ISLE OF WIGHT STEAM RAILWAY

Education Destination

1 0 1 6 3 1

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 at the Isle of Wight Steam Railway

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*)

The energy [...] average [...] energy [...]

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:

a) The size of the force
b) The distance the carriage moves in the direction of the force.

You should therefore be familiar with the following formula:

Work done by a force = **force** x **distance moved in the direction of the force**
(Joules, J) **(Newtons, N)** **(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 1kg = 9.81 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 25 tonnes

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

Your engine today _____ weighs [ ] tonnes or [ ] kg
(refer to the stock list on page 3)

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

1) What is the force of the engine?

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

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

Stage	Description	Distance	Energy transferred in Joules (J)
1	Wootton station -> under road bridge at Briddlesford Copse	0.9 miles	
2	Road bridge -> Havenstreet station	0.6 miles	
3	Havenstreet station -> over road bridge at Havenstreet	0.1 miles	
4	Over road bridge -> under road bridge at Rowlands Wood	0.62 miles	
5	Under road bridge -> Ashey station	1.0 miles	
6	Ashey station -> start of tunnel	0.7 miles	
7	Start of tunnel -> end of tunnel	0.15 miles	
8	End of tunnel -> Smallbrook station	1.5 miles	

Locomotive	Type	Mass (imperial)	Mass (tonnes) (approx)	Built	Moved To IoW
Calbourne	0-4-4T		49	1891	1925
Freshwater	A1X 0-6-0T		28	1877	1913
Newport	A1X 0-6-0T		28	1878	1902
Invincible	0-4-0ST		28	1915	1971
Ajax	0-6-0T		40	1918	1972
Royal Engineer	0-6-0T		49	1953	1992
D2554	0-6-0DM		30	1955	1966
D2059 ("Edward")	0-6-0DM		31	1959	1988
235	0-4-0DM		22	1945	1992