4. A gas is compressed from a volume of $2m^3$ to a volume of $1m^3$ at a constant pressure of $100\ N/m^2$. Then it is heated at constant volume by supplying 150 J of energy. As a result, the internal energy of the gas: **[Main Online April 19, 2014]**

(a) increases by 250 J (b) decreases by 250 J

(c) increases by 50 J (d) decreases by 50 J

4. (a) As we know,

$\Delta Q = \Delta u + \Delta w$ (Ist law of thermodynamics)

$\Rightarrow \Delta Q = \Delta u + P\Delta v$

or $150 = \Delta u + 100(1-2)$

$= \Delta u - 100$

$\therefore \quad \Delta u = 150 + 100 = 250J$