

CHM-115-A
Exam Instructions

- All answers are to be submitted on the answer sheet provided. The **best** answer to each question should be indicated by marking with a **pencil** in the space provided. There is only one answer for each question. The color marked on the top of the answer sheet should match the color of this page.
- Print your name on the computer answer sheet. Then code it by darkening the appropriate letters with a **pencil**. Code your LAST (family) name **first**.
- Code your identification number (ASU 10-digit Affiliate ID, not your Social Security Number) in the "Identification #" section of the answer sheet. **This is very important.** Failure to properly code the answer sheet could result in the loss of your grade.
- Put all calculations on the examination pages. **Do not put any extra marks on the computer answer sheet.**
- Since the examination will be computer graded, read the directions for marking answers, located on the back of the answer sheet very carefully before starting.
- The computer answer sheet will be the only one graded. It will not be returned to you but may be viewed in PS H-240 if there is any question of accuracy in grading. You may wish to circle your answer on the examination as well for future reference. **You may keep the examination.**
- The exam consists of 25 multiple choice questions worth 4 points each. Make sure that your copy of the exam contains all 25 questions.
- A periodic table is attached to the end of the examination.
- Grades will be posted in my display case near the second-floor H-wing labs.
- Some information you may find useful:

$$T = t + 273.15$$

$$PV = nRT$$

$$\Delta E = q + w, \Delta E = \Delta H - P\Delta V$$

$$w = -P\Delta V = -\Delta n_{\text{gas}}RT$$

$$R = 0.08206 \text{ L atm/mol K} = 8.314 \text{ J/mol K}$$

$$\Delta S_{\text{vap}} = \Delta H_{\text{vap}}/T_{\text{boil}}, \Delta S_{\text{fus}} = \Delta H_{\text{fus}}/T_{\text{melt}}$$

$$\Delta S^\circ = \sum nS^\circ_{\text{products}} - \sum nS^\circ_{\text{reactants}}$$

$$\Delta H^\circ = \sum n\Delta H^\circ_f(\text{products}) - \sum n\Delta H^\circ_f(\text{reactants})$$

$$G^\circ = \sum n\Delta G^\circ_f(\text{products}) - \sum n\Delta G^\circ_f(\text{reactants})$$

$$\Delta G = \Delta H - T\Delta S, \Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$$

$$\Delta G = \Delta G^\circ + RT \ln Q$$

$$Q = \frac{\prod P_{\text{products}}^a}{\prod P_{\text{reactants}}^b}$$

$$Q = \frac{\prod [\text{products}]^a}{\prod [\text{reactants}]^b}$$

$$\Delta G^\circ = -RT \ln K$$

$$\text{Zero order: } -\Delta[A]/\Delta t = k, [A] = [A]_0 - kt,$$

$$t_{1/2} = [A]_0/2k$$

$$\text{First order: } -\Delta[A]/\Delta t = k[A],$$

$$\ln[A] = \ln[A]_0 - kt,$$

$$t_{1/2} = 0.693/k$$

$$\text{Second order: } -\Delta[A]/\Delta t = k[A]^2,$$

$$[A]^{-1} = [A]_0^{-1} + kt,$$

$$t_{1/2} = 1/k[A]_0$$

$$\Delta H^\circ = E_{a,f} - E_{a,r}$$

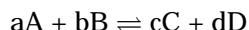
$$k = Ae^{-E_a/RT}$$

$$\ln(k_1/k_2) = (E_a/R)(T_2^{-1} - T_1^{-1})$$

Spectrochemical Series:

C > N > O > F > Cl > S > Br > I

$$K_c = k_f/k_r$$



$$K_c = [C]^c[D]^d/[A]^a[B]^b$$

$$K_p = K_c (RT)^{\Delta n(\text{gas})}$$

$$\ln K = -\Delta H^\circ/RT + \Delta S^\circ/R$$

$$\ln(K_1/K_2) = (\Delta H^\circ/R)(T_2^{-1} - T_1^{-1})$$

$$ax^2 + bx + c = 0, x = \{-b \pm \sqrt{(b^2 - 4ac)}\}/2a$$

$$K_w = [\text{H}_3\text{O}^+][\text{OH}^-] = 1.0 \times 10^{-14} \text{ at } 25^\circ\text{C}$$

$$\text{pH} = -\log [\text{H}_3\text{O}^+]$$

$$\text{pX} = -\log X$$

$$\text{pH} + \text{pOH} = \text{p}K_w = 14$$

$$K_w = K_aK_b$$

$$\text{pH} = \text{p}K_a + \log ([A^-]/[HA])$$

$$E^\circ_{\text{rxn}} = E^\circ_{\text{ox}} + E^\circ_{\text{red}}$$

$$E^\circ_{\text{cell}} = E^\circ_{\text{ox}} + E^\circ_{\text{red}}$$

$$\Delta G = -nFE$$

$$\Delta G^\circ = -nFE^\circ$$

$$F = 96500 \text{ coul/mol } e^-$$

$$E^\circ_3 = (n_1 E^\circ_1 + n_2 E^\circ_2)/n_3$$

$$E = E^\circ - (2.303RT/nF) \log Q = E^\circ - 0.05916/n \log Q$$

$$E^\circ = (2.303RT/nF) \log K = 0.05916/n \log K$$

$$N = N_0 e^{-kt} = N_0 e^{-0.693 t/t_{1/2}}$$

$$E = mc^2$$

$$E \text{ in MeV} = 931.48 \text{ MeV/amu} \times \text{mass defect in amu}$$

$$\text{mass of electron} = 0.000549 \text{ amu}$$

$$\text{mass of proton} = 1.00728 \text{ amu}$$

$$\text{mass of neutron} = 1.00867 \text{ amu}$$

Acid	Base
HClO ₄	ClO ₄ ⁻
H ₂ SO ₄	HSO ₄ ⁻
HI	I ⁻
HBr	Br ⁻
HCl	Cl ⁻
HNO ₃	NO ₃ ⁻
H ₃ O ⁺	H ₂ O
HSO ₄ ⁻	SO ₄ ²⁻
H ₂ SO ₃	HSO ₃ ⁻
H ₃ PO ₄	H ₂ PO ₄ ⁻
HNO ₂	NO ₂ ⁻
HF	F ⁻
CH ₃ CO ₂ H	CH ₃ CO ₂ ⁻
H ₂ CO ₃	HCO ₃ ⁻
H ₂ S	HS ⁻
NH ₄ ⁺	NH ₃
HCN	CN ⁻
HCO ₃ ⁻	CO ₃ ²⁻
HS ⁻	S ²⁻
H ₂ O	OH ⁻
NH ₃	NH ₂ ⁻
OH ⁻	O ²⁻