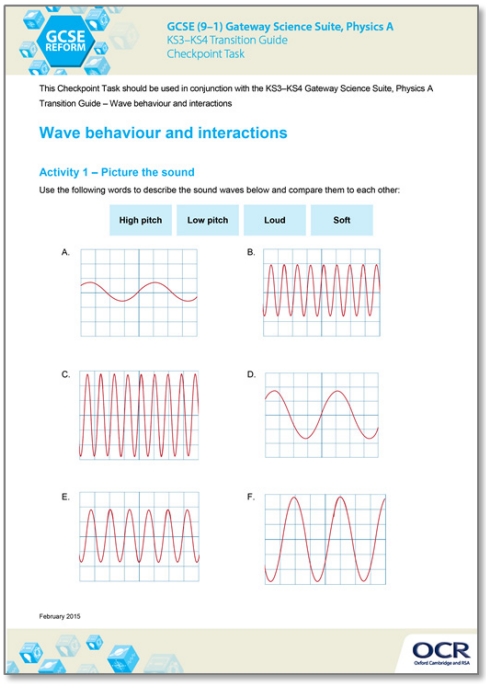
This Checkpoint Task should be used in conjunction with the KS3–KS4 Gateway Science Suite, Physics A Transition Guide – Wave behaviour and interactions

PROVISIONAL

Wave behaviour and interactions

Instructions and answers for teachers

These instructions should accompany the OCR resource 'Wave behaviour and interactions' activity *which supports OCR GCSE (9–1) Gateway Science Suite, Physics A.*



The Activity:

This resource comprises of 3 tasks.

This activity offers an opportunity for English skills development.

This activity offers an opportunity for maths skills development.

Associated materials:

'Wave behaviour and interactions' Checkpoint Task learner activity sheet.

PROVISIONAL

This resource is an exemplar of the types of materials that will be provided to assist in the teaching of the new qualifications being developed for first teaching in 2016. It can be used to teach existing qualifications but may be updated in the future to reflect changes in the new qualifications. Please check the OCR website for updates and additional resources being released. We would welcome your feedback so please get in touch.

February 2015

Introduction to the task

The checkpoint tasks can be run before teaching waves at Key Stage 4 as a method of checking prior learning and highlighting any misconceptions that have been carried through KS3. They could also be used as an assessment tool after teaching the topic at Key Stage 3 or as separate tasks at appropriate points during teaching. They address issues that learners have been shown to struggle with, even at A Level, and so can always be relevant.

Waves has always been a topic that has challenged learners as it can be very abstract and learners often refer to their day-to-day experiences as a reference point. The three tasks can be run as a circus or used as a differentiated task for mixed ability groups. Although they all serve to challenge and extend, they work at different levels.

The three tasks below are designed so that they can be used in a number of ways:

- As three individual checkpoint tasks during the teaching of the topic.
- As an ‘experts’ activity where groups of learners are assigned a different task and after completing the task, one person from each group forms a new group to share what they have learned.
- As a differentiated task where the level of challenge of the task increases as you go through them
- As a circus of activities where each group completes all three tasks.

Running the activities

Activity 1– Picture the sound

Learning outcomes:

- Correctly use the terms volume and pitch to describe sounds.
- Recall that the volume/loudness of a sound wave depends on its amplitude.

‘Picture the sound’ encourages learners to re-evaluate their previous understanding of sound keywords like ‘pitch’ and ‘volume’ and link this to the waveform traces.

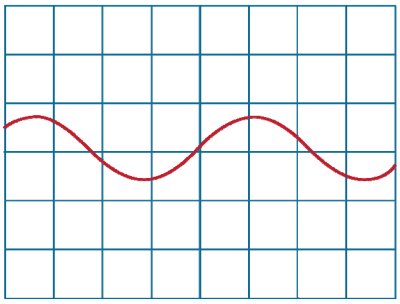
Student task sheet

Picture the sound

Use the following words to describe the sound waves below and compare them to each other:

High pitch	Low pitch	Loud	Soft

A.



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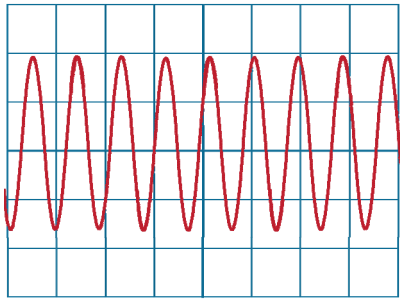

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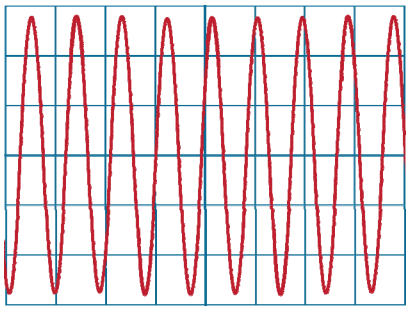

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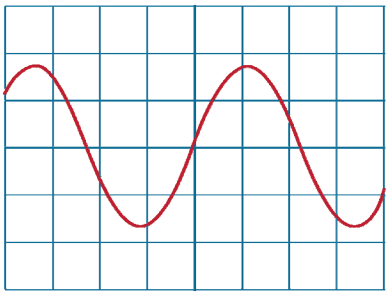

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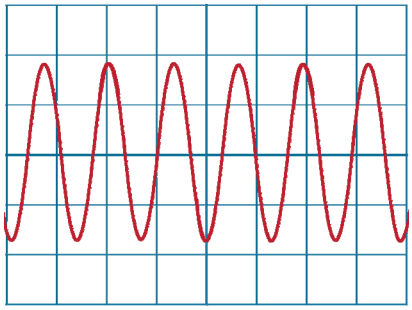

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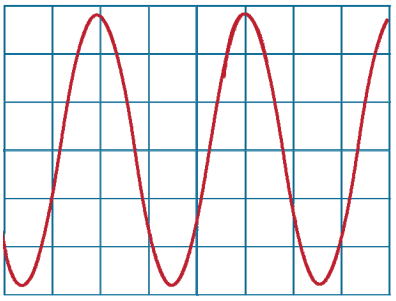


Suggested answers

A: low pitch, soft

B: high pitch, loud

C: high pitch (same pitch as B as it has the same frequency) but louder

D: low pitch (same as A as it has the same frequency) but louder

E: higher pitch than A and D/lower pitch than B and C, loud (as loud as B)

F: low pitch, loud (as loud as C)

Possible extension activity

Learners could also apply what they have done and use waveforms to create a 'track' that another learner or group of learners could try to re-create.

Activity 2 – Energy or matter?

Learning outcomes:

- Recall that waves transfer energy.
- Explain that a wave transfers energy and not matter by causing small oscillations.
- Evaluate models for demonstrating how waves transfer energy.

This activity challenges learners to address the concept of waves transferring energy rather than matter. It can be difficult for learners to understand the concept of particles oscillating about a fixed point. Learners are to look at the pictures and describe and explain how the wave travels.

Student task sheet

Energy or matter?

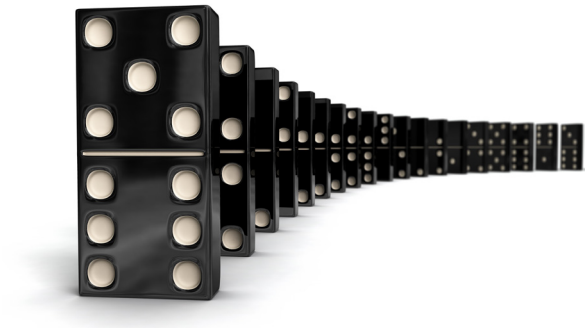
What is a wave? How does it move?

Use the pictures below to describe and explain how the wave is behaving and how energy is being transferred.

Keywords you may want to use:

oscillate	**energy**	**matter**	**vibration**

1.



2.

3.

4.

Suggested descriptions and explanations

1. Dominoes:

   The dominoes pass on energy from one domino to another but each domino only moves a small distance. Although the effects of moving the first domino can be seen across a large distance, that domino remains where it starts off. The downfall of this model is that the dominoes only fall; they cannot be picked up again so the model does not show oscillation.

2. Queen:

   The Queen's hand moves back and forth, showing an oscillation but it does not explicitly show transfer of energy. Although it could be argued that the air around the Queen's hand is being moved.

3. Wavy hair:

   The hair shows a wave form. Learners may also link this to the term, 'flowing locks', as it looks as if the hair is flowing or fluid. The major disadvantage of this model is that the hair is static and there is no oscillation.

4. Water wave:

   No matter actually moves along a water wave. The water molecules move up and down but do not actually move along. The waves are transverse and the energy does move along it.

Possible extension activity

Challenge learners to devise their own model for a wave that highlights the fact that waves transfer energy and not matter.

Activity 3 – Seeing colours

Learning outcomes:

- Recall that white light is a combination of three primary colours of light.
- Explain how the three primary colours of light combine to form secondary colours.
- Apply knowledge of the colours of light to explain how different objects appear to be different colours.

Seeing colours allows you to assess how well learners understand the concept of white light being a mixture of all the colours and how different coloured objects reflect and absorb different parts of the spectrum. Learners are to look at the pictures of the coloured cubes and determine the colour of the cube or the light that is being shone on them.

Suggested answers

Red	Blue
Red	Black/no light
Blue/Magenta	Red

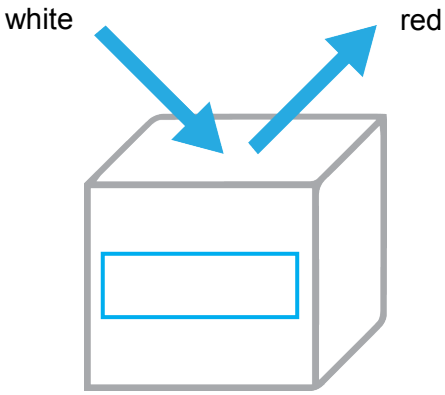
Possible extension activities

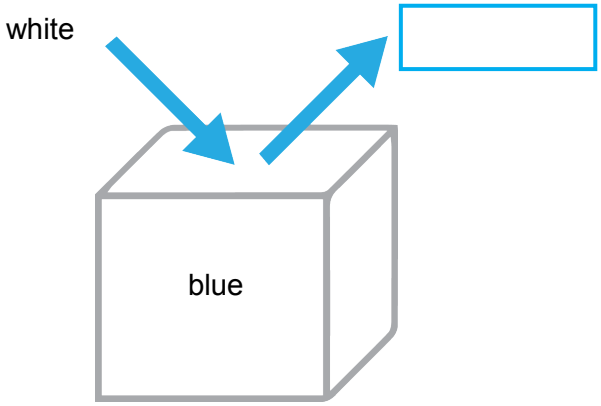
Challenge learners to apply this to real life situations such as stage lighting or yellow streetlights.

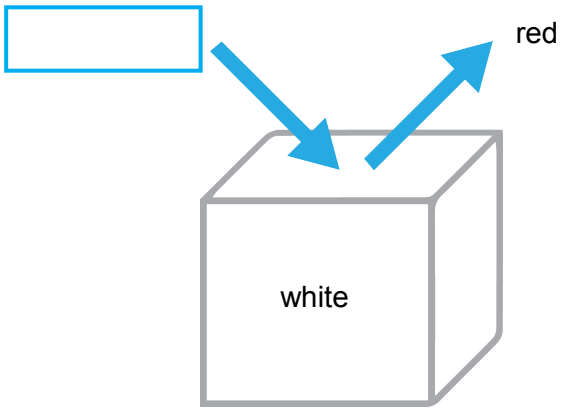
Student task sheet

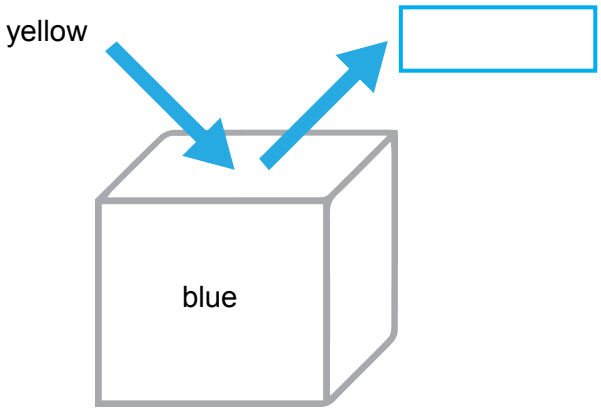
Seeing colours

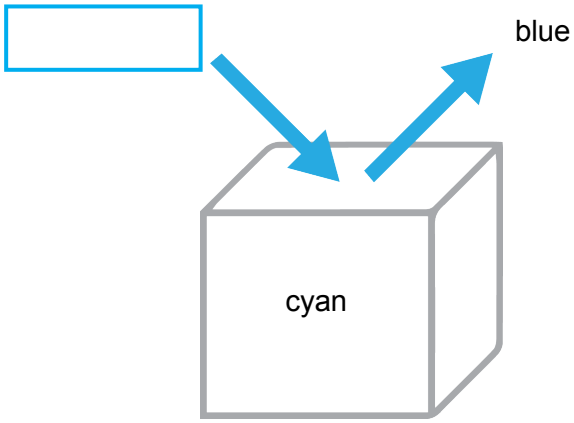
Fill in the missing labels with the colour (of the light or of the box). You must be able to justify your decisions. For some boxes, there may be more than one correct answer.

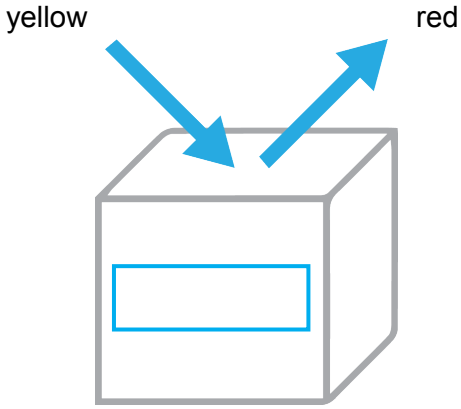












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February 2015