

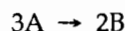
Name _____

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

- 1) A solution is prepared by dissolving 7.00 g of glycerin ($C_3H_8O_3$) in 201 g of ethanol (C_2H_5OH). The freezing point of the solution is _____ $^{\circ}C$. The freezing point of pure ethanol is $-114.6^{\circ}C$ at 1 atm. The molal-freezing-point-depression constant (K_f) for ethanol is $1.99^{\circ}C/m$. The molar masses of glycerin and of ethanol are 92.1 g/mol and 46.1 g/mol, respectively.
- A) -115.4 B) 0.752 C) -121.3 D) -107.9 E) -113.8
- 2) The osmotic pressure of a solution formed by dissolving 25.0 mg of aspirin ($C_9H_8O_4$) in 0.250 L of water at $25^{\circ}C$ is _____ atm.
- A) 1.38 B) 2.45 C) 13.6 D) 1.14×10^{-3} E) 0.0136
- 3) Formation of solutions where the process is endothermic can be spontaneous provided that _____.
- A) they are accompanied by an increase in order
B) the solvent is a gas and the solute is a solid
C) they are accompanied by another process that is exothermic
D) the solvent is water and the solute is a gas
E) they are accompanied by an increase in disorder
- 4) The solubility of Ar in water at $25^{\circ}C$ is $1.6 \times 10^{-3} M$ 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.
- A) 1.6×10^{-3} B) 4.0×10^{-3} C) 6.4×10^{-4} D) 7.5×10^{-2} E) 1.6×10^3
- 5) A solution contains 28% phosphoric acid by mass. This means that _____.
- A) 1 L of this solution has a mass of 28 g
B) 1 mL of this solution contains 28 g of phosphoric acid
C) 100 g of this solution contains 28 g of phosphoric acid
D) the density of this solution is 2.8 g/mL
E) 1 L of this solution contains 28 mL of phosphoric acid
- 6) Molality is defined as the _____.
- A) moles solute/kg solution
B) moles solute/Liters solution
C) moles solute/moles solvent
D) moles solute/kg solvent
E) none (dimensionless)
- 7) A solution is prepared by dissolving 15.0 g of NH_3 in 250 g of water. The density of the resulting solution is 0.974 g/mL. The mole fraction of NH_3 in the solution is _____.
- A) 0.922 B) 16.8 C) 0.0640 D) 0.940 E) 0.0597

- 8) 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.
- A) 0.498 B) 0.0918 C) 0.367 D) 0.413 E) 0.790
- 9) The freezing point of ethanol (C₂H₅OH) is -114.6°C. The molal freezing point depression constant for ethanol is 2.00°C/m. What is the freezing point (°C) of a solution prepared by dissolving 50.0 g of glycerin (C₃H₈O₃, a nonelectrolyte) in 200 g of ethanol?
- A) -5.42 B) -132.3 C) -120.0 D) -114.6 E) -115
- 10) Colligative properties of solutions include all of the following except _____.
- A) an increase in the osmotic pressure of a solution upon the addition of more solute
 B) depression of vapor pressure upon addition of a solute to a solvent
 C) the increase of reaction rates with increase in temperature
 D) elevation of the boiling point of a solution upon addition of a solute to a solvent
 E) depression of the freezing point of a solution upon addition of a solute to a solvent

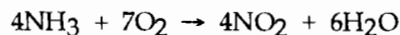
11) Consider the following reaction:



The average rate of appearance of B is given by $\Delta[B]/\Delta t$. Comparing the rate of appearance of B and the rate of disappearance of A, we get $\Delta[B]/\Delta t = \text{_____} \times (-\Delta[A]/\Delta t)$.

- A) -3/2 B) -2/3 C) +3/2 D) +2/3 E) +1

12) Which one of the following is not a valid expression for the rate of the reaction below?



A) $-\frac{1}{4} \frac{\Delta[\text{NH}_3]}{\Delta t}$

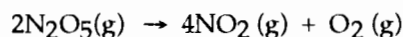
B) $\frac{1}{4} \frac{\Delta[\text{NO}_2]}{\Delta t}$

C) $-\frac{1}{7} \frac{\Delta[\text{O}_2]}{\Delta t}$

D) $\frac{1}{6} \frac{\Delta[\text{H}_2\text{O}]}{\Delta t}$

E) All of the above are valid expressions of the reaction rate.

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



When the rate of formation of NO₂ is 5.5×10^{-4} M/s, the rate of decomposition of N₂O₅ 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}

14) Of the units below, _____ are appropriate for a first-order reaction rate constant.

A) M s^{-1}

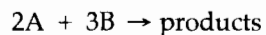
B) s^{-1}

C) $\text{M}^{-1} \text{s}^{-1}$

D) $\text{L mol}^{-1} \text{s}^{-1}$

E) mol/L

15) If the rate law for the reaction



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

A) $k[\text{A}]^2[\text{B}]^3$

B) $k[\text{A}][\text{B}]$

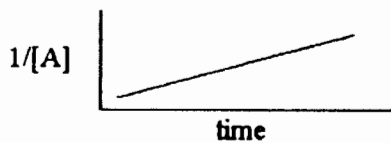
C) $k[\text{A}][\text{B}]^2$

D) $k[\text{A}]^2[\text{B}]$

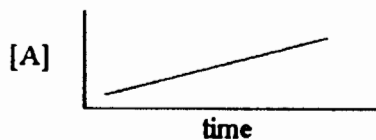
E) $k[\text{A}]^2[\text{B}]^2$

16) Which one of the following graphs shows the correct relationship between concentration and time for a reaction that is second order in [A]?

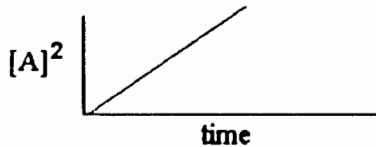
A)



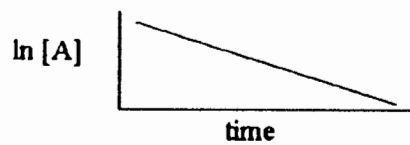
B)



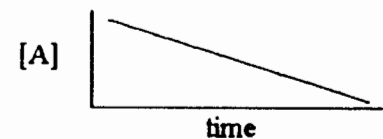
C)



D)

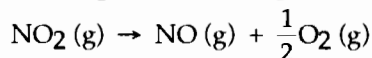


E)



- 17) One difference between first- and second-order reactions is that _____.
- A) the rate of a first-order reaction does not depend on reactant concentrations; the rate of a second-order reaction does depend on reactant concentrations
 - B) the half-life of a first-order reaction does not depend on $[A]_0$; the half-life of a second-order reaction does depend on $[A]_0$
 - C) the rate of a first-order reaction depends on reactant concentrations; the rate of a second-order reaction does not depend on reactant concentrations
 - D) a first-order reaction can be catalyzed; a second-order reaction cannot be catalyzed
 - E) the half-life of a first-order reaction depends on $[A]_0$; the half-life of a second-order reaction does not depend on $[A]_0$

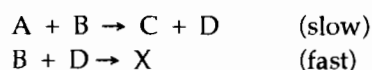
- 18) At elevated temperatures, nitrogen dioxide decomposes to nitrogen oxide and oxygen:



The reaction is second order in NO_2 with a rate constant of $0.543 \text{ M}^{-1} \text{ s}^{-1}$ at 300°C . If the initial $[\text{NO}_2]$ is 0.260 M , it will take _____ s for the concentration to drop to 0.100 M .

- A) 11.3 B) 8.8×10^{-2} C) -0.611 D) 0.299 E) 3.34

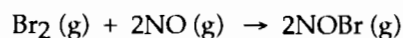
- 19) The mechanism for formation of the product X is:



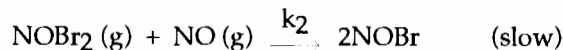
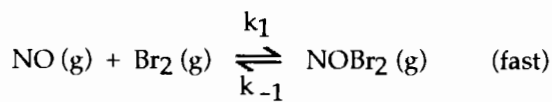
The intermediate reactant in the reaction is _____.

- A) A B) B C) C D) D E) X

- 20) A possible mechanism for the overall reaction



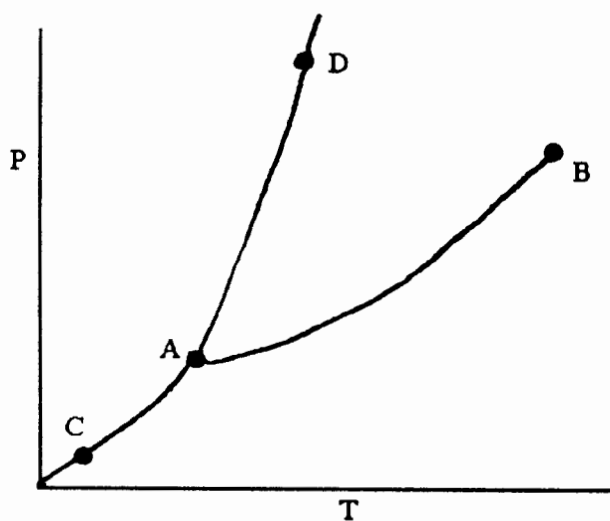
is



The rate law for formation of NOBr based on this mechanism is rate = _____.

- A) $(k_2k_1/k^{-1})[\text{NO}][\text{Br}_2]^2$
- B) $k_1[\text{NO}]^{1/2}$
- C) $(k_1/k^{-1})^2[\text{NO}]^2$
- D) $k_1[\text{Br}_2]^{1/2}$
- E) $(k_2k_1/k^{-1})[\text{NO}]^2[\text{Br}_2]$

- 21) A catalyst can increase the rate of a reaction _____.
- A) by changing the value of the frequency factor (A)
 - B) by lowering the activation energy of the reverse reaction
 - C) by lowering the overall activation energy (E_a) of the reaction
 - D) by providing an alternative pathway with a lower activation energy
 - E) All of these are ways that a catalyst might act to increase the rate of reaction.
- 22) The heat of fusion of water is 6.01 kJ/mol. The heat capacity of liquid water is 75.2 J/mol \cdot K. The conversion of 50.0 g of ice at 0.00°C to liquid water at 22.0°C requires _____ kJ of heat.
- A) 17.2
 - B) 3.8×10^2
 - C) 0.469
 - D) 21.3
 - E) Insufficient data are given.



- 23) On the phase diagram above, segment _____ corresponds to the conditions of temperature and pressure under which the solid and the gas of the substance are in equilibrium.
- A) BC
 - B) CD
 - C) AC
 - D) AD
 - E) AB
- 24) Chromium crystallizes in a body-centered cubic unit cell. There are _____ chromium atoms per unit cell.
- A) 1
 - B) 2
 - C) 4
 - D) 6
 - E) 8
- 25) Viscosity is _____.
- A) unaffected by temperature
 - B) the "skin" on a liquid surface caused by intermolecular attraction
 - C) the same as density
 - D) the resistance to flow
 - E) inversely proportional to molar mass

Answer Key

Testname: PRACTICE_EXAM_2.TST

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

- 1) A
- 2) E
- 3) E
- 4) B
- 5) C
- 6) D
- 7) E
- 8) D
- 9) C
- 10) C
- 11) D
- 12) E
- 13) B
- 14) B
- 15) C
- 16) A
- 17) B
- 18) A
- 19) D
- 20) E
- 21) D
- 22) D
- 23) C
- 24) B
- 25) D