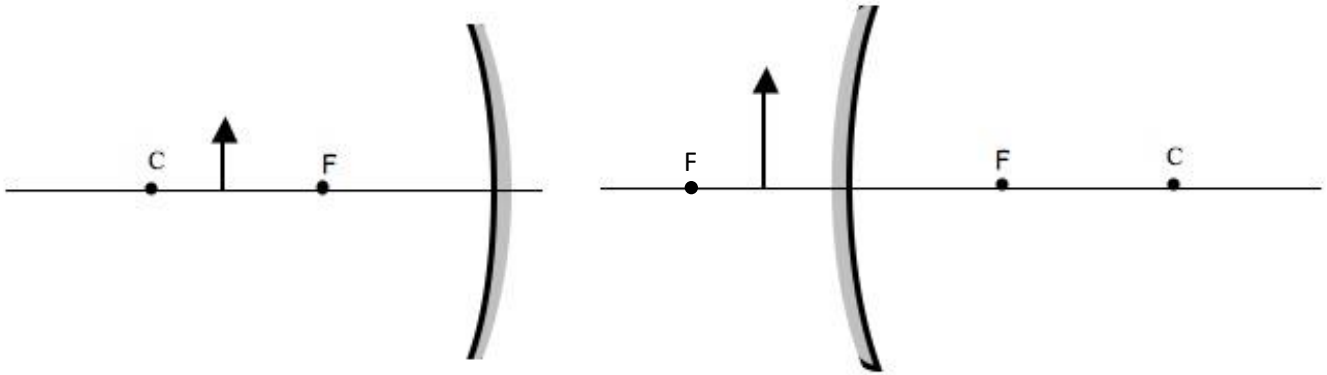
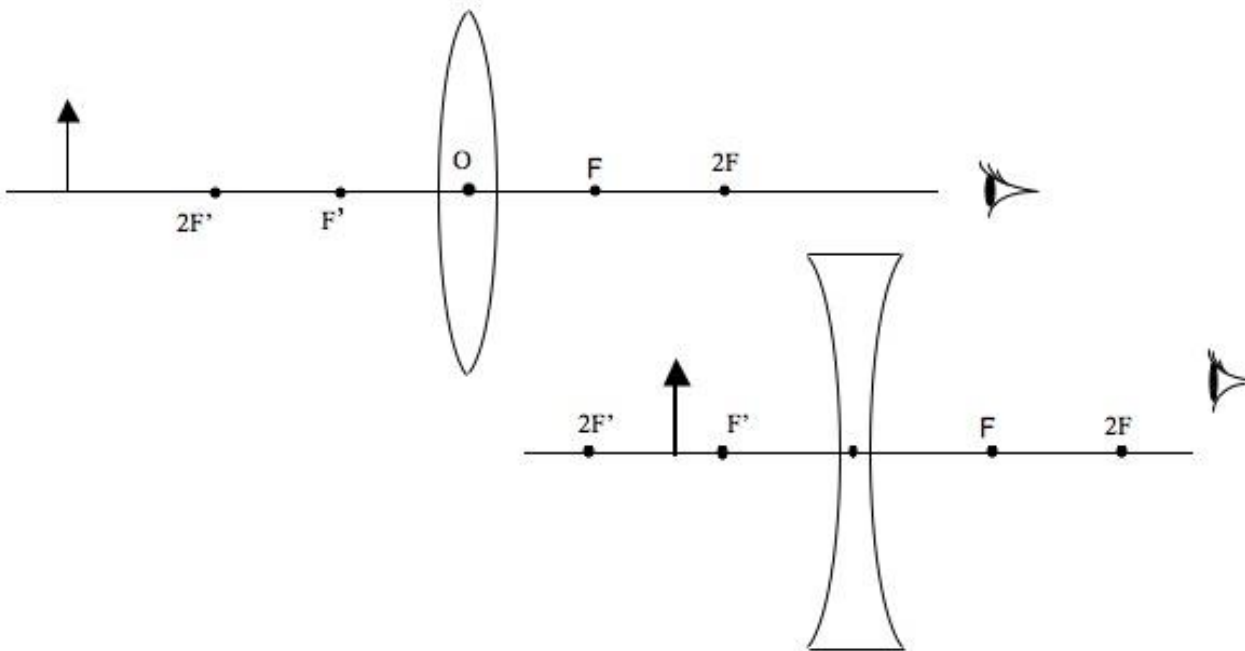


Chapters 26-29 Review Questions

1. Draw the ray diagrams for the mirrors below. Use dotted lines to indicate virtual rays where appropriate.



2. Draw the ray diagrams for the lenses below. Use dotted lines to indicate virtual rays where appropriate.



3. In the picture below, why do some people see a black and blue dress, while others see a white and gold one? (The original photo is in the middle.)



4. What kind of lens is used to correct nearsightedness: convex or concave?
5. A combination of a _____ (adjective) lens and a _____ (adjective) lens is the essential configuration of both the microscope and the refracting telescope.
6. Why are reflecting telescopes more effective than refracting telescopes? (Give two advantages.)
7. When a laser beam passes through a double-slit to a wall or screen, why does a pattern of bright and dark fringes appear?
8. Why do two perpendicular polarizers block the transmission of all light?
9. How does an LCD screen work?
10. How do polarized sunglasses work?
11. What did Young's double-slit experiment prove about the nature of light?
12. Why does white light form a spectrum of colors when it passes through a diffraction grating?
13. Write the two postulates of Einstein's Special Theory of Relativity:
14. Write gamma, also known as the Lorentz factor:
15. If I take off from Earth in a spaceship and travel at 100,000 miles per second to a distant galaxy and back, I will have aged _____ (adverb) than the people I left behind.
16. If I am an astronaut floating in space and I suddenly see a satellite flying by at $\frac{3}{4}$ the speed of light, I will see it as _____ (adjective) than its actual length.
17. As an object's velocity increases, its _____ (noun) also increases. Explain how this makes it impossible for any object to ever reach light speed.
18. The equation $E = mc^2$ shows us that a tiny amount of mass contains a _____ (adjective) amount of energy.
19. How do GPS systems rely on the theory of relativity for accuracy?
20. Why did Einstein meet with President Roosevelt in 1939?
21. You are standing on Earth watching a SpaceX rocket ship take off on a long journey. The rocket ship accelerates to four fifths the speed of light. When 10 years will have passed for you on earth, how many years will the ship's pilot have experienced? (HINT: use $\Delta t = \gamma \Delta t'$ and remember that Δt is Earth time.)
22. In single-slit diffraction, why does the slit need to be very narrow in order to observe a diffraction pattern?
23. Write the equation for constructive interference in a diffraction grating, and explain what each symbol means.
24. Provide the ray diagram of a magnifying glass with the object inside the F point.
25. Explain how the ciliary muscles of the human eye work to focus the lens on distant or near objects.
26. Explain how a compound microscope works.
27. Explain the relativistic phenomenon of relative simultaneity.
28. Explain the relativistic phenomenon of time dilation. Why and how does it happen?

29. What do falling muons teach us about length contraction?

30. Explain how relativistic mass increase is a direct consequence of the conservation of momentum.

31. In the picture below, why do both squares on the right appear brown, while the corresponding squares on the left appear brown and orange?

