Periodic Table of the Elements

1A 1	2A 2	3B 3	4B 4	5B 5	6B 6	7B 7	8B 8	8B 9	8B 10	1B 11	2B 12	3A 13	4A 14	5A 15	6A 16	7A 17	8A 18
1 H 1.0079																	2 He 4.0026
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.1797
11 Na 22.9898	12 Mg 24.3050											13 Al 26.9815	14 Si 28.0855	15 P 30.9738	16 S 32.066	17 Cl 35.4527	18 Ar 39.948
19 K 39.0983	20 Ca 40.078	21 Sc 44.9559	22 Ti 47.88	23 V 50.9415	24 Cr 51.9961	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.69	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.9216	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.4678	38 Sr 87.62	39 Y 88.9059	40 Zr 91.224	41 Nb 92.9064	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.9055	46 Pd 106.42	47 Ag 107.8682	48 Cd 112.411	49 In 114.82	50 Sn 118.710	51 Sb 121.75	52 Te 127.60	53 I 126.9045	54 Xe 131.39
55 Cs 132.9054	56 Ba 137.327	57 La 138.9055	72 Hf 178.49	73 Ta 180.9479	74 W 183.85	75 Re 186.207	76 Os 190.2	77 Ir 192.22	78 Pt 195.08	79 Au 196.9665	80 Hg 200.59	81 Tl 204.3833	82 Pb 207.2	83 Bi 208.9804	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)									

58 Ce 140.115	59 Pr 140.9076	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.965	64 Gd 157.25	65 Tb 158.9253	66 Dy 162.50	67 Ho 164.9303	68 Er 167.26	69 Tm 168.9342	70 Yb 173.04	71 Lu 174.967
90 Th 232.0381	91 Pa 231.0359	92 U 238.0289	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

This print-out should have 8 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

DAL 0301 02
15:11, general, multiple choice, < 1 min, fixed.
001
Which of the statements below concerning thermodynamic sign convention is NOT true:

1. w is positive when work is done by the system. **correct**

2. ΔG is negative when a reaction is spontaneous.

3. Work is done on the system when ΔV is negative.

4. ΔS is positive when there is increasing disorder.

5. ΔH is negative when heat is released to the surroundings.

Explanation:
   w is positive only when work is done ON the system, not BY the system. When the system does work, volume increases or the number of moles increases ($\Delta V > 0$, $\Delta n > 0$).

$$w = -P\,\Delta V = -\Delta n\,R\,T$$

and will therefore be negative when ΔV or Δn is positive.

Mlib 64 5086
15:12, general, multiple choice, > 1 min, fixed.
002
A friend states that water freezing is a violation of the second law of thermodynamics.
   Your best reply would be that

1. although the entropy of the water decreases the entropy of the universe increased. **correct**

2. the second law does not apply to water.

3. the second law does not apply at $0°$C.

4. you must be thinking of the first law.

Explanation:
   The Second Law of Thermodynamics says that in spontaneous changes, the universe tends toward a state of greater disorder.

ChemPrin3e 07 54
15:13, basic, numeric, < 1 min, wording-variable.
003
   Which of the compounds
   I) $N_2H_4(\ell)$;
   II) $C_6H_{12}(\ell)$ (cyclohexane);
   III) $CuO(s)$;
   IV) $PCl_3(g)$;
is/are stable with respect to decomposition into their elements under standard conditions at $25°$C?

	ΔH_f° $\left(\frac{kJ}{mol}\right)$	ΔS_m° $\left(\frac{J}{K \cdot mol}\right)$	ΔG_f° $\left(\frac{kJ}{mol}\right)$
$CuO(s)$	-157.3	42.63	-129.7
$C_6H_{12}(\ell)$	-156.4	26.7	204.4
$PCl_3(g)$	-287.0	311.78	-267.8
$N_2H_4(\ell)$	50.63	121.21	149.34

1. III and IV only **correct**

2. I, III and IV only

3. II only

4. I and II only

5. II and III only

6. I, II and III only

7. II, III, and IV only

8. III only

9. Another combination

10. Cannot be determined

Explanation:

Examine the standard free energies of formation of the compounds.

Compounds with a negative free energy of formation are stable, whereas those with a positive free energy are unstable with respect to the elements that compose them. Accordingly, only $CuO(s)$ and $PCl_3(g)$ are thermodynamically stable while $C_6H_{12}(\ell)$ and $N_2H_4(\ell)$ are unstable.

ChemPrin3e T07 01
15:13, basic, multiple choice, < 1 min, fixed.
004
Calculate the change in entropy of a large pail of water after 200 J of energy is reversibly transferred to the water at 20°C.

1. $- 0.733 \text{ J} \cdot \text{K}^{-1}$

2. $+0.683 \text{ J} \cdot \text{K}^{-1}$ **correct**

3. $- 0.683 \text{ J} \cdot \text{K}^{-1}$

4. $+0.733 \text{ J} \cdot \text{K}^{-1}$

5. $- 200 \text{ J} \cdot \text{K}^{-1}$

Explanation:

ChemPrin3e T07 09
15:13, general, multiple choice, < 1 min, fixed.
005
Calculate the normal boiling point of chloroform given that the standard entropy and enthalpy of vaporization of chloroform is +93.7 J/K/mol and 31.4 kJ/mol, respectively.

1. 335 K **correct**

2. 215 K

3. 375 K

4. 405 K

5. 450 K

Explanation:

ChemPrin3e T07 44

15:15, general, multiple choice, < 1 min, fixed.
006
For the reaction

$$2\,SO_3(g) \to 2\,SO_2(g) + O_2(g)$$

$\Delta H_r^\circ = +198 \text{ kJ·mol}^{-1}$ at 298 K.

Which statement is true for this reaction?

1. The reaction is driven by the enthalpy.

2. The reaction will not be spontaneous at low temperatures.

3. ΔG_r° will be negative at high temperatures. **correct**

4. The reaction will not be spontaneous at any temperature.

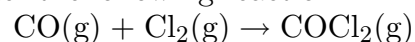**5.** ΔG_r° will be positive at high temperatures.

Explanation:

DAL 0301 13
15:14, general, multiple choice, < 1 min, fixed.
007
Consider the following reaction:
$$CO(g) + Cl_2(g) \to COCl_2(g)$$

Species	ΔH_f^0	S^0
	kJ/mol	J/mol·K
CO	−110.5	197.6
Cl_2	0.0	223.0
$COCl_2$	−223.0	289.2

Calculate ΔG^0 for the reactions at 298 K.

1. -73.34 kJ/mol **correct**

2. 221.1 kJ/mol

3. -7.3 J/mol

4. -500.0 kJ/mol

Explanation:

ChemPrin3e T07 42
15:13, basic, multiple choice, $<$ 1 min, fixed.
008
The entropy of fusion of water is $+22.0$ J $\cdot K^{-1} \cdot mol^{-1}$ and the enthalpy of fusion of water is $+6.01$ kJ$\cdot mol^{-1}$ at $0°$C.

What is ΔS_{total} for the melting of ice at $0°$C?

1. $-$ 6010 J $\cdot K^{-1} \cdot mol^{-1}$

2. 0 **correct**

3. $-$ 22.0 J$\cdot$ $K^{-1} \cdot mol^{-1}$

4. $+6010$ J$\cdot$ $K^{-1} \cdot mol^{-1}$

5. $+22.0$ J$\cdot$ $K^{-1} \cdot mol^{-1}$

Explanation: