

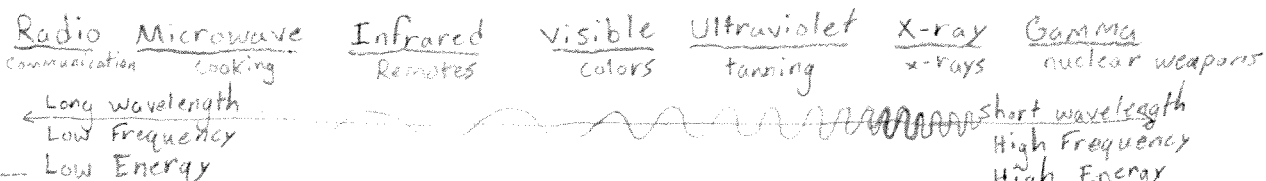
# LIGHT STUDY GUIDE

Name \_\_\_\_\_  
Period \_\_\_\_\_

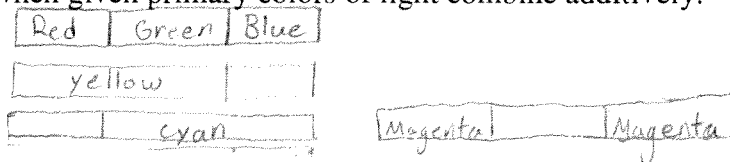
**KEY**

## Chapter 27-28: Light & Color

1. List the 7 categories of electromagnetic waves in order from lowest frequency to highest frequency. For each type of wave, give an example of how it might be used and describe the relationship among the different waves. e.g. frequency, wavelength and photon energy.



2. What is the source of an electromagnetic wave? Is it a transverse or longitudinal wave?  
Composed of vibrating electric & magnetic fields that regenerate each other
3. What is the speed of light and is it always constant? Transverse Electrons.  
 $3 \cdot 10^8$  m/s no it varies based on material
4. List the order of colors in the color spectrum.  
Red, orange, yellow, green, blue, violet
5. State which colors have the longest and which have the shortest wavelength.  
Red - longest Violet - shortest
6. Name the additive primary colors of light.  
Red, Green, Blue
7. Specify the result when given primary colors of light combine additively.



8. Define complementary colors and give examples.

Two colors added to produce white

- Blue & yellow
- Red & cyan
- Green & magenta

9. Differentiate between white light and black.

white is all the colors  
black is absence of color (light)

10. Name the subtractive primary colors of paints.

yellow, cyan, magenta

11. Calculate the wavelength of the FM radio station at 101.9 MHz.

$$v = f \cdot \lambda \quad \lambda = \frac{v}{f} \quad \frac{3 \cdot 10^8 \text{ m/s}}{101900000 \text{ Hz}} = 2.94 \text{ m}$$

12. Calculate the frequency of blue light. (wavelength of blue is 465 nm)

$$v = f \cdot \lambda \quad f = \frac{v}{\lambda} \quad \frac{3 \cdot 10^8 \text{ m/s}}{(4.65 \cdot 10^{-7} \text{ m})} = 6.45 \cdot 10^{14} \text{ Hz}$$

## Chapter 29-30: Mirrors & Lenses

13. Explain the law of reflection. Diagram and label a reflected ray.

$\theta_{\text{incidence}} = \theta_{\text{reflection}}$  light wave strikes an object and bounces off



14. Define refraction.

Bending of light. Caused by a change in speed when it passes from one material to another.

15. Illustrate and explain the effects of refraction of light waves by drawing a ray as it enters a piece of crown glass at a 40° angle.



16. What is the index of refraction of a material? How is Snell's law related to the index of refraction? Ratio of speed of light in air verse the speed in a substance, ratio between index of refraction and respective angles.

$$n_1 \cdot \sin \theta_1 = n_2 \cdot \sin \theta_2$$

17. Explain and illustrate how mirages are formed.

An image of a distant object produced by the refraction of light.

18. Explain how a prism separates white light into colors.

It bends the white light and the colors refract

19. Define lens and mirror.

Lens: Transparent material with at least one curved surface that causes light rays to bend, or refract, as they pass through.

Mirror: light rays reflect and are symmetrical + reversible

20. Distinguish between converging and diverging lenses.

converge: light rays focus at a single point.

diverge: thinner in the middle, thicker edges, virtual images

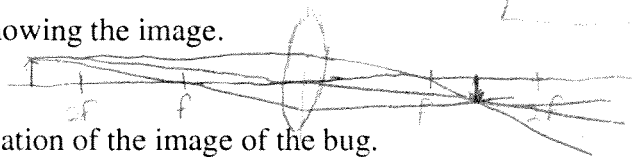
21. Aidan is looking through a converging lens at a bug, which is 75.0 cm away from the lens.

Aidan's lens has a focal length of 20.0 cm. Aidan adjusts the lens so he can see a focused image of the bug.

- a. How far from the lens is the image of the bug?

$$\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f} \quad | \quad (75 \text{ cm}^{-1}) + (d_i^{-1}) = (20 \text{ cm}^{-1}) \quad | \quad d_i = \boxed{27.3 \text{ cm}}$$

- b. Draw a ray diagram showing the image.



- c. Calculate the magnification of the image of the bug.

$$M = -\frac{d_i}{d_o} \quad | \quad -\frac{27.3 \text{ cm}}{75 \text{ cm}} = \boxed{-.364 \text{ smaller}}$$

- d. Is the image upright or inverted?

inverted

22. Explain how convex and concave lenses form images.

convex: light rays focus in one point

concave: light rays spread out, virtual

23. List some examples of lens in optical instruments.

Reading glasses, magnifying glasses, cameras

24. Explain how the human eye forms images.

The lense of our eye converges light to the retina.

25. Explain the causes of nearsightedness and farsightedness and accommodations for each.

Nearsightedness: images form in front of retina, diverging lens

farsightedness: images form behind the retina, converging lens