This print-out should have 20 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 10.0 points

What would you propose as the rate law for the reaction of bromine with nitric oxide if the second step of a proposed mechanism is the rate determining step?

Step 1: $NO + Br_2 \rightarrow NOBr_2$

Step 2: $NOBr_2 + NO \rightarrow 2\,NOBr$

1. $k\,[NO]^2\,[Br_2]\,[NOBr_2]^{-1}$

2. $k\,[NO]\,[Br_2]\,[NOBr_2]^{-1}$

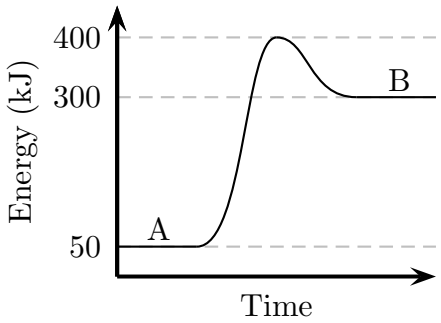
3. $k\,[NO]^2$

4. $k\,[NO]\,[Br_2]\,[NOBr_2]$

5. $k\,[NO]^2\,[Br_2]$

002 10.0 points

The graph describes the energy profile of a reaction.



What are the values for ΔH and E_a, respectively, for the reaction in the direction written?

1. −250 kJ, −100 kJ

2. −250 kJ, 100 kJ

3. 250 kJ, 350 kJ

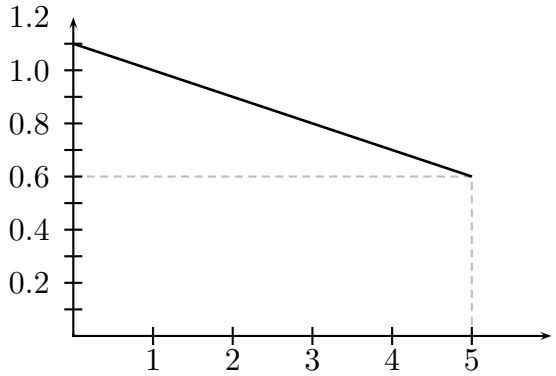
4. −250 kJ, 350 kJ

5. 250 kJ, 100 kJ

003 10.0 points

The graph is a plot of ln A *vs* t for the reaction

$$A \rightarrow B$$



rate $= k\,[A]$ is the rate law for this reaction. What was the initial concentration of [A]?

1. 1.8 M

2. 3.0 M

3. 5 M

4. 0.6 M

5. 1.1 M

004 10.0 points

Which of the following statements regarding collision and transition state theory are true?

I) Reactants must collide to form products.
II) Activation energy is always positive.
III) Reactant molecules must absorb energy to form the transition state.
IV) Reactant collisions must be oriented properly to form products.

1. II and III only

2. I, III, and IV only

3. I, II, III, and IV

4. I and IV only

5. II, III, and IV only

005 10.0 points

In the reaction

$3\,Mg(s) + 2\,Fe^{2+}(aq) \rightarrow 2\,Fe(s) + 3\,Mg^{2+}(aq)$, $\frac{\Delta[Fe]}{\Delta t} = 2.4 \times 10^{-4}$ M/s. What is $\frac{\Delta[Mg]}{\Delta t}$?

1. -3.6×10^{-4} M/s

2. -1.6×10^{-4} M/s

3. $+3.6 \times 10^{-4}$ M/s

4. $+1.6 \times 10^{-4}$ M/s

5. $+1.2 \times 10^{-4}$ M/s

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006 10.0 points

A reaction has a rate constant of $k = 5.5 \times 10^{-4}$ M^2s^{-1}. What is the reaction order?

1. -2

2. 0

3. 1

4. 2

5. -1

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007 10.0 points

What is the rate law for the reaction

$$A + B + C \rightarrow D$$

if the following data were collected?

Exp	$[A]_0$	$[B]_0$	$[C]_0$	Initial Rate
1	0.4	1.2	0.7	2.32×10^{-3}
2	1.3	1.2	0.9	7.54×10^{-3}
3	0.4	4.1	0.8	9.25×10^{-2}
4	1.3	1.2	0.2	7.54×10^{-3}

1. rate $= 3.36 \times 10^{-3}\,[A]^1\,[B]^3\,[C]^0$

2. rate $= 1.79 \times 10^{-3}\,[A]^0\,[B]^2\,[C]^1$

3. rate $= 1.49 \times 10^{-3}\,[A]^0\,[B]^3\,[C]^1$

4. rate $= 4.48 \times 10^{-3}\,[A]^1\,[B]^2\,[C]^1$

5. rate $= 5.37 \times 10^{-3}\,[A]^1\,[B]^3\,[C]^0$

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008 10.0 points

The decomposition of hydrogen peroxide to form water is a first order process. If it takes 20 minutes for the initial concentration to fall from 1.6 M to 0.8 M, how much time has passed when only 0.05 M of the initial 1.6 M remains?

1. 100 minutes

2. 120 minutes

3. 80 minutes

4. 160 minutes

5. 40 minutes

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009 10.0 points

At 0°C and 1 atmosphere of pressure, which of the following gases would have the lowest average molecular speed?

1. H_2

2. NH_3

3. N_2

4. CO_2

5. Ar

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010 10.0 points

What is the molecular weight of a (hypothetical) gas that diffuses 1.414 times faster than nitrogen (N_2)?

1. 23.5 g/mol

2. 32.6 g/mol

3. 14.0 g/mol

4. 46.6 g/mol

5. 4.85 g/mol

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011 10.0 points

Given the gases Cl_2, Kr, CO_2, Ne, put them in order of their INCREASING rate of effusion.

1. $CO_2 < Ne < Kr < Cl_2$

2. $Kr < Cl_2 < CO_2 < Ne$

3. $Cl_2 < Kr < Ne < CO_2$

4. $Ne < CO_2 < Cl_2 < Kr$

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012 10.0 points

In an improved version of the gas law, P is replaced by $\left(P + \dfrac{n^2\,a}{V^2}\right)$. In this expression, the second term, $\dfrac{n^2\,a}{V^2}$, accounts for

1. the forces of repulsion between molecules.

2. the excluded volume of the molecules.

3. the forces of attraction between molecules.

4. the size of the molecules.

5. the size of the container.

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013 10.0 points

Under which of the following conditions is a real gas most likely to deviate from ideal behavior?

1. Tuesdays and Thursdays

2. zero pressure

3. if it is a noble gas

4. high volume

5. low pressure

6. low temperature

7. new moon

8. low density

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014 10.0 points

If 250 mL of a gas at STP weighs 2 g, what is the molar mass of the gas?

1. $8.00\ \text{g} \cdot \text{mol}^{-1}$

2. $44.8\ \text{g} \cdot \text{mol}^{-1}$

3. $56.0\ \text{g} \cdot \text{mol}^{-1}$

4. $28.0\ \text{g} \cdot \text{mol}^{-1}$

5. $179\ \text{g} \cdot \text{mol}^{-1}$

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015 10.0 points

At constant temperature, the rate of effusion of H_2 is

1. None of these

2. one-fourth that of oxygen gas.

3. twice that of helium gas.

4. four times that of oxygen gas.

5. one-half that of helium gas.

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016 10.0 points

Which of the following molecules would have the smallest a and b term, respectively, in the van der Waals' equation: $O_3, CHF_3, SF_5Cl, SiHCl_3, Xe$.

1. Xe and SF_5Cl, respectively

2. Xe and O_3, respectively

3. CHF_3 and CHF_3, respectively

4. Xe and Xe, respectively

5. $SiHCl_3$ and O_3, respectively

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017 10.0 points

If a 10 L gaseous system at 400 K and 4 atm is heated to 800 K and allowed to expand to 20 L, what will the new pressure of the system be?

1. 2 atm

2. 16 atm

3. 4 atm

4. 1 atm

5. 8 atm

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018 10.0 points

A sample of gas occupies 10.5 L at 600 torr and 50°C. What volume will it occupy at STP?

1. 7.01 L

2. 9.81 L

3. 11.2 L

4. 15.7 L

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019 10.0 points

If the temperature of an ideal gas is raised from 100°C to 200°C, while the pressure remains constant, the volume

1. increases by a factor of 100.

2. None of these

3. remains the same.

4. doubles.

5. goes to $\frac{1}{2}$ of the original volume.

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020 10.0 points

The molar volume of a gas at STP is

1. 22.4 liters.

2. 12.4 gallons.

3. 6.02×10^{23} liters.

4. 12.4 liters.