

Physics II Trivia Review

Ch. 22, 24, 25, 26: Induction, EM Waves, Mirrors, Lenses
General Physics IIA

Round 1 — Quick Warm-Up (1 point each)

1. A loop of wire sits in a magnetic field that is constant in time. Is an emf induced?
 2. According to Lenz's law, an induced current acts to oppose what quantity?
 3. In vacuum, what property is the same for all electromagnetic waves?
 4. If light enters a material with a larger index of refraction, does its speed increase, decrease, or stay the same?
 5. A plane mirror forms an image that is always _____ and _____.
 6. A diverging lens always produces an image that is _____ and _____.
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Round 2 — Multiple Choice Challenge (2 points each)

7. Increasing the wavelength of an electromagnetic wave in vacuum will
 - (a) increase its frequency
 - (b) decrease its frequency
 - (c) increase its speed
 - (d) decrease its speed
8. A concave mirror produces a virtual image when the object is
 - (a) beyond the focal point
 - (b) at the focal point
 - (c) between the focal point and the mirror
 - (d) very far away
9. Which of the following can produce a real image?
 - (a) a plane mirror only
 - (b) a diverging lens only
 - (c) a concave mirror or a converging lens

- (d) a plane mirror or a diverging lens
10. If the resistance of a coil doubles while the induced emf stays the same, the induced current
- (a) doubles
 - (b) is cut in half
 - (c) stays the same
 - (d) becomes zero
11. Which relationship is correct for electromagnetic waves in vacuum?
- (a) $c = \frac{f}{\lambda}$
 - (b) $c = \lambda f$
 - (c) $c = \frac{\lambda}{f}$
 - (d) $c = \lambda + f$
12. When light passes from air into water, which quantity stays the same?
- (a) speed
 - (b) wavelength
 - (c) frequency
 - (d) index of refraction
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Round 3 — Induction Round (2 points each)

13. State Faraday's law in words.
14. A larger rate of change of magnetic flux produces a _____ induced emf.
15. If the magnetic flux through a loop increases into the page, the induced current creates a magnetic field that points _____ the page.
16. A circular loop has radius 5.0 cm. If its area doubles while everything else stays the same, what happens to the magnetic flux?
17. A loop moves into a magnetic field region. Why is there an induced current while it is entering, but not after it is fully inside a constant field region?
18. A coil of N loops in a changing magnetic field will have an induced emf smaller, the same as, or greater than a coil with one loop?
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Round 4 — EM Waves Round (2 points each)

19. If frequency increases in vacuum, what happens to wavelength?
 20. Which color of visible light has the higher frequency: red or blue?
 21. If light slows down in a material, what must be true about the material's index of refraction compared with vacuum?
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Round 5 — Mirrors and Lenses (3 points each)

22. For a concave mirror with focal length 10 cm, an object is placed 30 cm in front of the mirror. Is the image real or virtual?
 23. For a plane mirror, how does image distance compare with object distance?
 24. What does a negative magnification mean physically?
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Round 6 — Quick Calculations (4 points each)

25. A coil experiences an induced emf of 0.80 V and has resistance $4.0\ \Omega$. Find the current.
 26. An EM wave has frequency 6.0×10^{14} Hz. Find its wavelength in vacuum.
 27. What region of the EM spectrum is the wave of the last question in?
 28. Light enters water ($n = 1.33$). Find its speed in water.
 29. A concave mirror has $f = 10$ cm and $d_o = 30$ cm. Find the image distance.
 30. A converging lens has $f = 15$ cm and $d_o = 40$ cm. Find the image distance.
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Final Round — Team Challenge (6 points)

A circular loop of radius 5.0 cm is in a magnetic field perpendicular to the loop. The field increases from 0.10 T to 0.50 T in 0.20 s.

1. Find the induced emf.
2. State, qualitatively, the direction of the induced current.