

CLASS 12

PHYSICS

EXTRA QUESTIONS

Class 12 Physics Chapter 7 Alternating Current – Extra Questions with Answers

From rms values and reactance to resonance and the Q-factor, Class 12 Physics Chapter 7 covers a lot of ground -- these questions revisit the key formulas and definitions.

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Class 12 Physics Chapter 7 – Solutions and Notes

From rms values and reactance to resonance and the Q-factor, Class 12 Physics Chapter 7 covers a lot of ground — these questions revisit the key formulas and definitions.

Very Short Answer Questions (1 mark)

Q1. What is the phase difference between voltage and current in a pure resistive ac circuit?

Ans: Zero — voltage and current are in phase.

Q2. What is the phase difference between voltage and current in a pure inductive ac circuit?

Ans: 90° — current lags the voltage by 90° .

Q3. What is the phase difference between voltage and current in a pure capacitive ac circuit?

Ans: 90° — current leads the voltage by 90° .

Q4. Write the formula for the capacitive reactance of a capacitor C in an ac circuit of frequency f.

Ans: $X_C = 1/(2\pi fC)$.

Q5. What is the power factor of a circuit, and what is its value for a series LCR circuit at resonance?

Ans: Power factor is $\cos\phi = R/Z$, the fraction of apparent power actually consumed; at resonance $Z=R$, so the power factor is **1** (maximum).

Short Answer Questions (2–3 marks)

Q6. A 50Ω resistor is connected to a 200V, 50Hz ac supply. Find the rms current and the average power consumed.

Ans: $I_{rms} = V_{rms}/R = 200/50 = 4A$. $P = V_{rms}I_{rms} = 200 \times 4 = 800W$.

Q7. Find the inductive reactance of a 0.5H inductor at 50Hz.

Ans: $X_L = 2\pi fL = 2\pi \times 50 \times 0.5 \approx 157.08\Omega$.

Q8. Explain why a capacitor blocks dc but allows ac to pass.

Ans: For dc (zero frequency), the capacitive reactance $X_C = 1/(2\pi fC)$ becomes infinite, so no steady current can flow once the capacitor is charged. For ac, the reactance is finite (and decreases as frequency increases), so the continuously reversing voltage keeps charging and discharging the capacitor, allowing a continuous alternating current to flow through the circuit.

Higher-Order Thinking / Application Questions

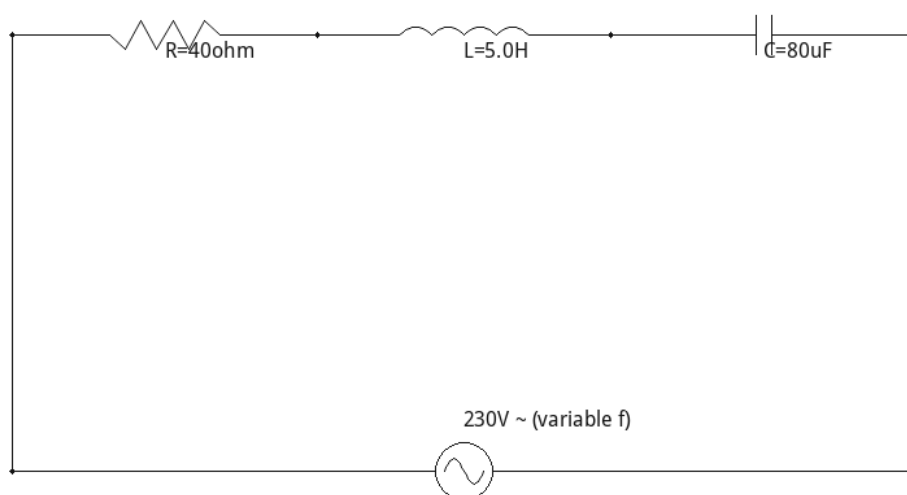
Q9. A series LCR circuit has $L=1.0H$, $C=25\mu F$ and $R=5\Omega$. Find the resonant angular frequency and the Q-factor of the circuit, and explain what a high Q-factor physically means for the sharpness of resonance.

Ans: $\omega_r = 1/\sqrt{LC} = 1/\sqrt{1.0 \times 0.000025} = 200 \text{ rad/s}$. $Q = (1/R)\sqrt{L/C} = (1/5)\sqrt{1.0/0.000025} = 40$. A high Q-factor means the resonance curve (current vs. frequency) is very sharply peaked around the resonant frequency — the circuit responds strongly only to a narrow band of frequencies close to ω_r and falls off quickly away from it, which is exactly the property that makes high-Q LCR circuits useful for selectively tuning in one radio station while rejecting nearby frequencies.

Q10. Explain, in terms of energy, why the average power dissipated in an ac circuit depends on the power factor $\cos\phi$, and why a purely reactive (L or C only) circuit — despite carrying current and having a voltage across it — dissipates no net power.

Ans: The instantaneous power delivered to any ac circuit is $p(t)=v(t)i(t)$. When voltage and current are out of phase by an angle ϕ , averaging $v(t)i(t)$ over a full cycle gives $P_{\text{avg}}=V_{\text{rms}}I_{\text{rms}}\cos\phi$ — the $\cos\phi$ factor (the power factor) accounts for the fact that current and voltage are not always simultaneously at their peak (or simultaneously zero), so their product averages to less than the simple $V_{\text{rms}}I_{\text{rms}}$. In a purely reactive circuit, $\phi=90^\circ$ and $\cos\phi=0$, so despite both $v(t)$ and $i(t)$ being nonzero at various instants, their product is positive for exactly half of each cycle (energy flowing into the reactive element) and negative for the other half (that same energy flowing back out to the source) — these contributions exactly cancel over a full cycle, so no net energy is permanently transferred from the source; the reactive element only ever stores and returns energy, it never dissipates it.

Quick visual: a worked diagram from the full [Solutions](#) page, for reference.



Series LCR circuit: $R=40\text{ohm}$, $L=5.0\text{H}$, $C=80\mu\text{F}$, variable-frequency 230V ac source.

Class 12 Physics Chapter 7 – Solutions and Notes

For complete step-by-step answers and a quick summary, check the [Class 12 Physics Chapter 7 Solutions](#) and [Class 12 Physics Chapter 7 Revision Notes](#).

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