

Laidler/Meiser, Physical Chemistry 3rd Edition Errata 0-395-918480 3-30902

The following are corrections to the Answers to Problems section, pages 989-998.

Chapter 1

1.2 879°C **1.12** 0.500 dm³ **1.14** 956 Torr **1.34** $2.73 \times 10^{12} \text{ s}^{-1}$; 3.05×10^{37} **1.43** (a) 1.155 (b) 11.55

1.48 Similar to Fig. 1.12 **1.49** (b) 650 kPa **1.50** 0.24 dm³ mol⁻¹

1.63 $2^{\text{nd}} = -(a + RTb)$; $3^{\text{rd}} = a^2/(2RT) + ab + RTb^2$; $RT/V_m - (a + RTb)/V_m^2$

Chapter 2

2.5 $\Delta U = -972.2 \text{ kJ mol}^{-1}$ **2.17** $d = 1.7267 \text{ J K}^{-1} \text{ mol}^{-1}$; $e = 9.344 \times 10^{-2} \text{ J K}^{-2} \text{ mol}^{-1}$ **2.29** 84.840 MJ h⁻¹

2.35 8.244 dm³ **2.42** (b) -430 J, -604 J **2.43** (a) 17.00 dm³ **2.48** 226.0 K **2.54** 4th item: -2.218 kJ

2.57 (b) 1.790 $\times 10^5$ kJ

Chapter 3

3.11 25.99 J K⁻¹ **3.14** (b) 64.2 K **3.18** 42.4 J K⁻¹ **3.20** (a) sys, -30.52 J K⁻¹ (b) sys, 24.49 J K⁻¹

(c) sys, 1.57 J K⁻¹ **3.29** -23.4 J K⁻¹; 24.3 J K⁻¹ **3.37** -213 J mol⁻¹ **3.38** last item, -5.706 kJ mol⁻¹

3.39 (c) 85.00 kJ mol⁻¹ (d) 500.6 K **3.41** 147.6 J K⁻¹ mol⁻¹ **3.44** -4.28 kJ mol⁻¹ **3.46** ; $q_{\text{rev}} = -1.73 \text{ kJ mol}^{-1}$,

$w_{\text{rev}} = 1.73 \text{ kJ mol}^{-1}$ **3.49** ; -1.59 kJ mol⁻¹; **3.51** (d) True only for the total entropy. **3.68** (a) $RT \ln (f_2/P_2)$

Chapter 4

4.5 ; $2.82 \times 10^{-6} \text{ bar}$ **4.7** ; 0.0321 mol dm⁻³; **4.9** $7.94 \times 10^{-9} \text{ bar}$; $2.56 \times 10^{-10} \text{ mol dm}^{-3}$

4.20 K_C (a) 1091 (mol dm³)⁻³ (b) $4.0682 \times 10^{39} \text{ (mol dm}^{-3}\text{)}^{-2}$ (c) $1.9766 \times 10^{16} \text{ (mol dm}^3\text{)}^{-1}$ (d) 9.5×10^{-13}

4.27 (d) -108.25 kJ mol⁻¹ **4.28** (a) -457.14 kJ mol⁻¹; -483.64 kJ mol⁻¹; -88.88 J K⁻¹ mol⁻¹ (b) $1.222 \times 10^{80} \text{ bar}^{-1}$

4.32 (b) $2.38 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ **4.37** (b) 9.68×10^{-6} (c) $\Delta H_T^\circ/\text{J mol}^{-1} = 47\,367 - \dots$

(d) $\ln K_p = 15.60 - 5697/(T/\text{K}) - 1.51 \ln (T/\text{K}) + 1.41 \times 10^{-4}(T/\text{K}) + 4.61 \times 10^4/(T/\text{K})^2$ (e) 0.71

4.38 ; 316.8 kJ mol⁻¹; **4.39** (a) 0.0638; ... **4.40** ; -42.16 kJ mol⁻¹ **4.43** 54.02 J K⁻¹ mol⁻¹ **4.45** ; 3.212 kJ mol⁻¹

4.46 2nd item: $3.37 \times 10^{-56} \text{ dm}^3 \text{ mol}^{-1}$;

Chapter 5

5.3 42.7 kJ mol⁻¹ **5.8** 55.07 kJ mol⁻¹ **5.13** 373.13 K **5.14** 27.55 Torr

5.16 = $\Delta_{\text{vap}}H_m/M \ln(T_2/T_1)(RT_1 + M)/(RT_2 + M)$ **5.17** 126 Torr **5.25** ρ instead of p **5.28** ρ instead of p

5.29 0.037 56 dm³ mol⁻¹ **5.30** $a_c = 0.181$ **5.37** 181.4 g mol⁻¹ **5.40** 97.3% **5.41** 0.3399; 1.03 **5.42** ; 0.975

5.44 0.970 **5.45** when $x_B \rightarrow 1$ **5.48** 249.6 kPa **5.49** 0.9737; **5.51** $\alpha = (i - 1)(v - 1)$, 1.94, 0.94

5.54 from Eq. 5.125, 0.068 K; from Eq. 5.126, 0.0703 K

Chapter 6

6.10 112.4 **6.20** 58% solid and 42% liquid **6.22** (c) 2 phases at 63.0°C; 19.6% phenol and 52.5 phenol

6.25 (b) β = first forms with liquid. At 1430°C, β converts to $\alpha + L$. About 50°C lower all is solid α . **6.38**

Solid spinel at 1950 K with L; at 1875 K ... **6.41** (a) region Aea : K₂CO₃ in equilibrium with water-rich saturated solution

Chapter 7

7.2 2.4 mA **7.5** 9.11 μmol **7.6** $4.07 \times 10^{-6} \text{ mol}^2 \text{ dm}^{-6}$ **7.17** (b) $36.5 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$; $78.5 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$;

$3.78 \times 10^{-4} \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$; $8.14 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$ **7.18** 0.4428; 0.5572 **7.20** $5.19 \times 10^{-2} \text{ cm}^2 \text{ s}^{-1}$; $7.91 \times 10^{-2} \text{ cm} \text{ s}^{-1}$

7.24 ; -877.9 $\times \text{J mol}^{-1}$ **7.25** 5th item: -355.7 kJ mol⁻¹ **7.28** (a) 55.90 kJ mol⁻¹ **7.29** $\log_{10} \gamma_{\pm}$: -0.049, -0.15,

-0.29, -0.38, -0.44, -0.49 **7.30** 124 kJ mol⁻¹ **7.31** 0.0148 g dm⁻³; $2.70 \times 10^{11} \text{ mol}^3 \text{ dm}^{-9}$

7.32 3rd item: 0.00667 M **7.39** 43.77 kJ mol⁻¹ **7.42** 3.8×10^{-8}

Chapter 8

8.2 AH₂ is oxidized by B **8.3** -0.90 V **8.6** $9.10 \times 10^7 \text{ dm}^6 \text{ mol}^{-2}$ **8.7** 5.31×10^{-11} **8.13** -0.157 V

8.14 (a) -0.0365 V (b) -0.16 V **8.17** 0.463 M **8.21** -29.6 mV **8.24** 0.48 **8.33** ; ...; -9.65 J K⁻¹ mol⁻¹

8.38 $5.03 \times 10^{-13} \text{ mol}^2 \text{ kg}^{-2}$; $7.09 \times 10^{-7} \text{ mol kg}^{-1}$ **8.40** $9.24 \times 10^{-9} \text{ mol kg}^{-1}$ **8.43** (b) 0.67

Chapter 9

9.2 1; 1; $6.2 \times 10^{-4} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ 9.7 (a) 0.540 μg 9.17 $k = 2.3182 \times 10^{-5} (\text{M s})^{-1}$
 9.23 (a) $k_1 = x_e/(2a_0 - x_e)t \ln [a_0x_e + x(2a_0 - x_e)]/a_0(x_e - x)$ 9.27 9.73 kJ mol^{-1} 9.43 (b) $8.60 \times 10^{-7} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$
 9.43 $3.08 \times 10^{-11} \text{ s}^{-1}$; last item: $-33.3 \text{ J K}^{-1} \text{ mol}^{-1}$ 9.47 ; -2 9.49 $7.54 \times 10^7 \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ 9.52 $-16.5 \text{ cm}^3 \text{ mol}^{-1}$

Chapter 10

10.4 ; $X + 2B \rightarrow 2Y + 2Z$ 10.20 1.28×10^{15} 10.21 I is I 10.22 18.1 eV 10.34 Initial fast equilibrium:
 $\text{Ag}^+ + \text{Ce}^{4+} \leftrightarrow \text{Ce}^{3+} + \text{Ag}^{2+}$ followed by a slow reaction $\text{Ag}^{2+} + \text{Tl}^{2+} + \text{Ag}^+$. This may be followed by a fast
 reaction: $\text{Tl}^{2+} + \text{Ce}^{3+} \leftrightarrow \text{Tl}^{3+} + \text{Ce}^{4+}$. Overall rate is: $v = k_2K_1[\text{Ce}^{4+}][\text{Ag}^+][\text{Tl}^{2+}]/[\text{Ce}^{3+}]$ 10.35 2.0 mmol dm^{-3} ;
 Curve 1 is nonlinear; Curve 2 is too sensitive to high $1/S$ values; Curve 3 gives evenly weighted data. 10.40 and
 10.41 E should be E

Chapter 11

11.1 (c) last item: 368 kJ mol^{-1} 11.9 (d) 2.58 pm 11.12 u 11.13 (a) 248 nm; $1.078 \times 10^6 \text{ m s}^{-1}$ 11.20 $h/2\pi l$
 $\partial/\partial x$; 11.22 for $m_l = -2$, $\theta = 144.7$ 11.29 and 11.36 δ should be ∂ 11.42 $4.052 \times 10^{-6} \text{ m}$; $4.903 \times 10^{-20} \text{ J}$

Chapter 12

12.3 (a) 0.46 D (b) 5.9% 12.5 17.7%; 11.8%; 5.5%; 1.8% 12.11 s and p should be s and p , psi_2

12.12 L^2 should be L^2 12.17 (d) a_1'

Chapter 13

13.13 ... $^3\text{D}_1$, $^3\text{P}_2$ $^3\text{P}_1$ $^3\text{P}_0$, $^3\text{S}_1$ 13.14 (b) $^2\text{D}_{5/2}$ $^2\text{D}_{3/2}$ ^1D : 13.27 $\Delta T_{0,J^{\infty}-1,J}$ 13.45 2nd line: 22 350 cm^{-1}

Chapter 14

14.3 (b) $E_0 = 1.855 \times 10^{-20} \text{ J}$ 14.6 ; ^{35}Cl : 4, 4.144; 14.9 $-11.4 \mu\text{T}$

Chapter 15

15.2 $-A_0$ should be $-U_0$ 15.3 $P = k_B T (\partial \ln Q / \partial V)_T$ 15.4 446.9 $\text{J K}^{-1} \text{ mol}^{-1}$ 15.6 8.3145 $\text{J K}^{-1} \text{ mol}^{-1}$ 15.8 n_j/N

15.12 (b) 42.8 15.16 2, 12, 6, 2, 6, 3, 6, 12, 1, 2 15.17 $k_B T / \sigma B h$ 15.18 186.2 $\text{J K}^{-1} \text{ mol}^{-1}$

15.21 ; (c) $dS/dT = 5R/2T$ 15.25 (a) $6.47 \times 10^5 \text{ bar}^{-1}$ (b) $3.58 \times 10^{-7} \text{ bar}^{-2}$

15.30 $\delta \varepsilon_v = h\nu[(1 + h\nu/2k_B T) - (1 - h\nu/2k_B T)]$ 15.32 (a) $4 \times 10^6 \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ (b) $4 \times 10^6 \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$
 (c) $4 \times 10^3 \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ (d) $4 \times 10^{-29} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ 15.34 T^0 , $T^{-0.5}$, T^{-1} , $T^{-1.5}$, T^{-2} 15.38 (a) T^{-1} (b) $T^{-1.5}$ (c) $T^{-1.5}$
 (d) T^{-2} (e) T^{-2} 15.40 $5.659 \times 10^{-21} \text{ m}^3 \text{ s}^{-1}$

Chapter 16

16.4 (a) ... (b) fcc 16.6 (a) 1.4447 \square (b) 10.498 g cm^{-3} 16.7 (b) 3.595 g cm^{-3} 16.12 $d_{hkl} = 1.44 \square$

16.26 6.12 pm 16.27 1.44 \square 16.33 (a) 408.6 pm (b) $N(\text{Ag}) = 4.0$; fcc 16.35 Calculate $d_{hkl} = a/\sqrt{h^2 + k^2 + l^2}$ and
 index with $a = d_{hkl} \sqrt{h^2 + k^2 + l^2}$. For $20^\circ 36'$, $hkl = 111$, $a = 564.0$ 16.40 673 kJ mol^{-1} 16.44 384 K

Chapter 17

17.2 19 660 bar 17.3 2416 bar; $-21.0 \text{ kJ mol}^{-1}$ 17.4 3690 17.5 2nd item: 2540 bar 17.11 ; -556 kJ mol^{-1}

17.12 ; $-8.89 \text{ kJ mol}^{-1}$ 17.13 ; -735 J mol^{-1} 17.14 415 pm; ... ; -789 J mol^{-1} 17.15 $-2.78 \times 10^{-23} \text{ J}$

17.16 He: $-7.28 \times 10^{-24} \text{ J}$, -4.38 J mol^{-1} ; Ne: $-2.60 \times 10^{-23} \text{ J}$; ...; Xe: $-1.41 \times 10^{-21} \text{ J}$, -850 J mol^{-1}

17.17 358 J mol^{-1} ; 227 J mol^{-1} ; 893 J mol^{-1} ; 17.18 $-1.20 \times 10^{-23} \text{ J}$; ...

17.19 (a) $E/E_{min} = -[n/(6-n)](r_o/r)^6 + [6/(6-n)](r_o/r)^n$ (b) $(r^*/r)^{n-6} = 6/n$ (c) $E = 4E_{min}[(r^*/r)^6 - (r^*/r)^{12}]$

Chapter 18

18.1 (c) 0.091, 18.3 (a) $3.82 \text{ dm}^3 \text{ mol}^{-1}$ 18.5 $7.35 \times 10^{-2} \text{ kPa}^{-1} \text{ Torr}^{-1}$, 222 cm^3 18.11 (a) (b) (c) are primed; (d)

is (b), and add (c) $\text{mol m}^{-2} \text{ s}^{-1}$ 18.12 $ka_o/x - 2k/3$ 18.13 $v = k/K^{1/2} [\text{H}_2]^{1/2}$ 18.14 A should be Δ , 3 times

18.15 $z = ka_o/(k_S - k) [1 - e^{-(k_S - k)r}]$ 18.16 (a) $v = kK[\text{A}]$; $E_a \text{ observed} = E_{a0} + \Delta H_{ad}$ (b) Eq. 18.36 (c) Eq. 18.44

(d) Eq. 18.15 $v = k/K$ 18.18 -10.8 mm 18.22 No 18.23 $2.56 \times 10^{-3} \text{ N m}^{-1}$ 18.26 216 g mol^{-1} ; 0.204 nm^2

Chapter 19

19.2 (a) 0.333 mm s^{-1} (b) $4.19 \times 10^{-15} \text{ m}^3$ (c) 2.00×10^{10} 19.5 (a) 0.085 $\text{m}^3 \text{ kg}^{-1}$ 19.10 (e) $7.263 \times 10^9 \text{ s}^{-1}$

19.12 (a) 10.8 cm (b) 0.96 cm 19.15 ; 132 000 g mol^{-1} 19.22 $3.44 \times 10^{-11} \text{ s}$ 19.24 (c) $2.6 \times 10^{-10} \text{ m}$ (f) 2.66 nm

19.25 (a) through (e) add h^{-1} to each set of units; for $r = 10^{-8} \text{ m}$, 7700 rpm 19.26 2nd last entry: $2.142 \times 10^{-12} \text{ m}^2 \text{ s}^{-1}$
 19.28 1.9×10^3

Chapter 20

20.1 $k_p[M]^{1/2}/\{kk_t\}^{1/2}[C]^{1/2}$ **20.2** $v = k_p(2I/k_t)^{1/2}[M]$ **20.8** 51 200 **20.09** (c) 448 nm **20.10** (b) 3.5×10^{-3}
20.13 5132 **20.14** (c) 45.9 nm