Ladera Vista Invitational Science Olympiad: Optics Test 2017-18

1. Reflection at a definite angle from a very smooth surface is called
   A. mirror reflection.
   B. specular reflection.
   C. diffuse reflection.
   D. replica reflection.

2. Two mirrors make an angle of 120° with each other. A ray is incident on mirror M_1 at angle of 65° to the normal. Find the direction of the ray after is reflected from mirror M_2.

3. The index of refraction is based on the ratio of the speed of light in
   A. two transparent materials.
   B. air to the speed of light in the transparent material.
   C. water to the speed of light in the transparent material.
   D. a vacuum to the speed of light in the transparent material.

4. The index of refraction for crown flint glass is 1.575. What is the speed of light in crown flint glass?

5. Light with the lowest frequency (longest wavelength) detected by your eyes is perceived as _____.

6. An optical microscope creates a magnified image of an object specimen with an _____ and magnifies the image further more with an eyepiece to allow the user to observe it by the naked eye.

7. A common telephoto lens for a 35-mm camera has a focal length of 200 mm and a range of f-stops from f/5.6 to f/45. What is the corresponding range of aperture diameters?

8. Three thin lenses, each with a focal length of 40.0 cm, are aligned on a common axis; adjacent lenses are separated by 52.0 cm. Find the position of the image of a small object on the axis, 80.0 cm to the left of the first lens.

9. A certain microscope has two possible objectives that can be used. One has a focal length of 20 mm, and the second has a focal length of 2 mm. Also available are two eyepieces of focal lengths 2.5 cm and 5 cm. If the length of the microscopes is 18 cm, what magnifications are possible?

10. There are two fundamentally different types of telescopes, both designed to aid in viewing distant objects, such as the planets in our Solar System. The two classifications are (1)_____, and (2) _____.

11. A reflecting telescope has an 8 inch diameter objective mirror with a focal length of 1500 mm. What is the magnification of this telescope when an eyepiece having an 18-mm focal length is used?

12. Visible light's wavelengths range from about _____ to _____.

13. What would the American Flag look like if you observed it in a room illuminated with only a blue light source?

14. List the additive primaries colors:

15. If you place a piece of red cellophane over the face one flashlight, a piece of green cellophane over the face of a second flashlight, and a piece of blue cellophane over the face of a third flashlight. When the three beams are superimposed on a white wall. The area where the green light overlaps the red light appears _____. The area where the blue light overlaps the red light appears _____. The area where the green light overlaps the blue light appears _____. However, the central region, where all the three colors overlap, is _____.

16. What color will be produced when equal proportions of magenta paint and yellow paint are mixed?

17. Suppose that light passes through two Polaroid filters whose polarization axes are parallel to each other. What would be the result?

18. Light becomes partially polarized as it reflects off nonmetallic surfaces such as glass, water, or a road surface. The polarized light consists of waves vibrate in a plane that is _____ to the reflecting surface.

19. Compare and contrast the images formed by concave and plane mirrors.

20. Identify the means by which you can use a concave and/or a plane mirror to produce an inverted image.

21. Identify the means by which you can use a converging lens to form a virtual image.

22. The image of an object is found to be upright and reduced in size. What type of mirror and/or lens is used to produce such an image?

23. Like the aperture of a camera, the size of the pupil opening can be adjusted by the dilation of the _____.

24. The _____ contains the rods and cones that serve the task of detecting the intensity and the frequency of the incoming light.

25. If the speed of light were the same in all media, would refraction still occur when light passes from one medium to another? Yes or No.