Daily Practice Problems

JEE PHYSICS

Topic: Electromagnetic Induction

Q.1 A flux of 1m Wb passes through a strip having an area A = 0.02 m^2. The plane of the strip is at an angle of 60º to the direction of a uniform field B. The value of B is-

(1) 0.1 T (2) 0.058 T

(3) 4.0 mT (4) none of the above.

Q.2 A small loop of area of cross section 10^{-4} m^2 is lying concentrically and coplanar inside a bigger loop of radius 0.628m. A current of 10A is passed in the bigger loop. The smaller loop is rotated about is diameter with an angular velocity ω. The magnetic flux linked with the smaller loop will be-

(1) $10^{-7} \sin \omega t$ (2) $10^{-7} \cos \omega t$

(3) $10^{-9} \sin \omega t$ (4) $10^{-9} \cos \omega t$

Q.3 A coil of N turns and area A is rotated at the rate of n rotations per second in a magnetic field of intensity B, the magnitude of the maximum magnetic flux will be-

(1) NAB (2) nAB

(3) NnAB (4) 2πnNAB

Q.4 The number of turns in a long solenoid is 500. The area of cross-section of solenoid is 2×10^{-3} m^2. If the value of magnetic induction, on passing a current of 2 amp, through it is 5×10^{-3} Tesla, the magnitude of magnetic flux connected with it in Weber will be-

(1) 5×10^{-3} (2) 10^{-2}

(3) 10^{-5} (4) 2.5

Q.5 The instantaneous flux associated with a closed circuit of 10Ω resistance is indicated by the following reaction $\phi = 6t^2 - 5t + 1$, then the value in amperes of the induced current at t = 0.25 sec will be-

(1) 1.2 (2) 0.8

(3) 6 (4) 0.2

Q.6 A cylindrical bar magnetic is lying along the axis of a circular coil. If the magnet is rotated about the axis of the coil then-

(1) e.m.f. will be induced in the coil

(2) Only induced current will be generated in the coil

(3) No current will be induced in the coil

(4) Both e.m.f. and current will be induced in the coil

Q.7 When a coil of area 2 cm^2 and having 30 turns, whose plane is normal to the magnetic field, is drawn out of the magnetic field, a charge of 1.5×10^{-4} coulomb flows in the circuit. If its resistance is 40 ohm, then the magnetic flux density in Tesla will be-

(1) 10 (2) 0.1

(3) 1 (4) 0.01

Q.8 When a magnet is being moved towards a coil, the induced emf does not depend upon-

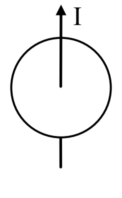
(1) the number of turns of the coil

(2) the motion of the magnet

(3) the magnetic moment of the magnet

(4) the resistance of the coil

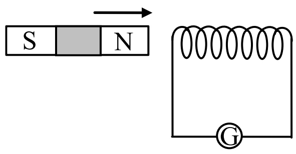
Q.9 A wire carrying current I, lie on the axis of a conducting ring. The direction of the induced current in the ring, when I is decreasing at a steady rate is-



(1) clockwise (2) anticlockwise

(3) alternatively clock and anticlockwise (4) no induced current flow in the ring

Q.10 A magnet is brought towards a fixed coil rapidly. Due to this induced emf, current and charge are E, I and Q respectively. If the speed of the magnet is doubled, then wrong statement is-



(1) E increases

(2) I increases

(3) Q remains unchanged

(4) Q increases

Q.11 A field of $5 \times 10^4/\pi$ ampere-turns/metre acts at right angles to a coil of 50 turns of area 10^{-2} m^2. The coil is removed from the field in 0.1 second. Then the induced emf in the coil is-

(1) 0.1 V (2) 80 KV

(3) 7.96 V (4) none of the above

Q.12 A coil having n turns and area A is initially placed with its plane normal to the magnetic field B. It is then rotated through 180º in 0.2 sec. The emf induced at the ends of the coils is-

(1) 0.1 nAB (2) nAB

(3) 5 nAB (4) 10 nAB

Q.13 A conducting circular loop is placed in a uniform magnetic field B = 40 mT with its plane perpendicular to the field. If the radius of the loop starts shrinking at a constant rate of 2mm/s, then the induced emf in the loop at an instant when its radius is 1.0 cm is-

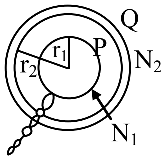
(1) $0.1\ \pi\ \mu$ V

(2) $0.2\ \pi\ \mu$ V

(3) $1.0\ \pi\ \mu$ V

(4) $1.6\ \pi\ \mu$ V

Q.14 Two plane circular coils P and Q have radii r_1 and r_2, respectively, ($r_1 << r_2$) and are coaxial as shown in fig. The number of turns in P and Q are respectively N_1 and N_2. If current in coil Q is varied steadily at a rate x ampere/sec then the induced emf in the coil P will be approximately-



(1) $\mu_0 N_1 N_2 \pi r_1^2$ (2) $\mu_0 N_1 N_2 \pi r_1^2 x$

(3) $\mu_0 N_1 N_2 \pi r_1^2 x / 2r_2$ (4) 0

Q.15 The rate of change of magnetic flux density through a circular coil of area 10^{-2} m and number of turns 100 is 10^3 Wb/m^2/s. The value of induced e.m.f. will be -

(1) 10^{-2}V (2) 10^{-3}V

(3) 10V (4) 10^3V

Q.16 A long solenoid contains 1000 turns/cm and an alternating current of peak value 1A is flowing in it. A search coil of area of cross-section 1×10^{-4} m^2 and having 50 turns is placed inside the solenoid with its plane perpendicular to the axis of the solenoid. A peak voltage of $2\pi^2 \times 10^{-2}$V is produced in the search coil. The frequency of current in the solenoid will be -

(1) 50 Hz (2) 100 Hz

(3) 500 Hz (4) 1000 Hz

Q.17 A coil of cross-sectional area 5×10^{-4} m^2 and having number of turns 1000 is placed perpendicular to a magnetic field of 10^{-2} T. The coil is connected to a galvanometer of resistance 500Ω. The induced charge generated in the coil on rotating it through an angle of π radian will be -

(1) 10 μC (2) 20 μC

(3) 50 μC (4) 100 μC

Q.18 Lenz's law is consistent with law of conservation of -

(1) current (2) emf

(3) energy (4) all of the above

Q.19 The north pole of a magnet is brought near a coil. The induced current in the coil as seen by an observer on the side of magnet will be-

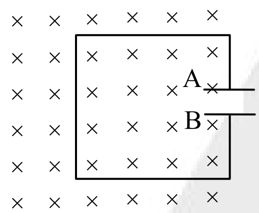
(1) in the clockwise direction

(2) in the anticlockwise direction

(3) initially in the clockwise and then anticlockwise direction

(4) initially in the anticlockwise and then clockwise direction.

Q.20 A magnetic field is directed normally downwards through a metallic frame as shown in the figure. On increasing the magnetic field-



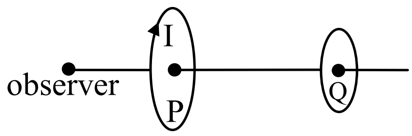
(1) plate B will be positively charged

(2) plate A will be positively charged

(3) none of the plates will be positively charged

(4) all of the above

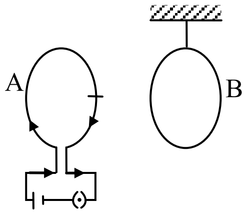
Q.21 Two coils P and Q are lying a little distance apart coaxially. If a current I is suddenly set up in the coil P then the direction of current induced in coil Q will be-



(1) clockwise (2) towards north

(3) towards south (4) anticlockwise

Q.22 A system S consists of two coils A and B. The coil A carries a steady current I while the coil B is suspended near by as shown in fig. Now if the system is heated so as to raise the temperature of two coils steadily then-



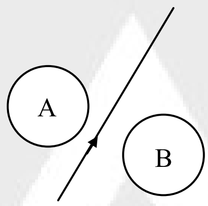
(1) the two coils show attraction

(2) the two coils show repulsion

(3) there is no change in the position of the two coils

(4) induced currents are not possible in coil B.

Q.23 Consider the situation shown in fig. If the current I in the long straight wire XY is increased at a steady rate then the induced emf's in loops A and B will be-



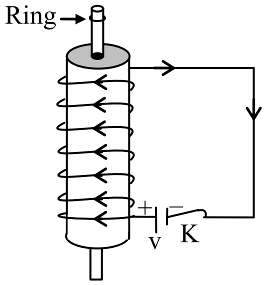
(1) clockwise in A, anticlockwise in B

(2) anticlockwise in A, clockwise in B

(3) clockwise in both A and B

(4) anticlockwise in both A and B

Q.24 A conducting ring is placed around the core of an electromagnet as shown in fig. When key K is pressed, the ring-



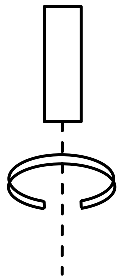
(1) remains stationary

(2) is attracted towards the electromagnet

(3) jumps out of the core

(4) none of the above

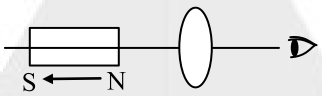
Q.25 A copper ring having a cut such as not to form a complete loop is held horizontally and a bar magnet is dropped through the ring with its length along the axis of the ring. Then acceleration of the falling magnet is- (neglect air friction)-



(1) g (2) less than g

(3) more than g (4) 0

Q.26 The north pole of a magnet is brought away from a coil, then the direction of induced current will be-



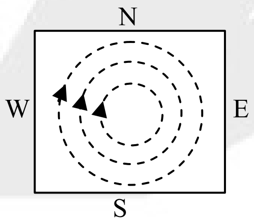
(1) in the clockwise direction

(2) in the anticlockwise direction

(3) initially in the clockwise and then anticlockwise direction

(4) initially in the anticlockwise and then clockwise direction.

Q.27 A metal sheet is placed in a variable magnetic field which is increasing from zero to maximum. Induced current flows in the directions as shown in figure. The direction of magnetic field will be-



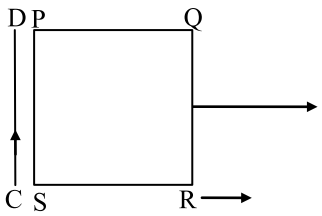
(1) normal to the paper, inwards

(2) normal to the paper, outwards.

(3) from east to west

(4) from north to south

Q.28 A square loop PQRS is carried away from a current carrying long straight conducting wire CD. The direction of induced current in the loop will be-



(1) anticlockwise

(2) clockwise

(3) sometimes clockwise some times anticlockwise

(4) current will not be induced

Q.29 A thin sheet of conductor, when allowed to oscillate in a magnetic field normal to the sheet, then the motion is-

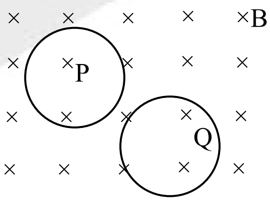
(1) damped due to air friction

(2) damped due to eddy currents

(3) accelerated due to eddy currents

(4) not effected by induced currents

Q.30 P and Q are two circular thin coils of same radius and subjected to the same rate of change of flux. If coil P is made up of copper and Q is made up of iron, then the wrong statement is-



(1) emf induced in the two coils is the same

(2) the induced current in P is more than that in Q

(3) the induced current in P and Q are in the same direction

(4) the induced currents are the same in both the coils.

ANSWER KEY

Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Ans.	2	4	1	1	4	3	3	4	4	4
Que.	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ans.	1	4	4	3	4	1	2	3	2	1
Que.	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Ans.	4	1	1	3	1	2	2	2	2	4