IIT – JEE: 2016 **REVISION TEST** **DATE: 02/03/15**
TOPIC: THERMODYNAMICS

SOLUTION

1. (d)
Since vessel is closed hence, volume = constant
$\therefore \quad \Delta V = 0$
$\therefore \quad W = -P\Delta V = 0$

2. (a)
$A_4C_3(s) + 12H_2O(l) \longrightarrow 4Al(OH)_3 + 3CH_4$
1mol 3 mol
initial volume $V_1 = 0$
final volume $= V_2$ due to 3 mol CH_4
$W = -P(V_2 - V_1)$
$= -P \times V_2 = -\frac{PnRT}{P} = -nRT$
$= -3 \times 2 \times 300 = -1800\,\text{cal}$

3. (c)
There are three $N-H$ bonds in NH_3

4. (d)

5. (c)

6. (a)

7. (c)

8. (d)
$\Delta H = \Delta E + \Delta n_g RT$
$\Delta n_g =$ moles of gaseous products $-$ moles of gaseous reactant
$\Delta H = \Delta E$ if $\Delta n_g = 0$

9. (b)

10. (d)

11. (c)

12. (c)

13. (c)

For adiabatic expansion

$$\frac{T_2}{T_1} = \left(\frac{V_1}{V_2}\right)^{\gamma-1}$$

$\gamma = 1.33$ for CO_2 (triatomic gas)

$$\left(\frac{150}{300}\right) = \left(\frac{10}{V_2}\right)^{0.33}$$

$$\left(\frac{1}{2}\right) = \left(\frac{10}{V_2}\right)^{1/3}$$

$$\frac{10}{V_2} = \frac{1}{8}$$

$$\therefore \quad V_2 = 80\,L$$

14. (b)

15. (a)

$$\Delta E = q + W$$

$$\Delta E = 1000 - 650$$

$$= 350\,kJ$$

(work done on system is positive, work done on the surrounding is thus negative)

16. (a)

17. (b)

18. (c)

Since ΔH is independent of path

$$\Delta H(A \to B)\, q(ACB) + w(ACB)$$

$$= 80J - 30J$$

$$= 50J$$

19. (a)

$$q(B \to A) = \Delta H(B \to A) - w(B \to A)$$

$$= -50J - (+20J)$$

$$= -70J$$

20. (d)

$$\Delta H(ADB) = \Delta H(A \to D) + \Delta H(D \to B)$$

$$50J = +40 + \Delta H(D \to B)$$

$$\Delta H(D \to B) = 10J$$

$$1(D \to B) + w(D \to B)10J$$

$$q(D \to B) + 0 = 10J \ (\text{Volume} = \text{consant})$$

$$\therefore \ q(D \to B) = 10J$$