Grade 7 Natural Science Worksheet

Assessment Task: Physical Sciences: colour

Colour
Part One: Splitting the light

You will need:

- A clear glass
- Water
- A large sheet of white paper or cardboard
- Torch
- Black paper – large enough to cover end of torch (or colour a sheet of white paper black using a thick coating of wax crayons)
- Scissors
- Plastic box (the type shops sell fruit and vegetables in, or an empty 2 litre plastic ice-cream container will do) OR a clear glass roasting/baking dish
- A mirror (must be able to fit into the plastic dish/box above)
- Masking tape

What to do:

1. Fill the glass with water and place it on a sunny window-sill where the sun is shining brightly. The glass must not be completely on the sill, but must be slightly over the edge of the sill (without being in danger of falling off).

2. Put the large sheet of white paper on the floor under the window.

3. What do you observe? [4]

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In 1666, Isaac Newton used a glass prism to split sunlight into the range of colours now known as the spectrum. He proved that white light is a mixture of all the colours. A prism is a triangular, thick piece of glass or crystal (any transparent and clear material) with two equal triangular faces joined by three rectangular flat faces. It is used for refracting light (deflecting the light at a certain angle). A beam of white light is shone into one of the flat rectangular faces of the prism and the prism refracts (deflects) the light beam. A spectrum or rainbow of the 'seven' colours shines from the other side of the prism.

You are now going to make a home-made spectrum which will produce similar effects.

4. Cut a small slit in the middle of the black paper and tape it over the end of the torch.
5. Fill the plastic box/clear glass dish halfway with water.
6. Lean the mirror against the end of the box in the water.
7. Point your torch so that the light beam shines on the mirror under the water.
8. Hold up your white paper, so that the spectrum can shine onto it.
9. Try and account for what is happening in this activity i.e. how can white light be 'split'?

[12]

10. You have made a rainbow from your water prism. How is it that a rainbow appears in the sky after rain? [4]

Your teacher will award up to 5 marks for the manner in which you conducted the practical work.

[5]

[25 marks]

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Part Two: Mixing the colours

You will need:

- Thick white paper or cardboard (about one A4 sheet)
- Paint or thick marking pens or wax crayons in the following colours: red, orange, yellow, green, blue, dark blue, purple
- Paintbrush (if using paints)
- Pencil
- String (about 1 m)

What to do:

1. Draw a circle on the paper/cardboard, about 30 cm in diameter. (Use a compass or draw around a round object - the circle must be perfectly round.)
2. Find the middle of the circle, and from the middle out, draw six lines, dividing the circle into seven equal sections.
3. Paint or colour each section a different colour, red, then purple, then blue, then green, then yellow and lastly orange next to the red. The paint must be intense (dark), as should the crayon-work. Don't leave any white paper showing through.
4. Make two holes in the circle, about 5 cm apart, on either side of the middle of the circle. Thread the string through the holes and tie the ends in a knot.
5. Hold the loops of the string in either hand. Flip the circle around to twist up the string. Then pull the string by pulling your hands apart to make the circle spin.
6. What do you observe? Explain your observations.

[10]

Your teacher will award a maximum of 5 marks for your colour wheel construction. [5]

[15 marks]

[Total: 40 marks]

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Suggested Solutions

Question number	Possible marks	Solution
1	25	3. You should see that the light is broken into the rainbow colours. [4] ✓✓✓✓ You may have to move the paper around to get it in the right spot. 9. Light travels in straight lines called rays. ✓✓ When light shines into the water, the rays slow down and bend. ✓✓ The different shades making up white light bend at different angles. ✓✓ This makes the light separate into the shades of the rainbow/spectrum. ✓✓ They are reflected off the mirror and onto the paper, where you can see them. ✓✓ In this activity, the water between the water surface and the mirror is the prism. ✓ ✓ [12] 10. Raindrops ✓ act like natural prisms, ✓ so if there is sunshine ✓ (either after or during rain) and raindrops falling (either around you or in the distance), a spectrum can be seen – the rainbow. ✓ [4] Award up to five marks for the manner in which the learner conducted the practical work. [5]
2	15	6. When the disc spins around at high speeds, your eyes see the different shades, ✓✓ but because of the speed, they get blurred together ✓✓ and the brain sees them as a mixture of all seven colours ✓✓ – which is white. ✓✓ The colours reappear as the disc slows down. ✓✓ Award 5 marks for the making of the colour wheel.