

O P JINDAL SCHOOL, SAVITRINAGAR

ASSIGNMENT

CLASS XII PHYSICS

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- 11 The instantaneous current and voltage of an ac circuit are given by $I = 10 \sin 314 t$ A and $V = 50 \sin (314 t + \pi/2)$ V. What is the power of dissipation in the circuit? 1

ANS: Phase difference between the current and voltage is $\pi/2$. So, the power dissipation $P_{av} = P_{rms} \cos \phi$ is zero.

- 12 Is there are any device by which direct current can be controlled without any loss of energy? 1

ANS: No. dc cannot be controlled without loss of energy.

- 13 A 110 V dc heater is used on an ac source, such that the heat produced is the same. What would be the value of the alternating voltage? 1

ANS: By the definition, value of the alternating voltage is equal to 110V.

- 14 Can ever the rms value be equal to the peak value of an ac? 1

ANS: Yes, when the ac is a square wave.

- 15 Which is more dangerous 220 ac or 220 dc and why? 1

ANS: $\because V_{rms} = \frac{V_m}{\sqrt{2}} \Rightarrow V_m = \sqrt{2} \times 220 \approx 311V > 220V$ dc [$\because V_{rms} = 200V$ (ac)] \therefore ac is more dangerous than dc because its peak value is very high and also ac is in nature.

16 Does a step down transformer violate the principle of conservation of energy? 1

ANS: No. In a transformer, if a voltage is increased, the current is decreased in the same ratio and the product VI (power) remains the same.

17 Why does a low power factor imply large power loss in transmission for circuits used for transporting electric power? 1

ANS: We know that $P = IV \cos \phi$, where $\cos \phi$ is the power factor. To supply a given power, at a given voltage, if $\cos \phi$ is small, we have to increase the current accordingly. But this will lead to large power loss (I^2R) in transmission.

18 At an airport, a person is made to walk through the doorway of a metal detector, for security reasons. Is she/he is carrying anything made of metal, the metal detector emits a sound. On what principle does this detector work? 1

ANS: The metal detector works on the principle of resonances in ac circuits.

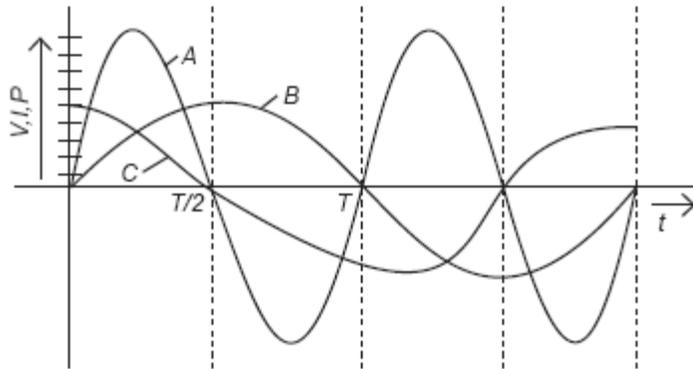
19 A bulb and a capacitor are connected in series to an ac source of variable frequency. How will the brightness of the bulb change on increasing the frequency of the ac source? 1

The brightness will increase ($\because X_C \propto \frac{1}{\nu}$), and heat produced $H \propto I^2$,

where $I_{\text{rms}} = \frac{V_{\text{rms}}}{\sqrt{X_C^2 + R^2}}$

ANS:

- 20 A device X is connected to an ac source $V = V_0 \sin \omega t$. The variation of voltage, current and power in one complete cycle is shown in the following figure.



- (i) Which curve shows power consumption over a full cycle?
(ii) Identify the device X.

ANS: (i) Curve A, because time period of curve A is half as compared to time periods of curves B and C.
(ii) The device X can be a capacitor, an inductor or LC circuit.