Work Done Practice

1 Which of these forces do work and why?

(a) Force of the engine moving a car.

(b) The magnetic force of a magnet stuck to the fridge.

(c) Twisting a string.

(d) The weight of a ball as it flies up in the air.

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2 A horse pulls a carriage along a road with a force of 110 N over 20 m. Complete the sentences.

(a) The horse has done 100 N $\times$ 20 m $=$ ☐ J of work.

(b) The horse pulls the cart another 30 m. How much work has been done over this distance?

work (J)	$=$	force (N)	$\times$	distance (m)
☐	$=$	110	$\times$	___

(c) A second horse is now attached to the cart and also pulls the cart with a force of 110 N. There is now $2\times$ 110 N $=$ ☐ N pulling the cart.

(d) The two horses pull the cart a further 50 m. What is the work done by the horses?

work (J)	$=$	force (N)	$\times$	distance (m)
☐	$=$	___	$\times$	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.

work a (J)	$+$	work b (J)	$+$	work c (J)	$=$	total work (J)
___	$+$	☐	$+$	☐	$=$	☐

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3 A frog uses their legs like springs to jump to a lily pad. The frog's legs store 0.3 J elastic potential energy. 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** has _____ compared 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) ____ have been transferred from the _____ store of the frog's legs to the _____ store of the frog. That store _____ by ____.

4 Two identical objects are dropped through a height of 3 m. Each object has a 30 N force acting on it.

(a) Calculate how much work has been done on one object.

work (J)	=	force (N)	×	distance (m)
	=		×	

(b) Will the same amount of work have been done on 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?

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5 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 on the stone?

(c) When the stone is being held in your hand for 10 s, how much work is done on the stone?

(d) When this heavy stone is held in your hand for 10 s with your arm outstretched, how much work is done by your hand?

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6 The work done to slow a car down on a flat road by distance has been recorded and put in the table below.

Work (J)	1000	2000	4000	6000	8000
Distance (m)	2	4		8	10

(a) How far did the car travel after 4000 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 to (a)?

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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 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?

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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?