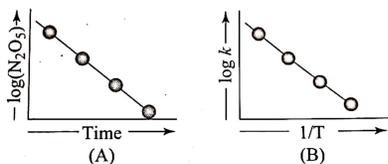


# NEW STANDARD ACADEMY

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CLASS 12 (Chemistry) DPP (Academy)

- The decomposition of  $\text{Cl}_2\text{O}_7$  at 400 K in the gas phase to  $\text{Cl}_2$  and  $\text{O}_2$  is a first order reaction. After 55 sec at 400K, the pressure of  $\text{Cl}_2\text{O}_7$  falls from 0.062 to 0.044 atm, the rate constant (in  $\text{s}^{-1}$ ) is calculated as  $x \times 10^{-3}$ , x is \_\_\_\_
- The reaction  $\text{SO}_2\text{Cl}_2(\text{g}) \rightarrow \text{SO}_2(\text{g}) + \text{Cl}_2(\text{g})$  is a first order gas reaction with  $k=2.2 \times 10^{-5} \text{sec}^{-1}$  at  $320^\circ\text{C}$ . What % of  $\text{SO}_2\text{Cl}_2$  is decomposed on heating for 90 min?
- The half-life of the reaction  $\text{N}_2\text{O}_5(\text{g}) \rightarrow 2\text{NO}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g})$  is 2.4 hrs at  $30^\circ\text{C}$ . Starting with 10g of  $\text{N}_2\text{O}_5$  how many grams of  $\text{N}_2\text{O}_5$  will remain after a period of 96 hour?  
For question 14-15
- Dinitrogen pentoxide decomposes to  $\text{NO}_2$  and  $\text{O}_2$  following first order kinetics  
 $\text{N}_2\text{O}_5(\text{g}) \rightarrow 2\text{NO}_2 + \text{O}_2(\text{g})$ , 0.2 mole of  $\text{N}_2\text{O}_5$  was taken in 2L vessel and heated at 200 K. The concentration of  $\text{N}_2\text{O}_5$  is measured at different intervals following graphs A and B were obtained from the data.

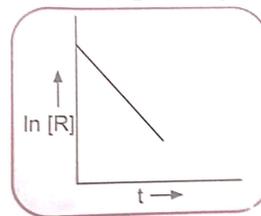


- Slope of straight line in graph A is  $-1.2 \times 10^2 \text{sec}^{-1}$ . What is half-life of the reaction?
  - $2.5 \times 10^{-2} \text{s}$
  - $2.5 \times 10^{-3} \text{s}$
  - $12.5 \times 10^{-4} \text{s}$
  - $2.5 \times 10^{-3} \text{m}$
- The rate of reaction after  $5 \times 10^{-3} \text{s}$  is
  - $6.90 \text{mol L}^{-1} \text{s}^{-1}$
  - $3.42 \text{mol L}^{-1} \text{s}^{-1}$

c)  $6.84 \text{mol L}^{-1}$

d)  $6.84 \text{mol s}^{-1}$

- Show graphically the average and instantaneous rate of reaction
- Distinguish between rate expression and rate constant of reaction.
- Explain the difference between order and molecularity of reaction with examples
- Define velocity constant. What are the units of rate constant of zero first and second order reaction.
- What do you understand by a first order reaction?  
Show that for a first order reaction time required to complete a definite fraction of the reaction is independent of initial concentration.
- What is the effect of temperature, concentration and catalyst on rate and rate constant of the reaction?
- Define order of reaction. Give an example and mathematical expression for a zero order reaction.
- The following data were obtained during the first order thermal decomposition of  $\text{SO}_2\text{Cl}_2$  at a constant volume.
- For a chemical reaction  $\text{R} \rightarrow \text{P}$ , the variation in the concentration (vs. time(t) plot is given as:



- Predict the order of the reaction.
  - What is the slope of the curve?
  - Write the unit of rate constant for this reaction.
- Define the following terms:
    - Pseudo first order reaction
    - Half period of reaction
  - Derive integrated rate equation for rate constant of zero order reaction.
  - For the reaction  $2\text{N}_2\text{O}_5(\text{g}) \rightarrow 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$ , the rate of formation of  $\text{NO}_2(\text{g})$  is  $2.8 \times 10^{-3} \text{Ms}^{-1}$ . Calculate the rate of disappearance of  $\text{N}_2\text{O}_5(\text{g})$ .

- The conversion of molecules X to Y follows second order kinetics. If concentration of X is increased to three times how will it affect the rate of formation of Y?
- A first order reaction has a rate constant  $1.15 \times 10^{-3} \text{ s}^{-1}$ . How long will 5g of this reactant take to reduce to 3g?
- What do you understand by the rate law and rate constant of a reaction? Identify the order of a reaction if the units of its rate constant are:
  - $\text{L}^{-1} \text{ mol s}^{-1}$
  - $\text{L mol}^{-1} \text{ s}^{-1}$
- What happens to the rate constant  $k$  and activation energy  $E_a$  as the temperature of a chemical reaction is increased? Justify.

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### CLASS 11 (Chemistry) DPP (Academy)

- What is the basic theme of organization in the periodic table?
- What is the basic difference in approach between the Mendeleev's periodic law and the modern periodic law?
- In terms of period and group where would you locate the element with  $z=114$ ?
- Write the atomic number of the element present in the third period and 17<sup>th</sup> group of the periodic table.
- Which element do you think would have been named by
  - Lawrence Berkeley laboratory
  - Seaborg's group?
- What does atomic radius and ionic radius really mean to you?
- What do you understand by isoelectronic species? name a species that will be isoelectronic with each of the following atoms or ions.
  - $F^-$
  - Ar
  - $Mg^{2+}$
  - Rb+
- Consider the following species :  $N^{3-}, O^{2-}, F^-, Na^+, Mg^{2+}$  and  $Al^{3+}$ 
  - What is common in them?
  - Arrange them in the order of increasing ionic radii
- Explain why Cations are smaller and anions are larger in radii than their parent atoms?

- What is the significance of the terms 'isolated gaseous atom and ground state while defining the ionization enthalpy and electron gain enthalpy?
- Energy of electron in the ground state of the hydrogen atom is  $-2.18 \times 10^{-18} \text{ J}$ . calculate the ionization enthalpy of atomic hydrogen in terms of J/mol
- Among the second period elements, the actual ionization enthalpies are in the order:  $Li < B < Be < C < O < N < F < Ne$   
explain why : (a) Be has higher  $\Delta_i H$  than B (b) O has lower  $\Delta_i H$  than N and F?
- What are the various factors due to which the ionization enthalpy of the main group elements tends to decrease down the group?
- The first ionization enthalpy values (in kJ/mol) of group 13 elements are:
 

B	Al	Ga	In	Tl
801	577	579	558	589

 How would you explain this deviation from the general trend ?
- Would you expect the second electron gain enthalpy of O as +ve, more -ve or less -ve than the first? Justify your answer
- Use the periodic table to answer the following questions:
  - Identify an element with -5 electrons in the outer sub-shell.
  - Identify an element that would tend to lose two electrons
  - Identify an element that would tend to gain two electrons
  - Identify the group having metal non-metal, liquid as well as gas at the room temperature.
- Assign the position of the element having outer electronic configuration:
  - $ns^2 np^4$  for  $n=3$
  - $(n-1)d^2 ns^2$  for  $n=4$  and
  - $(n-2)f^7 (n-1)d^1 ns^2$  for  $n=6$ , in the periodic table
- Considering the elements B, Al, Mg and K, the correct order of the metallic character is?
- Considering the elements F, Cl, O and N, the correct order of their chemical reactivity in terms of oxidizing property is:
- the first ( $\Delta_i H_1$ ) and second ( $\Delta_i H_2$ ) ionization enthalpies and electron gain enthalpies ( $\Delta_{eg} H$ ) few elements are given below ;

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Element	$\Delta_i H_1$ (kJ/mol)	$\Delta_i H_2$ (kJ/mol)	$\Delta_{eg} H$ (kJ/mol)
I	530	7300	-60
II	419	3051	-48
III	1681	3374	-328
IV	1008	1846	-295
V	2372	5251	+48
VI	738	1451	-40

which of the above element is likely to be ;

- The least reactive element
- The most reactive element
- The most reactive non- metal
- The least reactive non- metal
- The metal which can form stable binary halide of the formula  $MX_2$