

Team Number: KEY

School Name: _____

OPTICS ANSWER SHEET

For all questions, indicate your answer on the sheet provided. Only this answer sheet will be graded. **Answers without units or answers with incorrect units will not be given credit.**

1. 4.5×10^{14} Hz

2. 4 m

3. Diffuse

4. Convex OR Biconvex

5. 75 cm

6. -1.5 OR 1.5

7. Real

8. Inverted

9. 1.54

10. pupil

11. optic nerve

12. cornea

13. lens

14. retina

15. iris

16. 25.4°

17. 48.8°

18. 8.65×10^{-19} J OR 5.4 eV

19. Red

20. Green

21. Cyan

22. Magenta

23. White

24. 3×10^8 m/s

25. Violet

26. Cone + Rod

27. 5.6×10^{-7} m OR 560 nm

28. 2.25 cm

29. Interferometer OR Michelson Interferometer

30. 3.97×10^{-7} m OR 397 nm

31. Rayleigh scattering

32. 66.7 m

33. 6.25

34. Red

1) 4.95×10^{14} Hz. freq. stays the same

$$2) f = \frac{1}{\text{diopter}} = \frac{1}{.25 \text{ m}^{-1}} = \boxed{4 \text{ m}}$$

3) Diffuse

4) Convex

$$5) \frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

$$\frac{1}{30 \text{ cm}} = \frac{1}{50 \text{ cm}} + \frac{1}{d_i}$$

$$\frac{1}{75 \text{ cm}} = \frac{1}{d_i}$$

$$\boxed{d_i = 75 \text{ cm}}$$

$$6) m = \frac{-d_i}{d_o} = \frac{-75 \text{ cm}}{50 \text{ cm}} = \boxed{-1.5}$$

7) Real

8) Inverted \rightarrow negative magnification

$$9) n = \frac{c}{v} = \frac{c}{.65c} = \boxed{1.54}$$

10) pupil

11) optic nerve

12) cornea

13) ~~lens~~ lens

14) ~~retina~~ retina

15) iris

$$16) n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$(1) \sin(40^\circ) = (1.5) \sin \theta_2$$

$$\boxed{\theta_2 = 25.4^\circ}$$

$$17) n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$(1.33) \sin \theta_1 = (1.00) \sin(90^\circ)$$

$$\boxed{\theta_1 = 48.8^\circ}$$

$$18) E = \frac{hc}{\lambda} = \frac{(6.63 \times 10^{-34} \text{ J}\cdot\text{s})(3 \times 10^8 \text{ m/s})}{2.3 \times 10^{-7} \text{ m}} = 8.65 \times 10^{-19} \text{ J}$$

OR
5.4 eV

19) ~~Red~~ Red

20) GREEN

21) ~~Cyan~~ Cyan

22) Magenta

23) white

24) $3 \times 10^8 \text{ m/s}$

25) Violet

26) Cone, Rod

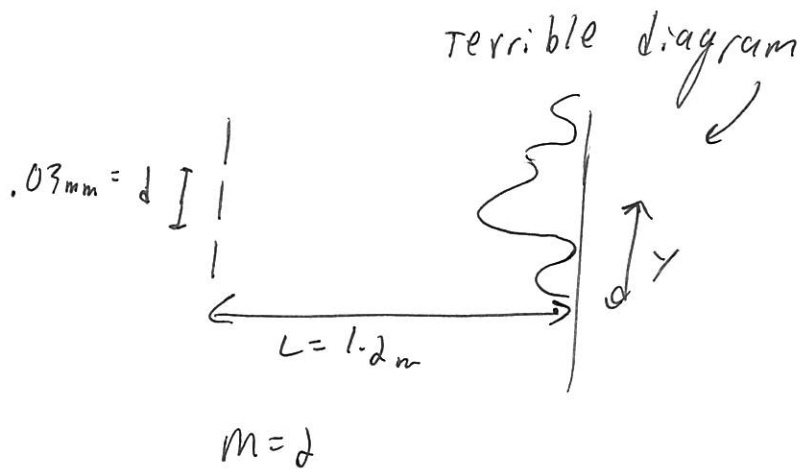
27) $y = \frac{m\lambda L}{d}$

$$.045 \text{ m} = \frac{2\lambda(1.2 \text{ m})}{(3 \times 10^{-5} \text{ m})}$$

$$\lambda = 5.6 \times 10^{-7} \text{ m}$$

OR

$$\lambda = 560 \text{ nm}$$



28) $\frac{1}{2}$ of ~~value~~ ~~value~~ for #27 since all fringes are equally spaced. 2.25 cm

29) Interferometer OR Michelson Interferometer

$$30) \frac{1}{\lambda} = R_H \left(\frac{1}{n^2} - \frac{1}{n'^2} \right) = (1.0974 \times 10^7 \text{ m}^{-1}) \left(\frac{1}{2^2} - \frac{1}{7^2} \right) = 2.52 \times 10^{-6} \text{ m}^{-1}$$

$$\lambda = 3.97 \times 10^{-7} \text{ m} = 397 \text{ nm}$$

31) Rayleigh Scattering

$$32) c = f\lambda$$

$$3 \times 10^8 \text{ m/s} = (4.5 \times 10^6 \text{ Hz}) \lambda$$

$$\lambda = 66.7 \text{ m}$$

$$33) 2.5^2 = 6.25 \times \text{brighter}$$

34) Red