

Telescope Worksheet

1. Know the following parts of telescopes and their function:

Tube - the cylinder that guides light to the primary mirror/lens
 Primary mirror/lens - the objective - the mirror/lens that focus light
 Secondary mirror - the mirror that bends light to eyepiece in reflecting newtonian telescope
 Eyepiece - the lens that magnifies the image made by objective
 Focuser knob - turn this to bring image into focus

2. What is the difference between a reflector and refractor telescope?

reflector - uses mirrors as objective refractor - uses a lens
 aperture

3. On our 8 inch telescope, which part is 8 inches?

aperture
 4. What advantages does an 8-inch telescope have over a 4-inch telescope? In what ways does it not have advantages? Advantage - more light captured.

Disadvantage - size, heavier & bigger
 5. What does the number of millimeters on different eyepieces refer to?

focal length
 6. How is the view through a long focal length eyepiece different from that through a short focal length eyepiece? Long - larger image, dimmer, smaller field of view. Short FL = smaller image, brighter, FOV larger.

7. A telescope has an objective aperture of 100 millimeters in diameter. What is the maximum effective magnification of this telescope? $100 \text{ mm} = 10.0 \text{ cm}$

$20 \times 10 = 200 \times$
 8. What is the f-ratio of a telescope with a 15 cm aperture and a focal length of 1.50m? $\text{Ratio} = \frac{\text{FL}}{\text{aperture}} = \frac{150 \text{ cm}}{15 \text{ cm}} = \frac{150 \text{ cm}}{15 \text{ cm}} = 10 \text{ cm}$

9. Complete the chart with the terms in parenthesis

	Low f/ratio	Higher f/ratio
Fast or slow telescope (faster or slower)	Fast	Slow
Brightness of telescope if they are similar size (brighter or dimmer)	Brighter	Dimmer
Magnification of image (lower wide-field view or narrow higher magnification) Field of View	Lower mag Larger FOV	Higher mag smaller FOV
Good for viewing ... (planets or star clusters & faint nebulae)	nebulae	planets star clusters

10. Which would provide a brighter image an 8 inch f/10 or an 8 inch f/6?

~~f/10~~ f/6

11. Which would provide more magnification, a 6 inch f/8 or a 6 inch f/5?

f/8

12. Which would provide a wider field of view a 4 inch f/6 or a 4 inch f/4?

f/4

13. Using a diagram, explain what the focal length of the eyepiece and the focal length of the objective are.



14. What does magnification mean?

enlarging the appearance of something

15. Write the equation that links magnification to the focal length of the objective and the focal length of the eyepiece.

$$\text{mag} = \frac{f_{Lo}}{f_{Le}}$$

16. What is the magnification of a telescope if the focal length of the eyepiece is 7 cm and the focal length of the objective is 140 cm?

$$\frac{140 \text{ cm}}{7 \text{ cm}} = 20 \times$$

17. Use this equation to calculate the magnification of the following telescopes, using an eyepiece with focal length 50 mm?

a. A reflector with focal length 150 cm

$$\frac{150 \text{ cm}}{5 \text{ cm}} = 30 \times$$

b. A reflector with focal length 1 meter

$$\frac{1 \text{ m}}{50 \text{ mm}} = \frac{1000 \text{ mm}}{50 \text{ mm}} = 20 \times$$

18. Complete the chart comparing an eye and a telescope.

	Eye	Telescope
Optical system	<i>pupil</i>	<i>aperture</i>
Opening	<i>lens</i>	<i>lens/mirror</i>
Focusing	<i>retina</i>	<i>eye/ccd camera</i>
Sensor		
Aperture opening	<i>small</i>	<i>large</i> <i>much larger</i>
Exposure time	<i>Short</i> <i>1/15 sec = 0.07 sec</i>	<i>0.1 → 60 secs</i> <i>usually</i>
Resolution	<i>lower</i>	<i>higher</i>
Field of View	<i>wider</i>	<i>smaller</i>
Color vs Black & White	<i>Both</i>	<i>No color without filters. Black & white</i>