

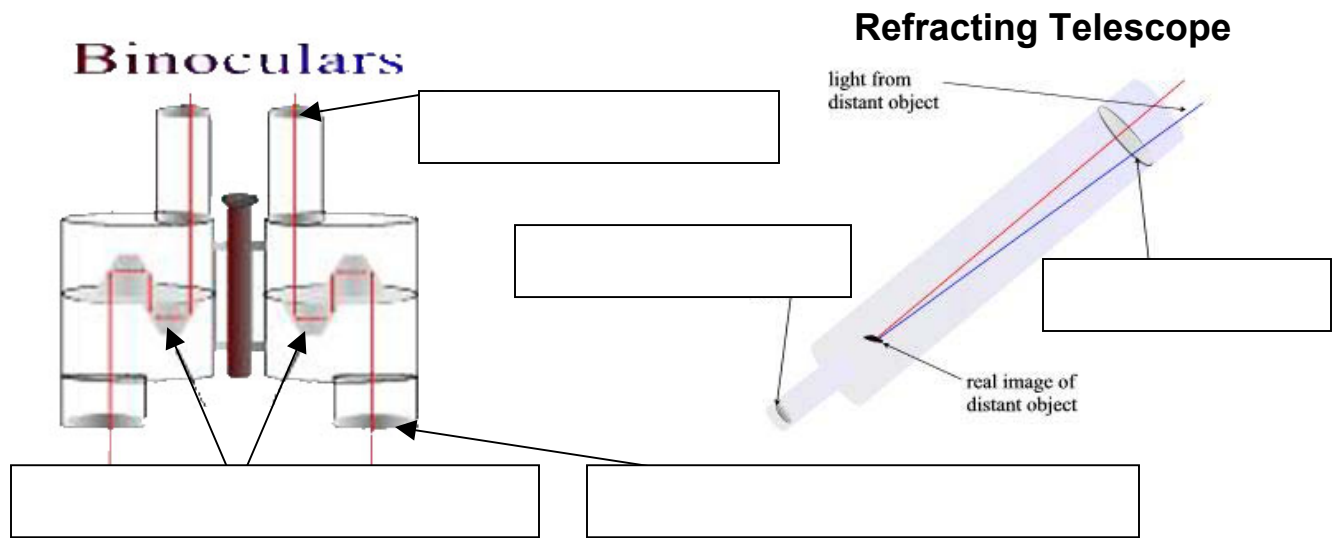
**1.1 The Challenge of light**

1. Pythagoras' thoughts about light were proven wrong because it was impossible to see ...
  - A. the light beams
  - B. dark objects
  - C. in the dark
  - D. shiny objects
  
2. Sir Isaac Newton is well known for many things. One thing that he showed was that white light is actually a mixture of different colors. He was able to demonstrate this by shining a light through ...
  - A. prism
  - B. water
  - C. glass
  - D. mirror
  
3. Albert A Michelson was able to accurately measure the speed of light by using mirrors on a mountain top. This was a refined measurement of the work of ...
  - A. Albert Einstein
  - B. Ole Romer
  - C. Euclid
  - D. Isaac Newton

**1.2 Optical Devices**

4. Any technology that uses light is called ...
  - A. a reflecting telescope
  - B. a refracting telescope
  - C. an optical device
  - D. a lens and mirror
  
5. Microbiology - the study of micro-organisms, began with the invention of these ...
  - A. binoculars
  - B. telescopes
  - C. mirrors
  - D. microscopes
  
6. The type of telescope that collects light from distant objects and focuses it in the eyepiece is called ...
  - A. retracting
  - B. reflecting
  - C. refracting
  - D. resisting
  
7. Binoculars are optical devices and are built using two of these types of prisms ...
  - A. retracting
  - B. reflecting
  - C. refracting
  - D. resisting

Label the following optical devices:



### 2.1 Light Travels in Rays and Interacts With Materials

8. This illustration demonstrates how light travels and is referred to as a ...
- A. light sketch
  - B. light diagram
  - C. ray sketch
  - D. ray diagram
9. When a light bulb in a lamp receives electrical energy, it will produce light. The term that that is used to indicate that the light source produces light is ...
- A. brilliant
  - B. electricity
  - C. luminous
  - D. intensity
10. This illustration demonstrates a type of reflection referred to as ...
- A. regular
  - B. crooked
  - C. diffuse
  - D. spectacular

### 2.2 The Law of Reflection

11. Reflection is the process in which light strikes a surface and bounces off that surface. The reflected ray will bounce back directly to the light source if it is lined up with the ...
- A. incident ray
  - B. reflected ray
  - C. normal line
  - D. reflecting surface

12. In stating the law of reflection, that the angle of incidence equals the angle of reflection it is necessary to understand that this is a law because ...
- A. a scientist has stated it
  - B. this relationship always happens
  - C. science is always accurate and precise
  - D. this relationship happens most of the time
13. When you attempt to focus an image on a screen, using a concave mirror, but cannot, yet, you can see an image when are looking into the same concave mirror, the image is called a ...
- A. virtual image
  - B. concave image
  - C. convex distortion
  - D. reflected distortion

### **2.3 Reflecting Light with Curved Mirrors**

14. When parallel rays of light hit the surface of this type of mirror, they are reflected back to a focal point in front of the mirror. The type of mirror that does this is called a ...
- A. bubble mirror
  - B. convex mirror
  - C. concave mirror
  - D. plane mirror
15. Cosmetic mirrors, flashlights, reflecting telescopes, and the headlights in a car are all examples of practical applications for these type mirrors ...
- A. plane mirror
  - B. bubble mirror
  - C. convex mirror
  - D. concave mirror
16. If an object is placed between the focal point in a concave mirror and the mirror itself, the image will appear ...
- A. Upright and smaller
  - B. Upright and larger
  - C. Inverted and smaller
  - D. Inverted and larger

### **2.4 Transparent Substances Refract light**

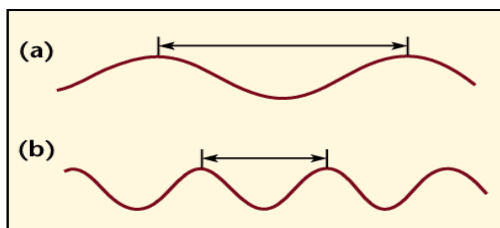
17. Refraction is the bending of light when it travels from one medium to another. What direction does the light bend when it travels from a medium of greater density to one of lesser density?
- A. along the normal
  - B. along the perpendicular
  - C. towards the normal
  - D. away from the normal

18. Mirages cause an illusion of a watery surface. This illusion is actually ...
- A. water drops reflecting the light
  - B. water drops refracting the light
  - C. the sky refracted by warm air
  - D. the sky reflected by warm air
19. During refraction, when the angle of incidence is doubled, the angle of refraction is ...
- A. also doubled
  - B. not necessarily doubled
  - C. decreased by the same amount
  - D. decreased by about half

### 2.5 Lenses Refract and Focus Light

20. When light passing through a lens, the light is bent, causing the rays of light to diverge. The type of lens is a ...
- A. convex lens
  - B. concave lens
  - C. optic lens
  - D. diamond prism lens
21. When light rays pass through a convex, lens the image that is formed is ...
- A. diverted
  - B. converted
  - C. inverted
  - D. implied

### 3.1 The Wave Model of Light



22. The arrows in (a) and (b) - identified in the illustration above - indicate the ...
- A. crest
  - B. rest position
  - C. amplitude
  - D. wavelength
23. As frequency increases, this will happen to the wavelength ...
- A. they get longer and less frequent
  - B. they get longer and more frequent
  - C. they get shorter and less frequent
  - D. they get shorter and more frequent

24. White light is refracted through a device that breaks it up into all the visible colors that make up white light. The device that does this is called a ...
- A. refractor dish
  - B. refractor lens
  - C. prism
  - D. light source

### **3.2 The Electromagnetic Spectrum**

25. The only type of radiation which can penetrate solid material and concrete walls is ...
- A. x-rays
  - B. gamma rays
  - C. infrared waves
  - D. microwaves
26. Radar is an acronym for radio detection and ranging. These devices send out waves, which bounce off objects and return (obeying the law of reflection). Older radar devices used radio waves, whereas modern radar devices use ...
- A. microwaves
  - B. ultraviolet waves
  - C. infrared waves
  - D. gamma rays

### **3.3 Producing Visible Light**

27. Phosphorescence is slightly different from fluorescence. In phosphorescence, the energy that is used to produce the light is absorbed by the material and then given off later. These types of materials ...
- A. glow in the dark
  - B. become natural light
  - C. last longer than fluorescent light
  - D. produce light and give off lots of heat
28. Incandescent light bulbs produce 95% heat and only 5% visible light. Fluorescent light bulbs are much more efficient, because they produce 80% heat and ...
- A. 2 times as much light
  - B. 3 times as much light
  - C. 4 times as much light
  - D. 5 times as much light

### **3.4 The Colors of Light**

29. The primary colors of light are:
- A. red, yellow and blue
  - B. red, green and yellow
  - C. red, yellow and green
  - D. red, green and blue

30. A television set puts the theory of color addition to practice. If you look closely at the screen, you will see that it is actually made up of rows of ...
- A. red, blue and yellow dots
  - B. blue, green and red dots
  - C. red, blue and yellow squares
  - D. blue, green and red squares

#### **4.1 Image Formation in Eyes and Cameras**

31. The eye and the camera can be thought of as image-producing technologies. One (the eye) happens to be a natural technology, while the other (the camera) is a ...
- A. photo advancement
  - B. film revolution
  - C. artificial technology
  - D. mechanical innovation
32. The retina in the eye has a thin layer of cells that are light sensitive. These cells are called photoreceptors. There are two kinds of photoreceptor cells. The type that detect color are the ...
- A. rods
  - B. cones
  - C. pines
  - D. iris
33. Night vision goggles or scopes are used to get images in the dark. A green image is formed on the screen because these glow green when light particles hit them ...
- A. photoreceptors
  - B. phosphors
  - C. photophors
  - D. phosphates

#### **4.2 Other Eyes in the Animal Kingdom**

34. Humans have 3 types of cones, each sensing a different wavelength of light. Birds tend to have much sharper vision than humans because they have ...
- A. 4 types of cones
  - B. 5 types of cones
  - C. 6 types of cones
  - D. 7 types of cones
35. Nocturnal animals, such as cats and owls have very large pupils to allow them to collect as much light as possible. The purpose of the thin layer inside their eyes, called the tapetum lucidum, is to act as this inside their eye ...
- A. a magnifier
  - B. a mirror
  - C. a lens
  - D. a filter

36. An ommatidia is a long tube-like structure with a lens on the outer surface, a focusing cone blow it and a light sensitive cell below that. Insect eyes have ommatidia facing in almost all directions because their eyes tend to have a ...

- A. round shape
- B. flat shape
- C. concave surface
- D. convex surface

#### 4.3 Image Storage and Transmission

37. A computer stores digital information by converting the information into ...

- A. pictures
- B. numbers
- C. letters
- D. symbols

38. CCD is a grid similar to a piece of graph paper. As light falls on a square of the grid, it creates a small amount of electricity in that square. This is then converted into digital information. CCD stands for ...

- A. Computer Charged Design
- B. Capture Charge Device
- C. Compact Charge Design
- D. Charge Coupled Device

39. The greatest advantage to digital imaging is that the pictures don't have to be ...

- A. translated
- B. recovered
- C. processed
- D. transmitted

40. The **Eye** and the **Camera** have a lot in common.

They both have compound lenses - converging lens - refracting the light to a focal point on the light sensitive layer to record an image.



- To focus a camera you move the lens backward or forward.
- The eye is focused by the ciliary muscle, which stretches the lens, changing its shape.

To control how much light gets in:

- The iris in your eye changes the size of the pupil - the dark spot in the center of your eye, which controls the amount of light that enters.
- Cameras adjust to let different amounts of light in by using the aperture and the shutter controls how long the light is allowed to get through.

The retina is like the film in a camera, covering the back of the eye.

Complete the **Comparison Chart** of the Eye and the Camera on the next page.

	The Eye	The Camera
Functioning Action		
<i>The opening for light.</i>	pupil	
<i>Regulates the amount of light coming in.</i>		
<i>Focuses the refracted light.</i>		lens
<i>Light-sensitive layer that records images.</i>	retina	

Use these words to complete the comparison chart above

shutter	film	
iris	lens	aperture