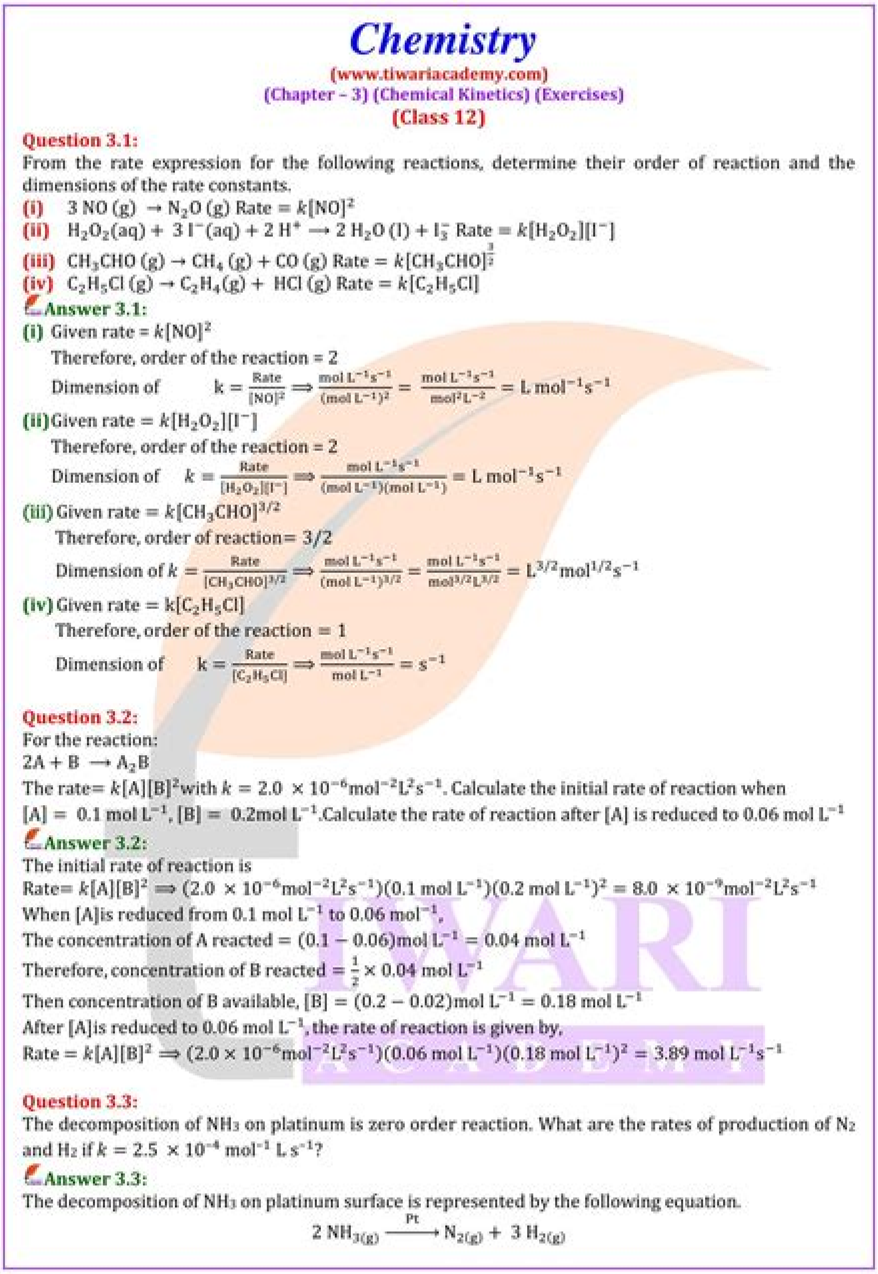
# Lessons In Chemistry Chapters



## Chemistry

(www.tiwariacademy.com)
(Chapter – 3) (Chemical Kinetics) (Exercises)
(Class 12)

**Question 3.1:**

From the rate expression for the following reactions, determine their order of reaction and the dimensions of the rate constants.

(i) $3\,NO\,(g) \rightarrow N_2O\,(g)$ Rate $= k[NO]^2$

(ii) $H_2O_2(aq) + 3\,I^-(aq) + 2\,H^+ \longrightarrow 2\,H_2O\,(l) + I_3^-$ Rate $= k[H_2O_2][I^-]$

(iii) $CH_3CHO\,(g) \rightarrow CH_4\,(g) + CO\,(g)$ Rate $= k[CH_3CHO]^{\frac{3}{2}}$

(iv) $C_2H_5Cl\,(g) \rightarrow C_2H_4(g) + HCl\,(g)$ Rate $= k[C_2H_5Cl]$

**Answer 3.1:**

(i) Given rate $= k[NO]^2$

Therefore, order of the reaction = 2

Dimension of $k = \frac{\text{Rate}}{[NO]^2} \Longrightarrow \frac{\text{mol L}^{-1}\text{s}^{-1}}{(\text{mol L}^{-1})^2} = \frac{\text{mol L}^{-1}\text{s}^{-1}}{\text{mol}^2\text{L}^{-2}} = \text{L mol}^{-1}\text{s}^{-1}$

(ii) Given rate $= k[H_2O_2][I^-]$

Therefore, order of the reaction = 2

Dimension of $k = \frac{\text{Rate}}{[H_2O_2][I^-]} \Longrightarrow \frac{\text{mol L}^{-1}\text{s}^{-1}}{(\text{mol L}^{-1})(\text{mol L}^{-1})} = \text{L mol}^{-1}\text{s}^{-1}$

(iii) Given rate $= k[CH_3CHO]^{3/2}$

Therefore, order of reaction= 3/2

Dimension of $k = \frac{\text{Rate}}{[CH_3CHO]^{3/2}} \Longrightarrow \frac{\text{mol L}^{-1}\text{s}^{-1}}{(\text{mol L}^{-1})^{3/2}} = \frac{\text{mol L}^{-1}\text{s}^{-1}}{\text{mol}^{3/2}\text{L}^{3/2}} = \text{L}^{3/2}\text{mol}^{1/2}\text{s}^{-1}$

(iv) Given rate $= k[C_2H_5Cl]$

Therefore, order of the reaction = 1

Dimension of $k = \frac{\text{Rate}}{[C_2H_5Cl]} \Longrightarrow \frac{\text{mol L}^{-1}\text{s}^{-1}}{\text{mol L}^{-1}} = \text{s}^{-1}$

**Question 3.2:**

For the reaction:

$2A + B \longrightarrow A_2B$

The rate= $k[A][B]^2$ with $k = 2.0 \times 10^{-6}\text{mol}^{-2}\text{L}^2\text{s}^{-1}$. Calculate the initial rate of reaction when $[A] = 0.1\text{ mol L}^{-1}$, $[B] = 0.2\text{mol L}^{-1}$.Calculate the rate of reaction after [A] is reduced to $0.06\text{ mol L}^{-1}$

**Answer 3.2:**

The initial rate of reaction is

Rate= $k[A][B]^2 \Longrightarrow (2.0 \times 10^{-6}\text{mol}^{-2}\text{L}^2\text{s}^{-1})(0.1\text{ mol L}^{-1})(0.2\text{ mol L}^{-1})^2 = 8.0 \times 10^{-9}\text{mol}^{-2}\text{L}^2\text{s}^{-1}$

When [A]is reduced from $0.1\text{ mol L}^{-1}$ to $0.06\text{ mol}^{-1}$,

The concentration of A reacted $= (0.1 - 0.06)\text{mol L}^{-1} = 0.04\text{ mol L}^{-1}$

Therefore, concentration of B reacted $= \frac{1}{2} \times 0.04\text{ mol L}^{-1}$

Then concentration of B available, $[B] = (0.2 - 0.02)\text{mol L}^{-1} = 0.18\text{ mol L}^{-1}$

After [A]is reduced to $0.06\text{ mol L}^{-1}$, the rate of reaction is given by,

Rate $= k[A][B]^2 \Longrightarrow (2.0 \times 10^{-6}\text{mol}^{-2}\text{L}^2\text{s}^{-1})(0.06\text{ mol L}^{-1})(0.18\text{ mol L}^{-1})^2 = 3.89\text{ mol L}^{-1}\text{s}^{-1}$

**Question 3.3:**

The decomposition of $NH_3$ on platinum is zero order reaction. What are the rates of production of $N_2$ and $H_2$ if $k = 2.5 \times 10^{-4}\text{ mol}^{-1}\text{ L s}^{-1}$?

**Answer 3.3:**

The decomposition of $NH_3$ on platinum surface is represented by the following equation.

$$2\,NH_{3(g)} \xrightarrow{Pt} N_{2(g)} + 3\,H_{2(g)}$$

Lessons in Chemistry chapters provide a unique blend of scientific inquiry and personal growth, exploring the life of a woman in the 1960s who navigates both the challenges of a male-dominated field and her own personal struggles. This article delves into the key chapters of the book, summarizing their content, themes, and the lessons they impart. Through the lens of chemistry, we will uncover the broader implications on society, gender roles, and perseverance.

# Chapter 1: The Introduction to Elizabeth Zott

## Character Overview

The opening chapter introduces us to Elizabeth Zott, a brilliant chemist whose passion for science is overshadowed by the societal norms of her time. She is depicted as a strong-willed and determined individual who faces numerous obstacles in her career due to her gender.

## Thematic Elements

- Societal Expectations: The chapter sets the tone for the struggles faced by women in the workforce during the 1960s.
- Passion for Science: Elizabeth's love for chemistry is evident, showcasing how her intellect goes beyond traditional gender roles.

# Chapter 2: The Chemical Reaction of Life

## Metaphorical Chemistry

In this chapter, Elizabeth draws parallels between chemical reactions and the complexities of human relationships. She often uses scientific principles to explain emotional dynamics, emphasizing how both require careful balance and understanding.

## Key Lessons

1. Understanding Reactions: Just as chemicals react under specific conditions, human relationships require the right environment to thrive.
2. Importance of Balance: The chapter illustrates the necessity of balance in both chemistry and life,

where extremes can lead to disastrous outcomes.

# Chapter 3: Breaking Barriers

## Professional Challenges

Elizabeth's struggles in the male-dominated field of chemistry become more pronounced in this chapter. She faces discrimination and skepticism from her colleagues, which highlights the systemic barriers women encounter in STEM fields.

## Empowerment Themes

- Resilience: Elizabeth's determination to prove herself serves as a powerful message about perseverance.
- Advocacy for Change: The chapter encourages readers to challenge societal norms and advocate for gender equality in the workplace.

# Chapter 4: Love and Chemistry

## Romantic Developments

This chapter explores Elizabeth's romantic relationship with her colleague, which adds a layer of complexity to her life. The interplay between her personal and professional life is examined, revealing how love can both inspire and complicate.

### Insights on Relationships

- Chemistry in Love: Just as in scientific experiments, relationships require effort, understanding, and sometimes, a willingness to take risks.
- Impact of Gender Roles: The chapter critiques traditional gender roles in relationships, challenging the notion that women must conform to societal expectations.

## Chapter 5: The Kitchen as a Laboratory

### Reinventing the Domestic Sphere

In a surprising turn, Elizabeth finds herself in the role of a homemaker, where she applies her scientific knowledge to cooking. This chapter serves to redefine the kitchen as a space of experimentation and creativity.

### Key Takeaways

1. Everyday Chemistry: Demonstrates how chemistry can be applied in daily life, emphasizing that science is not confined to laboratories.
2. Empowerment Through Knowledge: Elizabeth's innovative approach to cooking empowers her to reclaim her identity in a world that seeks to limit her.

## Chapter 6: The Ripple Effect

### Influencing Others

As Elizabeth begins to teach others about cooking and chemistry, she realizes the impact she can have on her community. This chapter highlights the importance of mentorship and sharing knowledge.

### Lessons on Teaching

- Knowledge Sharing: The chapter emphasizes that teaching is not just about imparting knowledge but also about inspiring others to think critically.
- Community Building: By engaging with her community, Elizabeth fosters connections that empower others, showcasing the importance of collaboration.

## Chapter 7: The Experiment of Life

### Taking Risks

This chapter focuses on the notion of experimentation, both in science and in life. Elizabeth reflects on her choices and the risks she has taken to pursue her dreams.

### Life Lessons

1. Embracing Uncertainty: Life, much like scientific experiments, is filled with unpredictability; embracing this can lead to growth.
2. Learning from Failure: Failure is an integral part of the experimental process, and the chapter encourages readers to view setbacks as opportunities for learning.

## Chapter 8: The Power of Community

### Building Bonds

Elizabeth’s interactions with her neighbors and her role in the community become central themes in this chapter. The importance of support networks is emphasized, showcasing how they can uplift individuals in challenging times.

## Impact of Community

- Support Systems: The chapter illustrates how community can provide emotional and practical support, crucial for personal and professional growth.
- Collective Strength: By working together, individuals can create change and challenge societal norms.

# Chapter 9: The Future of Chemistry

## Vision for Change

In the final chapter, Elizabeth reflects on her journey and the future of women in science. She envisions a world where gender equality is the norm and where women can thrive in their chosen fields.

## Hope and Inspiration

- Legacy of Change: Elizabeth’s story serves as a beacon of hope for future generations, encouraging them to pursue their passions regardless of societal barriers.
- Call to Action: The chapter ends with a powerful message urging readers to advocate for change, emphasizing that everyone has a role to play in dismantling systemic inequalities.

# Conclusion

Lessons in Chemistry chapters provide not only a compelling narrative about Elizabeth Zott’s life but also impart valuable lessons about resilience, empowerment, and the importance of pursuing one’s passion. Through the lens of chemistry, the book explores themes of gender equality, the power of community, and the necessity of embracing uncertainty. As readers journey through Elizabeth’s experiences, they are left with a profound understanding of the complexities of life and the enduring spirit of those who dare to challenge the status quo. The lessons learned in these chapters resonate far beyond the world of science, inspiring individuals to forge their own paths and advocate for a more equitable society.

## Frequently Asked Questions

### What are the main themes explored in the first chapter of 'Lessons in Chemistry'?

The first chapter introduces the protagonist, Elizabeth Zott, and sets the stage for her struggles as a female chemist in the male-dominated scientific community of the 1960s.

### How does Elizabeth Zott's character challenge societal norms in 'Lessons in Chemistry'?

Elizabeth Zott defies traditional gender roles by pursuing her passion for chemistry and advocating for women's rights, demonstrating resilience and intelligence in a world that often marginalizes women.

### What role does science play in the development of the plot in 'Lessons in Chemistry'?

Science serves as a central motif in the book, not only guiding the narrative but also symbolizing empowerment and the quest for knowledge, as Elizabeth uses her scientific expertise to navigate personal and societal challenges.

### How does the author use humor to address serious themes in 'Lessons in Chemistry'?

The author employs humor to lighten the exploration of serious themes such as sexism, loss, and resilience, making the narrative engaging while still prompting reflection on these important issues.

## What is the significance of the cooking show in 'Lessons in Chemistry'?

The cooking show becomes a platform for Elizabeth to share her scientific knowledge with a wider audience, blending chemistry and domestic life while empowering other women to embrace their intelligence.

## In 'Lessons in Chemistry', how does Elizabeth Zott's relationship with her daughter influence her actions?

Elizabeth's relationship with her daughter drives her determination to create a better world for future generations, motivating her to challenge the status quo and instill the value of education and independence in her child.

## What lessons about perseverance can be learned from Elizabeth Zott's journey in 'Lessons in Chemistry'?

Elizabeth's journey teaches readers about the importance of perseverance in the face of adversity, highlighting how resilience and a commitment to one's principles can lead to personal growth and societal change.

## How does 'Lessons in Chemistry' address the intersection of science and personal identity?

The book explores how Elizabeth's identity as a scientist intersects with her roles as a woman and mother, illustrating the complexities of balancing personal aspirations with societal expectations.

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