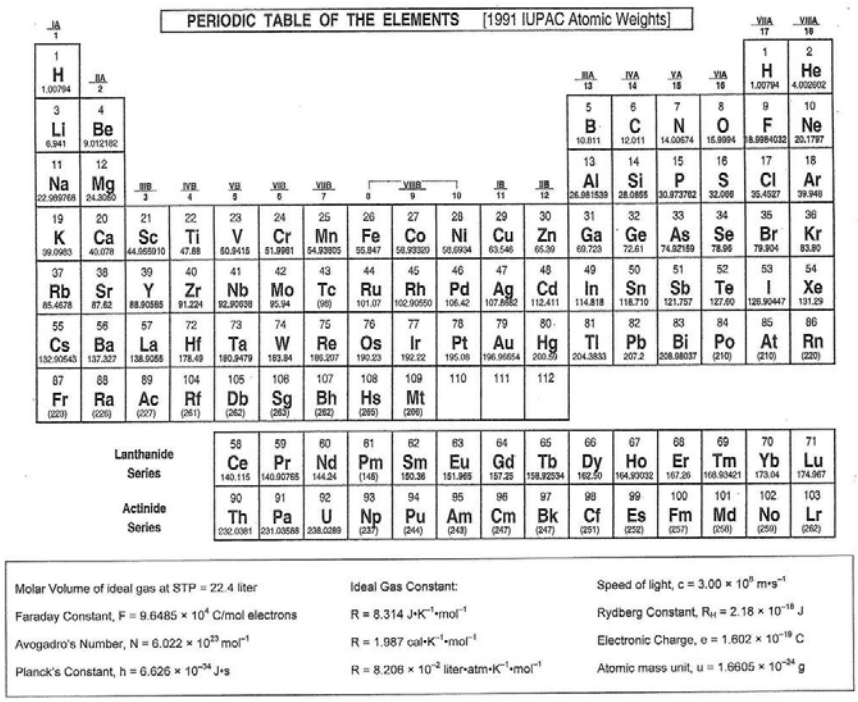
CHE 113 2015 FA Midterm Exam

Your Name: _____ **Your ID:** _____

# of Questions: 30

Date and Time of Exam Creation: Mon, Oct 12, 2015 @ 10:04:39

Total Exam Points: 30.00



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Question #: 1

In order to safely handle dry ice, what kind of personal protective equipment should you use?

A. bare hands
B. insulated gloves
C. eye glasses
D. socks

Question #: 2

When using a fire extinguisher, what does the word PASS stand for?

A. push, align, stand, sweep
B. pull, aim, squeeze, sweep
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A student fills a beaker with a solid material then uses roughly half of the material in an experiment. After the lab period is over, what should be done with the remaining unused material?

A. Pour the material back into the original container.
B. Dispose of it in the proper waste container.
C. Leave the material out for the TA to deal with.
D. Spread it across the balances.

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Which of the following students is wearing appropriate Personal Protective Equipment (PPE), minus goggles, for the General Chemistry Lab?

A.

B.

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D.

Question #: 5

What piece of safety equipment is pictured below?

A. eyewash fountain
B. fire blanket
C. safety shower
D. this is not safety equipment

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Which of the following provides an appropriate level of eye protection from fumes and splashes for use in the General Chemistry Lab?

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Question #: 7

What is the mass percent of nitrogen in $(NH_4)_2CO_3$ (molar mass = 96.06 g/mol)? Your answer should be reported to 4 significant figures.
__1__ %

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How many grams of baking soda ($NaHCO_3$) do you need to neutralize 500.0 mL of battery acid (H_2SO_4) that has been spilled on your garage floor? Assume that the concentration of the battery acid is 12.00 M.

$$H_2SO_4(aq) + 2\ NaHCO_3(s) \rightarrow Na_2SO_4(aq) + 2\ CO_2(g) + 2\ H_2O(l)$$

A. 1,008,000 g
B. 1,008 g
C. 504 g
D. 252 g

Question #: 9

Which of the following is the correct net ionic equation for the reaction that occurs between copper (II) nitrate and calcium sulfide?

A. $Ca^{+2}(aq) + S^{-2}(aq) \rightarrow CaS(s)$
B. $Cu(NO_3)_2(aq) + CaS(aq) \rightarrow Ca(NO_3)_2(aq) + CuS(s)$
C. $Cu^{+2}(aq) + S^{-2}(aq) \rightarrow CuS(aq)$
D. $Cu^{+2}(aq) + S^{-2}(aq) \rightarrow CuS(s)$

Question #: 10

Select all that apply.

The equivalence point of the acid / base titration between HCl and NaOH occurs when _____.

A. the acid and the base have neutralized each other
B. the pH stops changing with increasing volume of OH^-
C. the moles of H^+ = the moles of OH^-
D. the titration is stopped

Question #: 11

Consider the following reactions:

- $Fe_2O_3(s) + 3\ CO(g) \rightarrow 2\ Fe(s) + 3\ CO_2(g)$ $\quad \Delta H = -28.0$ kJ
- $3\ Fe(s) + 4\ CO_2(s) \rightarrow 4\ CO(g) + Fe_3O_4(s)$ $\quad \Delta H = +12.5$ kJ

What is the enthalpy of the reaction of Fe_2O_3 with CO?

$3\ Fe_2O_3(s) + CO(g) \rightarrow CO_2(g) + 2\ Fe_3O_4(s)$

A. 40.5 kJ
B. –15.5 kJ
C. –59.0 kJ
D. 109 kJ

Question #: 12

Which of the following is the most correct way to write the citation for the current edition of the lab manual in your report?

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B. French, April Dr., Soult, Allison, Dr., Savas, M. Meral, Dr., *et. al*. *Chemistry Laboratory Manual.* 2015. Online. http://www.chem21labs.com. 1 October, 2015.
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Question #: 13

The central atom in XeF_4 is surrounded by

A. 3 single bonds, 1 double bond, and no lone pairs of electrons.
B. 2 single bonds, 2 double bonds, and no lone pairs of electrons.
C. 3 single bonds, 1 double bond, and 1 lone pair of electrons,
D. 4 single bonds, no double bonds, and no lone pairs of electrons.
E. 4 single bonds, no double bonds, and 2 lone pairs of electrons.

Question #: 14

Which of the following substances has 3 electron groups around the oxygen atom?

A. CaO
B. CO
C. Li_2O
D. CO_2

Question #: 15

Which of the following species have the same molecular geometry?
CO_2, H_2O, $BeCl_2(g)$, N_2O

A. CO_2 and N_2O only
B. H_2O and N_2O only
C. H_2O and $BeCl_2(g)$ only
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E. CO_2, $BeCl_2(g)$, and N_2O

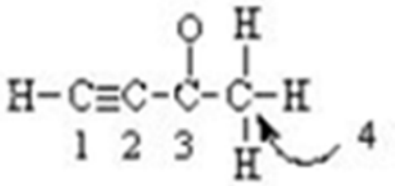
Question #: 16

What is the electron geometry of the central oxygen atom in ozone (O_3)?

A. linear
B. tetrahedral
C. trigonal bipyramidal
D. trigonal planar

Question #: 17

What is the hybridization at C#1 in the molecule below? Format your answer like sp3d2. No superscripts are needed.



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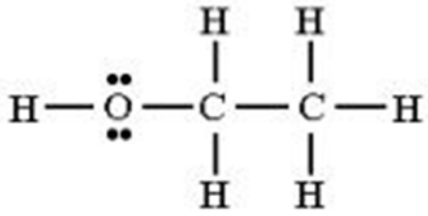
1. _____

Question #: 18

Which of the following are (is a) correct Lewis structure(s) for C_2H_6O? More than one answer may be correct.

A.



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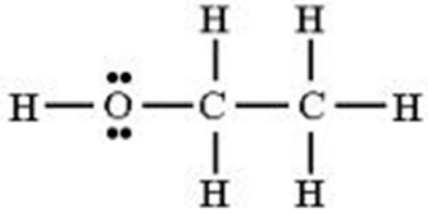
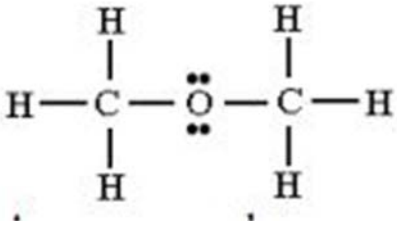


C.



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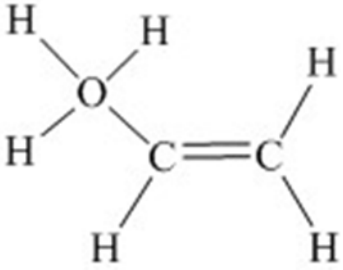

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Why should you not place dry ice in a sealed container?

A. The solid sublimes, giving off a gas that causes pressure to build up.
B. The dry ice is too warm and will cause the container to break.
C. The dry ice will get caught on the top of the container and the container won't open.
D. It is a good practice to put dry ice in a sealed container.

Question #: 20

A solution was prepared by dissolving 5.00 g of dry ice (CO_2) in 250.0 mL ethanol (C_2H_5OH). The freezing point depression constant (K_f) for ethanol is 1.99 ºC/m and pure ethanol's freezing point is –114.6 ºC. The density of ethanol is 0.789 g/mL. How much did the dry ice depress ethanol's freezing point?

A. –114.6 ºC
B. 0.197 ºC
C. –115.3 ºC
D. 1.15 ºC

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A student prepares a solution containing 23.4 grams of sucrose ($C_{12}H_{22}O_{11}$) in 156 g of water. How many grams of NaCl does the student need to measure out to make a solution of equal molality using the same volume of water?
__1__ grams salt

1. _____

Question #: 22

What is the expected freezing point of a 0.35 *m* aqueous $CaCl_2$ solution? The freezing point depression constant for water is 1.86 °C/*m*.

A. 0.019 °C
B. –0.651 °C
C. –1.95 °C
D. 5.31 °C

Question #: 23

What is the ideal value for the van't Hoff factor (*i*) for $Ba_3(PO_4)_2$?

A. 1
B. 9
C. 5
D. 2

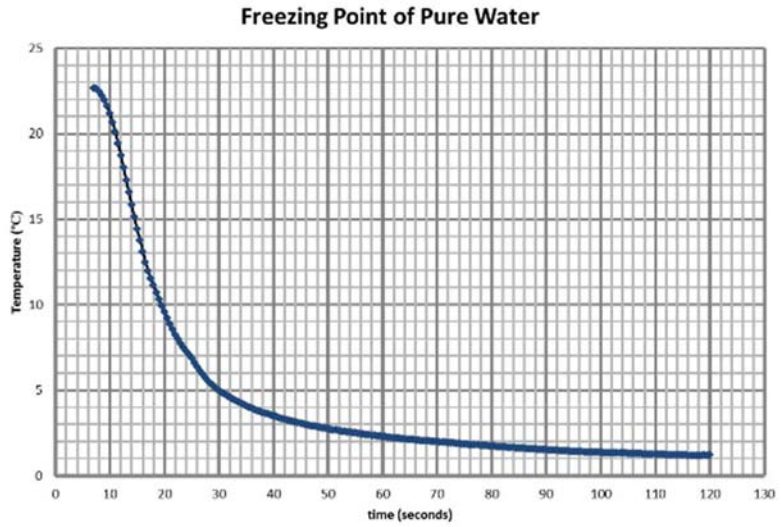
Question #: 24

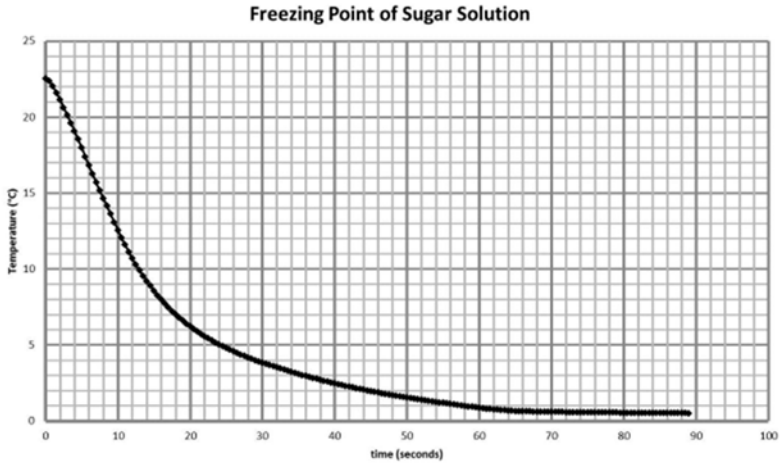
Steviol is a component of the sweetener Stevia's sweet-tasting glycosides. What is the molality of a solution containing 0.0125 grams of steviol ($C_{20}H_{30}O_3$) dissolved in 250. mL of water?

A. 3.94×10^{-5} *m*
B. 1.57×10^{-4} *m*
C. 2.00×10^{4} *m*
D. 4.54×10^{-4} *m*

Question #: 25

A student prepared a sugar solution containing 1.463 g of sugar ($C_{12}H_{22}O_{11}$) in 25.00 mL of water, and he/she produced the following freezing point data:





What is the K_f of water based on the student's data?

A. 20 °C/*m*
B. 8.8 °C/*m*
C. 4.2 °C/*m*
D. 0.49 °C/*m*

Question #: 26

The following initial rate/concentration data were collected for the reaction:

$$2\ A + B + 2\ C \rightarrow D + E + F$$

Intial Concentration, M	Initial rate, M/s		
[A]	[B]	[C]	$\Delta[D]/\Delta t$
1.0	0.50	0.40	1.8×10^{-4}
1.0	0.40	0.40	1.8×10^{-4}
1.0	0.30	0.80	9.0×10^{-5}
0.10	0.20	0.40	1.8×10^{-5}

What is the rate law for the reaction?

A. rate = $k[A]^2[B][C]$
B. rate = $k[A][B]^2[C]$
C. rate = $k[A][C]$
D. rate = $k[A][C]^{-1}$
E. rate = $k[B][C]^2$

Question #: 27

The reaction of A + B → products is found to be second order in [A] and first order in [B]. What is the rate law equation?

A. rate = $k[A][B]$
B. rate = $k[A]^2[B]$
C. rate = $k[A][B]^2$
D. rate = $k[B]$
E. rate = $k[A]^2$

Question #: 28

Consider the following proposed mechanism for the conversion of oxygen to ozone in the atmosphere:

$O_2(g) + 2\ NO(g) \rightarrow 2\ NO_2(g)$
$2\ NO_2(g) \rightarrow 2\ NO(g) + 2\ O_2(g)$
$2\ O(g) + 2\ O_2(g) \rightarrow 2\ O_3(g)$

$3\ O_2(g) \rightarrow 2\ O_3(g)$

Which of the following is the catalyst?

A. $O(g)$
B. $NO(g)$
C. $NO_2(g)$
D. $O_2(g)$

Question #: 29

In order to determine the energy of activation for the decomposition of hydrogen peroxide, a student determined that the rate constant at 22.33 ºC was 0.023 1/s. At 33.96 ºC the rate constant increased to 0.061 1/s. What is the activation energy?

A. 63 kJ/mol
B. –8.1 kJ/mol
C. 740 kJ/mol
D. 1.3×10^{-3} kJ/mol

Question #: 30

A student collected pressure measurements at 298 K over 120 seconds and plotted the data as the following reaction occured:

$$2H_2O_2(aq) \rightarrow 2H_2O(g) + O_2(g)$$

The slope of the best-fit line was determined to be 1.231 torr/s. What is the rate of the reaction (M/s)?

A. 2.57×10^{-3} M/s
B. 0.08206 M/s
C. 1.231 M/s
D. 6.62×10^{-5} M/s

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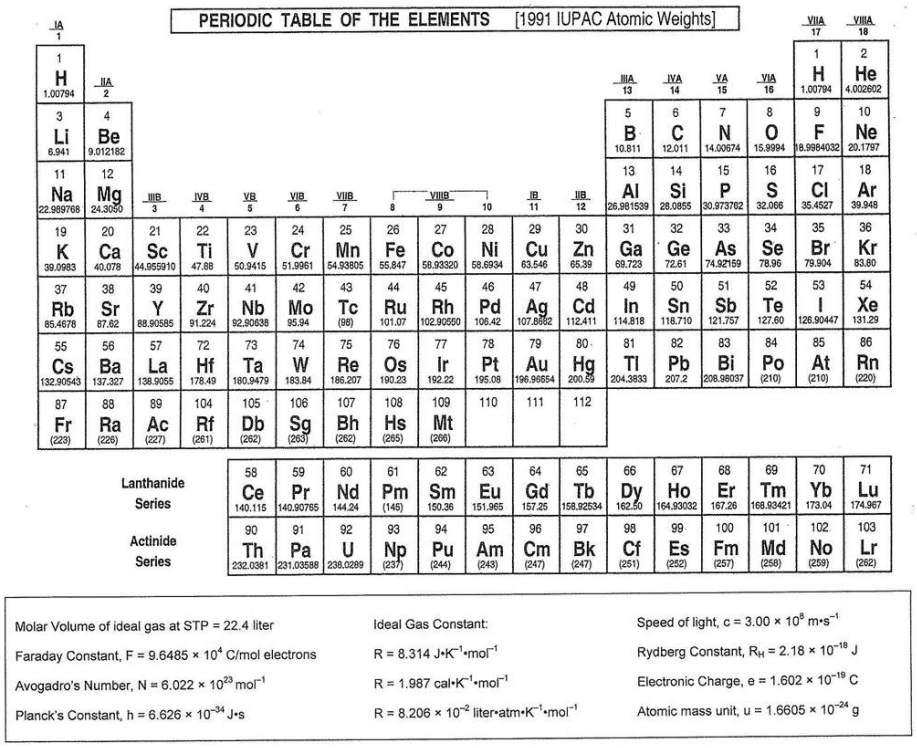

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A. linear
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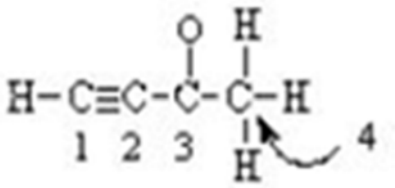
What is the hybridization at C#1 in the molecule below? Format your answer like sp3d2. No superscripts are needed.



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Item Weight: 1.0

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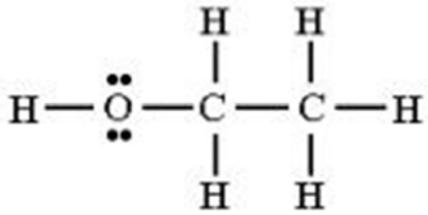
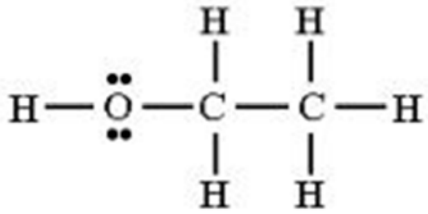
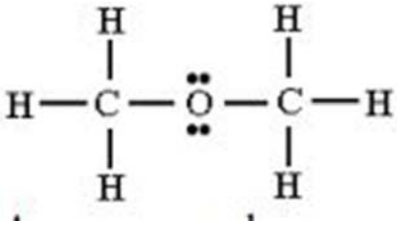
✓A.



B.



✓C.



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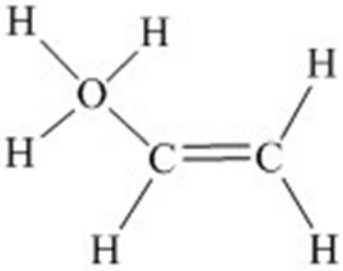

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C. –115.3 ºC
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A student prepares a solution containing 23.4 grams of sucrose ($C_{12}H_{22}O_{11}$) in 156 g of water. How many grams of NaCl does the student need to measure out to make a solution of equal molality using the same volume of water?
__1__ grams salt

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D. 5.31 °C

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B. 9
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C. 2.00×10^{4} *m*
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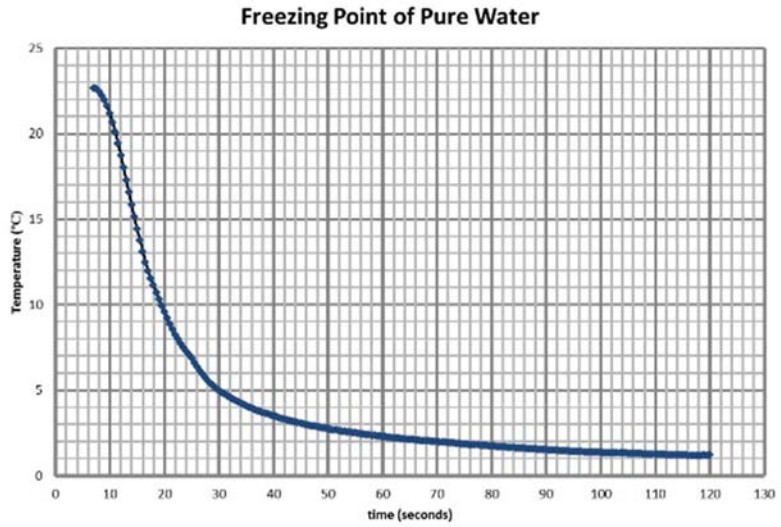

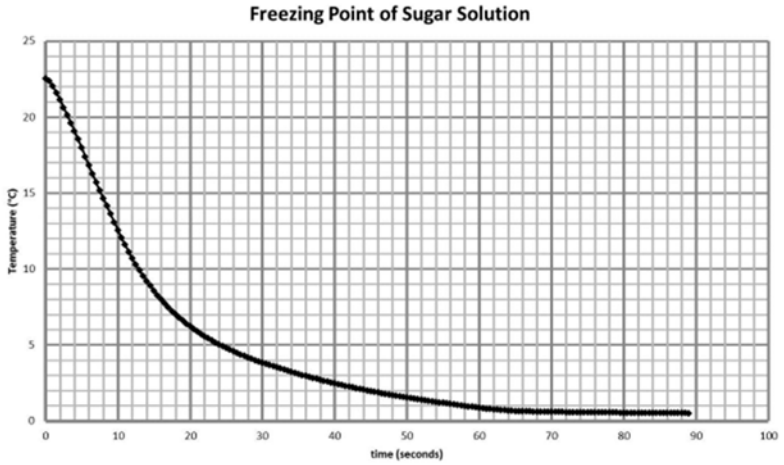

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Intial Concentration, M	Initial rate, M/s		
[A]	[B]	[C]	$\Delta[D]/\Delta t$
1.0	0.50	0.40	1.8×10^{-4}
1.0	0.40	0.40	1.8×10^{-4}
1.0	0.30	0.80	9.0×10^{-5}
0.10	0.20	0.40	1.8×10^{-5}

What is the rate law for the reaction?

A. rate = $k[A]^2[B][C]$
B. rate = $k[A][B]^2[C]$
C. rate = $k[A][C]$
✓D. rate = $k[A][C]^{-1}$
E. rate = $k[B][C]^2$

Item Weight: 1.0

Question #: 27

The reaction of A + B → products is found to be second order in [A] and first order in [B]. What is the rate law equation?

A. rate = $k[A][B]$
✓B. rate = $k[A]^2[B]$
C. rate = $k[A][B]^2$
D. rate = $k[B]$
E. rate = $k[A]^2$

Item Weight: 1.0

Question #: 28

Consider the following proposed mechanism for the conversion of oxygen to ozone in the atmosphere:

$O_2(g) + 2\ NO(g) \rightarrow 2\ NO_2(g)$

$2\ NO_2(g) \rightarrow 2\ NO(g) + 2\ O_2(g)$

$2\ O(g) + 2\ O_2(g) \rightarrow 2\ O_3(g)$

$3\ O_2(g) \rightarrow 2\ O_3(g)$

Which of the following is the catalyst?

A. $O(g)$
✓B. $NO(g)$
C. $NO_2(g)$
D. $O_2(g)$

Item Weight: 1.0

Question #: 29

In order to determine the energy of activation for the decomposition of hydrogen peroxide, a student determined that the rate constant at 22.33 ºC was 0.023 1/s. At 33.96 ºC the rate constant increased to 0.061 1/s. What is the activation energy?

✓A. 63 kJ/mol
B. –8.1 kJ/mol
C. 740 kJ/mol
D. 1.3×10^{-3} kJ/mol

Item Weight: 1.0

Question #: 30

A student collected pressure measurements at 298 K over 120 seconds and plotted the data as the following reaction occured:

$$2H_2O_2(aq) \rightarrow 2H_2O(g) + O_2(g)$$

The slope of the best-fit line was determined to be 1.231 torr/s. What is the rate of the reaction (M/s)?

A. 2.57×10^{-3} M/s
B. 0.08206 M/s
C. 1.231 M/s
✓D. 6.62×10^{-5} M/s

Item Weight: 1.0