Dr. Zellmer | Chemistry 1250 | T, R
Time: 7 PM Sun. | Spring Semester 2022 | April 3, 2022
40 min | Quiz IX

Name _____ Rec. TA/time _____

Show **ALL** your work or **EXPLAIN** to receive full credit.

1. (2 pts) The solubility of a solid solute is 32.3 g solute/100 g H_2O at 20 °C. What minimum mass (in grams) of solute would need to be added to 13.1 g H_2O at 20 °C to make the solution saturated?

2. (4 pts) Which of the following are **soluble** in **water**, H_2O, and **WHY** (give a brief explanation dealing w. IAF & type of compound; ionic, polar, nonpolar for both solute and solvent)? (Circle all that apply.)

NH_4ClO_3 C_6H_{12} CH_3OH CCl_4

3. (8 pts) When CH_3OCH_3 dissolves in H_2O forces of attraction are being broken in the solute and in the solvent and attractive forces are formed between the solute and solvent. Answer the following questions concerning this process. (H, C, N and O are in groups 1A, 4A, 5A and 6A, respectively. H, C, N and O have 1, 6, 7 and 8 electrons, respectively.) **Explain your choices!**

a) What forces of attraction are broken between CH_3OCH_3 molecules?

b) What forces of attraction are broken between H_2O molecules?

c) What forces of attraction are formed between CH_3OCH_3 and H_2O in forming the solution?

4. (2 pts) What happens to the solubility of a gas in water as temperature increases?

Not on Carmen quiz

5. (5 pts) You have a 0.0020 M aqueous $Fe(NO_3)_3$ solution? Assuming an "ideal" ionic solution (i.e. no ion-pairing), what would be the **osmotic pressure** at 30.0°C? **Show work or explain your answers.**

6. (4 pts) The freezing point of p-dichlorobenzene is 53.1°C. A solution of 1.26 g of a sulfa drug in 10.0 g of p-dichlorobenzene freezes at 47.9°C. What is the **molecular weight** of the sulfa drug? (K_f = 7.10°C/m)

7. (3 pts) For the reaction below, the rate of disappearance of reactant A ($-\Delta[A]/\Delta t$) is 0.55 M/s. What is the rate of appearance of product C ($\Delta[C]/\Delta t$) in M/s? **Show work or explain your answer.**

$$5\,A + 3\,B \longrightarrow 2\,C + 3\,D$$

8. (3 pts) For the reaction and rate law given below, which of the statements is **<u>CORRECT</u>**?

$$A + 3B + C \rightarrow D + E \qquad \text{rate} = k\,[A]^3\,[C]$$

1) the reaction is fourth order overall
2) tripling [A] will increase the rate by a factor of 9
3) doubling [C] will increase the rate by a factor of 4
4) assuming the units for rate are M/s, the units for k would be $M^{-3} \bullet s^{-1}$
5) tripling the rate constant, k, will increase the rate by a factor of 9

a) 1, 2 b) 1, 5 c) 2, 3 d) 1, 4 e) 1, 4, 5

9. (12 pts) The following data were measure for the reaction

$$4\,A + 2\,B \longrightarrow 3\,C + 2\,D$$

Experiment	[A] (M)	[C] (M)	Initial rate (M/s)
1	0.200	0.200	0.2000
2	0.600	0.200	5.4000
3	0.600	0.400	1.3500
4	0.200	0.400	0.0500
5	0.400	0.600	0.1778

a) What is the **rate law** for the reaction?

b) What is the reaction **order** with respect to each **compound** AND what is the **overall** reaction **order**?

order with respect to A =

order with respect to C =

overall order of the reaction =

c) What is the value of the **rate constant** (based on data from experiment 1)?

10. (6 pts) The rate law for the decomposition of AB_2 ($AB_2 \rightarrow AB + \frac{1}{2} B_2$) is

$$r = (0.630\ M^{-1} \bullet s^{-1})\ [AB_2]^2.$$

a) (4 pts) If the initial concentration of AB_2 is 3.00 M what will the **<u>concentration</u>** of AB_2 be (in M) after 1.00 minute?

b) (2 pts) What is the rate after 1.00 minute? Not asked for on the Carmen quiz.

11. (4 pts) The decomposition of AB ($AB \rightarrow A + B$) is zero order in AB with a rate constant of 1.10×10^{-3} $M \bullet s^{-1}$. If the initial concentration is 0.100 M at the very start of the reaction what is the second half-life (in minutes)?

USEFUL INFORMATION

R = 0.08206 L-atm/mol-K = 8.3145 J/mol-K

$$[A]_t = -kt + [A]_0 \qquad \frac{1}{[A]_t} = kt + \frac{1}{[A]_0} \qquad \ln[A]_t = -kt + \ln[A]_0$$

$$t_{1/2} = \frac{0.693}{k} \qquad t_{1/2} = \frac{1}{k[A]_0} \qquad t_{1/2} = \frac{[A]_0}{2k}$$

	IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIIIB			IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA
1	1.008 **H** 1																	4.003 **He** 2
2	6.941 **Li** 3	9.012 **Be** 4											10.811 **B** 5	12.011 **C** 6	14.007 **N** 7	15.999 **O** 8	18.998 **F** 9	20.179 **Ne** 10
3	22.990 **Na** 11	24.305 **Mg** 12											26.98 **Al** 13	28.09 **Si** 14	30.974 **P** 15	32.06 **S** 16	35.453 **Cl** 17	39.948 **Ar** 18
4	39.098 **K** 19	40.08 **Ca** 20	44.96 **Sc** 21	47.88 **Ti** 22	50.94 **V** 23	52.00 **Cr** 24	54.94 **Mn** 25	55.85 **Fe** 26	58.93 **Co** 27	58.69 **Ni** 28	63.546 **Cu** 29	65.38 **Zn** 30	69.72 **Ga** 31	72.59 **Ge** 32	74.92 **As** 33	78.96 **Se** 34	79.904 **Br** 35	83.80 **Kr** 36
5	85.47 **Rb** 37	87.62 **Sr** 38	88.91 **Y** 39	91.22 **Zr** 40	92.91 **Nb** 41	95.94 **Mo** 42	98 **Tc** 43	101.07 **Ru** 44	102.91 **Rh** 45	106.42 **Pd** 46	107.87 **Ag** 47	112.41 **Cd** 48	114.82 **In** 49	118.69 **Sn** 50	121.75 **Sb** 51	127.60 **Te** 52	126.90 **I** 53	131.39 **Xe** 54
6	132.91 **Cs** 55	137.33 **Ba** 56	138.91 **La** 57	178.39 **Hf** 72	180.95 **Ta** 73	183.85 **W** 74	186.21 **Re** 75	190.23 **Os** 76	192.22 **Ir** 77	195.08 **Pt** 78	196.97 **Au** 79	200.59 **Hg** 80	204.38 **Tl** 81	207.2 **Pb** 82	208.98 **Bi** 83	209 **Po** 84	210 **At** 85	222 **Rn** 86
7	223 **Fr** 87	226.03 **Ra** 88	227.03 **Ac** 89	261 **Rf** 104	262 **Ha** 105	263 **Sg** 106	262 **Ns** 107	265 **Hs** 108	266 **Mt** 109	269 110	272 111	277 112						

Lanthanide Series	140.12 **Ce** 58	140.91 **Pr** 59	144.24 **Nd** 60	145 **Pm** 61	150.36 **Sm** 62	151.96 **Eu** 63	157.25 **Gd** 64	158.93 **Tb** 65	162.50 **Dy** 66	164.93 **Ho** 67	167.26 **Er** 68	168.93 **Tm** 69	173.04 **Yb** 70	173.04 **Lu** 71
Actinide Series	232.04 **Th** 90	231.04 **Pa** 91	238.03 **U** 92	237.05 **Np** 93	**Pu** 94	**Am** 95	**Cm** 96	**Bk** 97	**Cf** 98	**Es** 99	**Fm** 100	**Md** 101	**No** 102	**Lr** 103

A PERIODIC CHART OF THE ELEMENTS
(Based on ^{12}C)