



Transferring Energy

STUDENT INTRODUCTION

- ▶ Energy is being transferred everywhere at the Isle of Wight Steam Railway
- ▶ This on-site activity enables you to engage with what you have learned about force, motion and energy



Did you know?

When a carriage is pulled/pushed by the engine to start it moving, the force exerted gives the carriage **momentum**. But this pull/push also transfers **energy** to the carriage.

This comes from the energy stored in the engine (*decreasing*) being transferred to the energy of the moving carriage (*increasing*).

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When a force (the engine) makes the object (carriage) move, it transfers energy to the moving object (carriage). We say that the force does 'work'. The amount of work depends on:

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- The size of the force
- The distance the carriage moves in the direction of the force.

You should therefore be familiar with the following formula:

$$\text{Work done by a force (Joules, J)} = \text{force (Newtons, N)} \times \text{distance moved in the direction of the force (metres, m)}$$

This formula also tells us the amount of energy transferred because they are both the same.

Energy and work are both measured in Joules. A force of 1 Newton applied over a distance of 1 metre does 1 Joule of work which is the same as saying it transfers 1 Joule of energy.

You also need to know that $1\text{kg} = 9.81\text{ N}$

Task 1: Fact Finding

The number of carriages on your train today is

The total weight of the carriages in tonnes if each weighs 20 tonnes

The total weight of the carriages in kg (1 tonne = 1000 kg)

Your engine today _____ weighs

tonnes or

kg

Task 2: Using the information on page one, work out the following:

1) What is the force of the engine (in Newtons)?

2) How much energy is transferred to move ONE carriage 10 metres (in Joules)?

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3) How much energy is transferred to move ALL your carriages for the 3 sections of the train's journey
(Note: you will need to count the number of carriages)

Record your answers in the table below - you will need a separate sheet for your calculations.

Stage	Description	Distance	Energy transferred in Joules (J)
2	Road bridge -> Havenstreet station	0.5 miles	
5	Under road bridge -> Asheys station	1.0 miles	
8	End of tunnel -> Smallbrook station	1.5 miles	

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