

ANSWER ALL THE QUESTIONS. THE WORTH OF EACH QUESTION IS IN () AFTER THE QUESTION.

1) Properties of Light

a) Name one property of light that can be explained by **both** the wave theory and the particle theory: [2]

_____.
b) Name one property of light that can be explained **ONLY by the wave** theory: [2]

_____.
c) Name one property of light that can be explained **ONLY by the particle** theory:

[2] _____.

2) Indicate the order of colors according to energy of the photon. Do this by placing **1** after the color with the **smallest** energy photon, 2 after the color with the next to smallest energy photon, etc. up to 6 after the color with the largest energy photon. [6]

orange	<u>2</u>
violet	<u>6</u>
green	<u>4</u>
yellow	<u>3</u>
red	<u>1</u>
blue	<u>5</u>

3) Indicate the order of types of radiation (light) according to energy of the photon. Do this by placing **1** after the type with the **smallest** energy photon, 2 after the type with the next to smallest energy photon, etc. up to 6 after the type with the largest energy photon. [6]

x-rays	<u>6</u>
visible	<u>4</u>
radio	<u>1</u>
microwaves	<u>2</u>
ultraviolet	<u>5</u>
infrared	<u>3</u>

4) Spectra

a) What is an **emission** spectrum? [4]

b) What is an **absorption** spectrum? [4]

5) Magnification of a telescope:"

a) A telescope has an objective lens of diameter 6 inches and focal length 200 cm. If an eyepiece of focal length 40 mm (40 mm = 4.0 cm) is used, what is the magnifying power of this telescope? [5]

50 X.

b) If a magnifying power of 200 is desired, what should the focal length of the eyepiece be for this telescope? [5]

1 cm = 10 mm.

c) What is the maximum useful magnification of this telescope? [5]

360 X.

6) Draw a picture of a **reflecting** telescope with a **Newtonian** focus and be sure to label all the relevant elements: [8]

7) What are the three major properties of a telescope, and what does each depend on?

a) [4] **Light gathering**

- depends on diameter of objective lens squared

b) [4] **Resolution (clarity of image)**

- depends on diameter of objective lens

c) [4] **Magnification**

- depends on focal length of objective divided by focal length of the eyepiece.

8) What are three of the major forces that affect the earth's surface:

a) [2]

b) [2]

c) [2]

9) Size of the earth

a) What is the approximate **circumference** for the earth (be sure to specify either miles or kilometers)? [5]

25,000 miles = 40,000 km

b) What is the approximate **radius** for the earth - that is, the distance from the surface to the center of the earth (specify miles or kilometers)? [3]

4,000 miles = 6,400 km

c) How high above sea level is the highest mountain (use the same units as you used in part b above)? [3]

5 miles = 8 km

10) Effects of the atmosphere on light:

What are the three major ways the atmosphere affects light from astronomical objects? Give one example of each.

a) [2] **absorbs light**

example: [2]

b) [2] **refracts (bends) light**

example: [2]

c) [2] **reflects (scatters) light**

example: [2]

11) TRUE or FALSE (+1 for each correct, 0 for each left blank, -1 for each one wrong
(or based on subtracting from 100: -0 if correct, -1 if blank, -2 if wrong)

- F a) A red photon has a **higher** energy than a blue photon.
- T b) A gamma ray photon has more energy than a visible photon.
- T c) We can determine the mass of the moon by watching it go around the earth.
- F d) A telescope with a diameter of 8 inches has **four** times the clarity as a telescope with a diameter of 4 inches.
- F e) A telescope with a diameter of 8 inches gathers **two** times more light than a telescope with a diameter of 4 inches.
- T f) The earth emits a lot of IR radiation which allows it to cool after being heated by the sun.
- F g) The winds in the Northern Hemisphere rotate **clockwise** around a low pressure area.
- F h) The highest mountains and the deepest ocean trenches are about **1%** of the radius of the earth.
- T i) Because of the earth's atmosphere, the earth is warmer than the moon which has no atmosphere.
- T j) The age of the earth is about 4.5 billion years according to science's best estimate and the age is supported by radioactive dating.