Thermodynamics (C)

Set – 1

Table 6.4 Effect of Temperature on Spontaneity of Reactions

$\Delta_r H^\ominus$	$\Delta_r S^\ominus$	$\Delta_r G^\ominus$	Description*
–	+	–	Reaction spontaneous at all temperatures
–	–	– (at low T)	Reaction spontaneous at low temperature
–	–	+ (at high T)	Reaction nonspontaneous at high temperature
+	+	+ (at low T)	Reaction nonspontaneous at low temperature
+	+	– (at high T)	Reaction spontaneous at high temperature
+	–	+ (at all T)	Reaction nonspontaneous at all temperatures

Q1. What is the condition for spontaneous reaction at low temperatures

A. ΔH<0,ΔS<0,ΔG<0,
B. ΔH<0,ΔS>0,ΔG<0
C. ΔH>0,ΔS<0,ΔG<0,
D. ΔH<0,ΔS>0,ΔG<0,

Ans. (A)

Q2. If ΔH<0,ΔS>0,ΔG<0 then the reaction is

A. Spontaneous reaction at high temperature
B. Spontaneous reaction at all temperatures
C. Non spontaneous reaction at low temperature
D. Non spontaneous reaction at high temperature

Ans. (B)

Set – 2

Table 6.1 Standard Enthalpy Changes of Fusion and Vaporisation

Substance	T_f/K	$\Delta_{fus}H^{\ominus}$/(kJ mol^{-1})	T_b/K	$\Delta_{vap}H^{\ominus}$/(kJ mol^{-1})
N_2	63.15	0.72	77.35	5.59
NH_3	195.40	5.65	239.73	23.35
HCl	159.0	1.992	188.0	16.15
CO	68.0	6.836	82.0	6.04
CH_3COCH_3	177.8	5.72	329.4	29.1
CCl_4	250.16	2.5	349.69	30.0
H_2O	273.15	6.01	373.15	40.79
NaCl	1081.0	28.8	1665.0	170.0
C_6H_6	278.65	9.83	353.25	30.8

(T_f and T_b are melting and boiling points, respectively)

Q1. Which compound has Highest melting point?

A. H_2O
B. C_6H_6
C. CH_3COCH_3
D. NaCl

Ans. (D)

Q2. Which compound has Lowest melting point?

A. H_2O
B. CO
C. N_2
D. NaCl

Ans. (C)

Q3. Which compound has Highest boiling point?

A. NH_3
B. CH_3COCH_3

C. H_2O
D. NaCl

Ans. (D)

Q4. Which compound has Lowest boiling point?

A. NaCl
B. CO
C. N_2
D. H_2O

Ans. (C)

Q5. Which compound has Highest enthalpy of fusion?

A. C_6H_6
B. NaCl
C. CH_3COCH_3
D. H_2O

Ans. (B)

Q6. Which compound has Highest enthalpy of vaporisation?

A. NaCl
B. CH_3COCH_3
C. H_2O
D. NH_3

Ans. (A)

Q7. Which compound has Lowest enthalpy of fusion?

A. CCl4
B. CO
C. N2
D. H2O

Ans. (C)

Q8. Which compound has Lowest enthalpy of vaporisation?

A. N_2

B. CO

C. CCl_4

D. H_2O

Ans. (A)

Set – 3

Table 6.2 Standard Molar Enthalpies of Formation ($\Delta_f H^\ominus$) at 298K of a Few Selected Substances

Substance	$\Delta_f H^\ominus$ / (kJ mol^{-1})	Substance	$\Delta_f H^\ominus$ / (kJ mol^{-1})
Al_2O_3(s)	-1675.7	HI(g)	+26.48
$BaCO_3$(s)	-1216.3	KCl(s)	-436.75
Br_2(l)	0	KBr(s)	-393.8
Br_2(g)	+30.91	MgO(s)	-601.70
$CaCO_3$(s)	-1206.92	$Mg(OH)_2$(s)	-924.54
C (diamond)	+1.89	NaF(s)	-573.65
C (graphite)	0	NaCl(s)	-411.15
CaO(s)	- 635.09	NaBr(s)	-361.06
CH_4(g)	-74.81	NaI(s)	-287.78
C_2H_4(g)	52.26	NH_3(g)	-46.11
CH_3OH(l)	-238.86	NO(g)	+ 90.25
C_2H_5OH(l)	-277.69	NO_2(g)	+33.18
C_6H_6(l)	+ 49.0	PCl_3(l)	-319.70
CO(g)	-110.53	PCl_5(s)	-443.5
CO_2(g)	-393.51	SiO_2(s) (quartz)	-910.94
C_2H_6(g)	-84.68	$SnCl_2$(s)	-325.1
Cl_2(g)	0	$SnCl_4$(l)	-511.3
C_3H_8(g)	-103.85	SO_2(g)	-296.83
n–C_4H_{10}(g)	-126.15	SO_3(g)	-395.72
HgS(s) red	-58.2	SiH_4(g)	+ 34
H_2(g)	0	$SiCl_4$(g)	-657.0
H_2O(g)	-241.82	C(g)	+716.68
H_2O(l)	-285.83	H(g)	+217.97
HF(g)	-271.1	Cl(g)	+121.68
HCl(g)	-92.31	Fe_2O_3 (s)	–824.2
HBr(g)	-36.40		

Q1. The standard enthalpy of formation is zero for-

A. $H_2(l)$
B. $CH_4(g)$
C. $H_2(g)$
D. HBr(g)

Ans. (C)

Q2. The standard enthalpy of formation for carbon is zero for-

A. C(Diamond)
B. C(Graphite)
C. C(g)
D. All of these

Ans. (B)

Q3. The standard enthalpy of formation is zero for-

A. $I_2(s)$
B. $H_2O(l)$
C. C(diamond)
D. $SO_2(g)$

Ans. (A)