Date Planned : __ / __ / __	Daily Tutorial Sheet-2	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level-1	Exact Duration :_____

16. Under which of the following conditions is the relation, $\Delta H = \Delta U + P\Delta V$ valid for a closed system?

(A) Constant pressure

(B) Constant temperature

(C) Constant temperature and pressure

(D) Constant temperature, pressure and composition

17. The work done in ergs for the reversible expansion of one mole of an ideal gas from a volume of 10 litres to 20 litres at 25^oC is:

(A) $-2.303 \times 298 \times 0.082 \log 2$ **(B)** $-298 \times 10^7 \times 8.31 \times 2.303 \log 2$

(C) $-2.303 \times 298 \times 0.082 \log 0.5$ **(D)** $-8.31 \times 10^7 \times 298 - 2.303 \log 0.5$

18. The molar heat capacities at constant pressure (assumed constant with respect to temperature) at A, B and C are in ratio of 3 : 1.5 : 2.0. The enthalpy change for the exothermic reaction $A + 2B \longrightarrow 3C$ at 300 K and 310 K is ΔH_{300} and ΔH_{310} respectively then :

(A) $\Delta H_{300} > \Delta H_{310}$

(B) $\Delta H_{300} < \Delta H_{310}$

(C) $\Delta H_{300} = \Delta H_{310}$

(D) if $T_2 > T_1$ then $\Delta H_{310} > \Delta H_{300}$ and if $T_2 < T_1$ then $\Delta H_{310} < \Delta H_{300}$

19. Benzene burns according to the following equation at 300 K (R = 8.314 J $mole^{-1}K^{-1}$)

$$2C_6H_6(\ell) + 15O_2(g) \rightarrow 12CO_2(g) + 6H_2O(\ell) \qquad \Delta H^o = -6542 \text{ kJ}$$

What is the ΔE^o for the combustion of 1.5 mol of benzene

(A) –3271 kJ **(B)** –9813 kJ **(C)** –4906.5 kJ **(D)** None of these

20. Ethyl chloride (C_2H_5Cl), is prepared by reaction of ethylene with hydrogen chloride:

$$C_2H_4(g) + HCl(g) \rightarrow C_2H_5Cl(g) \qquad \Delta H = -72.3 \text{ kJ / mol}$$

What is the value of ΔE (in kJ), if 98 g of ethylene and 109.5 g of HCl are allowed to react at 300 K.

(A) –64.81 **(B)** –190.71 **(C)** –209.41 **(D)** –224.38

21. One mole of solid Zn is placed in excess of dilute H_2SO_4 at 27°C in a cylinder fitted with a piston. Find the work done for the process if the area of piston is 500 cm^2 and it moves out by 50 cm against a pressure of 1 atm during the reaction.

$$Zn(s) + 2H^+(aq) \rightleftharpoons Zn^{2+}(aq) + H_2(g)$$

(A) –1.53 KJ **(B)** –2.53 KJ **(C)** zero **(D)** 2.53 KJ

22. The enthalpy change for the reaction of 50 mL of ethylene with 50.0 mL of H_2 at 1.5 atm pressure is $\Delta H = -0.31$ KJ . What is the ΔE in kJ?

(A) –0.3024 **(B)** –0.6048 **(C)** –0.12 **(D)** None

23. When 1 mole of ice melt at $0^{o}C$ and at constant pressure of 1 atm. 1440 calories of heat are absorbed by the system. The molar volumes of ice and water are 0.0196 and 0.0180 litre respectively. Calculate ΔH and ΔE for the reaction.

(A) $\Delta H = 720\ J$ **(B)** $\Delta H = 1440\ cal$ **(C)** $\Delta H = 1.4\ Kcal$ **(D)** $\Delta H = 0$

24. 130 g of Zn is dissolved in dilute sulphuric acid in an open beaker. Find the work done in the process assuming isothermal operation.

(A) –1200 cal **(B)** –1800 cal **(C)** + 1800 cal **(D)** + 1200 cal

25. The amount of heat required to raise the temperature of a diatomic gas by 1°C at constant pressure is 60 cal. The amount of heat which goes as internal energy of the gas is nearly.

(A) 60 cal **(B)** 30 cal **(C)** 42.8 cal **(D)** 49.8 cal

26. Calculate average molar heat capacity at constant volume of gaseous mixture containing 2 mole of each of two ideal gases $A\left(C_{v,m} = \frac{3}{2}R\right)$ and $B\left(C_{v,m} = \frac{5}{2}R\right)$:

(A) R **(B)** 2R **(C)** 3R **(D)** 8R

27. In the isothermal reversible compression of 52.0 mmol of a perfect gas at 260 K, the volume of the gas is reduced to one-third of its initial value. Calculate w for this process ?.

(A) 0 **(B)** + 123 J **(C)** –123 J **(D)** + 246 J

28. A sample of oxygen gas expands its volume from 3 L to 5 L against a constant pressure of 3 atm. If work done during expansion be used to heat 10 mole of water initially present at 290 K, its final temperature will be (specific heat capacity of water = 4.18 J/K-g) :

(A) 292.0 K **(B)** 298.0 K **(C)** 290.8 K **(D)** 293.7 K

29. If a certain mass of gas is made to undergo separately adiabatic and isothermal expansions to the same pressure, starting from the same initial conditions of temperature and pressure, then, as compared to that of isothermal expansion, in the case of adiabatic expansion, the final.

(A) Volume and temperature will be higher

(B) Volume and temperature will be lower

(C) Temperature will be lower but the final volume will be higher

(D) Volume will be lower but the final temperature will be higher

30. Determine $\Delta U°$ at 300K for the following reaction using the listed enthalpies of reaction :

$$4CO(g) + 8H_2(g) \longrightarrow 3CH_4(g) + CO_2(g) + 2H_2O(\ell)$$

$$C(\text{graphite}) + \tfrac{1}{2}O_2(g) \longrightarrow CO(g);\ \Delta H_1^{\circ} = -110.5\ kJ$$

$$CO(g) + \tfrac{1}{2}O_2(g) \longrightarrow CO_2(g);\ \Delta H_2^{\circ} = -282.9\ kJ$$

$$H_2(g) + \tfrac{1}{2}O_2(g) \longrightarrow H_2O(\ell);\ \Delta H_3^{\circ} = -285.8\ kJ$$

$$C(\text{graphite}) + 2H_2(g) \longrightarrow CH_4(g);\ \Delta H_4^{\circ} = -74.8\ kJ$$

(A) –653.5 kJ **(B)** –686.2 kJ **(C)** –747.4 kJ **(D)** None of these