Work Done Practice

| 1 | Which of these forces do work and why? (a) Force of the engine moving a car. (c) Stretching an elastic band. | | | | | |
|---|---|--|--|--|--|--|
| | (b) The magnetic force of a magnet stuck to the fridge. (d) The weight of a ball as it flies up in the air. | | | | | |
| 2 | A horse pulls a cart along a road with a force of $110\ \mathrm{N}$ over $20\ \mathrm{m}$. Complete the sentences. | | | | | |
| | (a) The horse has done $110 \text{ N} \times 20 \text{ m} = \boxed{\hspace{1cm}}$ J of work. | | | | | |
| | (b) The horse pulls the cart another 30 m. How much work has been done over this distance? | | | | | |
| | work done (J) = force (N) \times distance (m) = 110×30 | | | | | |
| | = | | | | | |
| | (c) A second horse is now attached to the cart and also pulls the cart with a force of | | | | | |
| | $110 \text{ N. There is now } 2 \times 110 \text{ N} = $ | | | | | |
| | (d) The two horses pull the cart a further 50 m. What is the work done by the horses? | | | | | |
| | work done (J) = force (N) \times distance (m) = 220×50 | | | | | |
| | | | | | | |
| | (e) What is the total work done by the horses on the cart from when it first started to move? Add up all of the amounts of work you have calculated. | | | | | |
| | | | | | | |
| | 2200 + | | | | | |
| 3 | A frog uses their legs like springs to jump to a lily pad. The frog's legs do 0.3 J of work. Complete the sentences using the words increased, decreased, stayed the same, elastic potential energy, kinetic energy, 0.3 J. | | | | | |
| | (a) When the frog is in the air, the frog's stored kinetic energy hascompared to before it jumped. | | | | | |
| | (b) When the frog is in the air, elastic potential energy stored in the frog's legs has compared to before it jumped. | | | | | |
| | (c) 0.3 J have been transferred from the store of the | | | | | |
| | frog's legs to the store of the frog. That store has by | | | | | |

- 4 Two identical objects are dropped through a height of 3 m. Each object has a weight of 30 N pulling it down.
 - (a) Calculate how much work has been done by one object.

work done (J) = force (N)
$$\times$$
 distance (m) = 30×3

- (b) Will the same amount of work have been done by the other object?
- (c) If the objects are now glued together, and then dropped, how does the amount of work done to the two objects compare with the work done when dropping a single object?
- A stone is held in your hand and then released. The mass of the stone is 3 kg and it has a weight of 30 N.
 - (a) Complete the word equation to calculate the work done:

- (b) When it falls through a height of 4 m, how much work is done by the stone?
- (c) When the stone is being held in your hand for $10 \, \text{s}$, how much work is done on the stone?
- (d) When this heavy stone is held in your hand for $10\,\mathrm{s}$ with your arm outstretched, how much work is done by your hand?
- 6 The work done to slow a car down on a flat road has been recorded for different distances travelled.

| Work (J) | 1000 | 2000 | 3000 | 4000 | 5000 |
|-----------------------------------|------|------|------|------|------|
| $\mathbf{Distance}\ (\mathbf{m})$ | 2 | 4 | | 8 | 10 |

- (a) How far did the car travel after 3000 J of work was done?
- (b) How much work was done after 1 m?
- (c) Energy is being transferred from the kinetic energy store of the car. Where is it going to?

- 7 A box of weight 100 N falls from a height of 1.5 m.
 - (a) How much work was done by the force of gravity?
 - (b) You drop the same object again, but this time from a height of 6 m. How much work was done this time?
 - (c) How much more work was done in (b) compared with (a)?
- 8 A goat weighing 140 N leaps on to a bale of straw 0.8 m off the ground.
 - (a) How much work must be done by the goat?
 - (b) For the goat to reach the top of the bale, she will need to jump a little higher, and in fact she jumps up 1.1 m from the ground. How much extra work does the goat have to do to land safely on top of the bale?
 - (c) When the goat jumps off the bale again, gravity pulls her down. How much work is done by gravity in pulling the goat back to the ground?



- 9 When a pendulum swings, it rises and falls. A 2 kg pendulum bob weighing 20 N is attached to a thin cable and given a push so that it swings from side to side.
 - (a) If it rises by 0.15 m above its lowest point, how much work is done in going from the lowest to the highest point of the swing?
 - (b) How many joules of kinetic energy will it have when it swings through the lowest point, where it is moving fastest?
 - (c) If the pendulum had 9 J of kinetic energy at the lowest point, how high would it rise at the end of its motion? (This is when it is no longer moving.)
 - (d) What will its gravitational energy be at that height?