FAULKES TELESCOPE

Light and Optics

Colours and Filters

Answer Sheet (Introductory)

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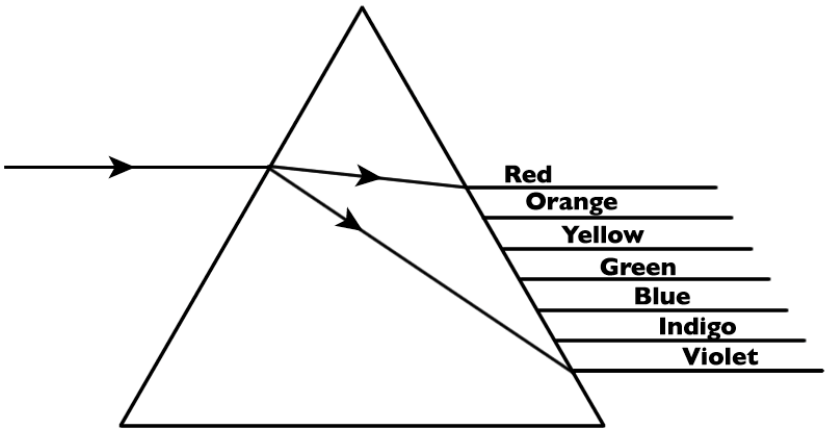
Splitting light

1. In the diagram below, label the colours which the white light is split into.



2. Rainbows are formed when light from the Sun is dispersed in the sky by drops of rain. This is nature's demonstration of the prism experiment described above. Using this information, fill in the blanks in the following sentences using the words below:

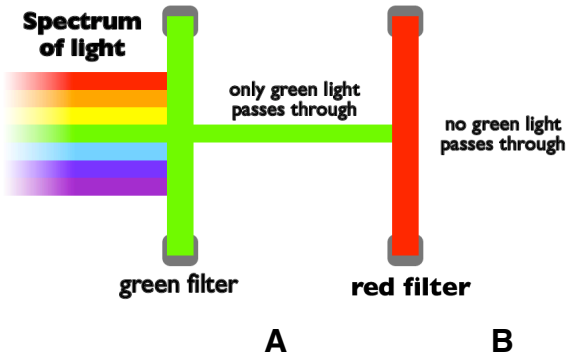
refracted	dispersed	seven
bent	raindrops	smoke
cloud	nine	rainbow

When white light shines on the side of a prism, the light is ***dispersed*** into ***seven*** separate colours. The same effect can be seen when light from the Sun shines on ***raindrops*** in the air. Different colours are seen because each separate colour is ***refracted/bent*** by different amounts as they travel through the prism or raindrop. In the sky, this results in a ***rainbow***.

Blocking light

As explained above, white light is made up of several different colours - red, orange, yellow, green, blue, indigo and violet. Filters can be used to block particular colours from white light and only allow one colour of light through. For example, if you shone white light onto a red filter, only the red part of the light would pass through the filter. The other colours would be absorbed. Similarly, if you shone white light on a blue filter, only the blue part of the white light would get through.

1. a). The diagram below shows white light shining onto a green filter, followed by a red filter. Label the colour of light which passes through the green filter at point A.



b). What colour light, if any, would be seen at point B? Explain your answer.

Point B is where the red filter is placed. When the green light shines on the red filter, it is absorbed by the filter, thus no light would pass through. So, no light at all would be seen after point B.

2. What would happen if you shone blue light onto a red filter? Explain your answer.

If blue light was shone onto a red filter, it would all be absorbed. No light would pass through the filter.

3. In a galaxy, the regions where stars form tend to be bluer than average, and the regions which contain older stars are redder than average.

a). Is a galaxy a source of light or a reflector of light?

A galaxy is a source of light.

b). If you wanted to look at star formation regions in a galaxy with the Faulkes Telescope, which filter would be best to use, red, green or blue?

Star forming regions in galaxies emit more strongly in the blue part of the electromagnetic spectrum, therefore they would be brighter and more apparent in an image taken through the blue filter.

c). If you wanted to look for regions which had a lot of older stars, which filter would be best to use, red, green or blue?

Regions which contain older stars emit more red light, so a red filter would be best to use to find these regions.

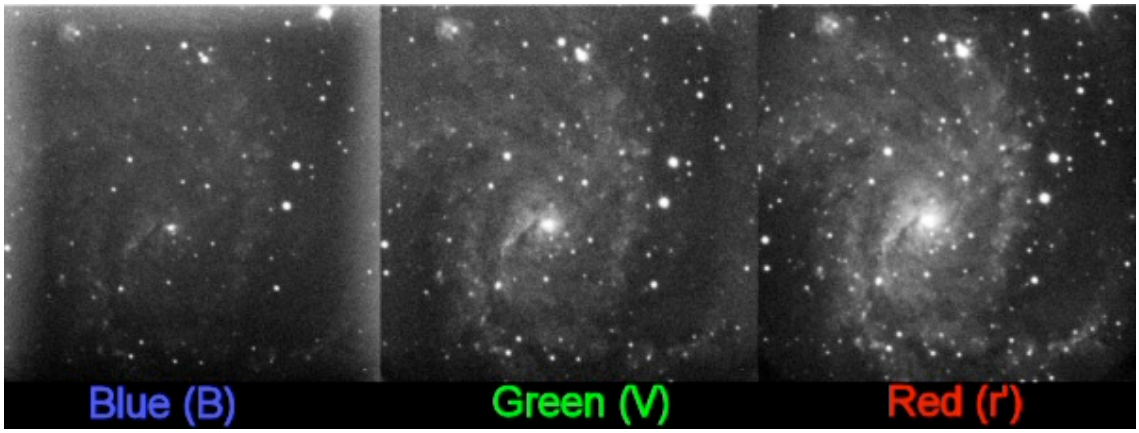
4. Below is a colour image of spiral galaxy NGC 6946, taken with the Faulkes Telescope North in Hawaii during a time when the moon was full.

a). Is the Moon a source of, or a reflector of light?

The Moon does not produce its own light - we see the Moon because it reflects light from the Sun towards us on Earth. Therefore, the Moon is a reflector of light.

The Moon, when full, reflects a lot of the blue light from the Sun. As a result, any images of faint objects taken with the Faulkes Telescopes around this time have a lot of stray blue light in them. This can be seen in the image below as a blue border.

Also shown below are the three separate red, green and blue images which make up the colour image above.



b). In which filter is the galaxy the faintest? Red, green or blue?

The galaxy is faintest through the Blue filter.

c). In which filter is the galaxy the brightest?

The galaxy is brightest through the Red filter.

d). If you were planning on observing a faint object when the moon is full, which filter would be best to use to make sure you get the most detail?

When the Moon is full, it reflects a lot of blue light from the Sun. This stray blue light then enters any image which is taken with a telescope, making the Blue image appear 'washed out', as seen in the above image. Images taken with the Red filter are least affected by the bright moonlight, as also shown above, thus it would be best to use the red filter at full moon when observing faint objects.

5. Fill in the blanks below and find the words in the wordsearch.

1. The range of colours in a rainbow is known as a ***spectrum***.

2. A ***rainbow*** is formed when sunlight is dispersed off raindrops.

3. White light passing through a prism is ***dispersed*** into different colours.

4. ***Violet*** light is dispersed the most by a glass prism.

5. ***Red*** light is dispersed the least by a glass prism.

6. The bending of light is known as ***refraction***,

7. A piece of apparatus which absorbs some colours of light but allows particular colours through is called a ***filter***.

8. When green light hits a blue filter, it is ***absorbed***.

9. A full moon ***reflects*** sunlight, particularly ***blue*** coloured light.

n	c	s	j	d	u	n	t	m	w	r
v	e	d	b	a	e	d	u	r	a	e
i	z	a	b	s	o	r	b	e	d	f
o	t	p	n	o	t	m	o	f	g	r
l	w	s	b	c	n	b	r	l	k	a
e	c	r	e	t	l	i	f	e	a	c
t	a	p	o	u	r	t	p	c	l	t
u	s	f	e	a	s	b	y	t	p	i
r	a	i	n	b	o	w	r	s	w	o
i	d	e	s	r	e	p	s	i	d	n