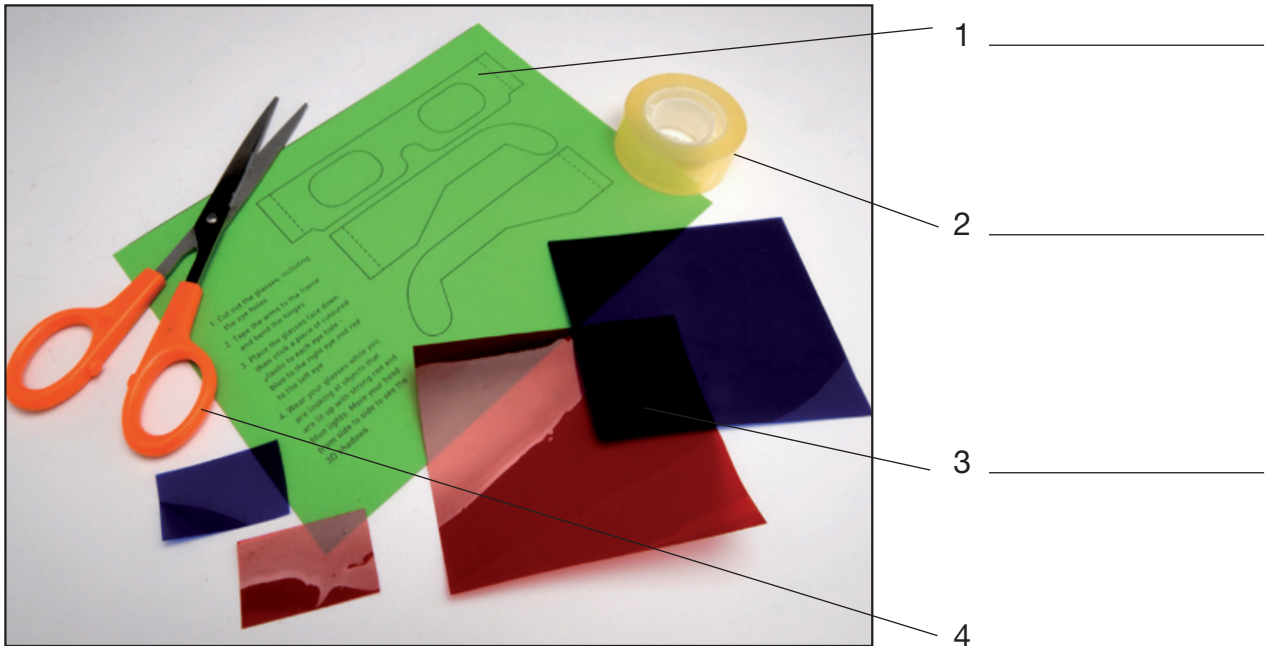


Exercise 1

Vocabulary: Materials

Label the diagram with the materials you used for this experiment.

template sticky tape plastic scissors



Exercise 2

Vocabulary: Preposition Phrases

Complete the instructions for the experiment with the correct preposition phrase from the box.

to the right in front of through along to the left in front of

- 1 Cut _____ all the lines on the the template till you're left with the pieces of the glasses to stick together.
- 2 Tape red plastic _____ eyehole and blue _____.
- 3 Stand _____ the red and blue slide projectors and put on your glasses.
- 4 Hold your hand _____ the projectors and look at its shadow _____ your glasses.

Look at your experiment sheet and check your answers.

Exercise 3

Conclusions: Speaking, Writing

What did you learn from this experiment? How are shadows produced? What happens when you use coloured filters and coloured glasses? Talk with a partner then complete the sentences together.

Use the words in the box to help you.

block	light	one colour	a 3D image
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- 1 Shadows are produced where _____.
- 2 Coloured shadows are produced where _____.
- 3 Glasses with coloured filters can produce _____.

Exercise 4

A Scientific Report: Writing

Now write a report on your experiment. Use the language provided to help you.

Useful Language

useful language for writing a scientific report

1. Say what you made

We made ...

2. Say how you made it

First we cut ...

Then we taped...

Next we stood ... and put on ...

Then we held our hands ... and looked ...

3. Say what you predicted would happen

We thought that wearing the glasses the wrong way round would have the effect of ...

Without the glasses we thought it would look ...

We thought that moving the object closer to the light source would have the effect of ...

We thought that moving the object further from the light source would have the effect of ...

Learning Objectives

Pupils learn how to produce the illusion of a 3D shadow using two different coloured light sources and colour-filtered glasses.

Content summary

Shadows are produced where the light is blocked. Coloured shadows are produced where only one colour of light is blocked. Glasses with coloured filters can give the effect of recombining the light to produce a 3D image.

Skills

Reading, speaking, writing

Grammar

Past simple; present simple

Vocabulary

Nouns: *template, plastic, scissors, eyehole, sticky tape, slide projector, glasses*
 Prepositions and adverbs (for talking about position): *along, to the left of, to the right of, in front of, the wrong way*
 Verbs: *tape, blocked*

Time needed

60–90 minutes

Age group

7–11

Materials needed

- 2 slide projectors or overhead projectors
- 1 red and 1 blue colour gel* (e.g. CS6020A and CS6020B)
- Interesting objects (opaque, translucent and transparent)

Practicalities

Interactive whiteboard projectors, slide projectors and overhead projectors are good strong light sources for this activity (you can also use strong torches of 2–3000,000 candle power). Remember that projector bulbs can get very hot and the colour filters may melt if placed in front of them for too long. Coloured filters from educational catalogues produce the correct shade of red and blue light. These filters can also be cut up and used for the students' 3D glasses. Make your room as dark as possible to get the full effect of the 3D shadows.

Procedure

1. Tell pupils they are going to conduct a scientific experiment investigating shadows and learn how to create a 3D image using coloured plastic.
2. Introduce/pre-teach the vocabulary that pupils will need: *template, plastic, scissors, eyehole, sticky tape, slide projector, glasses, to the left of, to the right of, in front of, the wrong way, tape, blocked*. Point to the objects, demonstrate the verbs and drill pronunciation.
3. Hand out the experiment sheet or put the sheet up on the interactive whiteboard or projector and have pupils read out the instructions in class.
4. Ask them to work in groups and predict the results of the experiment following the questions which are on the worksheet. You may need to give them a little time to think and talk about this. They can do this first in their own language but should then try to express it in English.
5. Pupils work in groups and follow the instructions on the experiment sheet. Monitor and help where required. Help pupils to say what they are doing in English.
6. Pupils try out their experiment. You will need to arrange it so that each group has a turn to come to the projectors (or other light source) to try out the experiment. Get them to record the result. They can make notes in English or in their own language.
7. Ask students to discuss in their groups these questions: Does it matter which way round you wear the glasses? Why is that? What happens if you move the object closer to or further from the light source? What did it look like without the glasses?
8. Hand out the worksheet and ask pupils to work their way through exercises 1, 2 and 3. They can check their answers with a partner. These exercises consolidate the vocabulary used in the experiment and get them to come to a conclusion about how shadows are produced and what happens when coloured filters are used. What happens when the card or paper tubes slide up and down?
9. Pupils then write up their findings in the form of a scientific report – encourage them to use the language in the Useful Language box. This exercise could be done for homework.

Extra ideas to explore with your students

Try this with unusual objects such as a metal grill tray or something that itself produces light.

Look at other 3D images on the web and in books. Which effect seems more real?

Links to everyday life

Stereo-daguerreo types were the first form of 3D entertainment. They were slotted into a viewer, which looked a bit like a pair of binoculars, and combined the images to make them appear 3D.

3D Shadows

Keith Kelly

Exercise 1 – Vocabulary: *Materials*

- 1 – the template to be cut out
- 2 – the plastic
- 3 – a roll of sticky tape
- 4 – the scissors

Exercise 2 – Vocabulary: *Verbs*

Answers are on the experiment sheet

Exercise 3 – Conclusions: *Speaking, Writing*

- 1 Shadows are produced where the light is blocked.
- 2 Coloured shadows are produced where only one colour of light is blocked.
- 3 Glasses with coloured filters can produce a 3D image.