Chapter 20 Worksheet 3

Name:

Instructions:

- Please enter your first and last name as it appears on the eLC roster (do not use a nickname).
- Your UGA myID is a combination of letters and numbers (example: mine is sre13137). **Do not use your 81x number.**
- If you have a printer, print the worksheet, write your answers on the template showing your work where appropriate, convert it to a PDF and Upload this worksheet to Gradescope by 11:59 p.m. on Thursday, September 10. **You do not need to upload anything to eLC.**
- If you do not have a printer, type your answers in the boxes and write your work on separate sheets of paper and convert your work to a PD. Upload the PDF of your work to eLC: go to Tools, Assignments, then "Chapter 20 Worksheet1". Then upload the worksheet template to Gradescope by 11:59 p.m. on Thursday, September 10.

1. The decomposition of a certain insecticide in water at 12 °C follows first-order kinetics with a rate constant of 1.45 yr^{-1}. A quantity of this insecticide is washed into a lake on June 1, leading to a concentration of 5.0 x 10^{-7} g/cm^3. Assume the temperature of the lake is constant.

$$\ln\frac{[A]_0}{[A]_t} = kt$$

What is the concentration of insecticide on June 1 of the following year?

How long will it take for the insecticide concentration to decrease to 3.0 x 10^{-7} g/cm^3?

2. Is Ea temperature dependent?

A. Yes, Ea increases as temperature increases.

B. Yes, Ea decreases as temperature increases.

C. No.

3. A particular reaction was found to have forward and reverse activation energies of 60 and 140 kJ mol^{-1}, respectively. The enthalpy change for the reaction is,

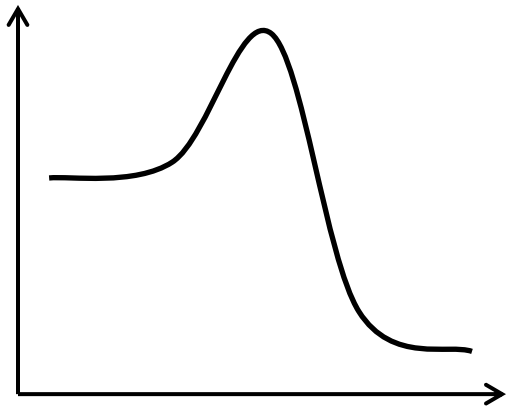
A. $\Delta H = 60$ kJ mol^{-1}

B. $\Delta H = -60$ kJ mol^{-1}

C. $\Delta H = 80$ kJ mol^{-1}

D. $\Delta H = -80$ kJ mol^{-1}

E. $\Delta H = 140$ kJ mol^{-1}



4. The apparent activation energy for the chemical reactions which produce light in a firefly is 50 kJ mol^{-1}. How many times slower would you expect the firefly to blink if you cooled down its surroundings from 300 K to 270 K?

A. ~0.1 x

B. ~0.3 x

C. ~3 x

D. ~9 x

E. ~1000 x

5. SO_2Cl_2 decomposes by first order kinetics and k = 2.81 x 10^{-3} min^{-1} at a given temperature. The initial concentration of SO_2Cl_2 = 0.015 M. Determine the half-life of the reaction.

A. $t_{1/2} = 0.6931 / 2.81 \times 10^{-3}\ min^{-1} = 246.6$ min

B. $t_{1/2} = 0.6931 / 2.81 \times 10^{-3}\ min^{-1} = 247$ min

C. $t_{1/2} = 1 / (2.81 \times 10^{-3}\ min^{-1}\ (0.015)) = 2.37 \times 10^{4}$ min

D. $t_{1/2} = 1/(2.81 \times 10^{-3}\ min^{-1}\ (0.015)) = 2.4 \times 10^{4}$ min

6. Select the correct rate expression for

$2HI(g) \rightarrow H_2(g) + I_2(g)$

A. rate = $-\Delta[HI] / \Delta t = -\Delta[H_2] / \Delta t = -\Delta[I_2] / \Delta t$

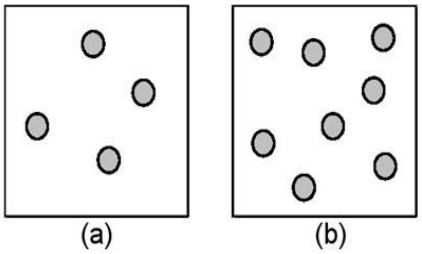
B. rate = $-\Delta[HI] / \Delta t = \Delta[H_2] / \Delta t = \Delta[I_2] / \Delta t$

C. rate = $-\frac{1}{2}\Delta[HI] / \Delta t = \Delta[H_2] / \Delta t = \Delta[I_2] / \Delta t$

D. rate = $-2\Delta[HI] / \Delta t = -\Delta[H_2] / \Delta t = -\Delta[I_2] / \Delta t$

E. rate = $-2\Delta[HI] / \Delta t = \Delta[H_2] / \Delta t = \Delta[I_2] / \Delta t$

7. Consider the first-order decomposition of A molecules (shaded spheres) in two vessels of equal volume. What is the half-life of decomposition in vessel (b) relative to the half-life of decomposition in vessel (a)?



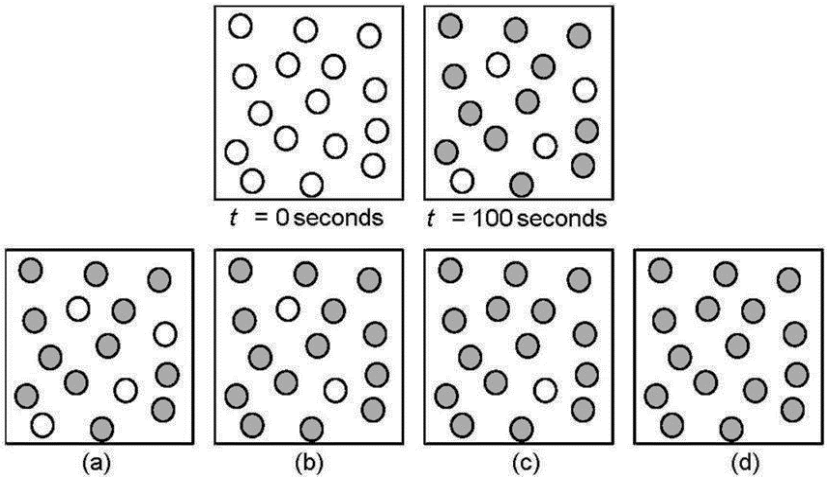
A. half-life in vessel (b)/half-life in vessel (a) = 4:1

B. half-life in vessel (b)/half-life in vessel (a) = 2:1

C. half-life in vessel (b)/half-life in vessel (a) = 3:2

D. half-life in vessel (b)/half-life in vessel (a) = 1:1

8. Consider the first-order reaction A → B in which A molecules (unshaded spheres) are converted to B molecules (shaded spheres). Given the following pictures at t = 0 seconds and t = 100 seconds, which picture represents the number of A and B molecules remaining at 200 seconds?



A. picture (a)

B. picture (b)

C. picture (c)

D. picture (d)

9. What fraction of collisions will have sufficient energy to react for a gas whose activation energy is 68 kJ/mol at 25°C?

10. The first-order reaction, $SO_2Cl_2 \rightarrow SO_2 + Cl_2$, has a half-life of 8.75 hours at 593 K. How long will it take for the concentration of SO_2Cl_2 to fall to 14.5% of its initial value?