Question 1. Consider Bohr's model of a one-electron atom where the electron moves around the nucleus. In the following, List-I contains some quantities for the nth orbit of the atom and List-II contains options showing how they depend on n.

	List I		List II
(I)	**Radius of the n^{th} orbit**	**(P)**	**$\propto n^{-2}$**
(II)	**Angular momentum of the electron in the n^{th} orbit**	**(Q)**	**$\propto n^{-1}$**
(III)	**Kinetic energy of the electron in the n^{th} orbit**	**(R)**	**$\propto n^{0}$**
(IV)	**Potential energy of the electron in the n^{th} orbit**	**(S)**	**$\propto n^{1}$**
		(T)	**$\propto n^{2}$**
		(U)	**$\propto n^{1/2}$**

Which of the following options has the correct combination considering List-I and List-II?

A. (I), (T)

B. (II), (R)

C. (I), (P)

D. (II), (Q)

Solution: (A)

$r = 0.59 \times n^2 / z \Rightarrow r \propto n^2 \Rightarrow (I)(T)$

$mvr = nh / 2\pi \Rightarrow (mvr) \propto n \Rightarrow (II)(S)$

$K E = 13.6 \times z^2 / n^2 \Rightarrow K E \propto n^{-2} \Rightarrow (III)(P)$

$P E = -2 \times 13.6 \times z^2 / n^2 \Rightarrow P E \propto n^{-2} \Rightarrow (IV)(P)$