

Physics > Big idea PSL: Sound, light and waves > Topic PSL2: How we see

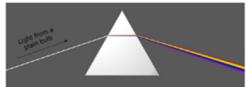
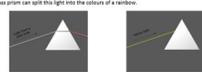
Progression toolkit: White light

Learning focus	Daylight and sunlight are made from all the colours of the spectrum, which together we see as 'white light'.				
As students' conceptual understanding progresses they can:					
Diagnostic questions	Colour TV	Bright lights	Light and day	Rainbow	Three into one
Response activities	Mixing coloured light			Yellow light	Newton's prisms

Key:

P Prior understanding from earlier stages of learning

B Bridge to later stages of learning

<p style="text-align: center;">Colour TV</p> <p style="text-align: center;">STUDENT WORKSHEET</p> <p>Colour TV</p> <p>A television uses light to make a picture.</p>  <p>How does a TV use light to make a picture?</p> <p>Which of these statements do you think are right?</p> <p>For each statement, tick (✓) one column to show what you think.</p> <table border="1"> <thead> <tr> <th>Statements</th> <th>I am sure this is right</th> <th>I think this is right</th> <th>I think this is wrong</th> <th>I am sure this is wrong</th> </tr> </thead> <tbody> <tr> <td>A. A TV picture is made up of thousands of tiny coloured lights.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B. All the colours on a TV are made by mixing just three colours of light.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C. Mixing red and green light makes the same colour as mixing red and green paint.</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p style="text-align: right;">1</p>	Statements	I am sure this is right	I think this is right	I think this is wrong	I am sure this is wrong	A. A TV picture is made up of thousands of tiny coloured lights.					B. All the colours on a TV are made by mixing just three colours of light.					C. Mixing red and green light makes the same colour as mixing red and green paint.					<p style="text-align: center;">Bright lights</p> <p style="text-align: center;">STUDENT WORKSHEET</p> <p>Bright lights</p> <p>Coloured lights can be mixed to make new colours.</p>  <p>Green light is added to red light.</p> <p>1. How bright is the new colour compared to the red light?</p> <p>Put a tick (✓) in the box next to the best answer.</p> <table border="1"> <tr> <td>A. Brighter</td> <td></td> </tr> <tr> <td>B. Same brightness</td> <td></td> </tr> <tr> <td>C. Dimmer</td> <td></td> </tr> </table> <p>2. What do you think affects the brightness of the new colour compared to the red light?</p> <p>For each statement, tick (✓) one column to show what you think.</p> <table border="1"> <thead> <tr> <th>Statements</th> <th>I am sure this is right</th> <th>I think this is right</th> <th>I think this is wrong</th> <th>I am sure this is wrong</th> </tr> </thead> <tbody> <tr> <td>A. There is now more light</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B. There is now more colour</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p style="text-align: right;">1</p>	A. Brighter		B. Same brightness		C. Dimmer		Statements	I am sure this is right	I think this is right	I think this is wrong	I am sure this is wrong	A. There is now more light					B. There is now more colour					<p style="text-align: center;">Light and day</p> <p style="text-align: center;">STUDENT WORKSHEET</p> <p>Light and day</p> <p>During the day the Sun is in the sky. The light from the Sun is very bright.</p>  <p>1. What colour is sunlight?</p> <p>Put a tick (✓) in the box next to the best answer.</p> <table border="1"> <tr> <td>A. Yellowish</td> <td></td> </tr> <tr> <td>B. Mixture of yellow, orange and red</td> <td></td> </tr> <tr> <td>C. Blue</td> <td></td> </tr> <tr> <td>D. None of the above</td> <td></td> </tr> </table> <p>2. What colour is daylight?</p> <p>Put a tick (✓) in the box next to the best answer.</p> <table border="1"> <tr> <td>A. Yellowish</td> <td></td> </tr> <tr> <td>B. Mixture of yellow, orange and red</td> <td></td> </tr> <tr> <td>C. Blue</td> <td></td> </tr> <tr> <td>D. None of the above</td> <td></td> </tr> </table> <p style="text-align: right;">1</p>	A. Yellowish		B. Mixture of yellow, orange and red		C. Blue		D. None of the above		A. Yellowish		B. Mixture of yellow, orange and red		C. Blue		D. None of the above		<p style="text-align: center;">Rainbow</p> <p style="text-align: center;">STUDENT WORKSHEET</p> <p>Rainbow</p> <p>Shining light through a prism can make a rainbow. The colours of a rainbow make a 'spectrum of light'.</p>  <p>Where do the colours of the rainbow come from?</p> <p>Put a tick (✓) in the box next to the best answer.</p> <table border="1"> <tr> <td>A. The prism makes the light squish because it's sticky.</td> <td></td> </tr> <tr> <td>B. The prism adds colours to the light.</td> <td></td> </tr> <tr> <td>C. The prism reacts with the light and changes its colour.</td> <td></td> </tr> <tr> <td>D. The prism splits up the colour that the light is made of.</td> <td></td> </tr> </table> <p style="text-align: right;">1</p>	A. The prism makes the light squish because it's sticky.		B. The prism adds colours to the light.		C. The prism reacts with the light and changes its colour.		D. The prism splits up the colour that the light is made of.		<p style="text-align: center;">Three into one</p> <p style="text-align: center;">STUDENT WORKSHEET</p> <p>Three into one</p> <p>Coloured lights can be mixed to make new colours. Red light and green light will together to make yellow light.</p>  <p>What happens when blue light is added as well?</p> <p>Which descriptions of the new colour do you think are right?</p> <p>For each statement, tick (✓) one column to show what you think.</p> <table border="1"> <thead> <tr> <th>Descriptions of the new colour</th> <th>I am sure this is right</th> <th>I think this is right</th> <th>I think this is wrong</th> <th>I am sure this is wrong</th> </tr> </thead> <tbody> <tr> <td>A. It's green</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B. It's white</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C. It's brighter than the yellow</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p style="text-align: right;">1</p>	Descriptions of the new colour	I am sure this is right	I think this is right	I think this is wrong	I am sure this is wrong	A. It's green					B. It's white					C. It's brighter than the yellow				
Statements	I am sure this is right	I think this is right	I think this is wrong	I am sure this is wrong																																																																																					
A. A TV picture is made up of thousands of tiny coloured lights.																																																																																									
B. All the colours on a TV are made by mixing just three colours of light.																																																																																									
C. Mixing red and green light makes the same colour as mixing red and green paint.																																																																																									
A. Brighter																																																																																									
B. Same brightness																																																																																									
C. Dimmer																																																																																									
Statements	I am sure this is right	I think this is right	I think this is wrong	I am sure this is wrong																																																																																					
A. There is now more light																																																																																									
B. There is now more colour																																																																																									
A. Yellowish																																																																																									
B. Mixture of yellow, orange and red																																																																																									
C. Blue																																																																																									
D. None of the above																																																																																									
A. Yellowish																																																																																									
B. Mixture of yellow, orange and red																																																																																									
C. Blue																																																																																									
D. None of the above																																																																																									
A. The prism makes the light squish because it's sticky.																																																																																									
B. The prism adds colours to the light.																																																																																									
C. The prism reacts with the light and changes its colour.																																																																																									
D. The prism splits up the colour that the light is made of.																																																																																									
Descriptions of the new colour	I am sure this is right	I think this is right	I think this is wrong	I am sure this is wrong																																																																																					
A. It's green																																																																																									
B. It's white																																																																																									
C. It's brighter than the yellow																																																																																									
<p style="text-align: center;">Confidence grid</p>	<p style="text-align: center;">Two-tier multiple choice</p>	<p style="text-align: center;">Simple multiple choice</p>	<p style="text-align: center;">Simple multiple choice</p>	<p style="text-align: center;">Confidence grid</p>																																																																																					
<p style="text-align: center;">Mixing coloured light</p> <p style="text-align: center;">STUDENT WORKSHEET</p> <p>Mixing coloured light</p> <p>Coloured lights can be mixed to make new colours.</p>  <p>Safety</p> <p>Check for loose wires or damaged plugs.</p> <p>Place the heavy lab pack towards the centre of the table.</p> <p>Apparatus and materials</p> <ul style="list-style-type: none"> lab pack (20V) red, green and blue filters 12 ray lamp white screen <p>Procedure</p> <ol style="list-style-type: none"> Plug both ray lamps into the lab pack and turn on. Put one coloured filter in each ray lamp. Shine the ray lamps at the screen to add the two colours of light. Write down the new colour in a results table. Write down how the brightness changes when the colours are added. Repeat for different pairs of colours. <p>To answer:</p> <ol style="list-style-type: none"> Did you get the colours that you expected? Explain your answer. What happens to the brightness of red light when a second red light is added? What happens to the brightness of the red light when a different colour is added? Why is it brighter or judge brightness when the colour are adjacent? <p>Practical skills question:</p> <ol style="list-style-type: none"> Why should the ray lamps always be the same distance from the screen? <p style="text-align: right;">1</p>	<p style="text-align: center;">Yellow light</p> <p style="text-align: center;">STUDENT WORKSHEET</p> <p>Yellow light</p> <p>A plain light bulb makes light a similar colour to daylight. A glass prism can split this light into the colours of a rainbow.</p>  <p>Predict</p> <p>What will happen if yellow light is shone at the prism?</p> <p>Explain why you think this will happen?</p> <p style="text-align: center;">Carry out the investigation</p> <p>Observe</p> <p>Complete and label the diagram. Show what you see.</p> <p>Explain why your prediction and explanation correct? If not, can you explain what you observed?</p> <p style="text-align: right;">1</p>	<p style="text-align: center;">Newton's prisms</p> <p style="text-align: center;">STUDENT WORKSHEET</p> <p>Newton's prisms</p> <p>A glass prism splits some light into a spectrum. A second prism is added to bend the light the other way.</p>  <p>Predict</p> <p>What will the second prism do to the spectrum of light?</p> <p>Explain why you think this will happen?</p> <p style="text-align: center;">Carry out the investigation</p> <p>Observe</p> <p>Describe what happens to the spectrum of light.</p> <p>Explain why your prediction and explanation correct? If not, can you explain what you observed?</p> <p style="text-align: right;">1</p>																																																																																							
<p style="text-align: center;">Application and practice</p>	<p style="text-align: center;">Predict, explain, observe, explain</p>	<p style="text-align: center;">Predict, explain, observe, explain</p>																																																																																							

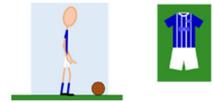
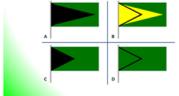
Progression toolkit: Colours we see

Learning focus	Light has colours that are seen when reflected by bodies.				
As students' conceptual understanding progresses they can:					
As students' conceptual understanding progresses they can:	Describe how white objects reflect all the colours in white light.	Describe how coloured objects selectively reflect particular colours in white light.	Describe how coloured objects selectively absorb or reflect particular colours of light.	Work out the colour a coloured object looks in light that is a different colour to the object (primary colours).	Work out the colour of an object that is a secondary colour, in red, green or blue light. B
Diagnostic questions	White stuff	Football kit	Blue bottle	TARDIS	Flag of Guyana
Response activities	Red fridge light		White king		Flag colours

Key:

P Prior understanding from earlier stages of learning

B Bridge to later stages of learning

<p>White stuff</p> <p>White light contains all the colours of the spectrum.</p>  <p>In white light, white objects look white.</p>  <p>Why do white objects look white in white light? Which of these statements do you think are right? For each statement, tick (✓) one column to show what you think.</p> <table border="1"> <thead> <tr> <th>Statements</th> <th>I am sure this is right</th> <th>I think this is right</th> <th>I'm not sure</th> <th>This is wrong</th> <th>I am sure this is wrong</th> </tr> </thead> <tbody> <tr> <td>A They reflect all the colours of the spectrum</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B They reflect no colours of light</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C White objects always look white</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Statements	I am sure this is right	I think this is right	I'm not sure	This is wrong	I am sure this is wrong	A They reflect all the colours of the spectrum						B They reflect no colours of light						C White objects always look white						<p>Football kit</p> <p>Harvey's football team has a new football kit. How white and white sports.</p>  <p>Why do you think the football kit looks blue and white? Which of these statements do you think are right? For each statement, tick (✓) one column to show what you think.</p> <table border="1"> <thead> <tr> <th>Statements</th> <th>I am sure this is right</th> <th>I think this is right</th> <th>I'm not sure</th> <th>This is wrong</th> <th>I am sure this is wrong</th> </tr> </thead> <tbody> <tr> <td>A Blue light reflects off the blue shirt</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B The shirt makes the light turn blue</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C Blue light reflects off the white shorts</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Statements	I am sure this is right	I think this is right	I'm not sure	This is wrong	I am sure this is wrong	A Blue light reflects off the blue shirt						B The shirt makes the light turn blue						C Blue light reflects off the white shorts						<p>Blue bottle</p> <p>A bottle looks blue in blue light and it looks blue in white light. Why does the bottle look blue in both kinds of light?</p>  <p>All of the gaps to explain why the bottle looks blue. You should only use the words reflects and absorbs.</p> <p>In blue light Blue light does not contain any other colour, just blue. When it lights up the bottle, the bottle _____ blue light. We see the light that the bottle _____.</p> <p>In white light White light contains all the colours of the spectrum. When the bottle is in white light it _____ blue light. The bottle _____ red light and green light. It _____ all of the colours in white light except for blue. We see the bottle because of the light that it _____.</p>	<p>TARDIS</p> <p>The Doctor's TARDIS lands on the Red Planet. There is only red light.</p>  <p>1. What colour will the TARDIS look on the Red Planet? Put a tick (✓) in the box next to the best answer.</p> <table border="1"> <tbody> <tr> <td>A Blue</td> <td><input type="checkbox"/></td> </tr> <tr> <td>B Red</td> <td><input type="checkbox"/></td> </tr> <tr> <td>C Purple (magenta)</td> <td><input type="checkbox"/></td> </tr> <tr> <td>D Black</td> <td><input type="checkbox"/></td> </tr> </tbody> </table> <p>2. Why do you think it looks this colour?</p> <table border="1"> <tbody> <tr> <td>A There is only red light</td> <td><input type="checkbox"/></td> </tr> <tr> <td>B Blue does not reflect red light</td> <td><input type="checkbox"/></td> </tr> <tr> <td>C The paint is blue</td> <td><input type="checkbox"/></td> </tr> <tr> <td>D The eye adds the red light to the blue</td> <td><input type="checkbox"/></td> </tr> </tbody> </table>	A Blue	<input type="checkbox"/>	B Red	<input type="checkbox"/>	C Purple (magenta)	<input type="checkbox"/>	D Black	<input type="checkbox"/>	A There is only red light	<input type="checkbox"/>	B Blue does not reflect red light	<input type="checkbox"/>	C The paint is blue	<input type="checkbox"/>	D The eye adds the red light to the blue	<input type="checkbox"/>	<p>Flag of Guyana</p> <p>The Flag of Guyana contains the colour yellow. We see yellow as a mixture of green light and red light.</p>  <p>The flag of Guyana shown here is in white light.</p> <p>Which of these statements about the 'golden arrow' are true? For each statement, tick (✓) one column to show what you think.</p> <table border="1"> <thead> <tr> <th>Descriptions of the new colour</th> <th>I am sure this is right</th> <th>I think this is right</th> <th>I'm not sure</th> <th>This is wrong</th> </tr> </thead> <tbody> <tr> <td>A It reflects red light</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B It absorbs blue light</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C It absorbs green light</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Descriptions of the new colour	I am sure this is right	I think this is right	I'm not sure	This is wrong	A It reflects red light					B It absorbs blue light					C It absorbs green light				
Statements	I am sure this is right	I think this is right	I'm not sure	This is wrong	I am sure this is wrong																																																																																			
A They reflect all the colours of the spectrum																																																																																								
B They reflect no colours of light																																																																																								
C White objects always look white																																																																																								
Statements	I am sure this is right	I think this is right	I'm not sure	This is wrong	I am sure this is wrong																																																																																			
A Blue light reflects off the blue shirt																																																																																								
B The shirt makes the light turn blue																																																																																								
C Blue light reflects off the white shorts																																																																																								
A Blue	<input type="checkbox"/>																																																																																							
B Red	<input type="checkbox"/>																																																																																							
C Purple (magenta)	<input type="checkbox"/>																																																																																							
D Black	<input type="checkbox"/>																																																																																							
A There is only red light	<input type="checkbox"/>																																																																																							
B Blue does not reflect red light	<input type="checkbox"/>																																																																																							
C The paint is blue	<input type="checkbox"/>																																																																																							
D The eye adds the red light to the blue	<input type="checkbox"/>																																																																																							
Descriptions of the new colour	I am sure this is right	I think this is right	I'm not sure	This is wrong																																																																																				
A It reflects red light																																																																																								
B It absorbs blue light																																																																																								
C It absorbs green light																																																																																								
<p>Confidence grid</p>	<p>Confidence grid</p>	<p>Focused cloze</p>	<p>Two-tier multiple choice</p>	<p>Confidence grid</p>																																																																																				
<p>Red fridge light</p> <p>Red light contains no other colours, just red. In daylight the fridge looks white.</p>  <p>Some students are discussing which colour the fridge looks in red light.</p> <p>Georgia: It reflects the red light into our eyes Harvey: The fridge looks red Kyle: The fridge always looks white Isaac: The red and white mix together Jasmine: White doesn't reflect any colours</p> <p>To answer:</p> <ol style="list-style-type: none"> Who do you think is right about the fridge in red light? Explain your answer? What mistakes do you think the other students make? What would you say to them to help them to understand? 	<p>White king (1)</p> <p>Suzanne is taking a photograph for the cover of her school's chess magazine. She is experimenting with different colours. She starts with a red background.</p>  <p>Predict What will the white king look like in red light?</p> <p>Explain Why do you think it will look like this?</p> <p>Observe Describe the colour of the king and of the background.</p> <p>Explain Were your prediction and explanation correct? If not, can you explain what you observed?</p>	<p>Flag colours</p> <p>This is the flag of Guyana, in South America.</p>  <p>Predict What will the flag of Guyana look like in green light?</p>  <p>Explain Why do you think it will look like this?</p> <p>Observe Which flag does it look like?</p> <p>Explain Were your prediction and explanation correct? If not, can you explain what you observed?</p>																																																																																						
<p>Talking heads</p>	<p>Predict, explain, observe, explain</p>	<p>Predict, explain, observe, explain</p>																																																																																						