science & technology
Department:
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REPUBLIC OF SOUTH AFRICA

SCIENCE SPAZA

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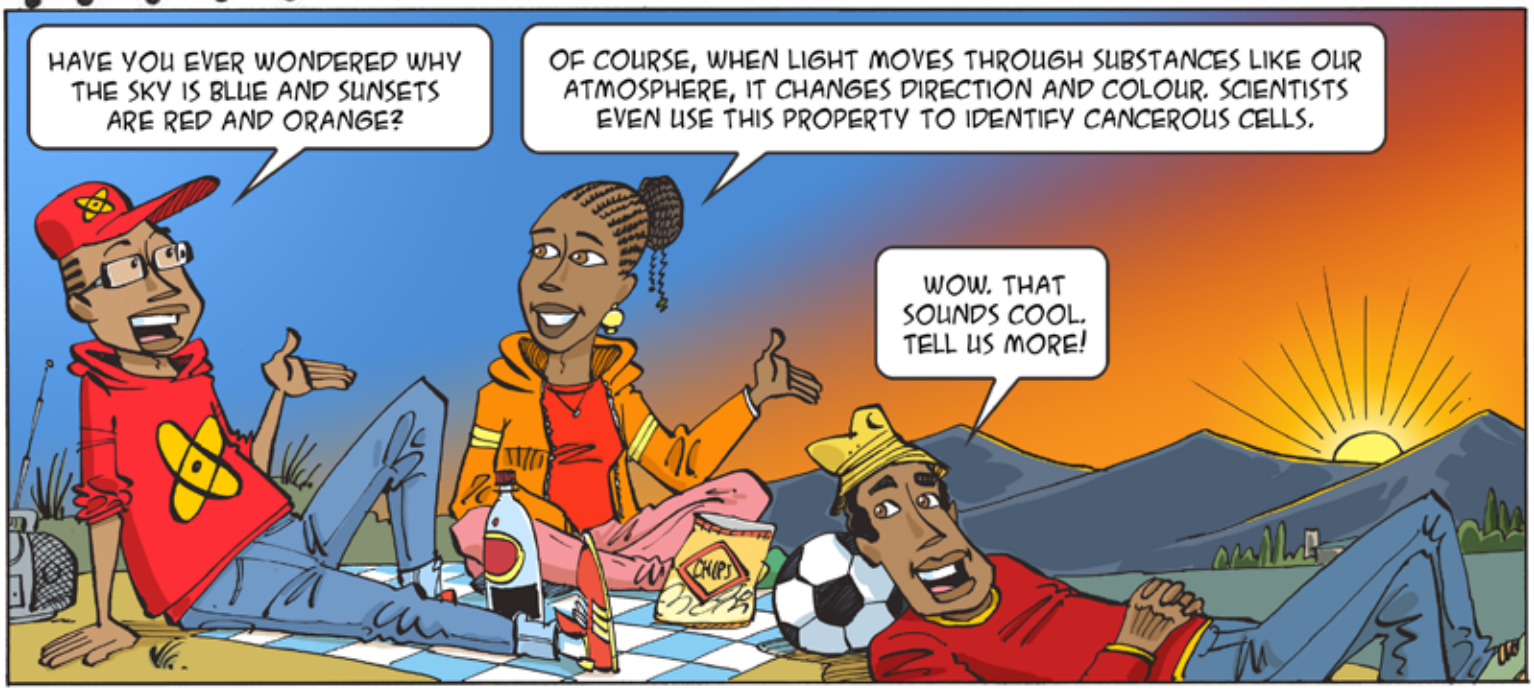
WHY IS THE SKY BLUE?



ACTIVITY: MAKE A MODEL OF THE SKY

YOU WILL NEED:

- A CLEAR PLASTIC OR GLASS CONTAINER (A BIG ONE WORKS BETTER THAN A SMALL ONE)
- A BRIGHT TORCH
- CLEAN WATER
- A LITTLE MILK OR DETTOL

1 FILL THE CONTAINER WITH WATER.

2 ADD A FEW DROPS OF MILK OR DETTOL TO THE WATER.

3 SHINE YOUR TORCH THROUGH THE WATER, AND LOOK AT THE LIGHT FROM THE TOP. WHAT COLOUR DO YOU SEE?

4 NOW LOOK AT THE LIGHT FROM DIRECTLY OPPOSITE THE TORCH. WHAT COLOUR DO YOU SEE?

Knowledge is Ncah!

SCIENCE SPAZA

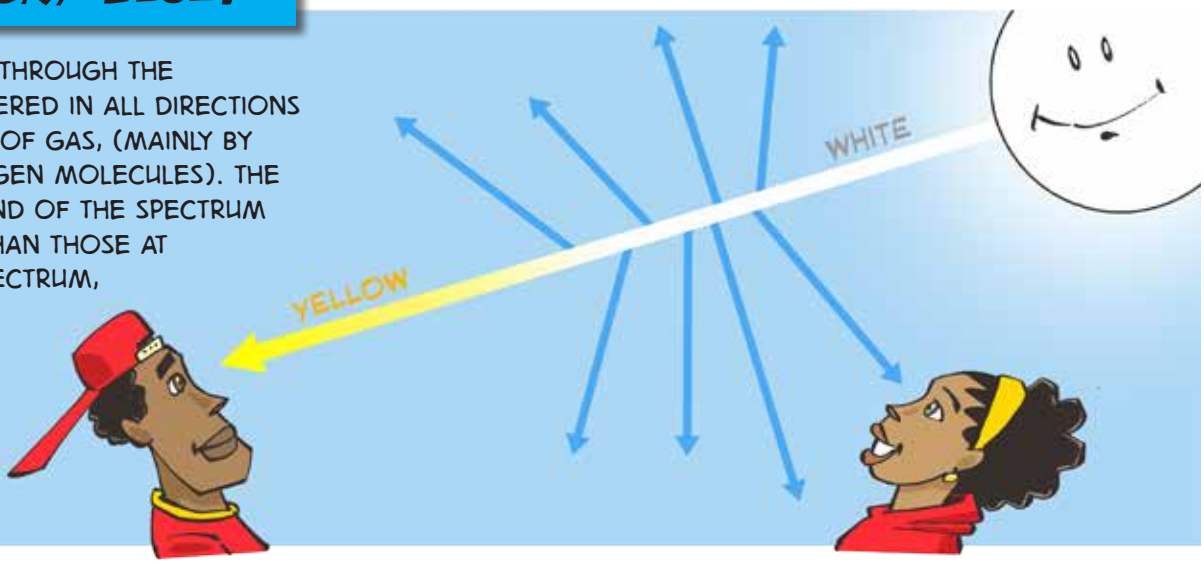
WHAT'S HAPPENING HERE?

WHITE LIGHT FROM THE SUN IS ACTUALLY MADE UP OF MANY COLOURS. YOU CAN SEE THIS WHEN LIGHT THAT SHINES THROUGH A PRISM SPREADS OUT INTO ITS DIFFERENT COLOURS. BLUE LIGHT IS BENT MORE THAN RED LIGHT. ALL THE COLOURS TOGETHER ARE CALLED THE ***VISIBLE LIGHT SPECTRUM***.

IN YOUR MODEL THE MILK OR DETTOL PARTICLES IN THE WATER ***SCATTER*** LIGHT IN ALL DIRECTIONS. BLUE LIGHT IS SCATTERED MORE THAN RED LIGHT. THIS IS WHY THE LIGHT NEAREST THE TORCH LOOKS BLUE. AS THE LIGHT TRAVELS THROUGH THE WATER, MORE OF THE BLUE LIGHT IS SCATTERED AWAY, SO THE LIGHT YOU SEE FROM OPPOSITE THE TORCH LOOKS ORANGE OR RED.

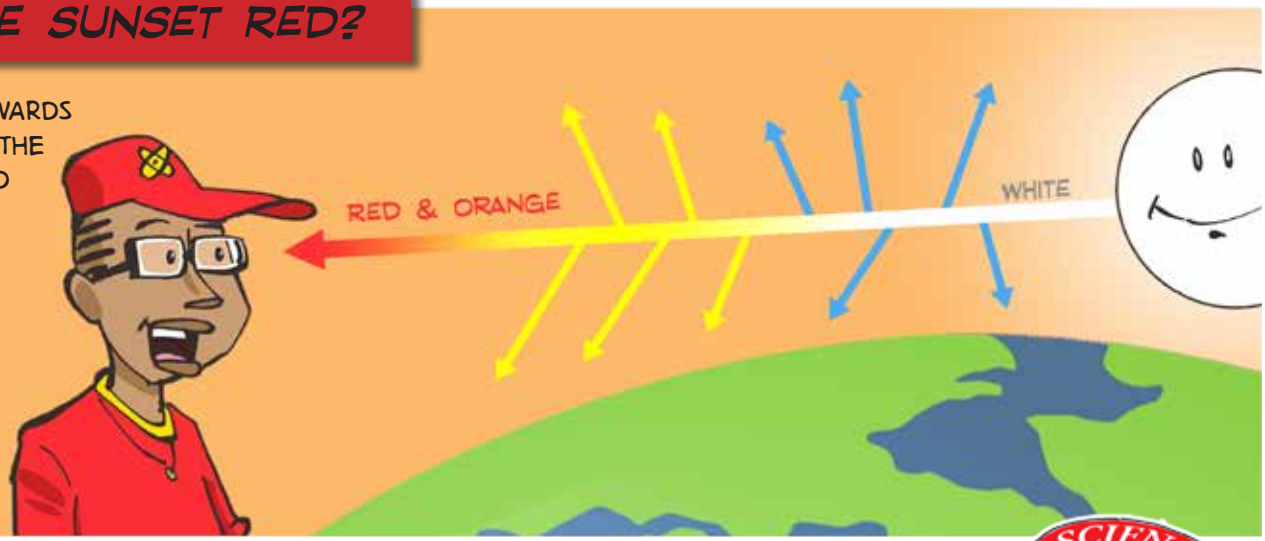
WHY IS THE SKY BLUE?

WHEN SUNLIGHT TRAVELS THROUGH THE ATMOSPHERE, IT IS SCATTERED IN ALL DIRECTIONS BY THE TINY MOLECULES OF GAS, (MAINLY BY THE NITROGEN AND OXYGEN MOLECULES). THE COLOURS AT THE BLUE END OF THE SPECTRUM ARE SCATTERED MORE THAN THOSE AT THE RED END OF THE SPECTRUM, SO LIGHT THAT IS RED, ORANGE AND YELLOW TRAVELS IN STRAIGHTER LINES. THIS MAKES THE SUN LOOK YELLOW IN COLOUR.



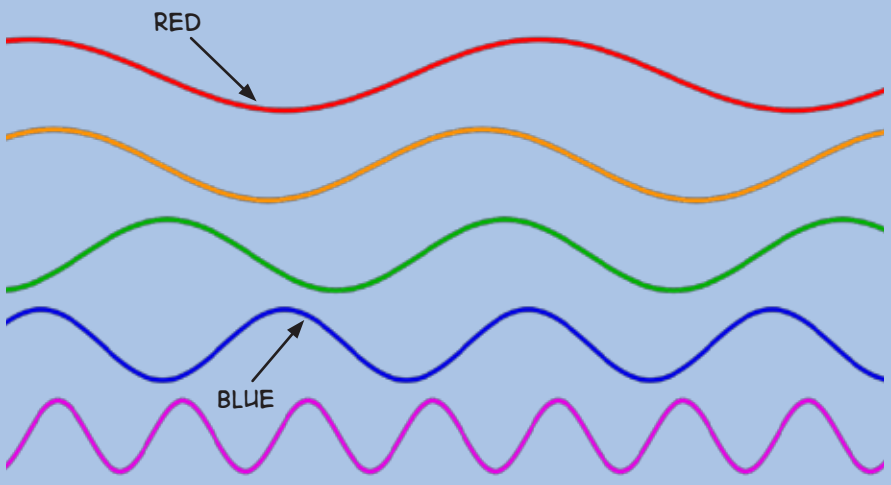
WHY IS THE SUNSET RED?

WHEN WE LOOK TOWARDS THE SUN AT SUNSET, THE LIGHT HAS TRAVELLED A LONGER DISTANCE THROUGH THE ATMOSPHERE, SO MORE OF THE BLUE LIGHT HAS BEEN SCATTERED AWAY. WE ONLY SEE THE RED AND ORANGE LIGHT.



WHY DO SOME COLOURS SCATTER MORE THAN OTHERS?

RED LIGHT HAS A LONGER WAVELENGTH THAN BLUE LIGHT. SHORT WAVELENGTHS ARE SCATTERED MORE THAN LONG WAVELENGTHS.



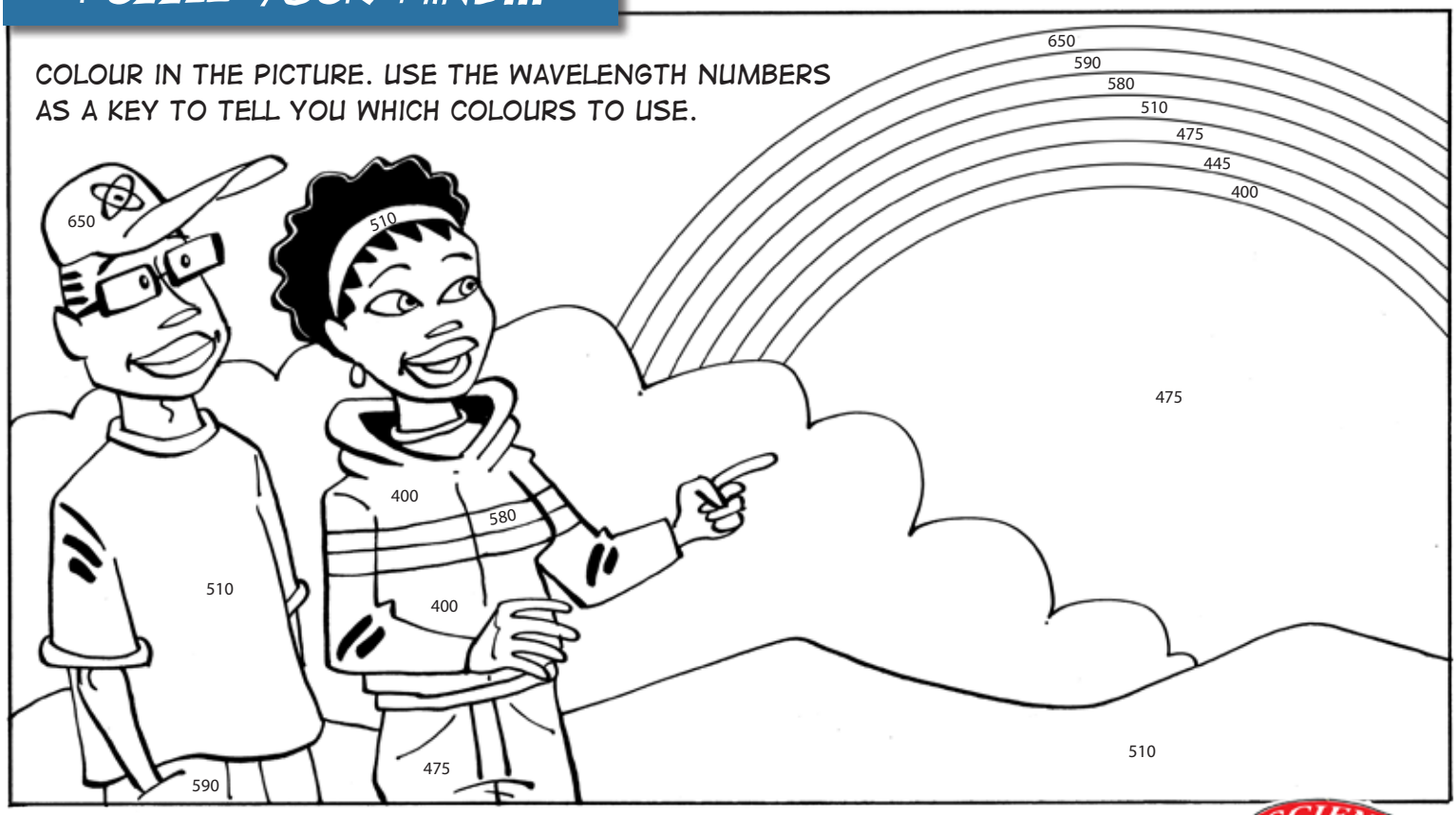
Colour	Wavelength (nm)
Red	650
Orange	590
Yellow	580
Green	510
Blue	475
Indigo	445
Violet	400

THIS TABLE SHOWS THE WAVELENGTHS OF THE DIFFERENT COLOURS OF THE VISIBLE SPECTRUM. VIOLET LIGHT HAS THE SHORTEST WAVELENGTH IN THE SPECTRUM, BUT THE SKY LOOKS BLUE, NOT VIOLET. THIS IS BECAUSE OUR EYES ARE MORE SENSITIVE TO BLUE LIGHT.

WE MEASURE WAVELENGTHS IN NANOMETRES (NM), WHERE 1 NM = $1X10^{-9}$ M. IN OTHER WORDS, IN 1 MILLIMETRE THERE ARE A MILLION NANOMETRES!

PUZZLE YOUR MIND!!!

COLOUR IN THE PICTURE. USE THE WAVELENGTH NUMBERS AS A KEY TO TELL YOU WHICH COLOURS TO USE.



CAREERS:

- CLIMATOLOGIST
- BIOPHOTONICS RESEARCHER
- COLOUR DESIGNER

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CURRICULUM LINKS

- GRADE 8: ***ENERGY & CHANGE*** (VISIBLE LIGHT)
- GRADE 9: ***PLANET EARTH & BEYOND*** (THE ATMOSPHERE)
- GRADE 11: ***WAVES, SOUND & LIGHT*** (GEOMETRICAL OPTICS)

USING LIGHT TO STUDY NANOMATERIALS

THE NATIONAL CENTRE FOR NANO-STRUCTURED MATERIALS (NCNSM) AT THE CSIR HAS SCIENTIFIC INSTRUMENTS THAT USE LIGHT SCATTERING TO STUDY NANOMATERIALS. THESE ARE MADE OF TINY PARTICLES CALLED NANOPARTICLES THAT HAVE SPECIAL PROPERTIES. ***NANOMATERIALS*** ARE BEING USED IN MANY SCIENTIFIC FIELDS INCLUDING HEALTH AND ELECTRONICS.

SPECTROSCOPY IS BEING USED IN CANCER RESEARCH. BECAUSE CANCER CELLS ARE DIFFERENT FROM OUR BODY'S HEALTHY CELLS, THEY SCATTER LIGHT DIFFERENTLY WHEN IT PASSES THROUGH THEM. THESE DIFFERENCES CAN BE USED TO DETECT SOME KINDS OF CANCER AT AN EARLY STAGE, AND EVEN TO IDENTIFY SOME KINDS OF CANCER.

WHAT MAKES A RAINBOW?

WHY DO YOU THINK YOU CAN SOMETIMES SEE A RAINBOW OF COLOURS IN THE SKY? DO SOME INVESTIGATION USING YOUR LIBRARY OR THE INTERNET TO FIND A SCIENTIFIC EXPLANATION FOR THE RAINBOW. WHAT TRADITIONAL BELIEFS ABOUT THE RAINBOW DO YOU KNOW OF IN DIFFERENT CULTURES?

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Visit www.sciencespaza.org, email info@sciencespaza.org, sms or WhatsApp us on 076 173 7130 or write to us at PO Box 22106, Mayor's Walk, 3208

This Science Spaza resource was produced for the National Science Week celebrations of the International Year of Light. National Science Week is an initiative of the Department of Science and Technology, implemented by the South African Agency for Science and Technology Advancement (SAASTA), a business unit of the National Research Foundation. For more information visit www.saasta.ac.za

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National Science Week

CSIR

NRF SAASTA National Research Foundation South African Agency for Science and Technology Advancement

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