

Exam 2; Chemistry 142

April 4, 2019

- PLEASE REMOVE THIS COVER PAGE CAREFULLY.
- YOU WILL NOT TURN THIS IN PAGE WITH YOUR EXAM SO DO NOT USE THIS PAGE AS SCRATCH PAPER TO SHOW YOUR WORK.

IA	IIA	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$										IIIA	IVA	VA	VIA	VIIA	VIIIA
1 H 1.00794																	2 He 4.00260
3 Li 6.941	4 Be 9.01218											5 B 10.81	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 24.305											13 Al 26.9815	14 Si 28.0855	15 P 30.9738	16 S 32.066	17 Cl 35.453	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 51.996	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 69.72	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 102.906	46 Pd 106.42	47 Ag 107.868	48 Cd 112.41	49 In 114.82	50 Sn 118.710	51 Sb 121.757	52 Te 127.60	53 I 126.905	54 Xe 131.29
55 Cs 132.905	56 Ba 137.33	57 La 138.906	58 Ce 140.12	59 Pr 140.908	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.925	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.967	
87 Fr (223)	88 Ra 226.025	89 Ac 227.028	90 Th 232.038	91 Pa 231.036	92 U 238.029	93 Np 237.048	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)	

58 Ce 140.12	59 Pr 140.908	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.925	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.967
90 Th 232.038	91 Pa 231.036	92 U 238.029	93 Np 237.048	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)

Solubility Product Constants (K_{sp}) at 25°C					
Ionic compound	K_{sp}	Ionic compound	K_{sp}	Ionic compound	K_{sp}
Halides		Sulfates		Hydroxides	
AgCl	1.8×10^{-10}	PbSO ₄	6.3×10^{-7}	Al(OH) ₃	3.0×10^{-34}
AgBr	5.0×10^{-13}	BaSO ₄	1.1×10^{-10}	Zn(OH) ₂	3.0×10^{-16}
AgI	8.3×10^{-17}	CaSO ₄	2.4×10^{-5}	Ca(OH) ₂	6.5×10^{-6}
PbCl ₂	1.7×10^{-5}			Mg(OH) ₂	7.1×10^{-12}
PbBr ₂	2.1×10^{-6}	Sulfides		Fe(OH) ₂	7.9×10^{-16}
PbI ₂	7.9×10^{-9}	NiS	4.0×10^{-20}		
PbF ₂	3.6×10^{-8}	CuS	8.0×10^{-37}	Carbonates	
CaF ₂	3.9×10^{-11}	Ag ₂ S	8.0×10^{-51}	CaCO ₃	4.5×10^{-9}
		ZnS	3.0×10^{-23}	SrCO ₃	9.3×10^{-10}
Chromates		FeS	8.0×10^{-19}	ZnCO ₃	1.0×10^{-10}
PbCrO ₄	1.8×10^{-14}	CdS	1.0×10^{-27}	Ag ₂ CO ₃	8.15×10^{-12}
Ag ₂ CrO ₄	1.2×10^{-12}	PbS	3.0×10^{-28}	BaCO ₃	5.0×10^{-9}

Complex Ion	Equilibrium Reaction ^b	K_f
[Co(NH ₃) ₆] ³⁺	$\text{Co}^{3+} + 6 \text{NH}_3 \rightleftharpoons [\text{Co}(\text{NH}_3)_6]^{3+}$	4.5×10^{33}
[Cu(NH ₃) ₄] ²⁺	$\text{Cu}^{2+} + 4 \text{NH}_3 \rightleftharpoons [\text{Cu}(\text{NH}_3)_4]^{2+}$	1.1×10^{13}
[Fe(CN) ₆] ⁴⁻	$\text{Fe}^{2+} + 6 \text{CN}^- \rightleftharpoons [\text{Fe}(\text{CN})_6]^{4-}$	1×10^{37}
[Fe(CN) ₆] ³⁻	$\text{Fe}^{3+} + 6 \text{CN}^- \rightleftharpoons [\text{Fe}(\text{CN})_6]^{3-}$	1×10^{42}
[PbCl ₃] ⁻	$\text{Pb}^{2+} + 3 \text{Cl}^- \rightleftharpoons [\text{PbCl}_3]^-$	2.4×10^1
[Ag(NH ₃) ₂] ⁺	$\text{Ag}^+ + 2 \text{NH}_3 \rightleftharpoons [\text{Ag}(\text{NH}_3)_2]^+$	1.6×10^7
[Ag(CN) ₂] ⁻	$\text{Ag}^+ + 2 \text{CN}^- \rightleftharpoons [\text{Ag}(\text{CN})_2]^-$	5.6×10^{18}
[Ag(S ₂ O ₃) ₂] ³⁻	$\text{Ag}^+ + 2 \text{S}_2\text{O}_3^{2-} \rightleftharpoons [\text{Ag}(\text{S}_2\text{O}_3)_2]^{3-}$	1.7×10^{13}
[Zn(NH ₃) ₄] ²⁺	$\text{Zn}^{2+} + 4 \text{NH}_3 \rightleftharpoons [\text{Zn}(\text{NH}_3)_4]^{2+}$	4.1×10^8
[Zn(CN) ₄] ²⁻	$\text{Zn}^{2+} + 4 \text{CN}^- \rightleftharpoons [\text{Zn}(\text{CN})_4]^{2-}$	1×10^{18}
[Zn(OH) ₄] ²⁻	$\text{Zn}^{2+} + 4 \text{OH}^- \rightleftharpoons [\text{Zn}(\text{OH})_4]^{2-}$	4.6×10^{17}

Acids		K_a
Phosphoric acid	H ₃ PO ₄	7.5×10^{-3}
Nitrous acid	HNO ₂	4.5×10^{-4}
Hydrofluoric acid	HF	3.5×10^{-4}
Formic acid	HCHO ₂	1.8×10^{-4}
Acetic acid	HC ₂ H ₃ O ₂	1.8×10^{-5}
Carbonic acid	H ₂ CO ₃	4.3×10^{-7}
Hydrosulfuric acid	H ₂ S	9.1×10^{-8}
Dihydrogen phosphate	H ₂ PO ₄ ⁻	6.2×10^{-8}
Hydrocyanic acid	HCN	4.9×10^{-10}
Hydrogen carbonate	HCO ₃ ⁻	5.6×10^{-11}
Hydrogen phosphate	HPO ₄ ²⁻	2.2×10^{-13}
Bases		K_b
Methylamine	CH ₃ —NH ₂	4.4×10^{-4}
Carbonate	CO ₃ ²⁻	2.2×10^{-4}
Ammonia	NH ₃	1.8×10^{-5}