Chapter 6

Electromagnetic Induction

(Assertion and Reason questions)

Directions: These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.

(a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

(c) If the Assertion is correct but Reason is incorrect.

(d) If both the Assertion and Reason are incorrect.

Q.1. Assertion: Induced emf will always occur whenever there is change in magnetic flux.
Reason: Current always induces whenever there is change in magnetic flux.

Q.2. Assertion: Faraday's laws are consequence of conservation of energy.
Reason: In a purely resistive ac circuit, the current legs behind the emf in phase.

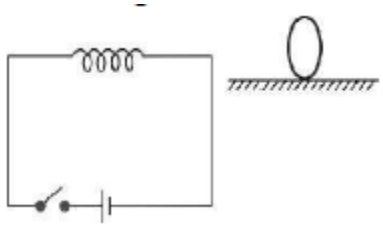
Q.3. Assertion: Only a change in magnetic flux will maintain an induced current in the coil.
Reason: The presence of large magnetic flux through a coil maintain a current in the coil of the circuit is continuous.

Q.4. Assertion: Lenz's law violates the principle of conservation of energy.
Reason: Induced emf always opposes the change in magnetic flux responsible for its production.

Q.5. Assertion: An induced current has a direction such that the magnetic field due to the current opposes the change in the magnetic flux that induces the current.
Reason: Above statement is in accordance with conservation of energy.

Q.6. Assertion: Acceleration of a magnet falling through a long solenoid decreases.
Reason: The induced current produced in a circuit always flow in such direction that it opposes the change to the cause that produced it.

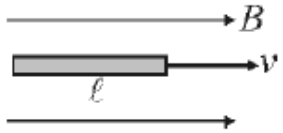
Q.7. Assertion: Figure shows a horizontal solenoid connected to a battery and a switch. A copper ring is placed on a smooth surface, the axis of the ring being horizontal. As the switch is closed, the ring will move away from the solenoid.



Reason: Induced emf in the ring, $e=-d\Phi/dt$

Q.8. Assertion: An emf can be induced by moving a conductor in a magnetic field.
Reason: An emf can be induced by changing the magnetic field.

Q.9. Assertion: Figure shows a metallic conductor moving in magnetic field. The induced emf across its ends is zero.



Reason: The induced emf across the ends of a conductor is given by $e = Bv\ell \sin\theta$.

Q.10. Assertion: Eddy currents are produced in any metallic conductor when magnetic flux is changed around it.
Reason: Electric potential determines the flow of charge.

Q.11. Assertion: An induced emf appears in any coil in which the current is changing.
Reason: Self induction phenomenon obeys Faraday's law of induction.

Q.12. Assertion: When number of turns in a coil is doubled, coefficient of self-inductance of the coil becomes 4 times.
Reason: This is because $L \alpha N^2$.

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ANSWER KEY

Q.1 : (c) Emf will always induces whenever, there is change in magnetic flux. The current will induced only in closed loop.

Q.2 : (c) In purely resistive circuit, the current and emf are in the same phase.

Q.3 : (c)

Q.4 : (a) Lenz's law (that the direction of induced emf is always such as to oppose the change that cause it) is direct consequence of the law of conservation of energy.

Q.5 : (b) **Q.6 :** (a)

Q.7 : (a) When switch is closed , the magnetic flux through the ring will increase and so ring will move away form the solenoid so as to compensate this flux. This is according to Lenz's law.

Q.8 : (b) In both the cases, the magnetic flux will change, and so there is an induced current.

Q.9 : (a)

Q.10 : (b) Both the statements are independently correct.

Q.11 : (b) **Q.12 :** (b)