# Medium Term Plan
# Energy - Light



**P levels**

Performance attainment targets (P scales) and performance descriptors are used for pupils aged 5 to 16 with special educational needs (SEN) who are working below the standard of the national curriculum tests and assessments. PSTT recognises that the national curriculum levels used in this document are no longer current. We have had so many requests to return these materials to the website that they remain in the documents as a guide for those who have used them in the past. The written statements may be useful to others as an indication of children's development. For further information about P levels see: https://www.gov.uk/government/publications/p-scales-attainment-targets-for-pupils-with-sen

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Primary Science Teaching Trust recommends that a full risk assessment is carried out before undertaking in the classroom any of the practical investigations contained in the plans.

**Safety Note**

PSTT advises teachers to refer to either CLEAPSS website or SSERC website for up to date health and safety information when planning practical activities for children.

# Teacher's Notes: Energy - light

## Big Questions

- Can you bend a pencil without breaking it?
- Do things still shine when the light goes out?
- Can you see round corners?
- Is light white?
- Is black a colour?
- Is light invisible?

## Answers

- Yes, put the pencil in a gless of water and look at the pencil from the side. Lights travels a different speeds through air and water (an example of refraction) making the pencil appear bent.
- Yes, some LEDs and fluorescent tubes still have some energy in them and continue to glow after they have been turned off.
- Yes, you can see around corners if you use a periscope.
- White light contains all the wavelengths of visible light.
- Black is the absence of light.
- The human eye can only see visible light, but light comes in many other "colors" - radio, infrared, ultraviolet, X-ray, and gamma-ray - that are invisible to the naked eye.

## Learning Objectives

### Pupils will have opportunities:

- To be able to identify and sort sources of light.
- To know how shadows are formed and the terms opaque, transparent and translucent
- To explore how light travels and can be split

## Quick review activities

- Go for a light walk to identify sources of light.
- Research and find out about lights used as warnings e.g. link to lighthouses and story about Grace Darling (literacy link).

- Search and sort materials which will reflect light.
- Find and materials which are opaque, transparent and translucent.
- Which of these objects is a light source? (use pictures and objects for pupils to sort)
- Simple game of 'Simon Says' eg Find me a bright light, Find me something dull, find me something which reflects.

## Vocabulary relevant to this topic

- Light – electromagnetic waves of particular frequencies and wavelengths (repesented as rays), make things visible
- Dark – the absence of light in a place
- Light source – an object which provides light
- Bright – showing or reflecting a strong light
- Shine – to give out light
- Shadow – an area which light rays cannot reach due to an obstacle in their path
- Transparent – lets light through
- Translucent – lets some light through
- Opaque- does not let light through
- Mirror – very smooth, shiny surface which reflects light
- Image – a picture or a likeness of something
- Reflect – to bounce back
- Ray – path that light takes
- Beam
- Purpose, Explore, Find, Explain, Investigate, Sort, Compare

## Background information about this topic

- **Light**
  Light energy is a form of radiation that is transmitted by electromagnetic waves. Sometimes light behaves as a wave and sometimes as a stream of 'energy packets'. Light waves are very different to sound waves because:
  They travel a million times faster 300 million metres per second – it takes 8 minutes for light from the Sun to reach us.
  They belong to the big family of different types of radiation that include X-rays, microwaves, ultra violet and infra-red. All these waves come from the Sun but most are filtered out by the atmosphere. These types of radiation are different because of different number of waves passing per second (frequency) and wavelengths.
  They can travel through a vacuum making it possible for light energy from the sun and stars to reach us here on Earth.
- **Light sources**
  Light comes from a wide variety of sources. All these sources emit or radiate their own heat and light. Included in this group is our Sun, the stars, electric lamps (bulbs), torches, fairy lights, bicycle lamps, candles, flames and fluorescent tubes.
  When explaining light sources to pupils, a clear distinction needs to be made between light sources that emit their own light energy and those which only reflect light. This latter includes the moon, the walls of your room, a surface of a desk, a shiny surface or mirror and the pages of a book.
- **Shadows**
  Opaque objects do not allow light to pass through them. They either reflect or absorb all of the light that falls on them. This causes an area behind the object (relative to the light source) to appear darkened because less light is falling there. This darkened area is a shadow. The closer an object is to a wall/ floor, the sharper the edge of its shadow will be: the further away the hazier the edge of the shadow. This is because more light from surrounding surfaces can reach the area behind the object. The brightest light sources will also cast the darkest and most defined shadows.
- Some materials are not opaque and allow some light to be transmitted through them. Transparent materials transmit most of the light that reaches them. They allow good visibility through them, e.g. glass, cellophane, water, air and some plastics. Translucent materials partially reflect and partially allow the passage of some light through them, e.g. greaseproof paper or frosted glass. The light that passes through them is scattered. Therefore, no clear image can be seen, and no sharp edged dark shadow is formed.

- **The 'reflection' of light.**
  We are able to see objects that do not emit their own light because most surfaces reflect some of the light that falls on them. This reflected light, which is scattered from the surfaces, enters our eyes. It is detected by light sensitive receptors in the eye and the nervous impulses are transmitted to the brain, which then processes and interprets the nervous impulses to create a picture of the world around us. Some people think that our eyes give off some kind of 'sight rays' that select the object to look at. Most animals do not see in colour – a bit like having our night vision all the time. Colour vision is due to light sensitive cells that respond to red, green and blue light
- Mirrors are smooth and shiny and are an example of a reflective object. Most of the light that falls on them is reflected to produce a sharp image of nearby objects. Curved surfaces distort the objects being reflected. Flat mirrors, however, give a true likeness of objects being reflected in them. This is because light travels in straight lines and when it is reflected at a particular angle (angle on incidence) it will be reflected at an equal angle (angle of reflection). This causes images to appear the wrong way round but not upside down. Mirrors can be used to see round corners e.g. periscopes. Dentist s' mirrors are concave and magnify the image and enable the dentist to see the minute details of the tooth.
- **The refraction of light**
  Some mes objects in water can appear bent. This is because when the light travels in a different medium is slows down or speeds up. A bit like roller skating on a smooth surface and then hi ng a rough path. Our brains and eyes believe light travels in straight lines so this is why refrac on causes optical illusions. It also causes white light to be split into different colours when it passes through a prism. Although there said to be 7 colours in the rainbow there are actually far more. The Archer fish has two parts to its eyes that allows it to see in water and air (copes with refraction) so it can see and catch its prey easily.

# Energy - light P1-3

**Objective 1: To be able to identify and sort sources of light.**

## Descriptions of intended outcomes at different levels of attainment

- Tolerates involvement in practical activity and responding to light in a darkened environment (P1i)
- Shows sustained response to activity by changes in body language (P1ii)
- Reacts to the new activities and experiences (P2i)
- Cooperates with share exploration in the dark den (P2ii)
- Requests the use of a different light source or reflector (P3i)
- Chooses a favourite or best result e.g. a light source or reflector (P3ii)

# Energy - light P1-3

**Objective 1: To be able to identify and sort sources of light.**

| Possible Activities: | Resources: |
|---|---|
| Dark Den – make a dark area or cave with a large piece of opaque material. Pupils to sit in den with simple light and tolerate changes of brightness.<br><br>Can also explore different light sources in the in the den. | Large piece of opaque material, torch or electric candle. Different sources of light e.g. head torch, bike lamp, fairy lights. |

| Optional activities you might like to try include: | Resources: |
|---|---|
| Explore light sources on 'walk' round school<br>Experience darkness in the light room | Voice recorder/ video camera |
| Dark den – make a dark area or cave with a large piece of opaque material. Pupils to sit in den with simple light sources that are shone on reflective objects | |

## Points to Note:

Pupil may think there is only dark and light – no variables of brightness

Pupils being wary of smaller confined spaces.
Be aware of heat from torches or any sharp objects.
Light sources can be used to encourage tracking

**Objective 2: To know how shadows are formed and the terms opaque, transparent and translucent**

## Descriptions of intended outcomes at different levels of attainment

- Encounters a range of sensory evidence during activities on shadows (P1i)
- Shows random, fleeting response to shadow formation (P1ii)
- Shows sustained response to identifying shadows (P2i)
- Performs actions often by trial and improvement e.g. shining torches (P2ii)
- Purposefully uses equipment to observe a change e.g. reaches out for torches (P3i)
- Actively explores making shadows for more extended periods (P3ii)

# Energy - light P1-3

**Objective 2: To know how shadows are formed and the terms opaque, transparent and translucent**

| Possible Activities: | Resources: |
|---|---|
| Experience a shadow puppet play or use one from you tube hp://www.youtube.com/watch?v=iCmFWJjc4RAÈ<br><br>Shine light through objects that are partly transparent and partly opaque to make interesting patterns. Move torches to change the pattern | Shadow puppet play or video, torches, net curtain, fans with grill covering, sieves, orange safety barrier netting |

| Optional activities you might like to try include: | Resources: |
|---|---|
| Experience shining light through different everyday objects in darkened room.<br>Experience shining torches through coloured filters –singly and overlapped | Torches, opaque, transparent and translucent everyday objects e.g. bubble wrap, plastic containers, paper, balloons, mugs, range of coloured filters |
| Experience making different shadows of themselves with a large light source.<br><br>Experience adults making shadow shapes or cut out different shapes and make noises if appropriate | |

## Points to Note:

Awareness of how individuals will act to flashing lights.
Risk assessment moving round the school.

# Energy - light P1-3

**Objective 3: To explore how light travels and can be split**

## Descriptions of intended outcomes at different levels of attainment

- Allows themselves to be involved in the activity (P1i)
- Gives intermittent reactions during the experiences (P1ii)
- Accepts and engages in shared or coactive exploration (P2i)
- Recognises familiar objects and events e.g. reaching out for coloured rice (P2ii)
- Explores materials in more complex ways or for longer time (P3i)
- Remembers learned responses over more extended periods of time e.g. how to wave the rainbow plate or put pom-pom in tube (P3ii)

| Possible Activities: | Resources: |
|---|---|
| Experience making rainbows with prisms in the light room<br><br>In a dark room with light walls, fill a large glass container with water and place a mirror inside. Tilt the mirror slightly and shine a light onto it to create a rainbow. Alter the angle of mirror or torch until rainbow appears on the wall.<br><br>Experience picking the right coloured pom-pom to match the tube colour. Stick the tubes to a wall with blu tac and put small balls under to catch pom-poms<br><br>Experience a rainbow salt tray – sprinkle salt lightly over the rainbow tray and then pupils can make patterns with fingers or moving other objects through the salt. | Light room, prisms, large glass container, mirror, torch, 7 coloured tubes one for each colour of the rainbow and matching soft pom- poms, blu tac, small dishes, plastic containers, recordings of rainbow songs, trays or box lids, paper in colours of rainbow, glue, salt |

# Energy - light P1-3

**Objective 3: To explore how light travels and can be split**

| Optional activities you might like to try include: | Resources: |
|---|---|
| Experience rainbow colours using coloured rice in zipped bags – feel textures and squishiness. Use them in conjunction with rainbow songs e.g. I can sing a rainbow or All the colours of the rainbow.<br>Make rainbows by piling the bags on top of each other or pouring layers into clear plastic containers | Zipped plastic bags, 2 cups of jasmine rice per bag, paint in colours of rainbow, container to mix rice and paint in. |
| Make different coloured jelly and use to make a big rainbow which pupils can explore.<br>Make plate rainbows by sticking lengths of 7 lengths of crepe paper in colours of rainbow to plate and letting pupils wave in the air to music | |

## Points to Note:

Must check pupils' tolerance to flashing lights.

Pupils not to flash lights in faces/ eyes

To make coloured rice: put 2 cups of rice in a container and shake with a good amount on paint until all rice coloured. Dry and then pour into a zipped bag. Jasmine rice also gives a nice smell.

To make a rainbow salt tray stick strips of coloured paper in rainbow order to a tray then cover with salt

# Energy - light P4-6

**Objective 1: To be able to identify and sort sources of light.**

## Descriptions of intended outcomes at different levels of attainment

- Explores objects using any sensory mode (P4i)
- Shows interest in what happens to colours in dark and light places or taking objects into the dark den (P4ii)
- Completes a simple task with guidance e.g. walks round school and puts symbol on dark and light places (P5i)
- Uses light sources with increasing independence (P5ii)
- Makes sensory based comparisons of colour in different lights with support (P6i)
- Explores light sources appropriately (P6ii)

| Possible Activities: | Resources: |
|---|---|
| Read a story or poem about light/ dark (e.g. The Owl Who Was Afraid of the Dark e.g. http://www.jamescarterpoet.co.uk/poems.html#thedark)<br><br>Play blindfold games e.g. blind man's bluff, guess the object<br><br>Explore and try out a range of light sources –begin to talk about the best one to have in certain situations e.g. to find a lost ring, eat dinner by etc | The Owl Who Was Afraid of the Dark book.<br>Blindfolds and some games e.g. crawl under blanket looking for objects and repeat with a torch.<br>Light sources e.g. torches, candles, bicycle lights, Glo-stars, Xmas tree lights, fibre optic lights, indoor fireworks, mobile phone etc |

# Energy - light P4-6

**Objective 1: To be able to identify and sort sources of light.**

| Optional activities you might like to try include: | Resources: |
|---|---|
| Make a dark den or other dark space and ask pupils to select something they think will help them see in the dark and then to try it!<br>Explore how to make batman's bat signal bigger and stronger | Batman sign templates, torches, large piece of opaque material or box to make den, mirrors, reflective strips, torches, night lights, metal spoons, foil, shiny Xmas baubles etc |
| Walk round school to find dark and light places. Select the correct symbol at each place. Explore what happens to colours in these places.<br>Present pupils with a range of objects and ask them to pick a light source from them | |

## Points to Note:

Pupils are often unaware that darkness is absence of light.

Be sensitive to pupils with visual impairment.

Spatial awareness and restriction of physical movement (may need to be supported by an adult).

Be aware that some light sources also give out heat.

# Energy - light P4-6

**Objective 2: To know how shadows are formed and the terms opaque, transparent and translucent**

## Descriptions of intended outcomes at different levels of attainment

- Communicates awareness of some obvious changes in shadows or light (P4i)
- Follows a simple step-by-step procedure to gather evidence (P4ii)
- Responds to simple scientific questions about shadows e.g. can you show me a shadow? Did it stop the light? (P5i)
- Tries out a range of equipment when they feel familiar with it (P5ii)
- Records using everyday objects provided e.g. making pile of things light won't go through (P6i)
- Completes a procedure e.g. shining light through different things by following simple instructions (P6ii)

| Possible Activities: | Resources: |
|---|---|
| Play guess the shadow or try to match to the actual object<br><br>Explore shining light through squares of different materials. If appropriate ask pupils which they think might stop the light.<br>Try making sun prints<br>http://www.stevespanglerscience.com/lab/experiments/sun-sensitive-paper-experiment | Torch and blank wall for shadows, shadow cards or objects to create shadows and screen so pupils can't see the object: tissue paper, sugar paper, bubble wrap, card, greaseproof, fabrics, clear plastic, light sensitive paper, leaves, flowers and other objects |

| Optional activities you might like to try include: | Resources: |
|---|---|
| Explore making own shadow behave in different ways e.g. make shadow thin or fat? Make it look like a monster? Make different shapes with a friend? Can you hide from shadow? Has shadow got a face? Coloured t-shirt?<br>Explore if you can make a coloured shadow using different coloured lights | Bright torch or data projector, blank wall for shadows, torches, cellophane in different colours, opaque objects to make shadows |

## Objective 2: To know how shadows are formed and the terms opaque, transparent and translucent

| | |
|---|---|
| Go on a shadow walk round school. Take pictures of shadows<br>Explore shining light through everyday objects to see which let light through and which don't.<br>Pupils can try holding coloured acetates/ filters in front of the torch to see what happens. Try mixing the coloured filters. This makes coloured light but not shadows because light can pass through acetate. | |

### Points to Note:

Pupil may think a shadow is an entity in itself and they are the same size all the time

Many pupils think that shadows have features and are coloured

If coloured acetates aren't available you can use sweet wrappers from Roses chocolates
Sugar paper can be used instead of light sensitive paper with bright light but takes longer to change and isn't always as obvious

# Energy - light P4-6

**Objective 3: To explore how light travels and can be split**

## Descriptions of intended outcomes at different levels of attainment

- Imitates actions e.g. shining torch or looking at reflections (P4i)
- Shows interest in the objects and activities (P4ii)
- Completes a simple task with guidance e.g. looks at all the shiny objects (P5i)
- Indicates where similar changes have happened e.g. where their reflection is upside down (P5ii)
- Makes sensory based comparisons with support e.g. making rainbows (P6i)
- Begins to make generalisations e.g. curved shiny objects change a reflection (P6ii)

| Possible Activities: | Resources: |
|---|---|
| Shine a torch with a pencil beam across the room onto a wall and sprinkle talc or powdered chalk in the space between the torch and the wall to show the light beam in a straight line.<br>Make pictures of light sourcesand use spaghetti or glittery string as light rays going out from the source.<br>Use a laser pen to show how light can be reflected from a mirror.<br>Let pupils explore shining light through a prism on a sheet of white paper – with help. Move the torch and watch what happens. Move the prism and watch what happens. Ask pupils what colours they can see. | Torch with pencil beam, laser pen, chalk dust or talc, mirrors, long spaghetti, glittery string, glue, pictures of light sources to add rays to, prisms of different shapes, torches, white paper |

# Energy - light P4-6

**Objective 3: To explore how light travels and can be split**

| Optional activities you might like to try include: | Resources: |
|---|---|
| Experience looking at their reflection in a variety of shiny objects.<br>Explore using mirrors to see behind and talk about where we use mirrors in everyday life e.g. dentist, road junctions, in cars,<br>Make a rainbow using a container of water In a dark room with light walls, fill a large glass container with water and place a mirror inside. Tilt the mirror slightly and shine a light onto it to create a rainbow. Alter the angle of mirror or torch until rainbow appears on the wall. Let pupils try moving mirror or torch for themselves with help. Talk about what happens and what colours they can see. | Concave, convex and plain mirrors, spoons, foil – plain and coloured, mobile phone mirror, shiny paper, container of water, torch |
| Experience looking at their reflections through water – put mirrors in bottom of container of water. Then pour water onto reflections and observe the distortion<br><br>Explore using mirrors to see round a corner<br><br>On a sunny day take pupils outside with sun behind them and spray water from the hosepipe to make a rainbow above the water.<br><br>Try making a rainbow by shining a torch onto a CD and onto a sheet of paper | |

# Energy - light P4-6

## Objective 3: To explore how light travels and can be split

### Points to Note:

Pupils may think that all reflective materials are the same and that light can travel round corners.

Pupils not to flash lights in faces/ eyes.

Be aware of allergies to talc or chalk dust

Keep laser pen away from pupils

Ensure that pupils put light rays from all directions for light sources like candles, bulbs

White light can be split into the colours of the rainbow

# Energy - light P7-8

**Objective 1: To be able to identify and sort sources of light.**

## Descriptions of intended outcomes at different levels of attainment

- Responds to questions requiring an informed answer (P7i)
- Demonstrates simple properties of light/ sources (P7ii)
- Makes their own observations about changes of light and describes these changes when questioned directly (P8i)
- Identifies obvious risks and reduces the risk e.g. heat from some light sources, requests a plastic mirror (P8ii)

| Possible Activities: | Resources: |
|---|---|
| Ask pupils to go round school and put a post-it note on things that give out light. Ask questions like 'Do windows give out light or just let it through?' 'Does the computer always give out light?' 'Does a mirror give out its own light?'<br><br>Look in a small hole in end of shoe box. Shine different brightnesses of torches in the hole in the top. Discuss what can be seen and does brightness make a difference. Ask if they can see colours. Then use centicubes which are the same shape but different colours and so don't give colour away. Place these in box and ask again if they can see colour.<br><br>Discuss different ways of making it possible to see more in the box as a group e.g. making the hole bigger or taking off the lid. | Shoe box with hole in lid for torch to shine through and flap at one end that can be opened or closed, torches with fairly flat batteries so very dim, torches with halogen bulbs that are very bright, objects to place in box, different coloured cencubes |

# Energy - light P7-8

**Objective 1: To be able to identify and sort sources of light.**

| Optional activities you might like to try include: | Resources: |
|---|---|
| Show photos and videos of using lights for celebrations e.g. Xmas, birthdays, fireworks, religious ceremonies<br><br>Try the light stick experiment or show video http://www.stevespanglerscience.com/lab/experiments/light-sticks-the-science-of-liquid-light<br><br>Tell pupils that when men went to the moon they left some objects there that reflect light so when they shine a laser it reflects it back to Earth and they use this to measure the distance between Earth and Moon. Can they find the best reflectors to put on the Moon? | Photos/ video of light sources used for celebrations, 3 light sticks, 2 beakers, ice water and hot water, reflective surfaces e.g. night time clothes, mirrors, street signs, bicycle reflectors, Xmas decorations, hologram paper, torches |
| Revisit light sources e.g. pick sources from range of objects or photos. Also sing song http://www.youtube.com/watch?v=Mztpcdc6YWI<br><br>Find out about lights with special jobs e.g. traffic lights, lighthouses, lights on appliances<br><br>Talk about things you can't do in the dark. E.g. look at book<br><br>Explore using a mirror to try to reflect light from a torch onto a particular spot | |

# Energy - light P7-8

**Objective 1: To be able to identify and sort sources of light.**

## Points to Note:

Pupils are not aware of light sources.

Pupils say the moon is a light source.

Light needs to be bright for colours to be seen.

Be aware that many light sources also give out heat.

**Objective 2: To know how shadows are formed and the terms opaque, transparent and translucent**

## Descriptions of intended outcomes at different levels of attainment

- Makes simple recordings of findings (P7i)
- Begins to respond to encouragement to repeat or modify tasks (P7ii)
- Communicates understanding by sorting and comparing materials (P8i)
- Explores and observes similarities and differences in materials when light is shone at them (P8ii)

| Possible Activities: | Resources: |
|---|---|
| Look at video on how to make shadow puppets. Design and create shadow puppets/ monsters<br><br>Explore shining torches through different materials to introduce terms opaque, translucent and transparent. Then set up a 'Materials treasure hunt' – finding materials which are opaque, translucent and transparent and collecting them in appropriately labelled tubs | Paper, card, scissors, sticks, sellotape, templates if needed, labelled tubs – opaque/ no light, translucent/ some light, transparent/ lots of light, range of materials e.g. different papers, fabrics, everyday objects<br>http://www.liverpoolmuseums.org.uk/kids/videos/shadow-puppets.aspx - how to make shadow puppets |

# Energy - light P7-8

**Objective 2: To know how shadows are formed and the terms opaque, transparent and translucent**

| Optional activities you might like to try include: | Resources: |
|---|---|
| Show a clip of the Britain's Got Talent shadow theatre performance. http://www.youtube.com/watch?v=a4Fv98jttYA and explore how to change shadows e.g. try different light sources, try moving light source nearer to/ away from object/ try moving object<br><br>Pupils to gather transparent, translucent and opaque materials from around school and sort using a large recording chart on floor/ hoops.<br><br>Shine a light through a comb – what do pupils see? What do they think is happening? | Different types of material opaque, transparent, translucent and vocabulary cards/ symbols for pupils to use.<br>Variety of materials found round school (identify before lesson if necessary), hoops or large recording chart, different sizes of torches, opaque objects, blank screen |
| Show clip of using hands to create different shapes.<br>http://www.youtube.com/watch?v=0-J9714e76g<br>Let pupils explore for themselves.<br>Take pictures of own shadow in different places round the playground or draw round in chalk<br><br>Match labels to the different materials for transparent, opaque or translucent. | |

## Points to Note:

Pupil may think a shadow is an entity in itself and they are the same size all the time.

Many pupils think that shadows have features and are coloured.

Awareness of using scissors safely.

# Energy - light P7-8

**Objective 3: To explore how light travels and can be split**

## Descriptions of intended outcomes at different levels of attainment

- Actively joins in science investigations (P7i)
- Distinguishes between different results e.g. points out which material made the best mirror (P7ii)
- Begins to arrange results e.g. different foil that gives best to worst reflection (P8i)
- Identifies changes and brings to the attention of others e.g. when making bendy mirrors (P8ii)

| Possible Activities: | Resources: |
|---|---|
| Show clip<br>https://www.bbc.com/bitesize/clips/zyntsbk<br>Repeat the experiment shown in the clip, providing three cards with holes in them. First ask the children to let the light travel in a straight line through the holes. Then invite them to try to direct the light in an angle using their mirrors. | Foil, torch with pencil beam. Laser pen, chalk dust or talc, pieces of card with a small holes in exactly the same place and means of holding upright, prisms, camera |

# Energy - light P7-8

**Objective 3: To explore how light travels and can be split**

| Optional activities you might like to try include: | Resources: |
|---|---|
| Explore making a mirror. Cover the back of a piece of glass or plastic with different materials and compare how good the reflection is.<br>Make a bendy mirror by covering card with reflective sticky back plastic (better than foil). Try looking at reflections in different shapes and hold shape in place with modelling clay.<br>Use a laser pen to show how light can be reflected from a mirror. Sprinkle with chalk dust/ talc. To make more visible.<br><br>Make a rainbow using a container of water In a dark room with light walls, fill a large glass container with water and place a mirror inside. Tilt the mirror slightly and shine a light onto it to create a rainbow. Alter the angle of mirror or torch until rainbow appears on the wall. Let pupils try moving mirror or torch for themselves to see what happens. | Pieces of glass or plastic to make mirrors with, foil, paint of different colours, black paper, coloured paper, card, reflective sticky back plastic, modelling clay, Laser pen, mirrors, container of water, mirror and torch |
| Experience looking at reflections in a variety of objects and record some dierences<br><br>If a large mirror is available try this experiment<br>http://www.stevespanglerscience.com/lab/experiments/flying-with-mirrors<br><br>Pupils to explore light travelling with mirrors e.g. seeing into the classroom cupboard or each person has a mirror and they have to arrange themselves so the beam from a torch travels to every mirror.<br><br>Make rainbows using some or all of the methods on this site not encountered before. http://www.wikihow.com/Make-a-Rainbow | |

# Energy - light P7-8

## Objective 3: To explore how light travels and can be split

### Points to Note:

Pupils may think that all reflective materials are the same and that light can travel round corners.

Risk assessment moving round the school

Take care when using foil – sharp edged

Do not shine torch directly into eyes.
Some pupils may be allergic to talc or chalk dust
The two pieces of card will need to be in line for the light to pass through. Again you can demonstrate afterwards using the chalk dust and moving one of the cards so they are no longer in line

# Energy - light L1-3

**Objective 1: To be able to identify and sort sources of light.**

## Descriptions of intended outcomes at different levels of attainment

- Describes light and dark using everyday vocabulary (L1i)
- Shows an understanding of comparative language e.g. more, less, brighter, dimmer (L1ii)
- Communicates simple observations (L1iii)
- Identifies and sorts light sources (L2i)
- Ranks results in order e.g. best to worst reflectors (L2ii)
- Draws on own observations to find answers to questions (L2iii)
- Recognises that light comes from a variety of sources and can identify primary and secondary sources (L3i)
- Uses scientific language when reporting what they found out (L3ii)
- Describes what they found out linking cause and effect e.g. Shiny objects are like mirrors and are good at reflecting or big torches give out the most light (L3iii)

| Possible Activities: | Resources: |
|---|---|
| Give pupils pictures of light some sources and some giving light from a reflected source (sun, stars, moon, torch, paper, computer screen) Ask pupils to sort into sources of light and light from reflection.<br><br>Compare the light from different torches and try to use words like bright, brighter, dull, duller, yellowish, whitish and give them a star rating for brightness<br><br>Measure the brightness of different light sources by seeing how many sheets of tracing paper it takes to block the light of different torches | Pictures of different light sources and reflective light for pupils to sort.<br>Sorting diagram/ hoops, tracing paper squares, torches of different sizes, |

# Energy - light L1-3

**Objective 1: To be able to identify and sort sources of light.**

| Optional activities you might like to try include: | Resources: |
|---|---|
| Pupils to use interactive programme to indentify and sort light sources.<br><br>Pupils in pairs to pretend they are in their bedroom at home and create a list of all the light sources.<br><br>Pupils to use a Carroll diagram to sort objects into whether they give out light or not.<br><br>Talk about things you can and cannot do in the dark.<br><br>Pupils try to create own blindfold game | Computer/ laptops<br>http://www.bbc.co.uk/bitesize/ks1/science/light/play/<br><br>http://www.bbc.co.uk/learningzone/clips/light-sources-in-your-bedroom-at-night/2428.html animated story<br>Sheet for light sources in own bedroom.<br><br>Carroll diagram (2 x 2 table) Object Gives out light / Does not give out light<br>Torch<br>Mirror |
| Write the word light in the middle of an A3 piece of paper or large floor book. In groups or as a class pupils to say/ write all the single words they associate with light<br><br>Explore using a mirror to try to reflect light from a torch onto a particular spot and then try to reflect light round the room<br><br>Find the best reflectors using a torch and a range of shiny, smooth and rough objects | |

# Energy - light L1-3

**Objective 1: To be able to identify and sort sources of light.**

## Points to Note:

Pupils may not distinguish between primary sources of light and reflectors
Pupils can think that light stays on a mirror during reflection

Pupils may be aware that light bounces off mirrors but not other objects

Pupils may also think the normal daylight is not form a light source

Risk assessment moving round the school, do not touch light bulbs. Do not look directly into the sun.

# Energy - light L1-3

**Objective 2: To know how shadows are formed and the terms opaque, transparent and translucent**

## Descriptions of intended outcomes at different levels of attainment

- Asks simple questions stimulated by their exploration of shadows (L1i)
- Draws on everyday experience to help answer questions about shadows e.g. what is the same about places where there are shadows? (L1ii)
- Makes suggestions in response to evaluation questions e.g. could you make a shadow a different way? (L1iii)
- Makes suggestions about how to find out about the best material for curtains or best shadow puppet (L2i)
- Presents their findings in appropriate ways (L2ii)
- Makes measurement using standard or non standard measures (L2iii)
- Link what they have found out to the way they use equipment to form shadows (L3i)
- Suggests and a way to record own observations (L3ii)
- Use scientific terminology to explain what they have found out (L3iii)

| Possible Activities: | Resources: |
|---|---|
| Also use activities from P7-8<br><br>Investigate the best way to make shadow puppets clearer, larger and smaller<br><br>Investigate which materials make the best curtains and why.<br><br>Investigate what happens to sunprints using different strengths of light sources http://www.stevespanglerscience.com/lab/experiments/sun-sensitive-paper-experiment | Torch, opaque objects, blank wall. Range of materials to make shadows with e.g. fabric samples, different card and paper types, samples of curtain fabrics, sun print paper, different strengths of light sources, objects to make prints with e.g. leaves, flowers |

# Energy - light L1-3

**Objective 2: To know how shadows are formed and the terms opaque, transparent and translucent**

| Optional activities you might like to try include: | Resources: |
|---|---|
| Also use activities from P7-8<br><br>Ask two pupils of different heights to stand side by side and work out how to make their shadows the same height.<br>Pupils to choose different ways of recording and presenting what they have found out.<br><br>Explore using a powerful torch to make long and short shadows. Set up a shadow stick outside and mark the length of the shadows on the ground every hour during the day. Some pupils may be able to link the change in shadow due to different position of sun to the introduction of making long and short shadows | Powerful torch, data projector blank wall/ screen, opaque object to make shadow with |
| Also use activities from P7-8<br><br>Investigate how distance from the source affects the size (e.g. lolly stick) of a shadow using an object of a set size and a metre ruler or lengths of tape. Record results and present as simple graph<br><br>Find places round school where there are no shadows and why. | |

## Points to Note:

Pupils unsure of relative position to affect the size/ clarity of shadow.
All materials and all opaque materials make clear shadows.

Not shining torch directly in eyes.

# Energy - light L1-3

**Objective 3: To explore how light travels and can be split**

## Descriptions of intended outcomes at different levels of attainment

- Experiences different ways to answer questions e.g. observing, making an object, exploring, looking for patterns (L1i)
- Shows an understanding of comparative language e.g. more, less (L1ii)
- Uses digital light meters to take measurements (L1iii)
- Uses equipment correctly to make observations or measurements (L2i)
- Presents evidence in an ordered way (L2ii)
- Says what happened in their experiment (L2iii)
- Selects equipment form that provided to answer a question (L3i)
- Identifies straightforward patterns in their observations (L3ii)
- Represents things in the real world using physical models e.g. drawing light rays or using spaghetti to represent rays (L3iii)

# Energy - light L1-3

**Objective 3: To explore how light travels and can be split**

| Possible Activities: | Resources: |
|---|---|
| In a dark room ask pupils to put torch on large piece of paper and switch on. Ask them to find out what happens when a mirror is put in path of light and to draw the path of the beam. Some pupils could add arrows. Try changing the angle of the mirror. Use spaghetti or string to show light rays<br><br>Ask pupils to draw simple mazes and to try to make light beam go round maze using mirrors.<br><br>Make or experience periscopes. http://www.webinnate.co.uk/science/week8.htm OR hp://www.wikihow.com/Make-a-Periscopeą<br><br>Watch http://www.youtube.com/watch?v=Gf33ueRXMzQ about colours of the spectrum and then explore shining light through different types of prisms. Place on white paper and draw round them, draw where torch was positioned and draw rainbows/ spectra on white paper<br><br>Draw and label the external features of the eye | Dark room, torches, large sheet of white paper, mirror, range of different prisms, white paper, coloured pens, materials to make periscopes as per site chosen e.g. mirrors, boxes/ card, scissors, tape |

# Energy - light L1-3

**Objective 3: To explore how light travels and can be split**

| Optional activities you might like to try include: | Resources: |
|---|---|
| Show a clip of light travelling in straight lines. http://www.bbc.co.uk/learningzone/clips/demonstrating-how-light-travels-in-straight-lines/1625.html Give pupils three pieces of card with small holes in exactly the same place to try for themselves. Let them sprinkle some talc/ chalk dust over to show the path of light.<br><br>Make a pinhole camera https://www.jpl.nasa.gov/edu/learn/project/how-to-make-a-pinhole-camera/<br><br>Pupils could watch the Avengers- Rise of the Silver Surfer and talk about reecve surfaces. Use light intensity meters to measure the amount of light which reects from each type of shiny material. Also look at the surfaces under a microscope.<br><br>Make a rainbow using a container of water In a dark room with light walls, fill a large glass container with water and place a mirror inside. Tilt the mirror slightly and shine a light on to it to create a rainbow. Ask pupils to investigate if the angle of the mirror or type of liquid makes a difference. Experience some optical illusions. http://www.sciencekids.co.nz/pictures/illusions.html and talk about what pupils can see. | Torches, card with holes in exactly the same place and means of standing them upright, chalk dust/talc, Avengers DVD Rise of the Silver Surfer or clip http://www.youtube.com/watch?v=74oUIzqhwVQ<br>Torches, various shapes and sizes of shiny objects, light intensity meters. Containers, mirrors, torches, range of liquids e.g. water, lemonade, salt water, boxes, greaseproof paper, black sugar paper, sellotape, pin, photographic paper, developer |

# Energy - light L1-3

## Objective 3: To explore how light travels and can be split

| | |
|---|---|
| Hinge 2 mirrors together and sit on a line drawn in paper. Move the mirrors closer or further apart and record shape seen either by taking photo or drawing lines to show position of mirrors on sheet of paper.<br>Make a simple kaleidoscope http://www.wikihow.com/Make-a-Kaleidoscope<br>Ask pupils to sort materials into good and bad reflectors. Shine a laser pen onto a good and bad reflective surface and talk about the difference.<br><br>Show the pupils film clip at:<br>https://www.bbc.com/bitesize/articles/zqdxb82<br><br>Try the activity at:<br>http://tlc.howstuffworks.com/family/science-projects-for-kids-spectrum-of-colors1.html Spin different circles with differing fractions of black and white and observe and record what colours they see.<br>Use activities from http://kidshealth.org/kid/htbw/eyes.html to help pupils find out about eyes. | |

## Points to Note:

Pupils may think that all reflective materials are the same and that light can travel round corners.

Also they may think that any reflective equipment is good for reflective clothing.

Care when using lots of different equipment.

Some advice on developing pinhole camera photographs can be found here http://users.rcn.com/stewoody/darkcam.htm