QB365 Question Paper Software
12th Standard - Physics
Alternating Current Assertion and reason

Exam Time: 00:20 Hrs | Date: 2025-09-30

Total Marks: 10

Questions:

1. **Assertion (A)** : Capacitor serves as a block for D.C and offers an easy path to A.C
   Reason (R) : Capacitive reactance is inversely proportional to frequency.
   Codes:
   (a) Both A and R are true and R is the correct explanation of A
   (b) Both A and R are true but R is NOT the correct explanation of A
   (c) A is true but R is false
   (d) A is false and R is also false

2. **Assertion (A) :** Long distance transmission of A.C is carried out at extremely high voltage.
   Reason (R) : For large distance, voltage has to be large.
   Codes:
   (a) Both A and R are true and R is the correct explanation of A
   (b) Both A and R are true but R is NOT the correct explanation of A
   (c) A is true but R is false
   (d) A is false and R is also false

3. **Assertion (A) :** Soft iron is used as a core of transformer.
   Reason (R) : Area of hysteresis loop for soft iron is small.
   Codes:
   (a) Both A and R are true and R is the correct explanation of A
   (b) Both A and R are true but R is NOT the correct explanation of A
   (c) A is true but R is false
   (d) A is false and R is also false

4. **Assertion (A) :** Today, most of the electrical devices use/require AC voltage.
   Reason (R) : Most of the electrical energy sold by power companies is transmitted and distributed as alternating current.
   (a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
   (b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
   (c) Assertion is true but Reason is false.
   (d) Assertion is false but Reason is true.

5. **Assertion (A) :** In a series R-L-C circuit, the voltages across resistor, inductor and capacitor are BV, 16V and 10V, respectively. The resultant emf in the circuit is 10 V.
   Reason (R) : Resultant emf of the circuit is given by the relation. $E = \sqrt{V_R^2 + (V_L - V_C)^2}$
   (a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
   (b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

6. **Assertion :** In series LCR resonance circuit, the impedance is equal to the ohmic resistance.
Reason: At resonance, the inductive reactance exceeds the capacitive reactance.
Codes:
(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(c) Assertion is correct, reason is incorrect
(d) Assertion is incorrect, reason is correct.

7. **Assertion :** The alternating current lags behind the emf by a phase angle of, $\pi/2$ when AC flows through an inductor.
Reason : The inductive reactance increases as the frequency of AC source increases.
Codes:
(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(c) Assertion is correct, reason is incorrect
(d) Assertion is incorrect, reason is correct.

8. **Assertion :** The power is produced when a transformer steps up the voltage.
Reason : In an ideal transformer VI = constant.
Codes:
(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(c) Assertion is correct, reason is incorrect
(d) Assertion is incorrect, reason is correct.

9. **Assertion :** The voltage and current in a series AC circuit are given by $V = V_0 \sin\omega t$ and $i = i_0 \cos\omega t$. The power dissipated in the circuit is zero.
Reason : Power in AC circuit is given by $P = V_0 I_0 \cos\Phi / 2$
Codes:
(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(c) Assertion is correct, reason is incorrect
(d) Assertion is incorrect, reason is correct.

10. **Assertion :** The power in an ac circuit is minimum if the circuit has only a resistor.
Reason: Power of a circuit is independent of the phase angle.
Codes:
(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(c) Assertion is correct, reason is incorrect
(d) Assertion is incorrect, reason is correct.

Answers Key:

1. **(a):** The capacitive reactance of capacitor is given by $X_C = \frac{1}{\omega C} = \frac{1}{2\pi f C}$
   So this is infinite for D.C (f = 0) and has a finite value for A.C Therefore a capacitor blocks D.C and offers an easy path for A.C.
2. **(c):** The transmission is done at high voltage due to which current through the wire is reduced By reduction in current corresponding dissipation of energy is also reduced $\left(\text{as } H \propto I^2 R\right)$ If transmissioh is done at low voltage then we have to use thick wire-in order to reduce the dissipation of energy. This increase the cost of transmission lines wires. In order to reduce both energy dissipation and cost of transmission wire, transmission is done at high voltage by using step-up transformers.
3. **(a):** The alternating current flowing through the coils, magnetises and demagnetises the iron core again and again over complete cycles. During each cycle of magnetisation, some energy is lost due to hysteresis, the energy lost during a cycle of magnetisation being equal to area of hysteresis loop (in magnitude). Energy loss can be reduce by selecting the material core, which has narrow hysteresis loop, that is why soft iron core is used.
4. (a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
5. (a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion
   The resultant emf in the L-C-R circuit is given by
   $\Rightarrow E = \sqrt{V_R^2 + (V_L - V_C)^2}$
   $\Rightarrow E = \sqrt{(8)^2 + (16 - 10)^2}$
   $\Rightarrow E = \sqrt{64 + 36}$
   $\Rightarrow E = 10 \text{ V}$
6. (c) Assertion is correct, reason is incorrect.
7. (b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
8. (a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
   Explanation:
   Transformer cannot produce power, but it transfer from primary to secondary.
9. (a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
10. (d) Assertion is incorrect, reason is correct.