Test 2

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) At elevated temperatures, dinitrogen pentoxide decomposes to nitrogen dioxide and oxygen: 1) _____

$$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$$

When the rate of formation of NO_2 is 5.5×10^{-4} M/s, the rate of decomposition of N_2O_5 is _____ M/s.

A) 1.4×10^{-4}
B) 2.8×10^{-4}
C) 5.5×10^{-4}
D) 2.2×10^{-3}
E) 10.1×10^{-4}

A flask is charged (filled) with 0.124 mol of A *and allowed to react to form* B *according to the reaction* A(g) →B(g). *The following data are obtained for* [A] *as the reaction proceeds:*

Time (s)	0.00	10.0	20.0	30.0	40.0
Moles of A	0.124	0.110	0.088	0.073	0.054

2) The average rate of disappearance of A between 20 s and 40 s is _____ mol/s. 2) _____

A) 8.5×10^{-4} B) 7.1×10^{-3} C) 1.4×10^{-3} D) 590 E) 1.7×10^{-3}

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

3) At 20 °C, a 2.65 M aqueous solution of ammonium chloride has a density of 1.1444 g/mL. What is the *molality* of ammonium chloride in the solution? The formula weight of NH_4Cl is 53.50 g/mol.

4) The following data were measured for the reaction of nitric oxide with hydrogen:

Experiment #	[NO] (M)	[H_2] (M)	Initial Rate (M/s)
1	0.10	0.10	1.23×10^{-3}
2	0.10	0.20	2.46×10^{-3}
3	0.20	0.10	4.92×10^{-3}

a) Determine the rate law for this reaction

b) Calculate the rate constant

c) Calculate the rate when [NO] = 0.050 M and [H_2] = 0.150 M

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

5) The concentration of nitrate ion in a solution that contains 0.900 M aluminum nitrate is _____ M. 5) _____

A) 2.70 B) 1.80 C) 0.450 D) 0.300 E) 0.900

6) Which substance in the reaction below either appears or disappears the fastest? 6) _____

$$4NH_3 + 7O_2 \rightarrow 4NO_2 + 6H_2O$$

A) H_2O

B) O_2

C) NH_3

D) NO_2

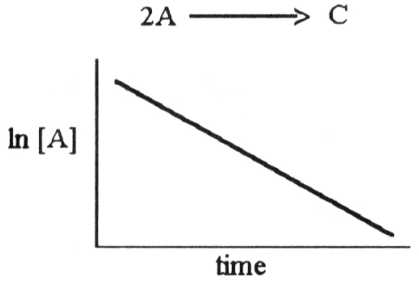
E) The rates of appearance/disappearance are the same for all of these.

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

7) When 52.0 g of an unknown nonvolatile nonelectrolyte is dissolved in 525.0 g of water, the resulting solution freezes at -0.930 ^{o}C. What is the molar mass of the unknown substance? *K*f = 1.86 ^{o}C/*m* for water.

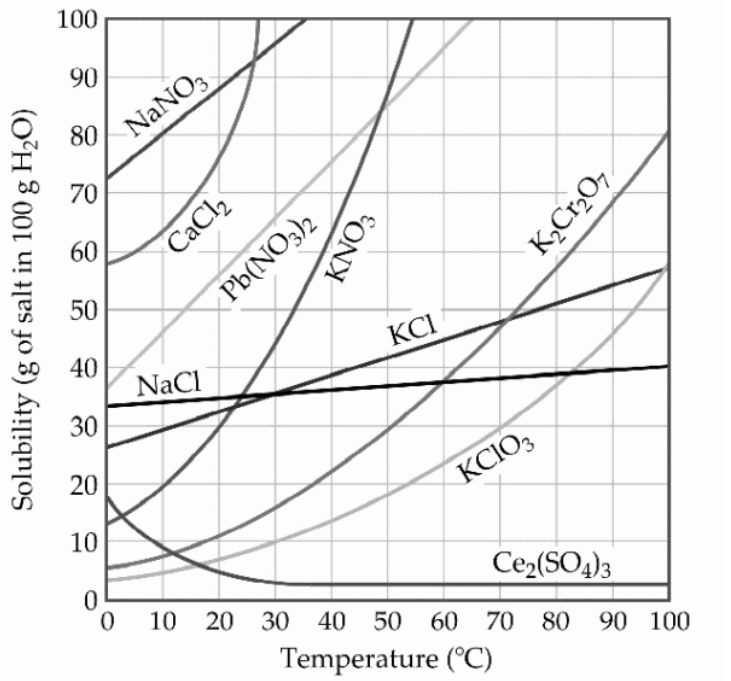
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

8) The graph shown below depicts the relationship between concentration and time for the following chemical reaction. 8) _____



The slope of this line is equal to _____.

A) -k B) k C) $\ln[A]_0$ D) -1/k E) 1/k



9) A sample of potassium nitrate (49.0 g) is dissolved in 100 g of water at 100 °C, with precautions taken to avoid evaporation of any water. The solution is cooled to 30.0 °C and no precipitate is observed. This solution is _____. 9) _____

A) hydrated
B) placated
C) supersaturated
D) saturated
E) unsaturated

10) Pairs of liquids that will mix in all proportions are called _____ liquids. 10) _____

A) saturated
B) unsaturated
C) polar liquids
D) miscible
E) supersaturated

11) The solubility of Ar in water at 25 °C is 1.6×10^{-3} M when the pressure of the Ar above the solution is 1.0 atm. The solubility of Ar at a pressure of 2.5 atm is _____ M. 11) _____

A) 4.0×10^{-3} B) 1.6×10^{-3} C) 6.4×10^{-4} D) 7.5×10^{-2} E) 1.6×10^{3}

12) The vapor pressure of pure ethanol at 60 °C is 0.459 atm. Raoult's Law predicts that a solution prepared by dissolving 10.0 mmol naphthalene (nonvolatile) in 90.0 mmol ethanol will have a vapor pressure of _____ atm. 12) _____

A) 0.413 B) 0.790 C) 0.498 D) 0.0918 E) 0.367

13) If the rate law for the reaction 13) _____

$$2A + 3B \rightarrow \text{products}$$

is first order in A and second order in B, then the rate law is rate = _____.

A) $k[A]^2[B]$ B) $k[A]^2[B]^2$ C) $k[A][B]$ D) $k[A][B]^2$ E) $k[A]^2[B]^3$

14) The overall order of a reaction is 2. The units of the rate constant for the reaction are _____. 14) _____

A) s/M^2 B) 1/s C) $M^{-1}s^{-1}$ D) 1/M E) M/s

15) The kinetics of the reaction below were studied and it was determined that the reaction rate did not change when the concentration of B was tripled. The reaction is _____ order in B. 15) _____

$$A + B \rightarrow P$$

A) zero B) first C) second D) third E) one-half