Answer Key

1. C
2. B
3. C
4. B
5. A
6. C
7. B
8. A
9. A
10. C
11. A
12. 6.0 cm
13. A
14. D
15. D
16. A
17. Refracting
18. Retina
19. Diopters
20. Opaque
21. Iris
22. Concave
23. Reflecting; Concave
24. An erect image: An image smaller than the object
25. Janssen
26. Photons
27. Spherical Aberration
28. Vacuum
29. 1.333
30. Snell
31. Critical
32.30 cm
33. Real
34. 8 cm
35. Inverted
36.30 cm
37. Real
38.5 cm
39. Inverted

40. Light incident perpendicular to a surface is not deflected, so light of the various frequencies in white light stays together despite the different velocities in the glass.

41. 5*10^-11

42. v = c/n= 3*10^8/2.42 = 1.24*10^8 m/s

43. Even a weak light involves many photons per second. Visual responses persist for a short time, so successive photons give the impression of a continuous transfer of energy.

44. For light going from glass into air:

Sin (i) = 1.00/1.52 = 0.658 i = 41°

For light going from glass into water:

Sin (i) = 1.33/1.52 = 0.875 i = 61°

45. Light waves consist of coupled frequencies in electric and magnetic fields and hence require no material medium for their passage.

For free response questions:

Give one point for work shown but incorrect answer.