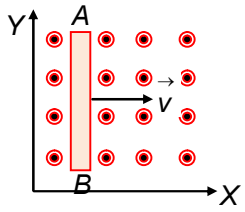
EXERCISE – I

NEET-SINGLE CHOICE CORRECT

1. A conductor rod AB moves parallel to positive x-axis in a uniform magnetic field (along positive z-axis) as shown. The end A of the rod gets



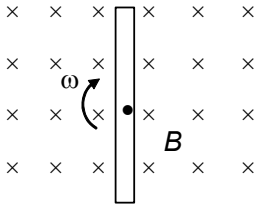
(a) positively charged

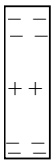
(b) negatively charged

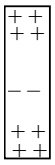
(c) neutral

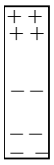
(d) first positively charged and then negatively charged

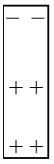
2. A conductor rotating with constant angular velocity ω inside a magnetic field B as shown. Which of the following represents the distribution of charge on conductor at that instant.



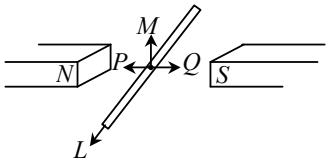
(a) 

(b) 

(c) 

(d) 

3. In the given figure a conducing rod is held between the poles of a permanent magnet. An electric potential difference will be induced between the ends of the conductor when it is moved in the direction of



(a) P (b) Q

(c) L (d) M

4. A magnet is moving towards a coil along its axis and the emf induced in the coil is ε. If the coil also starts moving towards the magnet with the same speed, the induced emf will be

(a) ε/2 (b) ε (c) 2ε (d) 4ε

5. A coil having 500 square loops, each of side 10 cm, is placed normal to a magnetic field which is increasing at the rate of 1.0 tesla per second. The induced emf is

(a) 0.1 V (b) 0.5 V (c) 1 V (d) 5 V

6. A rectangular coil of 100 turns and size 0.1 m × 0.05 m is placed perpendicular to a magnetic field of 0.1 T. If the field drops to 0.05 T in 0.05 s, the magnitude of the emf induced in the coil is

(a) 0.5 V (b) 0.75 V (c) 1.0 V (d) 1.5 V

7. A wire of length 1.0 m moves with a speed of 10 m/s perpendicular to a magnetic field. If the emf induced in the wire is 1.0 V, the magnitude of the field is

(a) 0.01 T (b) 0.1 T (c) 0.2 T (d) 0.02 T

8. A coil of cross sectional area 400 cm^2 having 30 turns is making 1800 rev/min in a magnetic field of 1 T. The peak value of the induced emf is

(a) 113 V (b) 226 V (c) 339 V (d) 452 V

9. A coil is rotated in a uniform magnetic field about an axis perpendicular to the field. The emf induced in the coil would be maximum when the plane of the coil is

(a) parallel to the field (b) perpendicular to the field

(c) at 45° to the field (d) in none of the above positions

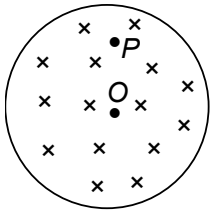
10. A coil of area 80 cm^2 and 50 turns is rotating with 2000 revolutions per minute about an axis perpendicular to a magnetic field of 0.05 T. The maximum value of emf developed in it is

(a) 2000 π V (b) $\frac{10\pi}{3}$ (c) $\frac{4\pi}{3}$ V (d) $\frac{2}{3}$ V

11. The wings of an aeroplane are 10 m apart. The plane is moving horizontally towards the north with a velocity of 200 m/s at a place where the vertical component of earth's magnetic field is 0.5×10^{-4} T. The induced emf set up between the ends of the wings is

(a) 0.1 V (b) 0.15 V (c) 1 V (d) 1.5 V

12. A uniform but increasing with time magnetic field exists in a circular region perpendicular to its plane as shown in figure. The direction of force on an electron at *P* is



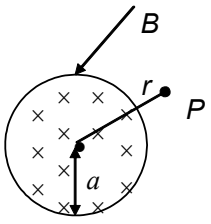
(a) towards right

(b) towards left

(c) into the plane of paper

(d) out of the plane of paper

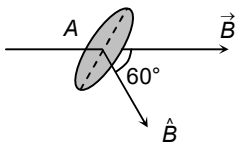
13. A uniform but time-varying magnetic field $B(t)$ exists in a circular region of radius *a* and is directed in to the plane of the paper as shown. the magnitude of the induced electric field at the point *P* at a distance *r* from the center of the circular region



(a) is zero (b) decreases as $1/r$

(c) increases as r (d) decreases as $1/r^2$

14. A coil area $A = 0.5\ m^2$ is situated in a uniform magnetic field $B = 4\ Wb/m^2$ and makes an angle of 60° with respect to the magnetic field as shown. The value of the magnetic flux through the area *A* would be equal to



(a) 2 weber (b) 1 weber (c) 3 weber (d) (3/2) weber

15. Lenz's law is a consequence of the law of conservation of

(a) charge (b) mass (c) momentum (d) energy

16. A copper ring is held horizontally and a bar magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the falling magnet is

(a) equal to that due to gravity

(b) less than that due to gravity

(c) more than that due to gravity

(d) depends on the diameter of the ring and the length of the magnet

17. A copper ring having a cut such as not to form a complete loop is held horizontally and bar magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the falling magnet is

(a) g (b) less than g

(c) more than g (d) depends on the relative size of the cut

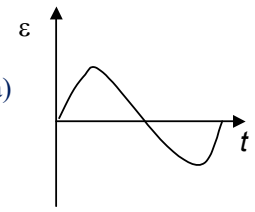
18. The mutual inductance of a pair of coils, each of N turns, is M henry. If a current of I ampere in one of the coils is brought to zero in t seconds, the average induced emf in the other coil, in volt, will be

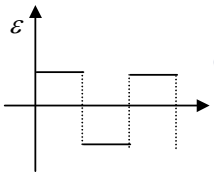
(a) $\frac{MI}{t}$ (b) $\frac{NMI}{t}$ (c) $\frac{MN}{It}$ (d) $\frac{MI}{Nt}$

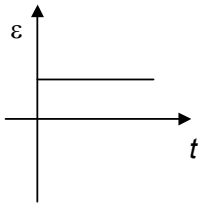
19. An emf of 5 mV is induced in a coil when, in a nearby placed another coil, the current changes by 5 A in 0.1 s. The mutual inductance between the two coils will be

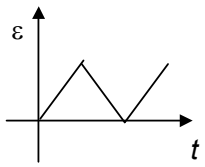
(a) 1 H (b) 0.1 H (c) 0.1 mH (d) 0.001 mH

20. A conducting rod is rotated in a plane perpendicular to a uniform magnetic field with constant angular velocity. The correct graph between the induced emf (ε) across the rod and time (t) is

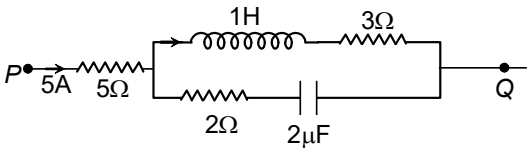
(a) 

(b) 

(c) 

(d) 

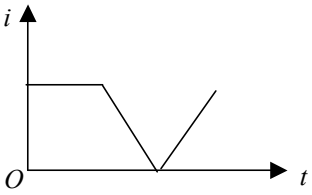
21. In the given circuit, the potential difference between point P and Q in steady state is

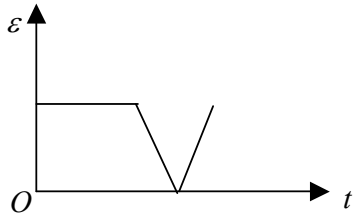


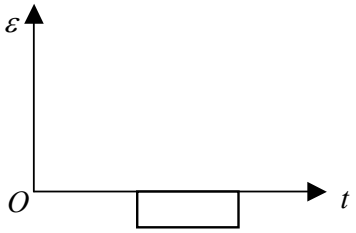
(a) 40 V (b) 21 V

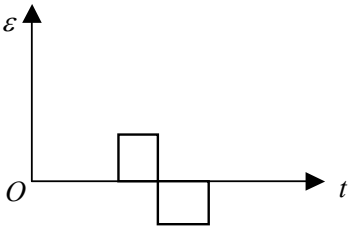
(c) 18 V (d) 18 V

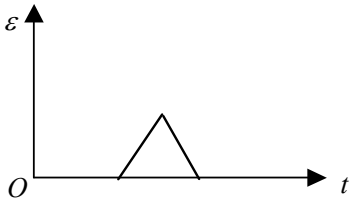
22. The current i in an induction coil varies with time t according to the graph shown in the figure. Which of the following graphs shows the induced emf ε in the coil with time



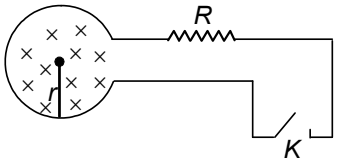
(a)


(b)


(c)


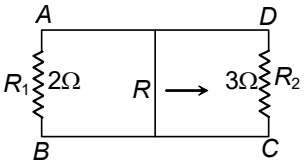
(d)


23. Shown in the figure is a circular loop of radius r and resistance R. A variable magnetic field of inductance $B = B_0 e^{-t}$ is established inside the coil. If the key (K) is closed, the electrical power developed right after closing the switch is equal to



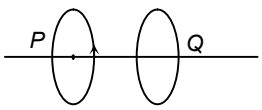
(a) $\frac{B_0^2 \pi r^2}{R}$ (b) $\frac{10 B_0 r^3}{R}$ (c) $\frac{B_0^2 \pi^2 r^4 R}{5}$ (d) $\frac{B_0^2 \pi^2 r^4}{R}$

24. A rectangular loop with a sliding connector of length 10 cm is situated in a uniform magnetic field perpendicular to plane of loop. The magnetic induction is 0.1T and resistance of connector (R) is 1 ohm. The side A B and C D have resistances 2 ohm and 3 ohm respectively. Find the current in connector during its motion with constant velocity one meter/sec



(a) $\frac{1}{220} A$ (b) $\frac{1}{110} A$ (c) $\frac{1}{440} A$ (d) $\frac{1}{55} A$

25. Two circular loops P and Q are placed with their planes parallel to each other. A current is flowing through P. If this current is increased, then



(a) the loops will attract each other
(b) the loops will repel each other
(c) the loops will neither attract nor repel each other
(d) loop Q will start moving