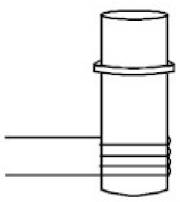
Electromagnetic Induction (EMI)

1. **Assertion (A):** A changing magnetic flux induces an electric field.
Reason (R): An inductor always tends to keep the flux constant.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

2. **Assertion (A):** A vertical iron rod has a coil of wire wound over it at the bottom end. An alternating current flows in the coil. The rod goes through a conducting ring as shown in the figure. The ring can float at a certain height above the coil



Reason (R): In the above situation, a current is induced in the ring which interacts with the horizontal component of the magnetic field to produce an average force in the upward direction.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

3. **Assertion (A):** When a circuit having large inductance is switched off sparking occurs at the switch.
Reason (R): Emf induced in an inductor is given by $|\varepsilon| = L\left|\frac{di}{dt}\right|$.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

4. **Assertion (A):** A metal ring is kept on a cardboard on top of a fixed current carrying solenoid. If current in the solenoid is switched off, the upward reaction of card board on the ring will increase.
Reason (R): Induced current in the ring will be in the same direction as in the solenoid.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

5. **Assertion (A):** If an iron rod is inserted into a steady current carrying solenoid, the current in solenoid decreases.
Reason (R): Magnetic flux linked with solenoid increases
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

6. **Assertion (A):** If a cylindrical bar magnet is dropped through a metallic pipe, it takes more time to come down the a similar unmagnetised cylindrical iron bar dropped through the same metallic pipe.
Reason (R): For the magnet, eddy currents are produced in the metallic pipe.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

7. **Assertion (A):** The self inductance of a solenoid can be increased by decreasing length if number of turns are fixed.
Reason (R): Self inductance of a solenoid is directly proportional to current passing through it.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

8. **Assertion (A):** If a coil carrying current in counter clockwise direction moves towards another stationary coil in the same plane, current induced in stationary coil will be counter clock wise.
Reason (R): Mutual induction between coils is independent of direction of current
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

9. **Assertion (A):** If a bar magnet is moved towards a conducting coil in a direction perpendicular to the plane of coil, the work done in moving the magnet will be more if it is moved faster rather than slower.
Reason (R): If the magnet is moved at a faster rate towards the circular coil, then the induced current in the circular coil is more.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

10. **Assertion (A):** The probability of burn out of a dc motor is maximum, when the motor is just switched on.
Reason (R): No back emf is developed in the armature of dc motor, when it is just switched on.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

11. **Assertion (A):** If a closed loop is kept in a space having time varying magnetic field, emf is always induced in the loop.
Reason (R): Induced emf in the loop is conservative in nature.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

12. **Assertion (A):** If a magnet is allowed to fall co-axially through a long copper tube, its acceleration decreases with time.
Reason (R): The direction of force on magnet doesn't change when it pass through a tube.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

13. **Assertion (A):** At the instant when magnetic flux is zero, emf induced in the coil is maximum when it is rotating in uniform magnetic field w.r.t. axis in the plane of coil.

Reason (R): emf induced in the coil is equal to rate of change of magnetic flux.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** Inductance coil are made of copper.

Reason (R): Induced current is more in wire having less resistance.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** A transformer cannot work on D.C. supply.

Reason (R): D.C. changes neither in magnitude nor in direction.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** ac current flows through a bulb and a solenoid connected in series. If a soft iron core is inserted in the solenoid, the bulb glows much brighter.

Reason (R): The inductance of solenoid decreases on inserting soft iron core in it.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** A choke coil has the characteristic of high inductance and low resistance

Reason (R): More is the inductive property of the choke coil, Power factor of the circuit approaches maximum.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. **Assertion (A):** Magnetic flux is a vector quantity.

Reason (R): Value of magnetic flux cannot be negative.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

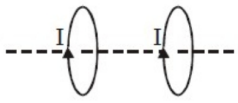
19. **Assertion (A):** Change in magnetic flux w.r.t. time produces an induced emf.
Reason (R): Faraday established induced emf experimentally.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

20. **Assertion (A):** An emf is induced in a closed loop where magnetic flux is varied. The induced electric field is not a conservative field.
Reason (R): For induced electric field, the line integral $\oint \vec{E} \cdot \vec{dl}$ around a closed path is non-zero.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

21. **Assertion (A):** It is more difficult to push a magnet into a coil with more loops.
Reason (R): This is because emf induced in each current loop resists the motion of the magnet.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

22. **Assertion (A):** When a coil is rotated in a uniform magnetic field about an axis perpendicular to the field, emf is induced in it which is maximum for the orientation of coil in which magnetic flux through the coil is zero.
Reason (R): In an electric generator, electrical energy is generated by rotating a coil in a magnetic field.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

23. **Assertion (A):** Two identical coaxial circular coils carry equal currents circulating in same direction. If coils approach each other, the current in each coil decreases.



Reason (R): When coils approach each other, the magnetic flux linked with each coil increases.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

24. **Assertion (A):** If we use a battery across the primary of a step up transformer, no voltage is obtained across secondary.
Reason (R): Battery gives a steady current.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

25. **Assertion (A):** Only a change of magnetic flux with time, will maintain an induced current in the coil.

Reason (R): The presence of a large magnetic flux will maintain an induced current in the coil.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

26. **Assertion (A):** The mutual inductance of two coils is doubled if the self-inductance of the primary and secondary coil is doubled.

Reason (R): Mutual inductance $M \propto \sqrt{L_1 L_2}$.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

27. **Assertion (A):** If a charged particle is released from rest in a time varying magnetic field, it moves in a circle.

Reason (R): In a time varying magnetic field, conservative electric field is induced.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

28. **Assertion (A):** A system cannot have mutual inductance without having self inductance.

Reason (R): If mutual inductance of system is zero, its self-inductance must be zero.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

29. **Assertion (A):** At any instant, if the current through an inductor is zero, then the induced emf may not be zero.

Reason (R): An inductor tends to keep the flux constant.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

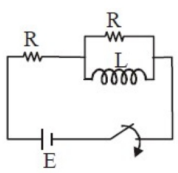
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

30. In shown circuit, switch is closed at t = 0.

Assertion (A): At $t = 0$, current through battery $I = \frac{E}{2R}$ and at $t = \infty$, current through battery will be $I = \frac{E}{R}$.



Reason (R): At t = 0, inductor will behave like open circuit and at t = ∞, inductor will behave like short circuit.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

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