NEET ANSWER KEY & SOLUTIONS

SUBJECT :- PHYSICS
CLASS :- 12th **PAPER CODE :- CWT-5**
CHAPTER :- ELECTRO MAGNETIC INDUCTION

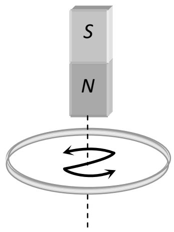
ANSWER KEY

1.	(C)	**2.**	(C)	**3.**	(A)	**4.**	(D)	**5.**	(B)	**6.**	(D)	**7.**	(B)
8.	(A)	**9.**	(D)	**10.**	(B)	**11.**	(C)	**12.**	(B)	**13.**	(D)	**14.**	(B)
15.	(C)	**16.**	(C)	**17.**	(A)	**18.**	(D)	**19.**	(C)	**20.**	(B)	**21.**	(B)
22.	(A)	**23.**	(A)	**24.**	(D)	**25.**	(B)	**26.**	(D)	**27.**	(C)	**28.**	(A)
29.	(B)	**30.**	(D)	**31.**	(A)	**32.**	(A)	**33.**	(A)	**34.**	(A)	**35.**	(A)
36.	(C)	**37.**	(C)	**38.**	(D)	**39.**	(A)	**40.**	(B)	**41.**	(D)	**42.**	(B)
43.	(D)	**44.**	(B)	**45.**	(B)	**46.**	(D)	**47.**	(A)	**48.**	(C)	**49.**	(C)
50.	(D)												

SOLUTIONS

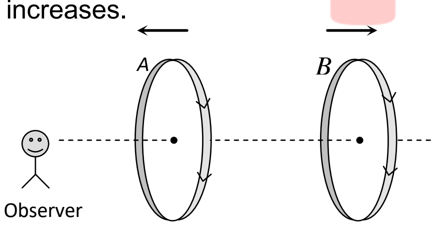
SECTION-A

1. (C)
Sol. As it is seen from the magnet side induced current will be anticlockwise.



2. (C)
Sol. $e = -\frac{d\phi}{dt} = -(16t+3) = -67\,units$

3. (A)
Sol. Induced current in both the coils assist the main current so current through each coil increases.



4. (D)
Sol. $|e| = N\left(\frac{\Delta B}{\Delta t}\right).A\cos\theta$

$= 500 \times 1 \times (10\times10^{-2})^2 \cos 0 = 5V.$

5. (B)

6. (D)
Sol. ϕ = BA cos θ
= 2.0 × 0.5 × cos 60°
= 2.0 × 0.5 × $\frac{1}{2}$ = 0.5 wb

7. (B)
Sol. $\phi = \mu_0 niA = 4\pi\times10^{-7} \times \frac{3000}{1.5} \times 2 \times \pi(2\times10^{-2})^2$

$= 6.31\times10^{-6}\,Wb$

8. (A)
Sol. Faraday's laws involve conversion of mechanical energy into electric energy. This is in accordance with the law of conservation of energy.

9. (D)
Sol. Since $\Delta\phi = 0$ hence EMF induced is zero.

10. (B)
Sol. According to Lenz's law.

11. (C)
Sol. By moving away from solenoid the ring will resist the changing flux in it.

12. (B)

13. (D)
Sol. According to fleming right hand rules Conductor cuts the flux only when, if it moves in the direction of *M*.

14. (B)
Sol. $e = B_v.v.l = 2\times10^{-4} \times \left(\frac{360\times1000}{3600}\right)\times 50$

$\Rightarrow e = 1\,V$

15. (C)
Sol. $e = NBA\,\omega;\ \omega = 2\pi f = 2\pi \times \frac{2000}{60}$

$\therefore e = 50\times0.05\times80\times10^{-4}\times2\pi\times\frac{2000}{60} = \frac{4\pi}{3}$

16. (C)
Sol. Peak value of $emf = e_0 = \omega NBA = 2\pi\nu NBA$

$= 2\pi\times50\times300\times4\times10^{-2}\times(25\times10^{-2}\times10\times10^{-2})$
$= 30\,\pi\,volt$

17. (A)
Sol. Given $\frac{di}{dt} = 2A/sec.,\ L = 5\,H$

$\therefore e = L\frac{di}{dt} = 5\times2 = 10\,V$

18. (D)

Sol. Induced emf $e = M\frac{di}{dt} = \frac{\mu_0 N_1 N_2 A}{l}.\frac{di}{dt}$

$= \frac{4\pi \times 10^{-7} \times 2000 \times 300 \times 1.2 \times 10^{-3}}{0.30} \times \frac{|2-(-2)|}{0.25}$

$= 48.2 \times 10^{-3}\ V = 48\ mV$

19. (C)

Sol. $M = -\frac{e_2}{di_1/dt} = -\frac{e_1}{di_2/dt}$

Also $e_1 = -L_1\frac{di_1}{dt}.e_2 = -L_2\frac{di_2}{dt}$

$M^2 = \frac{e_1 e_2}{\left(\frac{di_1}{dt}\right)\left(\frac{di_2}{dt}\right)} = L_1 L_2 \Rightarrow M = \sqrt{L_1 L_2}$

20. (B)

Sol. $e = -L\frac{di}{dt} \Rightarrow 8 = L\frac{(4-2)}{0.05} \Rightarrow L = 0.2\ H$

21. (B)

Sol. There will be self induction effect when soft iron core is inserted.

22. (A)

Sol. $e_2 = M\frac{di_1}{dt} \Rightarrow i_2 R_2 = M\frac{di_1}{dt} \Rightarrow 0.4 \times 5 = 0.5 \times \frac{di_1}{dt}$

$\Rightarrow \frac{di_1}{dt} = 4\ A/\sec.$

23. (A)

Sol. $V = \frac{1}{2}B\omega l^2$

$\omega = 2\pi f$

24. (D)

25. (B)

Sol. $L \alpha n^2$

26. (D)

Sol. $e = -L\frac{di}{dt} = -L\frac{(-2-2)}{0.05}$

$8 = L\frac{(4)}{0.05}$

$\therefore\ L = \frac{8 \times 0.05}{4} = 0.1H$

27. (C)

Sol. $\eta = \frac{e}{E} \times 100 \Rightarrow e = 0.3\ E$

Now,

$i = \frac{E-e}{R} \Rightarrow 12 = \frac{50-(0.3 \times 50)}{R} \Rightarrow R = 2.9\Omega$

28. (A)

29. (B)

Sol. $\frac{V_p}{V_s} = \frac{N_p}{N_s} = \frac{500}{2500} = \frac{1}{5} \Rightarrow V_p = \frac{200}{5} = 40\ V$

Also $i_p V_p = i_s V_s \Rightarrow i_p = i_s\frac{V_s}{V_p} = 8 \times 5 = 40\ A$

30. (D)

Sol. $\phi = NAB$

$\frac{\mu_0 Ni}{2R_1}\pi R_2^2 = Mi$

$M \propto \frac{R_2^2}{R_1}$

31. (A)

Sol. $\frac{V_s}{V_p} = \frac{i_p}{i_s} \Rightarrow i_p = \frac{11000 \times 2}{220} = 100\ A$

32. (A)

33. (A)

Sol. $\frac{V_s}{V_p} = \frac{N_s}{N_p} \Rightarrow \frac{V_s}{20} = \frac{5000}{500} \Rightarrow V_s = 200\ V$

Frequency remains unchanged.

34. (A)

Sol. $\frac{V_s}{V_p} = \frac{N_s}{N_p} = k \Rightarrow \frac{V_s}{30} = \frac{3}{2} \Rightarrow V_s = 45\ V$

35. (A)

Sol. $\frac{N_s}{N_p} = \frac{i_p}{i_s} \Rightarrow \frac{i_p}{i_s} = \frac{4}{5}$

SECTION-B

36. (C)

Sol. **Key Idea :** Inductance of a coil is numerically equal to the emf induced in the coil when the current in the coil changes at the rate of 1 As^{-1}. If I is the current flowing in the circuit, then flux linked with the circuit is observed to be proportional to I, ie,

$\phi \propto I$

or $\phi = LI$ ....(i)

where L is called the self-inductance or coefficient of self-inductance or simply inductance of the coil.

Net flux through solenoid,

$\phi = 500 \times 4 \times 10^{-3} = 2\ Wb$

or $2 = L \times 2$ [after putting values in Eq. (i)]

or L = 1 H

37. (C)

Sol. M = $\mu_0 n_1 A N_2 = \left(4\pi\times10^{-7}\right)\left(\frac{300}{0.20}\right)$ (10 × 10^{-4}) (400)

= 2.4 π × 10^{-4} H

38. (D)

Sol. Initially inductor will offer infinite resistance and capacitors zero resistor and finally capacitor will offer infinite resistance and inductor will offer zero resistance.

39. (A)

Sol. $U = \frac{1}{2}Li^2 = \frac{1}{2}\times100\times10^{-3}\times(10)^2 = 5J$

40. (B)

Sol. $i = i_0(1 - e^{-Rt/L})$

$i_0 = \frac{E}{R}$ (Steady current) when $t = \infty$

$i_\infty = \frac{E}{R}(1 - e^{-\infty}) = \frac{5}{10} = 1.5$

$i_1 = 1.5(1 - e^{-R/L}) = 1.5(1 - e^{-2})$

$\Rightarrow \frac{i_\infty}{i_1} = \frac{1}{1 - e^{-2}} = \frac{e^2}{e^2 - 1}$

41. (D)

Sol. Mutual inductance between two coil in the same plane with their centers coinciding is given by

$M = \frac{\mu_0}{4\pi}\left(\frac{2\pi^2 R_2^2 N_1 N_2}{R_1}\right)$ *henry.*

42. (B)

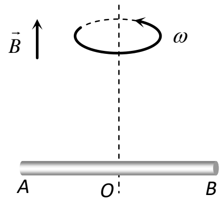
Sol. $e = M\frac{di}{dt} = 0.005\times\frac{d}{dt}(i_0\sin\omega t)$

$= 0.005\times i_0\omega\cos\omega t$

$\therefore e_{max} = 0.005\times10\times100\pi = 5\pi$

43. (D)

Sol. Potential difference between



O and *A* is $V_0 - V_A = \frac{1}{2}Bl^2\omega$

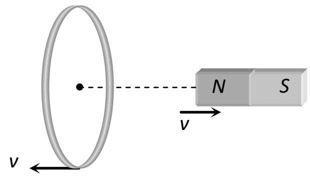
O and *B* is $V_0 - V_B = \frac{1}{2}Bl^2\omega$

so $V_A - V_B = 0$

44. (B)

Sol. $\left(\frac{d\phi}{dt}\right)_{\text{In first case}} = e$

$\left(\frac{d\phi}{dt}\right)_{\text{relative velocity } 2v} = 2\left(\frac{d\phi}{dt}\right)_{\text{I case}} = 2e$



45. (B)

Sol. When two coils are brought near to each other then flux changes to both the coils, due to which induce current produces, so the current in both decrease, because induce current oppose the main current.

46. (D)

Sol. At *B*, flux is maximum, so from $|e| = \frac{d\phi}{dt}$ at *B* $|e| = 0$

47. (A)

Sol.

$I = \frac{e}{R} = \frac{-N(d\phi/dt)}{R} = \frac{10\times10^8\times10^{-4}\times10^{-4}\times10}{20}$

= 5 *A*

48. (C)

Sol. The manner in which the two coils are oriented, determines the coefficient of coupling between them.

$M = K^2.L_1L_2$

When the two coils are wound on each other, the coefficient of coupling is maximum and hence mutual inductance between the coil is maximum.

49. (C)

Sol. $e = \frac{1}{2}B\omega r^2 = \frac{1}{2}\times0.1\times2\pi\times10\times(0.1)^2$

$= \pi\times10^{-2}\,V$

50. (D)

Sol. When current i_2 is decreased, then flux through A decreases. According to Lenz's law, attraction occurs between A and B. Similarly, when current i_1 is increased, then loops will repel each other. As distance between the loop decreases, M decreases. Hence, loops will repel each other and current i_1 will increase, when loop 1 is moved towards loop B. When loop B is moved away, loops will attract and i_2 will increase.