



THE GURUKUL INSTITUTE

PLOT 5C, 2ND FLOOR, GANAPATI COMPLEX, SEC-13, OPP. JAIPURIA SCHOOL, VASUNDHARA, GHAZIABAD (U.P)
IIT – DPP ON CHEMICAL ENERGETICS

- The standard heat of combustion of Al(s) is -838 kJ mol^{-1} at 298K, if Al reacts with O_2 at 298 K, which of the following releases 250 kJ of heat?
 - The reaction of 0.298 mole of Al.
 - The formation of 0.149 moles of Al_2O_3
 - The formation of 0.298 moles of Al_2O_3 .
 - The reaction of 8.046 grams of aluminium.
- Which of the following experimentally determined quantities requires more than one thermodynamical experiment?
 - The lattice energy of calcium chloride.
 - The heat of formation of methane
 - The energy required to atomize 1 mole of dimethyl ether, $(\text{CH}_3)_2\text{O}$
 - The heat of combustion of decanol.
- Which of the following statement(s) is (are) correct?
 - The reaction between the strong acid and strong base takes place with the evolution of heat.
 - $\Delta H_{\text{neutral}}$ of weak acid / strong base is less than the $\Delta H_{\text{neutral}}$ of strong acid / strong base.
 - $\Delta H_{\text{neutral}}$ of weak acid / strong base is equal to the ΔH formation of $\text{H}_2\text{O(l)}$ from its ions in the aqueous medium.
 - $\Delta H_{\text{neut. (weak acid / strong base)}} - \Delta H_{\text{neut. (strong acid / strong base)}} = \Delta H_{\text{ionic (weak acid)}}$
- Which of the following statement(s) is (are) correct?
 - For an exothermic reaction, $\sum \Delta H_f^\circ$ (products) $- \sum \Delta H_f^\circ$ (reactants)
 - $\sum \Delta H_f^\circ$ of $\text{CO}_2(\text{g})$ is same as the $\sum \Delta H_f^\circ_{\text{comb}}$ of carbon graphite.
 - all exothermic reactions have a free energy change negative.
 - For a reaction $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$, the heat at constant pressure and the heat at constant at a given temperature are same.
- The standard enthalpies of formation of $\text{CO}_2(\text{g})$, and HCCOH(l) are $-393.7 \text{ kJ mol}^{-1}$ and $-409.2 \text{ kJ mol}^{-1}$ respectively.
 - $-393.7 \text{ kJ mol}^{-1}$ is the enthalpy change for the reactions $\text{C(s)} + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$
 - The enthalpy change for the reaction $\text{CO}_2(\text{g}) + \text{H}_2(\text{g}) \rightarrow \text{HCCOH(l)}$ would be $-15.5 \text{ kJ mol}^{-1}$.
 - The enthalpy change for the reaction $\text{H}_2\text{O} + \text{CO} \rightarrow \text{HCCOH}$ is $-409.2 \text{ kJ mol}^{-1}$
 - The enthalpy change for the reaction $\text{H}_2 + \text{CO} \rightarrow \text{H}_2\text{O(l)} + \text{CO(g)}$ is $-409.2 \text{ kJ mol}^{-1}$.

MCQ

- AT 0°C , ice and water are in equilibrium & ΔS & ΔG for the conversion of ice to liquid water is
 - 0, $21.98 \text{ JK}^{-1}\text{mole}^{-1}$
 - $-ve$ zero
 - +ve, $21.98 \text{ JK}^{-1}\text{mole}^{-1}$
 - Zero, Zero.
- Calculate the maximum efficiency of an engine operating between 110°C & 25°C .
 - 11.1%
 - 22.2%
 - 33.3%
 - 44.4%
- 5 mole of an ideal gas expand reversibly from a volume of 8 dm^3 at a temperature of 27°C . Calculate the change in entropy.
 - 70.26 JK^{-1}
 - 82.55 JK^{-1}
 - 95.73 JK^{-1}
 - 107.11 JK^{-1}
- Entropy change involved in conversion of one mole of liquid water at 373K to vapor at the same temperature (latent heat of vaporization of water = 2.257 kJ g^{-1})
 - $30.7 \text{ JK}^{-1} \text{ mole}^{-1}$
 - $60.3 \text{ JK}^{-1} \text{ mole}^{-1}$
 - $90.8 \text{ JK}^{-1} \text{ mole}^{-1}$
 - $108.9 \text{ JK}^{-1} \text{ mole}^{-1}$
- What is value of ΔE (heat change at constant volume) for reversible isothermal evaporation of 90 g water at 100°C . Assuming water vapor behaves as an ideal gas & $(\Delta H_{\text{vap}})_{\text{water}} = 540 \text{ cal g}^{-1}$
 - $9 \times 10^3 \text{ cal}$
 - $6 \times 10^3 \text{ cal}$
 - 4.49 cal
 - none of these.

11. The specific heat of iodine vapor and solid are 0.031 and 0.055 cal/g respectively. If heat of iodine is 24 cal/g at 200°C, & its value at 250° C is
- a) 5.7 cal/g b) 11.4 cal/g c) 22.8 cal/g d) 45.6 cal/g
12. Bond dissociation energy of CH₃-H bond is 103 kcal mole⁻¹ and heat of formation of CH₄ (g) as -17.88 kcal mole⁻¹. The heat of formation of methyl radical is
- a) 3.61 kcal mole⁻¹ c) 33.61 kcal mole⁻¹
 b) -3.61 kcal mole⁻¹ d) -33.61 kcal mole⁻¹
13. Which one is not a state function
- a) Internal enthalpy c) Heat(q)
 b) Volume d) Enthalpy
14. An ideal gas undergoing expansion in vacuum shows
- a) $\Delta E=0$ b) W=0 c) q=0 d) All
15. In a reversible process, the value of $\Delta S_{\text{system}} + \Delta S_{\text{surr.}}$ is
- a) >0 b) <0 c) = 0 d) All
16. Molar heat capacity for a gas at constant temperature and pressure is
- a) 3/2 R c) depending on atomicity of gas
 b) 5/2 R d) infinity(∞)
17. Which reaction proceeds with increase in entropy?
- a) $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ c) $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
 b) $\text{Fe} + \text{S} \rightarrow \text{FeS}$ d) $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
18. What is average S-F bond energy in SF₆? Given ΔH_f of SF₆(g) S(g) & F(g) are -1100, 275 & 80 kJ mole⁻¹ respectively
- a) 520 kJ b) 401 kJ c) 309 kJ d) 254 kJ
19. If $\text{H}_2(\text{g}) \rightleftharpoons 2\text{H}(\text{g})$
 Then heat of atomization of H₂ is
- a) 52 kcal b) 104 kcal c) 20 kcal d) none of these
20. Which fuel provides the highest calorific value?
- a) Charcoal b) kerosene c) Wood d) Dung

