

LIGHT AND SHADOW

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LIGHT AND SHADOW
TEACHER'S MATERIAL

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LIGHT AND SHADOW

Teaching objectives: Studying shadows, reflection and how we see things		Time of the unit : 20 hours	
Content	Communication	Cognition	Culture
<p>1.- Shadows 1.1 formation 1.2 changes 1.2.1 size 1.2.2 position</p> <p>2.- Classification of materials depending on how much light can get through them 2.1 transparent 2.2 opaque 2.3 translucent</p> <p>3.- How we see things 3.1 light enters the eye 3.2 how the eye works</p> <p>4.- Reflection 4.1 how light is reflected in a mirror 4.2. classification of materials depending on how different surfaces reflect light 4.2.1 shiny surfaces 4.2.2 dull surfaces 4.3 flat and curved mirrors 4.4 differences between shadow and reflection</p>	<ul style="list-style-type: none"> • Making predictions • Understanding instructions • Describing processes • Answering questions • Discussing • Listing • Giving reasons • Contrasting • Comparing • Explaining • Defining 	<ul style="list-style-type: none"> • Comparing • Memorising • Identifying patterns • Explaining • Experimenting • Predicting • Describing • Drawing diagrams, bar charts • Generalising • Using key vocabulary and phrases • Using conventional symbols 	<ul style="list-style-type: none"> • Importance of light in Nature and in our daily life • Accuracy when carrying out an investigation • Encouraging observation and analysis of the world around us. • Theatre of shadows • Uses of mirrors in everyday life.

Activities development	Organization	Communication	Material	Teacher's resources
<p>questions about shadows.</p> <p>- Have you ever noticed your shadow ?</p> <p>- When do you notice that you have got a shadow ?</p> <p>- What else can you tell me about shadows ?</p> <p>- When do you notice that you have got a shadow ?</p> <p>Paraphrase what they say in English.</p> <p>4) Go for ten minutes to the playground and give the children some instructions :</p> <p>Find some shadows.</p> <p>Think about how they are made.</p> <p>5) Back to the classroom you give them a paper and they have to draw themselves with a shadow on a sunny day.</p> <p>worksheet 2</p> <p>6) Later, choose some drawings representing different ideas, show them to the children together and comment the differences.</p> <p>Tell them they have to carry out some investigations to understand the subject better like scientists do in their work.</p>	<p>Whole group</p> <p>Whole group</p> <p>Individually</p> <p>Whole group</p>	<p>Language through learning</p> <p>All the ones they need to do the different activities.</p> <p>Different vocabulary or phrases that they come across throughout the lesson.</p>		<p>2.- Seeing things</p> <p><u>Light</u> Every day science</p> <p>Ann Fullick Heinemann</p> <p>ISBN 0 – 431 – 16750 – 8</p> <p><i>Comment</i></p> <p>It's a reference book. It covers different aspects related to light , from speed of light to shadows.</p> <p>3.- Eyewitness science</p> <p><u>Light</u></p> <p>David Burnie</p> <p>Dorling Kindersley in association with the science museum</p> <p>London</p> <p>ISBN 0 – 86318-905 – 9</p> <p><i>Comment</i></p> <p>A very visual book with plenty of images.</p> <p>4.- Hands – on- science</p> <p><u>Physics</u></p> <p>50 great science experiments and projects</p> <p>Consulting editor Chris Oxlade Southwater</p> <p>ISBN 0</p> <p><i>Comment</i></p> <p>A variety of experiments some related to light, eg. how a camera works, how a film works.</p>

Lesson 2

Formation of shadows

Teaching objectives - To know that light travels in straight lines - To know how shadows are made		Time of the lesson: 2 hours		
Activities development	Organization	Communication	Material	Teacher's resources
<p>The children working in pairs do three different activities and you ask them to draw what they observe. They can try each activity, more than once, in order to observe it carefully.</p> <p>1) They shine a torch onto a card with a hole in it and look at the spot of light it makes on a wall. They add another card and do the same thing.</p> <p>2) They shine a powerful torch beam through a comb with widely spaced teeth.</p> <p>3) They shine the powerful torch beam through a cardboard tube.</p> <p>worksheet 1</p> <p>4) Show them different drawings and ask them some questions</p> <p>- Does light travel (move) from the light source ?</p> <p>- What happens when light from a source finds an obstacle on its way ?</p> <p>- Can light go around things ?</p> <p>Paraphrase the things they say in English.</p> <p>5) After debating you write the conclusions and they copy them on a paper.</p> <p>- worksheet 2</p>	<p>Pair work</p> <p>Pair work</p> <p>Pair work</p> <p>Individually</p> <p>Whole group</p> <p>Individually</p>	<p>Language of learning</p> <p>Shine, torch, hole, spot, wall, comb with spaced teeth, cardboard tube, through, travel, around, obstacle,....</p> <p>Language for learning</p> <p>Giving reasons</p> <p>Light travels from</p> <p>Light is blocked by</p> <p>Light can't go around</p> <p>Language through learning</p> <p>All the ones they need to do the different activities.</p> <p>Different vocabulary or phrases that they come across throughout the lesson.</p>	<p>- torches</p> <p>-cards with a hole in it.</p> <p>- cardboard tubes</p> <p>- combs with widely spaced teeth</p> <p>worksheet 1</p> <p>- worksheet 2</p> <p>ppoint helpsheets</p> <p>shadows lesson 2</p> <p>slides n° 6,7</p>	<p><i>To know more about the topic</i></p> <p>Books</p> <p>5.- <u>The science of light</u></p> <p>Projects and experiments with light and colour</p> <p>Steve Parker Heinemann</p> <p>ISBN 0 - 431 – 01342 – X</p> <p><i>Comment</i></p> <p>Very interesting experiments about light, how to make a kaleidoscope, a sundial, a pinhole camera.</p> <p>6.- Hands – on <u>Science</u></p> <p>Over 150 fantastic experiments__</p> <p>John Graham, Peter Mellett Kingfisher</p> <p>ISBN 0 – 7534-0676-4</p> <p><i>Comment</i></p> <p>Interesting experiments about light from spectrum of light to lenses.</p>

Lesson 3

Shadow changes

<p>Teaching objectives</p> <ul style="list-style-type: none"> - To know how shadows in sunlight change over the day - To know that the Earth spins on its axis 		<p>Time of the lesson: 2 hours</p>		
Activities development	Organization	Communication	Material	Teacher's resources
<p>1) Go to the playground on a sunny day and encourage children to explore their shadows in different positions. Then, each child choose one of these positions and record it with chalk on the tarmac. Later in the day they check to see if the shadows are in the same place and are the same size and shape.</p> <p>In order to make a later activity we are going to take photos of the shadows of each child.</p> <p>2) Talk about the shadows asking them :</p> <ul style="list-style-type: none"> - Are the shadows joined to your body ? - Are they in the same place ? - What are their shapes like ? - Is their size the same or different ? - Why do you think they have changed ? - At what time do you record your first shadow? And the second? - Does it make any difference ? <p>3) Give them a photo of their two shadows and tell them to answer some questions related to them. The questions will be more or less the same ones we have worked previously.</p> <p>worksheet 1</p> <p>4) At different times during a bright sunny day</p>	<p>Whole group</p> <p>Individually</p> <p>Whole group</p> <p>Individually</p>	<p>Language of learning</p> <p>Shadow, size, shape, same, different, in front of, join, Earth spins on its axis</p> <p>Language for learning</p> <p>Contrasting</p> <ul style="list-style-type: none"> - The size is the same / different. - They are in the same place / different. <p>Comparing</p> <ul style="list-style-type: none"> - They are longer / shorter. <p>Giving reasons</p> <ul style="list-style-type: none"> - My shadow is joined to. - I thinkbecause the sun was high/low in the sky. 	<ul style="list-style-type: none"> - Chalk, - Digital camera -Photos -worksheet 1 -worksheet 2 worksheet 3 - tape measure -computers - globe - model (person) -torch point helpsheets shadows lesson 3 slides n° 9,10 	<p><i>To know more about the topic</i></p> <p>Websites</p> <p>www.bbc.co.uk/schools/scienceclips/index~flash.shtml</p> <p><i>Comment</i></p> <p>Very interesting science clips related to the topics of the English curriculum. Some of these related to this topic</p>

Activities development	Organization	Communication	Material	Teacher's resources
<p>visit the play ground and set up a stick. Ask the children to measure and record the length of the shadow at different times of day . Also ask children to predict by drawing on the ground the height of the shadow at intermediate times. They present their results on a table and they make a bar chart.</p> <p>worksheet 2</p>	<p>Whole group</p> <p>Individually</p>	<p>Listing</p> <p>- The shadow stick gets shorter and then longer because.....</p> <p>- The first was at...</p> <p>- The second was at...</p>		
<p>5) Take a torch and an Earth globe with a model of a person stuck on it , move the Earth globe and the torch representing the Sun which stays still. Ask children some questions related to what they are observing.</p> <p>- What parts of the Earth are facing the Sun ?</p> <p>- Where is it at daytime ?</p> <p>- Where is it at nighttime ?</p> <p>- What happens to the shadow ?</p> <p>- Does it change ?</p> <p>- What makes it different ?</p> <p>- How long do you think the Earth spins on its axis ?</p>	<p>Whole group</p>	<p>Language through learning.</p> <p>All the ones they need to do the different activities.</p> <p>Different vocabulary or phrases that they come across throughout the lesson.</p>		
<p>6) After doing this activity all together we can ask children some questions about what the bar chart show them.</p> <p>- What has happened to the stick shadow ? Why ?</p> <p>Worksheet 3</p>	<p>Whole group</p> <p>Individually</p>			

Lesson 4
Position of shadows

Activities development	Organization	Communication	Material	Teacher's resources
<p>Teaching objectives</p> <p>-To know that the position of shadows depends on the direction of the light source. - To make and test predictions</p>		<p>Time of the lesson: 1 hour</p>		
<p>1) Put a plasticine figure on a sheet of white paper in the centre of a circle. Take a torch but don't switch it on. Ask children :</p> <p>- Where do you think the shadow is going to be ? - Make a prediction.</p> <p>With a felt-tipped pen you draw some predictions on the paper.</p> <p>Switch on the torch and ask a child to draw around the shadow in a different coloured pen.</p> <p>2) Each group repeat the activity number 1 carrying out ten predictions and tests.</p> <p>Children take turns to hold the torch and draw the predictions and outcomes in the same way as we did in number 1.</p> <p>worksheet 1</p> <p>3) Then we talk all together and you ask a child to predict where the shadow will be:</p> <p>- Can you explain why you think the shadow will be there ?</p>	<p>Whole group</p> <p>Groups of 3</p> <p>Individually</p> <p>Whole group</p>	<p>Language of learning</p> <p>Plasticine, felt-tipped pens,</p> <p>Language for learning</p> <p>Make predictions</p> <p>I think the position of the shadow depends on the direction of the torch.</p> <p>Language through learning</p> <p>All the ones they need to do the different activities.</p> <p>Different vocabulary or phrases that they come across throughout the lesson.</p>	<p>- plasticine figure</p> <p>- torch</p> <p>- white paper</p> <p>- felt-tipped pens</p> <p>shadows lesson 4 slides n° 12,13</p> <p>- worksheet 1</p> <p>ppoint helpsheets</p>	<p><i>To know more about the topic</i></p> <p>Websites</p> <p>- www.woodlands-junior.kent.sch.uk/teacher/science.html</p> <p><i>Comment</i></p> <p>The most visited school website in the United Kingdom.</p> <p>www.teachingideas.co.uk/science/contents.htm</p> <p><i>Comment</i></p> <p>You can find some ideas and useful worksheets.</p>

Lesson 5
Sizes of the shadows

Teaching objectives		Time of the lesson: 1 hour		
<ul style="list-style-type: none"> - To identify factors which might affect the size of a shadow - To apply their knowledge about shadows 				
Activities development	Organization	Communication	Material	Teacher's resources
<p>1) You tell the children they are going to do an investigation about how changing the distance from the light source affects the size of a shadow object.</p> <p>worksheet1</p> <p>After the investigation you comment the results with the children and you reach some conclusions. It could be interesting to talk about the importance of repeating the experiments and do them accurately.</p> <p>2) In order to apply the knowlegde they have about how to change the sizes of the shadows, they do the next activity.</p> <p>a) Draw and cut out a monster shape.</p> <p>b) Tape the wire to the bottom of the shape to make a handle.</p> <p>c) The room must be dark with light walls.</p> <p>d) Switch on the torch and place it about 3 metres from a light wall</p> <p>e) Hold the wire so the shape is between the light and the wall.</p> <p>f) Move it freely backwards and forwards and observe what happens to the shadow.</p>	<p>Individually</p> <p>Whole group</p> <p>Individually</p> <p>Groups of 3</p>	<p>Language of learning</p> <p>height, size, blur, edge, backwards, forwards</p> <p>closer, further</p> <p>Language for learning</p> <p>Comparing</p> <ul style="list-style-type: none"> - The closer the torch , the larger the shadow. - The further away the torch , the smaller the shadow. <p>Giving reasons</p> <ul style="list-style-type: none"> - The edge of the shadow becomes blurred because the shadow is larger. - The edges of the shadow are clear because the shadow is smaller. - I have moved the torch closer to the object. - I have moved the object further from the torch.. <p>Language through learning</p> <p>All the ones they need to do the different activities.</p> <p>Different vocabulary or phrases that they come across throughout the lesson.</p>	<ul style="list-style-type: none"> -torch -metre ruler -object -worksheet1 -instructions - pencil - pair of scissors - black card - pieces of wire - sticky tape - room with light walls ppoint helpsheets 	<p><i>Teacher's note</i></p> <p>Activity 2</p> <p>We can use this activity as an assessment activity. We can check what the children have learned about the sizes of the shadows.</p> <p>After step f) you give some instructions to the groups of three.</p> <ul style="list-style-type: none"> - How can you make the shadow bigger ? - Can you do it in a different way ? - What have you moved to make the shadow bigger ? - What has happened to the edges of the shadow ? - How can you make the shadow smaller ? - What has happened to the edges of the shadow ? <p>To help them you can also give them out these instructions written.</p> <p>-instructions</p> <p>Optional activity</p> <p>In your English lessons you can organise a theatre of shadows. The children with your help can write some short dialogues using the monsters shapes they have done in their science lesson and then, they can perform the play for the whole school.</p>

Lesson 6

Classification of materials

Teaching objectives		Time of the lesson: 3 hours		
<p>- To know how to classify materials depending on how much light can get through them: Transparent, opaque and translucent</p> <p>- To carry out an investigation</p> <p>- To know that translucent and opaque materials form shadows and transparent ones do not.</p>				
Activities development	Organization	Communication	Material	Teacher's resources
<p>1) Present children with a collection of objects/material including some opaque, transparent and some translucent. Explain to them that some materials let more light come through than others. Ask children:</p> <p>- How could we test how much light each material lets through ?</p> <p>Tell them that there are some devices that can measure how much light goes through.</p> <p>As part of the demonstration, exaggerate putting the light meter very close to the torch or much further away, try to demonstrate that you need to keep it at the same distance.</p> <p>Ask the groups to decide how many materials to test and record their results on a chart. - worksheet 1</p> <p>2) After that ask each group to give a piece of the material that lets all the light through. Put these in a group with the label transparent. Do the same with the other materials</p> <p>Bring out some new samples of materials and ask children which group they think they would belong to and why. Put them in the relevant group. - labels</p>	<p>Whole group</p> <p>Groups of 3 or 4</p> <p>Individually</p> <p>Whole group</p> <p>Pair work</p>	<p>Language of learning</p> <p>aluminium foil, wallpaper, cellophane, clingfilm, tracing paper, wood, opaque, transparent, translucent, tissue paper, A4 paper, light meters, predict, test, switch on, switch off, most, least</p> <p>Language for learning</p> <p>Giving reasons</p> <p>- The..... let(s) no light through.</p> <p>- The let (s) a little light through.</p> <p>- The let(s) a lot of light through.</p> <p>- A shadow is formed.</p> <p>- No shadow is formed.</p> <p>- This is because let(s) a lot of /a little/no light through.</p> <p>Make predictions</p> <p>- I think/I predict that....will happen.</p> <p>- A shadow will be formed.</p>	<p>- aluminium foil</p> <p>-wallpaper</p> <p>-cellophane</p> <p>-clingfilm</p> <p>-tracing paper</p> <p>-wood</p> <p>- tissue paper</p> <p>- A-4 paper</p> <p>- light meters</p> <p>- screen</p> <p>- worksheet 1</p> <p>-worksheet 2</p> <p>- labels</p> <p>ppoint helpsheets</p> <p>shadows lesson 6 slides n° 15,16, 17</p>	<p><i>To know more about the topic</i></p> <p>Websites</p> <p>- www.sciencemuseum.org.uk/on-line/launchpad/index.asp</p> <p><i>Comment</i></p> <p>Some interesting experiments you can try in your science lessons</p> <p>- www.thinktank.ac/education/try.htm</p> <p><i>Comment</i></p> <p>Website of the Science Museum in Birmingham. There are some interesting experiments you can do in your science lessons.</p>

Activities development	Organization	Communication	Material	Teacher's resources
<p>3) Ask the children to work in pairs and to choose 5 materials and discuss what they think the shadow would be like. They record their predictions on a chart then, they carry out a test and record their findings.</p> <p>-worksheet 2</p> <p>4) A useful way to reinforce all the work done in these five lessons about shadows is using BBC website . You should select the suitable activities.</p> <p>www.bbc.co.uk/schools/scienceclips/index~flash.shtml</p>	<p>Individually</p>	<p>- No shadow will be formed</p> <p>Language through learning</p> <p>All the ones they need to do the different activities.</p> <p>Different vocabulary or phrases that they come across throughout the lesson.</p>		<p><i>Teacher's note</i></p> <p>Optional activity</p> <p>You can organize a display in which your pupils in groups ,explain to the rest of the school the classification of the materials they have done.</p>

Activities development	Organization	Communication	Material	Teacher's resources
<p>2) Ask the children to draw some paths that light can take from light source. Talk about different sources of light, if necessary show them some images of these different sources of light, in order to remember the names. Remind them light travels in straight lines, so they should use the ruler to draw the rays of light.</p> <p>-worksheet 1</p>				

Lesson 2
How the eye works

Teaching objectives -To know how our eyes enable us to see -To know the names and functions of the parts of the eye		Time of the lesson: 3 hours		
Activities development	Organization	Communication	Material	Teacher's resources
<p>1) Show a diagram of the eye, explaining to children how light from the objects around us is detected and the functions of the different parts of the eye. -Ppoint diagram of the eye</p> <p>2)In order to reinforce the children's learning, they play a matching game. matchinggame</p> <p>3) After they have played the matching game, give them the diagram of the eye and they have to give the different names. - worksheet 1</p> <p>3) You revise with the children the different functions of the parts of the eye. Try to give them some strategies, in order, to remember the names and functions. (eg., you talk about the different parts following the order that the light comes into the eye.)</p> <p>You give the children a worksheet and they have to match the function with the part of the eye. - worksheet 2</p>	<p>Whole group</p> <p>Groups of four</p> <p>Individually</p> <p>Individually</p>	<p>Language of learning Pupil, retina, cornea, iris, optic nerve, lens, brain, amount of</p> <p>Language for learning Explaining</p> <p>- Pupil lets in the correct amount of light.</p> <p>- Iris controls the amount of light let in by the pupil.</p> <p>- Cornea protects the sensitive parts of the eye.</p> <p>- Retina detects the light.</p> <p>- Lens focuses the light to give a sharp image.</p> <p>- Optic nerve sends messages to the brain.</p> <p>Language through learning All the ones they need to do the different activities. Different vocabulary or phrases that they come across throughout the lesson.</p>	<p>-Ppoint diagram of the eye</p> <p>-matchinggame</p> <p>- worksheet 1</p> <p>- worksheet 2</p> <p>- ppoint helpsheets</p> <p>how we see things slide n° 6 to 10</p>	<p><i>Teacher's note</i></p> <p>How the eye works</p> <p>In the human eye, the muscles in the iris cause the small hole in the middle (the pupil) to contract in bright light or enlarge in dim light. The lens in the eye focuses light rays onto a sensitive layer at the back of the eye called the retina. Cells in the retina send signals along the optic nerve to the brain, which interprets them as an image. The way the light rays cross over means that the image is upside down or inverted in the eye. However, when we are babies, the brain soon learns to turn the image from the eye the right way</p>

Activities development	Organization	Communication	Material	Teacher's resources
<p>4) We tell the children that we are going to make a pinhole tube to understand better how our eyes work. To do it we are going to follow the instructions of www.thinktank.ac/ (school programmes, try this at home, photography activities, Let's focus)</p> <p>5) A useful way to reinforce all the work done in these five lessons about shadows is using BBC website . You could select the suitable activities.</p> <p>www.bbc.co.uk/schools/scienceclips/index~flash.s</p>	<p>Individually</p>			

REFLECTION

Lesson 1
How light is reflected in a mirror

Activities development		Organization	Communication	Material	Teacher's resources
<p>Teaching objectives</p> <p>- To know how light is reflected in a mirror</p> <p>- To know that mirrors change the direction in which light is travelling</p>		<p>Time of the lesson: 2 hours</p>			
<p>1) Revise with children how we see non-luminous objects and the way we represent light travelling (with arrows) Ask them to draw some diagrams that illustrate it. In order to help them you show one to them.</p> <p>diagram</p> <p>worksheet 1</p>		<p>Whole group</p> <p>Individually</p>	<p>Language of learning</p> <p>flat, smooth, mirror, reflection, ray of light, swap round, left, right, shiny.</p>	<p>- torch</p> <p>- safe mirrors</p>	<p><i>Teacher's notes</i></p> <p>The -ppointhelsheet is a tool to help children with key vocabulary and phrases they should use in the different lessons of this unit.</p> <p>It has two different parts : the vocabulary with the images and the phrases with two options. Children have to choose the right one.</p> <p>How light is reflected in a mirror</p> <p>The surface of a mirror is so flat and smooth that rays of light that strike it in an almost parallel manners are reflected as a series of almost parallel rays and we can see a clear image in the mirror, the same as what we see if we look directly at the object, but left and right are swapped round.</p>
<p>2) We do this activity to introduce two properties of the objects : smooth and shiny related to reflection.</p> <p>After the children have touched and looked at a selection of different objects to experiment the differences, they classify them in two groups, smooth and shiny. Finally, you give them a sheet to reinforce their learning.</p> <p>-labels</p> <p>worksheet2</p>		<p>Whole group</p> <p>Individually</p>	<p>Language for learning</p> <p>Describing</p> <p>- The / It is smooth.</p> <p>- The / It is shiny</p> <p>- The mirror / It is smooth and shiny</p> <p>- The mirror / It is flat.</p> <p>Giving reasons</p> <p>- Because all the light is travelling in one direction.</p> <p>- Mirror changes the direction of the light.</p>	<p>worksheet 1</p> <p>-labels</p> <p>- selection of objects</p> <p>(shiny and smooth)</p> <p>worksheet2</p> <p>worksheet3</p> <p>-ppointhelsheet</p>	
<p>3) You show the children a mirror and ask them to describe its surface.</p> <p>- What does the mirror look like ?</p> <p>- What does "shiny" mean ?</p>		<p>Whole group</p>	<p>Comparing</p> <p>- The is smoother than the.....</p> <p>- The is shinier than the</p>	<p>diagram</p>	
<p>4) We start this activity revising the concept "scattered" and we represent it by using a child pretending to be a light source, the rest of the children are the rays of light coming out from this light source, they will go off in many different directions.</p>		<p>Whole group</p>	<p>Defining</p> <p>- Shiny means that it reflects well.</p> <p>- Scattered nmeans that light goes off in many directions.</p>		

Activities development	Organization	Communication	Material	Teacher's resources
<p>5) With this activity we try to know how light works with an ordinary object and with a mirror.</p> <p>With only a little light in the classroom, you shine a torch across the room so that the children can see the spot of light it forms. Then, you place the torch on the desk and use a mirror to reflect the light to different parts of the room and ask them :</p> <p>- Is the light being scattered ? (it is not)</p> <p>- How do you know this ? (all the light is travelling in one direction)</p> <p>- This is called "reflection"</p> <p>- Do the mirrors reflect light ?</p> <p>- What happens to the direction of light when you use a mirror ?</p> <p>6) You give mirrors to the children and leave them to use it freely. Then, some minutes later you give them some instructions.</p> <p>- Try to look behind you !!</p> <p>- Try to look around corners !!</p> <p>- Look inside the wastepaper bin !!</p> <p>- Play with more than one mirror !!.</p> <p>.....</p> <p>Later, you ask them to draw some diagrams of what they have been doing.</p> <p>worksheet3</p>	<p>Whole group</p> <p>Individually</p>	<p>Language through learning</p> <p>All the ones they need to do the different activities.</p> <p>Different vocabulary or phrases that they come across throughout the lesson.</p>		<p><i>Teacher's note</i></p> <p>Differences between reflection and scattering</p> <p>Mirrors reflect light. They change the direction in which it is travelling. Reflection is different from scattering, because all the rays of light that hit a mirror from a particular direction will travel off in the same direction as each other, whereas scattered rays go off in many different directions.</p> <p>Reversed image</p> <p>Emphasize the fact that, the picture, or image, in a mirror is reversed, right becomes left and left becomes right.(activity6).</p>

Lesson 2

Classification of materials

Teaching objectives		Time of the lesson: 3 hours		
- To classify materials depending on how different surfaces reflect light : shiny and dull - To know that flat and curved mirrors reflect light in different ways - To distinguish between shadow and reflection				
Activities development	Organization	Communication	Material	Teacher's resources
1) You give each group of children a selection of different materials asking them . - Can you see your reflection ? - Does it reflect a torch beam ? After having explored the materials they classify them in two groups : the ones that reflect and the ones that don't reflect. label When they have done the classification, you ask them . - What do their surfaces look like ? (you start by the reflective ones, because they have studied shiny surfaces) You ask the same question related to the other group(non-reflective). Probably they will say non-shiny. Now you can introduce the word dull and you swap the labels for shiny and dull. 2) Now each group chooses five different materials and record their results, discussing the question written on the worksheet. worksheet 1 3)Finally, you comment the results with the whole group, emphasising the conclusions. 4) Give each group of children a flat mirror and a curved one, they explore them and they	Groups of 3 or 4. Whole group Groups of 3 or 4 Individually Whole group Group s of 3 or 4	Language of learning shiny, dull, spoon, make-up mirrors, flat mirrors, curved mirrors, polish metal, polish wood, Language for learning Giving reasons - I can see my reflection. - I can't see my reflection. - It is shiny. - It is dull. - Shadows are attached to the object. Contrasting - My shadow is dark and I can only see my shape. - I can see my face reflected on a shiny surface. Defining - Dull surfaces don't reflect light and can't be used as mirrors.	- torch - aluminium foil paper - painted surfaces matt and gloss - paper - whiteboard - book - flat mirrors. . curved mirrors -shiny spoons - make-up mirrors -polished metals - polished wood - labels - ppointhelpsheet - worksheet 1 - worksheet2 - worksheet 3 reflectionshadowppoint	<i>Teacher's note</i> Uses of shiny and dull materials in everyday life After activity 3 you can talk to the children about the benefits of using different kind of materials: dull to hide and highly reflective materials for visibility. Smooth, shiny surfaces such as mirrors and polished metals reflect light well. Dull and dark surfaces such as dark fabrics do not reflect light well. Reflective surfaces can be very useful. Mirrors inside cars reflect light to help drivers see objects behind them. Reflective strips on clothing and bikes help cyclists to be extra visible at night. 'Cat's eyes' on the road reflect light from car headlamps to help the driver see the road at night. Try always to elicit from them the different materials and uses If you want you can plan a written activity about it. Curved mirrors Curved surfaces can either be concave , which means that they curve inwards , or convex , which means that they curve outwards . The mirrors we use to see our reflections are flat because although the images they produce are reversed from right to left, they are the same size and shape as the objects . Curved mirrors produce distorted images that can be larger or smaller (convex mirror) than the object reflected. Examples of convex mirrors : rear view mirrors in cars, astronaut visors : These kinds of mirrors help people to see as much as possible. Magnifying make-up and shaving mirrors are concave.

Activities development	Organization	Communication	Material	Teacher's resources
<p>discuss in their group about the differences and the similarities of the two types of mirrors .</p> <p>You ask them how they will record their results. Accept more than one option.</p> <p>5) After activity 4, you help them with their conclusions asking them.</p> <p>- What are the similarities ?</p> <p>- What are the differences ?</p> <p>Write down all they say and then discuss with them in order to reach some conclusions.</p> <p>Ask them about the different uses of flat and curved mirrors in everyday life.</p> <p>Finally, they copy the conclusions and they draw curved and flat mirrors and their use in everyday life.</p> <p>- worksheet2</p> <p>6) Shadow or Reflection ? They have to classify different images you show them on their worksheets.</p> <p>reflectionshadowppoint</p> <p>After correcting this activity , ask them what shadows have in common. Do the same with reflections and finally ask them about the differences between shadows and reflections.</p> <p>Later they write the conclusions on their worksheets.</p> <p>worksheet 3</p>	<p>Whole group</p> <p>Individually</p> <p>Individually</p> <p>Whole group</p> <p>Individually</p>	<p>- Shiny surfaces reflect light and can be used as mirrors.</p> <p>- All the mirrors reflect light and we can see the reflections.</p> <p>- Flat mirrors produce reversed images the same size and shape as the object.</p> <p>- Curved mirrors produce images that can be larger or smaller than the object reflected.</p> <p>- A shadow is formed when light is blocked.</p> <p>- When light is reflected it changes direction when it hits a shiny surface.</p> <p>Language through learning</p> <p>All the ones they need to do the different activities.</p> <p>Different vocabulary or phrases that they come across throughout the lesson.</p>		<p>Uses of shiny and dull materials in everyday life</p> <p>After activity 3 you can talk to the children about the benefits of using different kind of materials: dull to hide and highly reflective materials for visibility. Smooth, shiny surfaces such as mirrors and polished metals reflect light well. Dull and dark surfaces such as dark fabrics do not reflect light well. Reflective surfaces can be very useful. Mirrors inside cars reflect light to help drivers see objects behind them. Reflective strips on clothing and bikes help cyclists to be extra visible at night. 'Cat's eyes' on the road reflect light from car headlamps to help the driver see the road at night.</p> <p>ICT resource</p> <p>You can use the BBC website to reinforce the learnings of the children. You could select the activity and the quiz related to reflection.</p> <p>www.bbc.co.uk/schools/scienceclips/index~flash.shtml</p> <p>children's opinion</p> <p>This is a sheet where children can explain to the teacher how they feel about this unit and what they have learned.</p> <p>frontpagestudentsbook</p> <p>This is the frontpage of the book the students they will have with all the worksheets.</p>

- How can you make the shadow **bigger** ?

- Can you do it in a **different way** ?

- What have you **moved** to make the shadow **bigger** ?

- What has **happened** to the **edges** of the shadow ?

- How can you make the shadow **smaller** ?

- What has **happened** to the **edges** of the shadow ?

OPAQUE

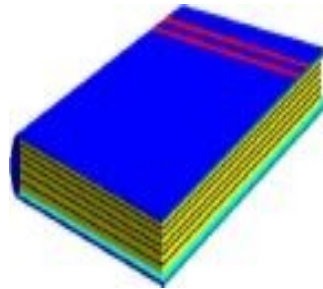
TRANSPARENT

TRANSLUCENT

DIAGRAM

HOW WE SEE NON-LUMINOUS OBJECTS

LIGHT SOURCE → OBJECT → EYE



SMOOTH

SHINY

ROUGH

SMOOTH

SHINY

DULL

REFLECT

DON'T REFLECT

TOP SECRET !!!

You don't need to write your name !!!

Hello !

Here, there are some questions I would like you answer , because I'm very interested in knowing your opinion and your feelings about the unit we have studied, **Light and shadow**.

1) Things you have liked

.....
.....

2) Things you haven't liked

.....
.....

3) The most difficult thing for me was

.....
.....

4) The easiest thing for me was

.....
.....

5) Looking at your book, what lessons you remember better ? Why ?

.....
.....
.....
.....
.....

Thank you very much for your collaboration

LIGHT AND SHADOW
STUDENT'S MATERIAL

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[ppoint shadows vocabularyandprases](#)

[ppoint howweseethings vocabularyandphrases](#)

[ppoint reflection vocabularyand phrases](#)

LIGHT AND SHADOW

Name

Date.....

Draw the most important source of **light** in the daytime and write the name.

Draw other sources of **light** and write the names.

LIGHT AND SHADOW

Name

Date.....

Draw yourself and your shadow

ME AND MY SHADOW

At.....

LESSON 1

I think my shadow is	always the same
	different

This shadow is	longer	than the other
	shorter	

I can see because of	the light
	the darkness

I noticed my shadow on a	sunny day
	cloudy day

LIGHT AND SHADOW

Name

Date

Draw

A torch onto a card

A torch through a comb

A torch through a cardboard tube

LIGHT AND SHADOW

Name

Date.....

Write the conclusions about how light travels.

.....

.....

.....

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LESSON 2

Light travels from the	light source
	sky

Light	is blocked	by an object and it forms a shadow
	isn't blocked	

Light	can	go around things
	can't	

LIGHT AND SHADOW

Name

Date.....

Look carefully at your shadows image and choose the right answer, then write it.

1.- Is your shadow joined to your body ?

1	<i>Yes, it is</i>
2	<i>No, it isn't</i>

2.- Are the two shadows in the same or in a different place ?

1	<i>They are in the</i>	1	<i>same</i>	<i>place</i>
2	<i>They are in a</i>	2	<i>different</i>	

3.- How is your second (2nd) shadow ?

<i>My second shadow is</i>	1	<i>shorter</i>
	2	<i>longer</i>

4.- At what time do you record your first (1st) shadow ? and the second (2nd) ?

<i>The first at..... and the second at.....</i>

5.- Why do you think your shadow has changed

Because the sun was	<i>1 higher</i>	<i>in the sky</i>
	<i>2 lower</i>	

.....

.....

LIGHT AND SHADOW

Name

Date.....

Measure the length of the shadow at different times during the day.
Record your findings on the chart below.

Length of the shadow	Time

LIGHT AND SHADOW

Name

Date.....

Looking at the bar chart

What have you found out?

I have found that

.....

.....

.....

.....

.....

*Try to explain your results by saying **why** this happened.*

Copy the right one

Shadows are longer when the sun is	1 higher	in the sky because the Earth is tilting	1 nearer	away to the sun
	2 lower		2 further	

.....

.....

Finish the phrase

Shadows are shorter when

.....

LESSON 3

The size is	the same
	<hr/> different

They are in	the same	place
	<hr/> a different	

They are	longer
	<hr/> shorter

My shadow is joined to

I think the shadow is	longer	because the sun is	high	in the sky
	<hr/> shorter		low	

The shadow stick gets shorter and then longer because.....

LIGHT AND SHADOW

Name

Date.....

Make ten predictions about where the shadow is going to be. Then check them.

Predictions	True False	Yes No
1 st		
2 nd		
3 rd		
4 th		
5 th		
6 th		
7 th		
8 th		
9 th		
10 th		

Choose the right answer and then copy it

The position of the shadow depends on	1the direction	of the torch
	2the colour	

.....
.....

LESSON 4

I think the position of the shadow depends on	the direction <hr/> the colour	of the torch
---	-----------------------------------	--------------

LIGHT AND SHADOW

Name

Date.....

Use a torch, an object, a metre ruler and a screen or wall to investigate the size of shadow cast by an object at different distances from the source of light:

Starting at 1 metre distance, move the torch closer to the block in 10 cm steps. Each time measure the height of the shadow and fill in your results in the table.

Distance (cm)	100	90	80	70	60	50	40	30	20	10
Height (cm)										

1.- What happens to the shadow as the light source gets closer to the block ?

.....

.....

2.- Did you observe any other differences in the shadow ?

.....

.....

3.- Repeat some of your observations (20, 40, 80, 100 cm) and see if you get the same results.

3.1 If your results are different why might this be ?

.....

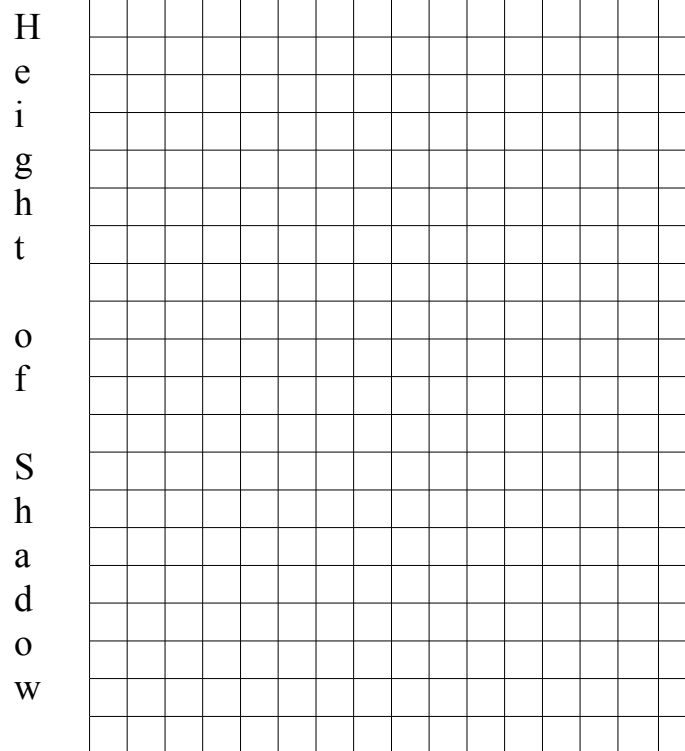
.....

3.2 Why is it important to repeat experiments ?

.....

.....

4.- Use the grid below to draw a graph of your results



LESSON 5

The closer the torch	the larger the shadow
	the smaller the shadow

The further away the torch	the smaller the shadow
The closer the torch	

The edge of the shadow is blurred	because	the shadow is larger
		the shadow is smaller

The edge of the shadow is clear	because	the shadow is smaller
The edge of the shadow is blurred		

LIGHT AND SHADOW

Name

Date.....

Write your results in the chart below.

Material	How much light comes through

Answer these questions

1.- How many different materials did you try ?

2.- Which material let the **most** light through ?

.....

3.- Which material let the **least** light through ?

.....

4.- Write the materials in order from the **least** to the **most** transparent

.....

.....

.....

LIGHT AND SHADOW

Name

Date.....

Material	What I predict will happen	What did happen	Why I think this happened
			Because....

Choose the right answer and then copy it.

Opaque and translucent materials	1 don't form	shadows
	2 form	

.....

.....

.....

Transparent materials	1 let the light through	and	1 form	shadows
	2 don't let any light through		2 don't form	

.....

.....

.....

LESSON 6

The..... let(s)	no	light through
	<u>a little</u>	
	a lot of	

A	shadow	is formed
<u>No</u>		

This is because	let(s)	no	light through
			<u>a little</u>	
			a lot of	

I	think	a	shadow will be formed
	<u>predict</u>	no	

LIGHT AND SHADOW

Name

Date.....

Draw two different paths that light can take from a light source.

1st path of light light source

2nd path of light light source

LESSON 1

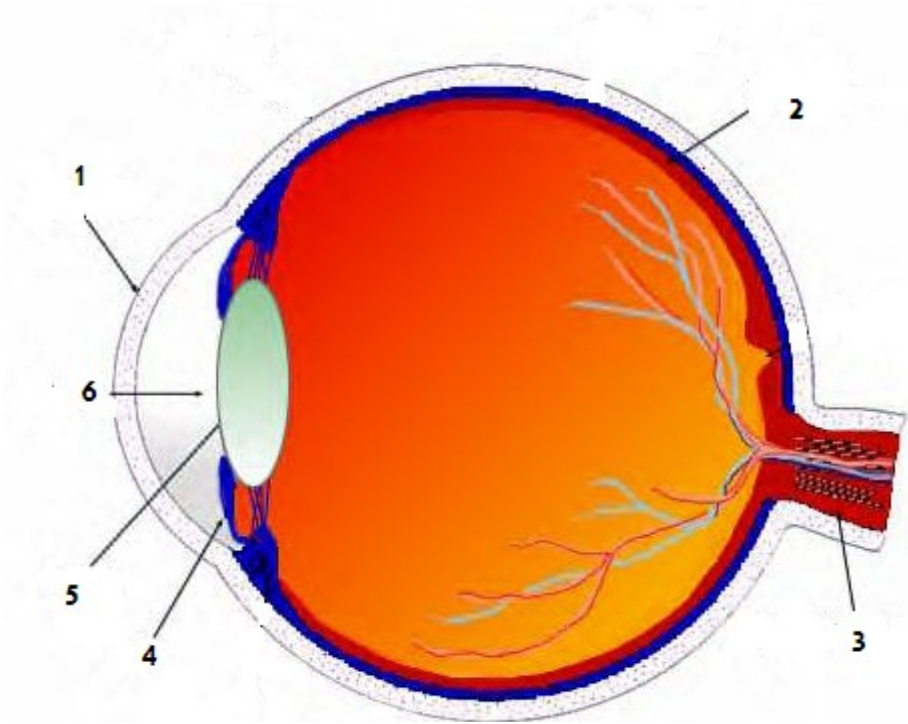
We need	more light
We don't need	

We need to point the torch at the	object
	person

LIGHT AND SHADOW

Name

. Date.....



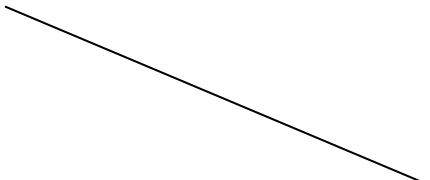
Write the names of the different parts of the eye.

LIGHT AND SHADOW

Name

Date

Match the functions with the different parts of the eye

- **Cornea** sends messages to the brain
 - **Retina** protects the sensitive parts of the eye
 - **Pupil** controls the amount of light let in by the pupil
 - **Lens** lets in the correct amount of light
 - **Iris** focuses the light to give a sharp image
 - **Optic nerve** detects the light
- 

LESSON 2

Retina	detects the light
Cornea	

Iris	controls the amount of light let in by the pupil
Retina	

Cornea	lets in the correct amount of light
Pupil	

Optic nerve	focuses the light to give a sharp image
Lens	

Cornea	protects the sensitive parts of the eye
Iris	

Pupil	sends messages to the brain
Optic nerve	

LIGHT AND SHADOW

Name

Date.....

1. Draw three diagrams showing the way that light enters the eye.
Don't repeat the light sources and the objects !!

Diagram 1

Light of source.....	Object.....

Diagram 2

Light of source.....	Object.....

Diagram 3

Light of source.....	Object.....

LIGHT AND SHADOW

Name

Date.....

1.- Choose three **shiny** objects and three **smooth** ones and draw them in the right place.

Write the names as well.

SMOOTH	SHINY

LIGHT AND SHADOW

Name

Date.....

Draw two diagrams of what you have been looking at.

Seeing objects behind you



Seeing objects around the corner



LESSON 1

The	is	<u>smooth</u>
		shiny

The mirror is smooth, shiny and flat

Because all the light is travelling in	<u>one direction</u>
	many directions

<u>Mirror changes</u>	the direction of the light
Mirror doesn't change	

The..... is	smoother	than the.....
	<u>shinier</u>	

"Shiny" means that	<u>it reflects</u>	well
	it doesn't reflect	

"Scattered" means that light goes off in	<u>any directions</u>
	one direction

LIGHT AND SHADOW

Name

Date.....

Choose five different materials, test them and then write your results in the table below.

Name of material	Does it reflect a torch beam ?	Is it shiny or dull ?

Answer these questions:

- 1) Which is the **most** reflective material ?
- 2) Which is the **least** reflective material ?
- 3) Looking at the table above, choose the correct answer and copy it.

Shiny surfaces	reflect light
	————— don't reflect light

.....
.....

4) Looking at the table above, choose the correct answer and copy it.

Dull surfaces	reflect light
	<hr/> don't reflect light

.....

.....

LIGHT AND SHADOW

Name

Date.....

1.-Write the conclusions about the differences and similarities between **flat** and **curved** mirrors.

.....

.....

.....

.....

.....

.....

.....

.....

2.-Draw different mirrors we use in everyday life.

Flat mirrors	Curved mirrors

LIGHT AND SHADOW

Name

Date.....

1.- Looking at the different slides write “**S**” for shadow and “**R**” for reflection.

1) 2) 3) 4) 5) 6) 7)

8) 9) 10) 11) 12) 13) 14)

15) 16)

2.- What do all these shadows have in common ?

.....
.....
.....
.....

3.- What do all these reflections have in common ?

.....
.....
.....
.....

4.- What are the differences ?

.....
.....
.....
.....

LESSON 2

I can see	my reflection
I can't see	

It is	shiny
	dull

My shadow is dark and	I can only see my shape
	I can see my face

I can see my face reflected in a	shiny	surface
	dull	

Dull	surfaces reflect light and can be used as mirrors
Shiny	

Flat mirrors	produce images that can be larger or smaller than the object reflected
	produce reversed images the same size and shape as the object

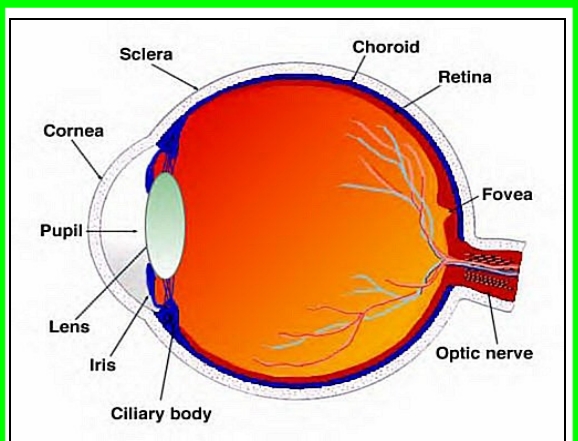
A shadow is formed	when light is blocked
	when light hits a shiny surface

Light and shadow

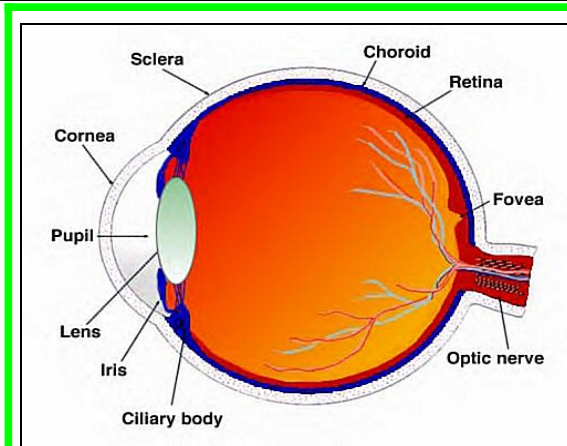
NAME

LEVEL

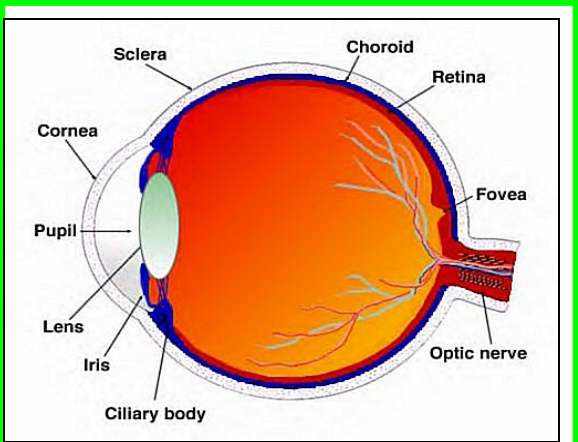
SCHOOL YEAR



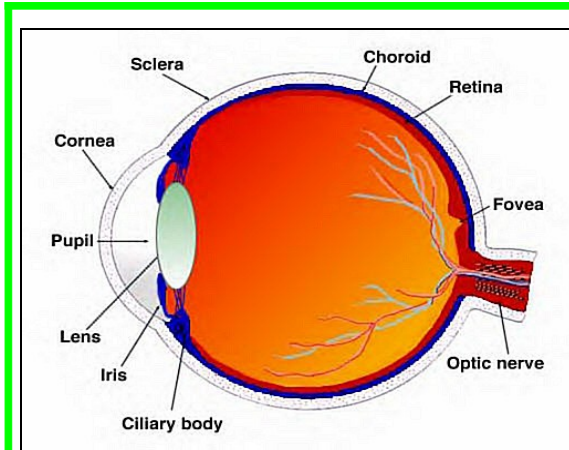
CORNEA



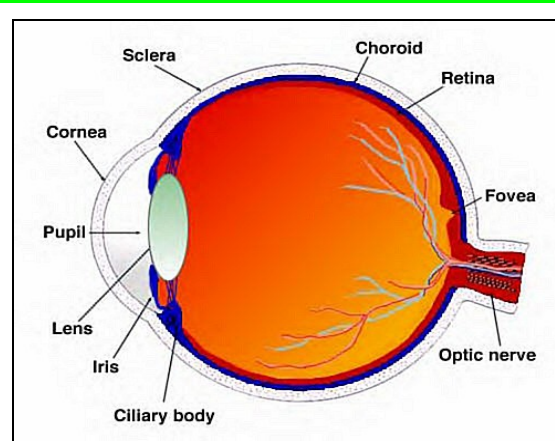
RETINA



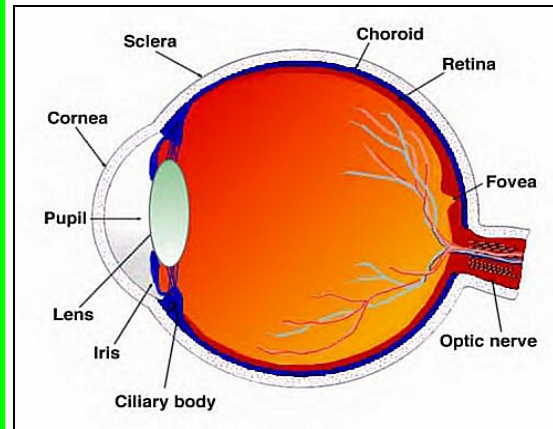
IRIS



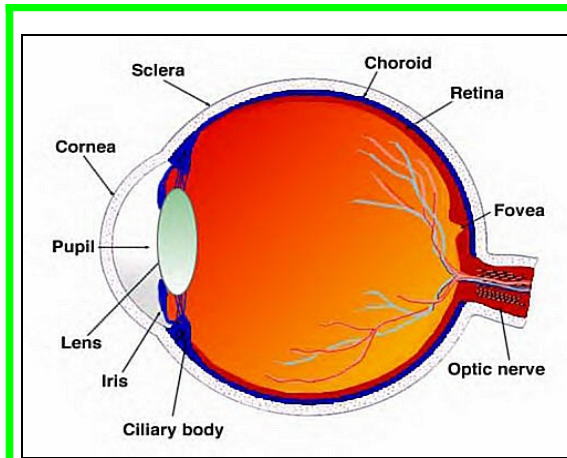
LENS



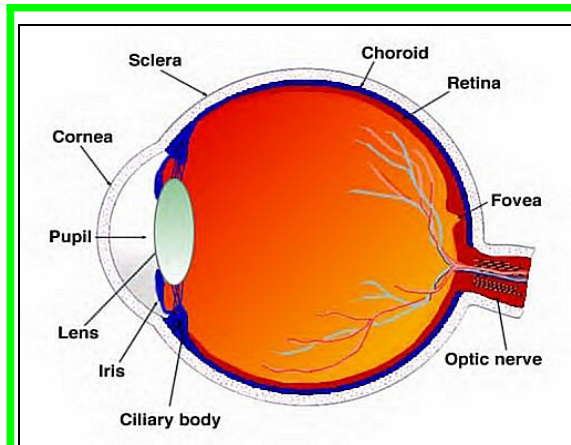
OPTIC NERVE



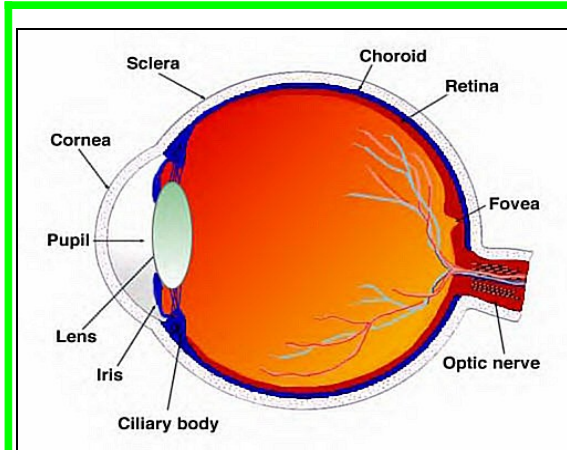
PUPIL



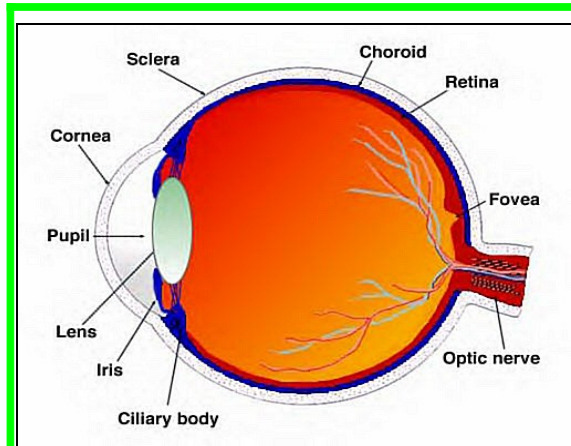
**LETS IN THE CORRECT
AMOUNT OF LIGHT.**



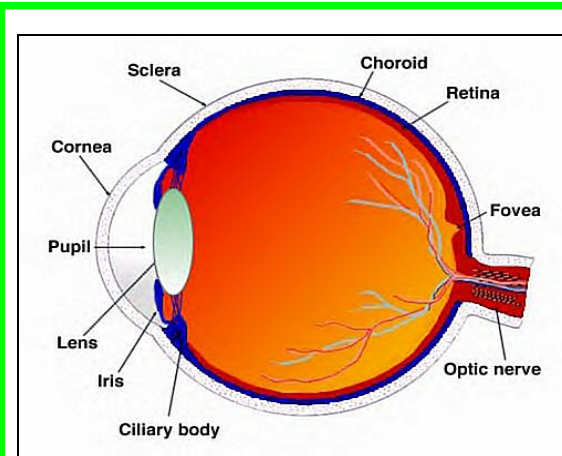
**CONTROLS THE AMOUNT
OF LIGHT LET IN BY THE
PUPIL.**



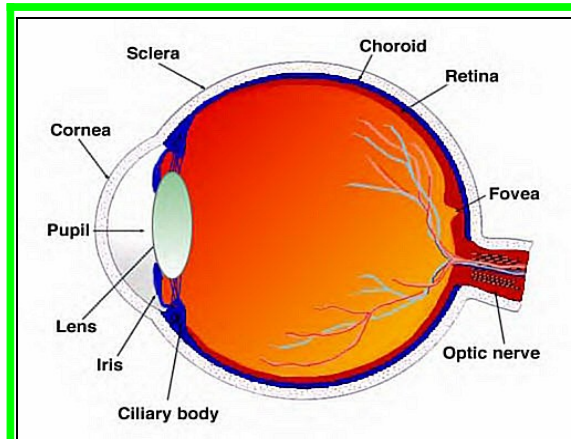
**PROTECTS THE
SENSITIVE
PARTS OF THE EYE.**



DETECTS THE LIGHT.



**FOCUSES THE LIGHT TO
GIVE A SHARP IMAGE.**



**SENDS MESSAGES TO
THE BRAIN.**