

Part 1: Write “TRUE” if the statement is correct and write “FALSE” if the statement is incorrect.

1. Plane mirror has spherical reflective surface.
2. Concave mirror has reflective surface that is curved inward.
3. The eye-lens merely provides the finer adjustment of the focal length required to focus objects on the retina.
4. The subtractive primary colors are obtained by subtracting one of the three additive primary colors from white light.
5. The human eye mainly senses red, green and blue, and the brain interprets combinations of these into all the colors.
6. Compliment of cyan is blue.
7. Image formed by concave lens is always Virtual.
8. Black object reflects all colors while white object absorbs all colors
9. Myopia can be corrected by convex lens.
10. Refracting telescope uses concave mirror to form an image of distant object.

Part 2: Matching**A**

11. Myopia
12. Hyper-metropia
13. White color
14. Cyan color
15. Magenta color
16. Yellow color
17. Concave lens
18. Concave mirror
19. Convex lens
20. Convex mirror

B

- A. Red + Green + Blue
- B. Converging mirror
- C. Red + Green
- D. Diverging lens
- E. Far-sightedness
- F. Plane mirror
- G. Red + Blue
- H. Diverging mirror
- I. Near-sightedness
- J. Blue + Green
- K. Converging lens

Part 3: Choose the correct answer from given alternatives

21. If object is at infinite distance away from converging lens then the **image** formed by the lens will be:
A. Upright B. virtual C. highly diminished D. highly magnified
22. Image of a given object is formed at between F_2 and $2F_2$ of **convex lens**. Position of the object is: ____
A. at beyond $2F_1$ B. at between F_1 and $2F_1$ C. at beyond $2F_2$ D. at F_2
23. If two plane mirrors are placed inclined to each other at 60° , number of images formed by the mirror are:
A. $\sin^{-1}(0.625)$ B. 5 C. $\sin 60^\circ$ D. 6
24. Image formed by convex mirror is always ____
A. Enlarged B. real C. inverted D. virtual
25. Image formed by convex lens is: virtual, upright and enlarged if the object is placed at:
A. Infinity B. $2F_1$ C. between $2F_1$ and F_1 D. between F_1 and O
26. Which of the following remains the same, when light refracts?
A. frequency B. wavelength C. speed D. all
27. Which of the following remains the same, when light reflects?
A. frequency B. wavelength C. speed D. all
28. Which of the following is not converging lens?
A. The lens that used to correct myopia C. Eyepiece lens of telescope
B. The lens that used to correct hyper-metropia D. eyepiece lens of microscope
29. Which of the following is white in color?
A. Sclera B. iris C. ciliary muscle D. pupil

30. Most of refraction of light rays entering the eye occurs:
 A. In the lens B. at the outer surface of cornea C. in the optical lobe D. on the retina
31. What is mid-point of surface of spherical mirror?
 A. Optical center B. Center of curvature C. Focus D. Pole
32. If the image is formed at center of curvature of concave mirror, the object must be at: ____
 A. F B. between F and C C. between F and O D. C
33. If incident ray of light is shone on plane mirror perpendicular to its surface then angle of reflection is: ____
 A. 90° B. 0° C. critical angle D. $\sin^{-1}(0.625)$
34. Cyan color-filter allows _____ but, absorbs _____ respectively.
 A. red & green, blue B. green and blue, cyan C. green and blue, red D. red and blue, cyan
35. Convex mirror are preferred than plane mirror because:
 A. It forms an enlarged image C. it forms left-right inverted image
 B. It has wider field of view D. all
36. Which of the following is not application of concave mirror?
 A. Head light of vehicles C. solar furnace
 B. Rear view (wing mirror) of vehicles D. electric torches
37. Magenta color filter allows _____ but, absorbs _____ respectively.
 A. red & blue, green B. blue & green, magenta C. green & red, blue D. red & blue, magenta
38. Image formed by diverging lens is always:
 A. Virtual B. enlarged C. inverted D. all
39. Which of the following is set of ***subtractive primary color***?
 A. Red, Green, Blue B. Green, Yellow, Red C. Cyan, Yellow, Magenta D. black, red, white
40. Near point of hyper-metropic eye is:
 A. 25cm B. less than 25cm C. more than 25cm D. 2.3cm
41. Ability of eye-lens to change its focal length is: ____
 A. Presbyopia B. hyper-metropia C. accommodation D. myopia
42. Mirror whose reflective surface is curved in ward is called:
 A. Convex mirror B. plane mirror C. diverging mirror D. concave mirror
43. Which of the following is **incorrect** about fiber optics?
 A. Angle of incidence is greater than critical angle while operating.
 B. Refractive index of cladding is greater than refractive index of core.
 C. Refractive index of core is greater than refractive index of cladding
 D. Light undergoes multiple total internal reflection
44. Minimum distance at which eye can see clear image of an object comfortably without feeling strain is: ____
 A. focal point B. far point C. near point D. blind spot
45. Image formed by plane mirror is not:
 A. upright B. virtual C. diminished D. left-right inverted
46. Which of the following can form real image?
 A. Plane mirror B. convex mirror C. concave lens D. concave mirror
47. Image formed by convex mirror is always:
 A. Virtual B. diminished C. nearer than the object D. all
48. Lens is optical instrument that:
 A. refracts light B. reflects light C. disperses light D. diffracts light
49. Which of the following controls amount of light entering the eye?
 A. Cornea B. lens C. iris D. sclera
50. Overall image formed by telescope is:
 A. Diminished B. inverted C. virtual D. all
51. Which of the following is not property of overall image formed by microscope?
 A. Magnified B. upright C. virtual D. left-right and up-down inverted

Part 4: workout: solve the following problems showing all necessary steps.

52. Compute color subtraction:

A. Yellow – red = B. White - green = C. Cyan – green =

53. A 50m tall tower is 10m away from Wing mirror (rear view) of a car. Find the following if radius of curvature of the mirror is 4m.

A. Focal length B. image distance C. magnification D. image height

54. Two plane mirrors are placed inclined to each other at 45°. Find number of images formed by the mirror.

55. A 20m tall tower is 5m away from convex lens. Find the following if radius of curvature of the mirror is 2m.

A. Focal length B. image distance C. magnification D. image height

Part 5: Answer the following questions accordingly.

56. Discuss clearly how human sees objects (explaining function of each structure within eye).

57. Explain what microscope and how it works.

58. Discuss how telescope works (both refracting and reflecting).

59. List properties of image formed by convex lens when the object is:

a. at infinity b. beyond $2F_1$ c. at $2F_1$ d. between $2F_1$ and F_1 e. at F_1 f. at between F_1 and P

60. List properties of image formed by concave mirror when object is:

a. at infinity b. beyond C c. at C d. between C and F e. at F f. at between F and P

61. Discuss eye defects and their correction

62. What are similarities of concave lens and convex mirror?

Equations

Number of images formed by two plane mirrors (N)	$N \approx \left(\frac{360^\circ}{\theta} - 1\right), \text{ if } \left(\frac{360^\circ}{\theta}\right) \text{ is even integer}$ $N \approx \left(\frac{360^\circ}{\theta}\right), \text{ if } \left(\frac{360^\circ}{\theta}\right) \text{ is an odd integer.}$	θ = angle between the mirrors f = focal length u = object distance v = image distance m = magnification h' = image height h = object height
Mirror formula	$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$	Where,
Lens formula	$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$	
Magnification of lens or mirror	$m = \frac{h'}{h} = -\frac{v}{u}$	
Total magnification of microscope	$m_{total} = m_{objective} \times m_{eyepiece}$	

Sign conventions for spherical mirrors

Quantity	Positive when	Negative when
Object location, U	Object in front of the mirror (real object)	Object is back of the mirror (virtual)
Image location, v	Image in front of the mirror (real image)	Image is in the back of the mirror (virtual image)
Object height, h	Object is up-right	Object is inverted
Image height, h'	Image is upright	Image is inverted
Focal length, f	Mirror is concave	Mirror is convex
Magnification, m	Image is up-right	Image is inverted

Sign convention

Quantity	Positive when	Negative when
Object location, u	Object in front of lens (real object)	Object is in back of lens (virtual object)
Image location, v	Image is in back of lens (real image)	Image is in front of the lens (virtual image)
Image height, h'	Image is upright	Image is inverted
Focal length	Converging lens	Diverging lens
R_1 and R_2	Center of curvature is in back of lens	Center of curvature is in front of lens