Work Done Energy Transfer

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Zainab pushes a box with a force of 50 N for 4.0 m across a floor. Calculate the work done. (2 marks)

Step 1 · Write the equation

work done = force × distance (along the line of action of the force), $W = F\,s$

Step 2 · Substitute and calculate

$W = 50 \times 4.0 = 200$ J

Answer: 200 J

Check: 1 J = 1 N m, so N × m gives J.

2. Now try one with the steps

A crane does 2400 J of work lifting a load with a force of 120 N. How far does it lift the load? (2 marks)

Step 1 · Rearrange

Step 2 · Calculate

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. State what is meant by work done. [1]

2. Write the equation linking work done, force and distance. [1]

3. A force of 50 N pushes a box 4.0 m. Calculate the work done in joules. [2]

4. State what 1 joule of work means. [1]

5. A 30 N box is lifted 1.5 m onto a shelf. Calculate the work done against gravity in joules. [2]

6. 2400 J of work is done by a force of 120 N. Calculate the distance moved. [2]

7. Explain why work done against friction makes surfaces warm up. [2]

8. Ravi holds a heavy box still for one minute. Explain why, in physics, he does no work on the box. [2]

9. A car's brakes provide a force of 6000 N over 25 m. Calculate the work done in kJ. [3]

10. A 2.0 kg bag is lifted 3.0 m. Calculate the work done against gravity in joules. g = 9.8 N/kg. [2]

11. Kofi pushes a trolley with a force of 40 N for 12 m, taking 8.0 s. Calculate his power in watts. [3]

12. A 1200 kg car at 15 m/s stops with a constant braking force of 4500 N. Calculate the braking distance. [4]

13. Use the idea of work done to explain why a car's braking distance increases four times when its speed doubles (same braking force). [3]

14. A 500 N force pushes a crate 6.0 m. The crate gains 1800 J of kinetic energy. Calculate the average friction force on the crate. [3]

4. Before you hand it in

"Holding a heavy weight still is doing work."
Work = force × distance moved in the direction of the force. No movement means no work done on the object (your muscles still use energy internally).

Using the mass (kg) force when lifting
To lift an object, the force is its weight: W = m g. A 2 kg bag needs about 19.6 N.

Using the length of a slope distance for work against gravity
Work done against gravity = weight × vertical height gained.

Answering in N or N/m
Work done (energy) is in joules, J (equivalent to N m).