Chemistry 152 March 1, 2006 BLUE examination

Name_____

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

1) A solution is prepared by adding 30.00 g of lactose (milk sugar) to 110.0 g of water at 55°C. The partial pressure of water above the solution is _____ torr. The vapor pressure of pure water at 55°C is 118 torr. The MW of lactose is 342.3 g/mol.

A) 94.1 B) 92.7 C) 116.3 D) 169.4 E) 1.670

2) When argon is placed in a container of neon, the argon spontaneously disperses throughout the neon because _____.

A) the dispersion of argon atoms produces an increase in disorder
B) of the large attractive forces between argon and neon atoms
C) of solvent-solute interactions
D) of hydrogen bonding
E) a decrease in energy occurs when the two mix

3) Which one of the following substances would be the most soluble in CCl_4?

A) CH_3CH_2OH B) NaCl C) NH_3 D) $C_{10}H_{22}$ E) H_2O

4) The concentration of nitrogen in water is _____ M when the partial pressure of N_2 above the solution is 0.826 atm. Henry's Law constant for this system is 6.8×10^{-4} mol/L-atm.

A) 1.2×10^{3} B) 8.2×10^{-3} C) 0.43 D) 5.6×10^{-4} E) 5.6

5) Which one of the following concentration units varies with temperature?

A) mole fraction
B) molality
C) mass percent
D) molarity
E) all of the above

6) As the concentration of a solute in a solution increases, the freezing point of the solution _____ and the vapor pressure of the solution _____.

A) increases, increases
B) increases, decreases
C) decreases, decreases
D) decreases, is unaffected
E) decreases, increases

7) The most likely van't Hoff factor for an 0.01 m CaI_2 solution is _____.

A) 3.29 B) 3.00 C) 2.69 D) 1.00 E) 1.27

8) Nitrogen dioxide decomposes to nitric oxide and oxygen via the reaction:

$$2NO_2 \rightarrow 2NO + O_2$$

In a particular experiment at 300°C, $[NO_2]$ drops from 0.0100 to 0.00650 M in 100 s. The rate of appearance of O_2 for this period is _____ M/s.

A) 3.5×10^{-3} B) 1.8×10^{-5} C) 7.0×10^{-3} D) 3.5×10^{-5} E) 7.0×10^{-5}

The peroxydisulfate ion ($S_2O_8^{2-}$) *reacts with the iodide ion in aqueous solution via the reaction:*

$$S_2O_8^{2-}(aq) + 3I^- \rightarrow 2SO_4(aq) + I3^-(aq)$$

An aqueous solution containing 0.050 M *of* $S_2O_8^{2-}$ *ion and* 0.072 M *of* I^- *is prepared, and the progress of the reaction followed by measuring* $[I^-]$. *The data obtained is given in the table below.*

Time (s)	0	400	800	1200	1600
$[I^-]$ (M)	0.072	0.057	0.046	0.037	0.029

9) The concentration of $S_2O_8^{2-}$ remaining at 400 s is _____ M.

A) -0.007 B) +0.057 C) +0.035 D) +0.015 E) +0.045

10) A reaction was found to be second order in carbon monoxide concentration. The rate of the reaction _____ if the [CO] is doubled, with everything else kept the same.

A) triples
B) is reduced by a factor of 2.
C) remains unchanged
D) increases by a factor of 4
E) doubles

The data in the table below were obtained for the reaction:

$$A + B \rightarrow P$$

Experiment Number	[A] (M)	[B] (M)	Initial Rate (M/s)
1	0.273	0.763	2.83
2	0.273	1.526	2.83
3	0.819	0.763	25.47

11) The order of the reaction in A is _____.

A) 1 B) 2 C) 3 D) 4 E) 0

12) The magnitude of the rate constant is _____.

A) 0.278 B) 38.0 C) 2.21 D) 42.0 E) 13.2

13) For a first-order reaction, a plot of _____ versus _____ is linear.

A) $\ln [A]_t, \frac{1}{t}$ B) $\frac{1}{[A]_t}, t$ C) $\ln [A]_t, t$ D) $t, \frac{1}{[A]_t}$ E) $[A]_t, t$

14) The reaction

$$CH_3\text{-}N{\equiv}C \rightarrow CH_3\text{-}C{\equiv}N$$

is a first-order reaction. At 230.3°C, $k = 6.29 \times 10^{-4}\ s^{-1}$. If $[CH_3\text{-}N{\equiv}C]$ is 1.00×10^{-3} initially, $[CH_3\text{-}N{\equiv}C]$ is _____ after 1.000×10^3 s.

A) 5.33×10^{-4} B) 4.27×10^{-3} C) 2.34×10^{-4} D) 1.00×10^{-6} E) 1.88×10^{-3}

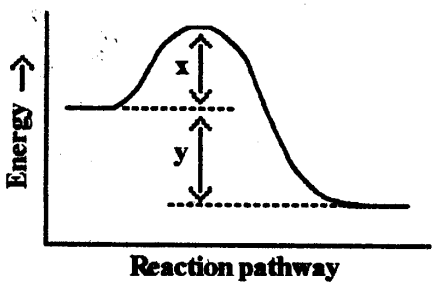
The reaction A → B *is first order in* [A]. *Consider the following data.*

time (s)	[A] (M)
0.0	1.60
10.0	0.40
20.0	0.10

15) The rate constant for this reaction is _____ s^{-1}.

A) 3.1×10^{-3} B) 0.013 C) 0.14 D) 3.0 E) 0.030

16) Which energy difference in the energy profile below corresponds to the activation energy for the forward reaction?



A) x B) y C) y - x D) x - y E) x + y

17) In the energy profile of a reaction, the species that exists at the maximum on the curve is called the _____.

A) product
B) activated complex
C) activation energy
D) atomic state
E) enthalpy of reaction

18) In general, as temperature goes up, reaction rate _____.

A) stays the same regardless of whether the reaction is exothermic or endothermic

B) goes up if the reaction is exothermic

C) goes up if the reaction is endothermic

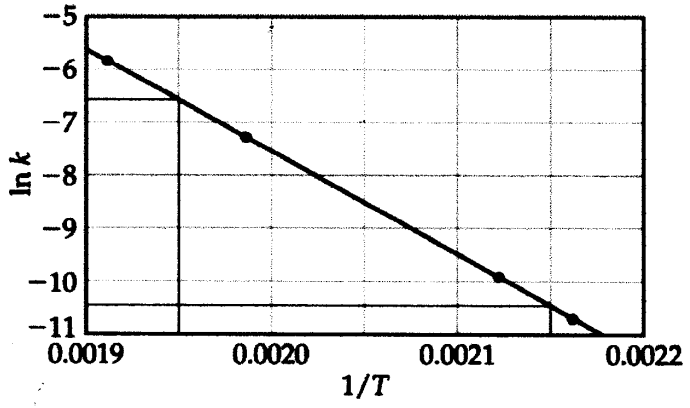
D) goes up regardless of whether the reaction is exothermic or endothermic

E) stays the same if the reaction is first order

19) At elevated temperatures, methylisonitrile (CH_3NC) isomerizes to acetonitrile (CH_3CN):

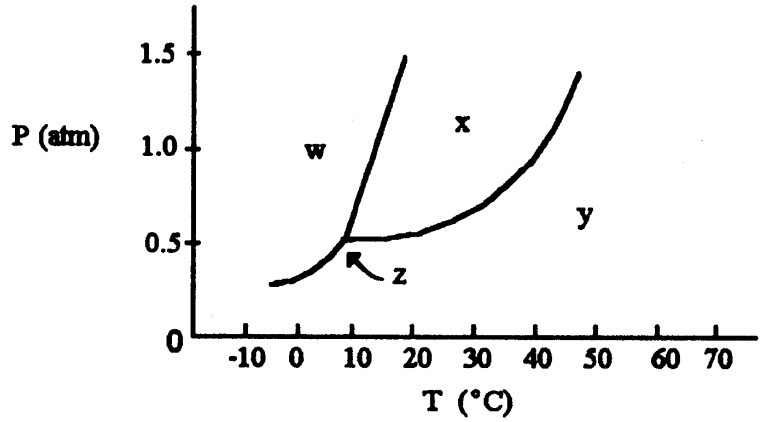
$$CH_3NC\,(g) \rightarrow CH_3CN\,(g)$$

The dependence of the rate constant on temperature is studied and the graph below is prepared from the results.



The energy of activation of this reaction is _____ kJ/mol.

A) 4.4×10^{-4} B) 1.6×10^{5} C) 160 D) 4.4×10^{-7} E) 1.9×10^{4}



20) The normal boiling point of the substance with the phase diagram shown above is _____ °C.

A) 10 B) 20 C) 30 D) 40 E) 50

21) When the phase diagram for a substance has a solid–liquid phase boundary line that has a negative slope (leans to the left), the substance _____.

A) melts rather than sublimes under ordinary conditions

B) sublimes rather than melts under ordinary conditions

C) can go from solid to liquid, within a small temperature range, via the application of pressure

D) cannot be liquefied above its triple point

E) cannot go from solid to liquid by application of pressure at any temperature

22) CsCl crystallizes in a unit cell that contains a Cs^+ ion at the center of a cube and a Cl^- ion at each corner. What is the total number of ions (Cs^+ ions and Cl^- ions) that lie within a unit cell of CsCl?

A) 4 B) 9 C) 2 D) 6 E) 5

23) Of the following, _____ is an exothermic process.

A) melting

B) boiling

C) subliming

D) freezing

E) All of the above are exothermic.

24) A solution is prepared by dissolving 0.60 g of nicotine (a nonelectrolyte) in water to make 12 mL of solution. The osmotic pressure of the solution is 7.55 atm at 25°C. The molecular weight of nicotine is _____ g/mol.

A) 50 B) 28 C) 43 D) 0.60 E) 160

25) A solution containing 10.0 g of an unknown liquid and 90.0 g water has a freezing point of -3.33°C. Given $K_f = 1.86°C/m$ for water, the molar mass of the unknown liquid is _____ g/mol.

A) 161 B) 69.0 C) 333 D) 619 E) 62.1

Answer Key
Testname: EXAM2_DRAFT.TST

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

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