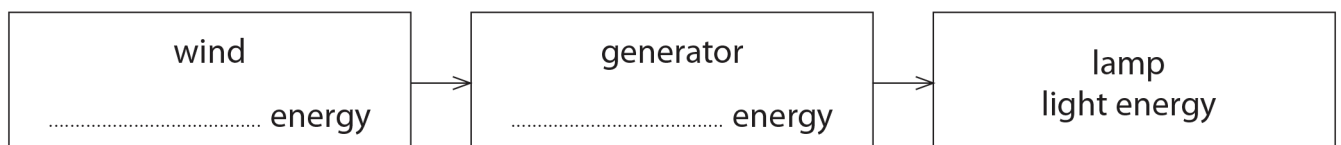
If the farmhouse is about 7 m high, the height of the axle of the generator is

(1)

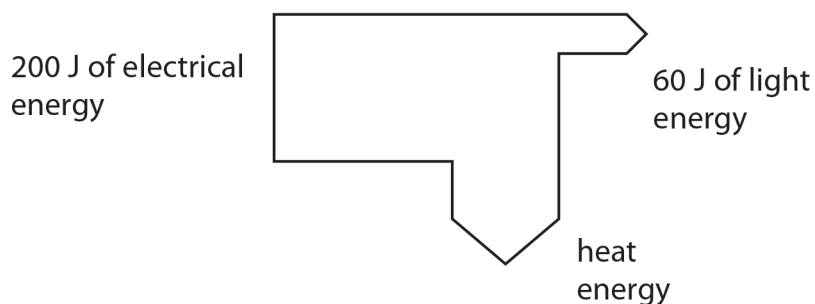
- ☐ **A** 20 m
- ☐ **B** 50 m
- ☐ **C** 100 m
- ☐ **D** 150 m

(ii) Complete the flow chart to show the energy transfers that take place from the wind to light a lamp.

(2)



(b) A student produced a diagram to show energy changes in a lamp.



(i) Calculate the amount of heat energy produced by the lamp.

(1)

heat energy = J

(ii) Calculate the efficiency of the lamp.

(2)

efficiency =

(iii) When the lamp is first switched on, it heats up.
It then reaches a constant temperature.

Explain why the temperature of the lamp remains constant.

(2)

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- (c) A wind power system costs £6000 to install.
It saves £250 each year.

Calculate the payback time.

(2)

payback time =

