

TEACHER NOTES

Science: Physics

Motion & Force (Force and Balance)

Contextual Summary

This resource is for students in key stage 3.

They will travel on the ferry to the Isle of Wight, where they will carry out various tasks on board.

The resource relates to the 'Forces' part of the Science curriculum at this key stage, where students identify the effects of balanced and unbalanced forces on a ferry.

Students will complete force diagrams on board the ferry. They will think about all the forces which act upon the boat.

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Task Imp Curriculum relevant materials supporting school trips to the Isle of Wight

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Students will cover the basics of forces, including air resistance, water resistance, friction, upthrust and weight. Resultant forces are also addressed in the higher ability resource.

This knowledge will be used to produce forces diagrams and explanations of balanced and unbalanced forces.

Ability Levels

There are two variants of this resource for students of higher and lower ability in key stage 3.

Teachers can support as necessary.

The language is simpler in the lower ability resource and requires less detail.

Key skills practised in this unit:

- ✓ Numeracy – using maths in real life situations
- ✓ Understanding forces which act upon objects
- ✓ Observation skills
- ✓ Drawing scientific diagrams
- ✓ Calculating forces.

Relationship to Curriculum

This resource links to the required teaching as specified by the National Curriculum 2014 for key stage 3 Science. The tasks cover physics / forces, specifically identifying the effects of balanced and unbalanced forces.



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SUBJECT

Science: Physics

UNIT

Motion & Force

OPPORTUNITIES FOR USE

- ✗ Pre-Visit
- ✓ On-Site Activity
- ✗ Post-Visit

Peripheral Task

CURRICULUM / SYLLABUS

- ✓ National Curriculum 2014
- ✓ Curriculum for Excellence

Applies to Resources numbered:

1 0 7 0 6 1
1 0 7 0 6 2

Learning Opportunities

Pre-Visit /Post-Visit

- ▶ Basic forces knowledge input before the journey and/or post visit follow up could be to investigate the dimensions of the ferries, leading to altering ferry design or sea defences to decrease wind forces acting on the ferries.
- ▶ Students could also look into tidal energy and marine environments around the ferry harbours.

On-Site

- ▶ Students complete the Science resource linked to this teacher note:

Resource ID:

107061 (KS3 lower ability)

107062 (KS3 higher ability)

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Enrichment Opportunities

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- ▶ Students could make model boats, altering the dimensions.
- ▶ They could take a trip to a boat yard or invite a guest speaker in, to discuss ferry design and construction. (Taking into account all the forces which act upon the boats.)
- ▶ Cross curricular links with Maths, DT and Art.

Learning Outcomes

- ✓ To understand about forces and how they affect stationary or moving objects.
- ✓ To construct force diagrams.
- ✓ To calculate the resultant force. (Higher only)

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- ▶ Hundreds more resources
- ▶ Search by age, subject, exam board
- ▶ Virtual venue tours and maps
- ▶ Bespoke online itinerary builder
- ▶ Risk assessments
- ▶ Travel and accommodation



TEACHER ANSWERS

Answer Sheet – higher resource (107052)

- Q1** Catamaran, sailing boats, speed boats yachts, etc. Some are travelling faster, so overtake the ferry. Some are slower, so the ferry passes by them.
- Q2** Different shapes, sizes, engine size, some under sail only, streamline, less friction/ water resistance.
- Q3** Green buoys indicating speed restrictions of 6 knots in the harbour.
- Q4** **Speed = distance ÷ time**
- Q5** **Distance = speed x time** $13.13\text{mph} \times 1\text{hr} = 13.13\text{ miles}$

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- Q8** **Speed = distance ÷ time** $11.385 \div 0.75 = 15.18\text{mph}$
 $0.75 = \frac{3}{4}$ of an hour.
Also accept 0.765 for $\frac{3}{4}$ hr (as 0.017×45) $11.385 \div 0.765 = 14.88\text{ mph}$
- Q9** In the harbours the ferry will need to travel slowly, at the 6 knots, this will bring the overall average speed down.

Extension – see individual graphs.

