



# BEHAVIOUR OF LIGHT 1

**Domain:** 5.6

applies basic physical models, theories and laws to situations involving energy, force and motion

## Transparent, Translucent and Opaque

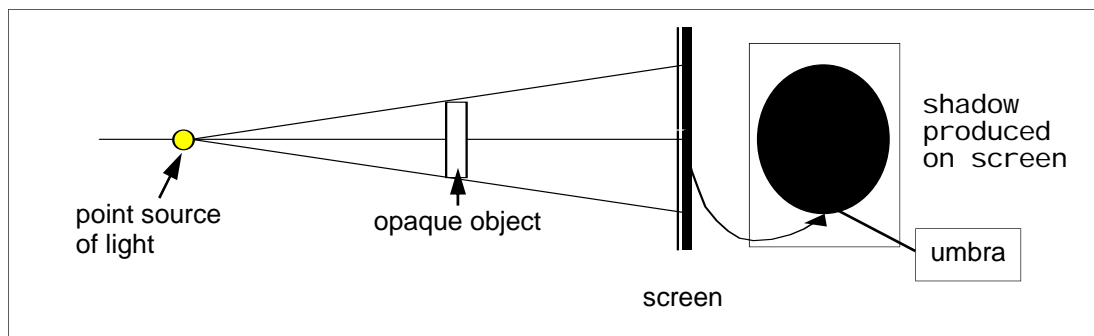
**Transparent**- A transparent substance allows light to pass through it. Examples include clear glass, clear plastic and clear water.

**Translucent**- A translucent substance allows some light to pass through it. Examples include frosted glass, white plastic light fittings and heavily tinted glass.

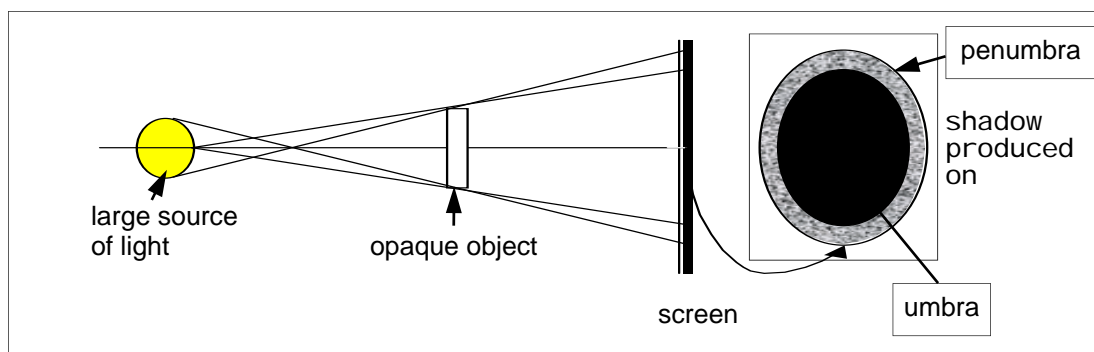
**Opaque**- An opaque substance does not allow light to pass through it but either reflects or absorbs it. Examples include wood, concrete, milk and many plastics.

## Shadows

Opaque substances cast **shadows**. A shadow forms when light is intercepted and **absorbed** by an opaque substance. A point source of light results in a very sharp dark shadow called an **umbra**. Each point in the umbra receives no light. The umbra has the same shape as the opaque substance.

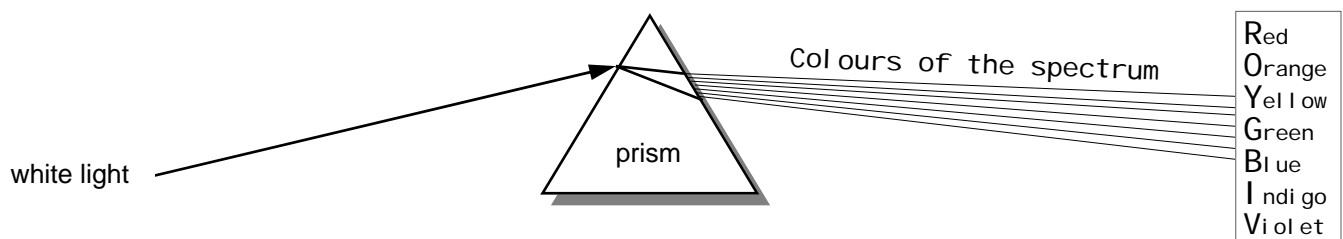


An extended or large light source will produce an umbra behind an opaque object but the umbra will be surrounded by a partial shadow called the **penumbra**. The penumbra is not a total shadow and receives some light.



## Dispersion of Light

White light can be split up into different colours. This is called **dispersion**. The different colours produced are called a **spectrum**. A transparent glass or plastic prism can be used to do this:



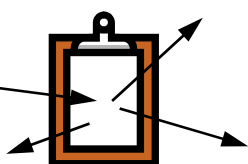
A **rainbow** is formed by the dispersion of sunlight by raindrops. The sun must be behind us and the shower of rain in front of us.

## Absorption of Light

When white light strikes an opaque substance some colours may be **reflected** while others are **absorbed**. The colour of the object depends on the colour(s) it reflects.

*A surface which scatters reflected white light in all directions appears white:*

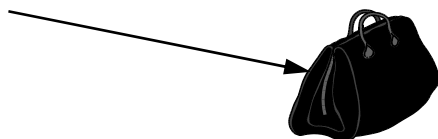
white light



white light  
reflected  
and  
scattered

*A surface which absorbs all the colours of white light appears black:*

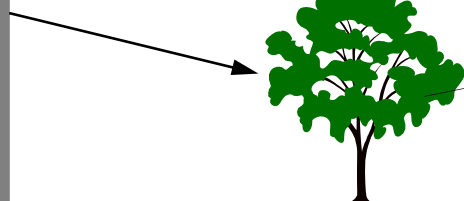
white light



all light is  
absorbed; no  
colour(s) are  
reflected

*A coloured object absorbs some colours and reflects others:*

white light



all colours  
are absorbed  
except green  
which is  
reflected

The sky appears **blue** because very small particles of matter such as dust particles in the air disperse the blue and violet colours of white light. The other colours are not affected. When sunlight passes through the Earth's atmosphere, some of the blue light is scattered in all directions, many kilometres above the Earth's surface. So when we look up at the sky it appears blue to us, even though the air is colourless.

More work will be done on colour later.

## Questions:

1. Describe the difference between transparent, translucent and opaque substances.
2. Classify the following substances as transparent, translucent and opaque:  
*lemonade, wood, beer, pure water, steel, this sheet of paper.*
3. Explain how a shadow is formed?
4. (a) What type of light produces an umbra?  
(b) What type of light produces a penumbra?
5. What is dispersion of light?
6. What are the seven colours of the spectrum?
7. Explain how an object can appear: (a) white; (b) black; (c) coloured.
8. Describe why the sky can appear blue?