

chemistry 9701 june 11 paper 2 answers Handbook

chemistry 9701 june 11 paper 2 answers

Are you preparing for the Chemistry 9701 examination scheduled for June 11? Whether you're a student aiming for top marks or a teacher seeking reliable answer keys, understanding the detailed solutions for Paper 2 of the Chemistry 9701 exam is essential. This article provides comprehensive and well-structured answers to help you grasp key concepts, improve your exam techniques, and boost your confidence. Dive into the detailed solutions, tips, and important points related to the Chemistry 9701 June 11 Paper 2.

Overview of Chemistry 9701 June 11 Paper 2

Before diving into the answers, it's important to understand what Paper 2 typically covers. The Chemistry 9701 June 11 exam consists of structured questions that assess a student's understanding of various chemistry topics, including physical chemistry, inorganic chemistry, and organic chemistry.

Key features of Paper 2:

- Structured questions divided into sections
- Emphasis on calculations, explanations, and diagrams
- Time management is crucial due to the variety of questions
- Focused on application of concepts rather than rote memorization

General Approach to Answering Paper 2 Questions

To maximize your scores, adopt a strategic approach:

1. Read Questions Carefully

- Understand what is being asked
- Highlight keywords and command words (e.g., explain, calculate, compare)

2. Plan Your Answers

- Allocate time for each question
- Decide which questions to answer first based on confidence

3. Write Clear and Concise Answers

- Use proper scientific terminology
- Label diagrams clearly
- Show all calculations step-by-step

4. Review Your Answers

- Check for errors
- Ensure all parts of multi-part questions are answered

Detailed Answers to Common Chemistry 9701 June 11 Paper 2 Questions

Below is a breakdown of typical questions and model answers based on the June 11 Paper 2.

Question 1: Physical Chemistry Calculations

Q1.1: Calculate the molar mass of a compound given its percentage composition.

Sample Data:

Compound contains 40% Carbon, 6.7% Hydrogen, and 53.3% Oxygen.

Answer:

- Assume 100 g of compound:
 - Carbon: 40 g
 - Hydrogen: 6.7 g
 - Oxygen: 53.3 g
- Calculate number of moles for each element:

- Moles of Carbon = $40 / 12.01 \approx 3.33$ mol
- Moles of Hydrogen = $6.7 / 1.008 \approx 6.65$ mol
- Moles of Oxygen = $53.3 / 16.00 \approx 3.33$ mol

- Find the simplest ratio:

- Carbon : Hydrogen : Oxygen $\approx 3.33 : 6.65 : 3.33$
- Divide all by 3.33:
- C ≈ 1
- H ≈ 2
- O ≈ 1

- Empirical formula: CH_2O

- Molar mass of empirical formula:

- $\text{C} (12.01) + \text{H}_2 (2.016) + \text{O} (16.00) \approx 30.03$ g/mol

- If molar mass of the compound is known or given, determine molecular formula accordingly.

Question 2: Organic Chemistry

Q2.1: Draw the structure of an organic compound based on IUPAC name.

Sample Name: Ethanol

Answer:

- The structure of ethanol is $\text{CH}_3\text{CH}_2\text{OH}$.
- Draw a two-carbon chain with a hydroxyl group attached to the first carbon.
- Label all atoms and bonds clearly.

Diagram:

...

H H

||

H?C?C?OH

||

H H

...

Key points:

- Recognize that ethanol is a primary alcohol.
- Understand the functional group (?OH).

Question 3: Inorganic Chemistry and Periodic Table

Q3.1: Explain the trend in atomic radius across a period and down a group.

Answer:

- Across a period: Atomic radius decreases as you move from left to right.

Reason: Increasing nuclear charge pulls electrons closer to the nucleus, reducing size.

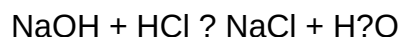
- Down a group: Atomic radius increases as you move down the group.

Reason: Additional electron shells are added, increasing the size despite increased nuclear charge.

Question 4: Chemical Equations and Reactions

Q4.1: Write the balanced chemical equation for the reaction between sodium hydroxide and hydrochloric acid.

Answer:



Explanation:

- Sodium hydroxide reacts with hydrochloric acid to produce sodium chloride (salt) and water.
- The reaction is a typical acid-base neutralization.

Additional Tips for Chemistry Paper 2 Success

Understanding Key Concepts:

- Master the periodic table trends
- Be comfortable with organic reaction mechanisms
- Practice stoichiometry and calculations regularly
- Know common inorganic compounds and their uses

Practicing Past Papers:

- Review previous exam questions to familiarize yourself with question styles
- Time yourself during practice to improve speed

Using Model Answers Effectively:

- Compare your answers with model solutions
- Identify areas for improvement
- Learn how to structure longer answers coherently

Resources for Further Preparation

- Official Cambridge Chemistry Past Papers and Mark Schemes
- Chemistry textbooks with detailed explanations
- Online tutorials and video lessons
- Revision guides focusing on Paper 2 topics

Conclusion

Achieving success in Chemistry 9701 June 11 Paper 2 requires understanding the exam structure, practicing questions thoroughly, and mastering key concepts across all chemistry branches. Use this guide as a comprehensive resource for answers, tips, and strategies to excel in your exam. Remember, consistent preparation and active engagement with past papers will significantly enhance your confidence and performance. Good luck!

Chemistry 9701 June 11 Paper 2 Answers: An In-Depth Analysis and Review

Chemistry, often regarded as the central science, bridges the gap between physics and biology, offering insights into the fundamental nature of matter and energy. For students preparing for the Cambridge International AS & A Level Chemistry examination, specifically the 9701 syllabus, understanding the structure and expected answers of past papers is crucial. This review delves into the June 11 Paper 2 answers, providing a comprehensive, analytical perspective that not only elucidates the correct responses but also explores the underlying concepts, common pitfalls, and strategies for mastery.

Overview of the Chemistry 9701 June 11 Paper 2

The June 11 Paper 2 of the Chemistry 9701 syllabus is designed to assess students' understanding of core concepts through structured questions requiring detailed written responses. Unlike Paper 1, which often tests multiple-choice and short-answer questions, Paper 2 emphasizes longer, explanatory answers, calculations, and application-based questions.

Key features of the paper include:

- A diverse range of questions spanning inorganic, organic, and physical chemistry.
- Emphasis on data analysis, calculations, and conceptual understanding.
- Questions structured to evaluate reasoning, problem-solving, and practical knowledge.

Understanding the answers provided for this paper offers students insights into the examiners' expectations, marking schemes, and common approaches to answering complex questions.

Section 1: Inorganic Chemistry ? Transition Elements and Periodic Trends

Question 1: Properties of Transition Metals

Sample Question: Describe the general properties of transition metals and explain why they exhibit

variable oxidation states.

Answer Analysis:

The core properties of transition metals include:

- Variable oxidation states: Transition metals have partially filled d subshells, allowing them to lose different numbers of electrons and thus exhibit multiple oxidation states. For example, iron can exist as Fe^{2+} or Fe^{3+} .
- Formation of colored compounds: Due to d-d electronic transitions, compounds of transition metals often display vivid colors.
- Catalytic activity: Many transition metals or their compounds act as catalysts, such as Fe in Haber's process.
- Magnetic properties: Unpaired d electrons confer paramagnetism; for instance, MnO is paramagnetic.
- High melting and boiling points: Due to metallic bonding involving delocalized electrons.

Why do they exhibit variable oxidation states?

Transition metals have comparable energies between their 4s and 3d electrons, enabling electrons to be lost or gained relatively easily. The energy difference between these orbitals allows multiple oxidation states to be stabilized, especially when forming complex ions.

Implications for students:

Understanding the electronic structure and energy considerations is essential. Examiners often look for explanations related to electron configurations, stability of oxidation states, and the role of d orbital involvement.

Section 2: Organic Chemistry ? Hydrocarbons and Functional Groups

Question 2: Nomenclature and Isomerism in Organic Compounds

Sample Question: Name the compound with the molecular formula C_4H_8 and describe possible structural isomers.

Answer Analysis:

Compounds with C_4H_8 are alkenes or cycloalkanes. The main isomers include:

- But-1-ene: $\text{CH}_2=\text{CHCH}_2\text{CH}_3$
- But-2-ene: $\text{CH}_3\text{CH}=\text{CHCH}_3$
- Cyclobutane: a cyclic structure with four carbon atoms.
- 2-Methylpropene (isobutene): $(\text{CH}_3)_2\text{C}=\text{CH}_2$

Structural Isomerism Explanation:

Structural isomers differ in the connectivity of their atoms. For C_4H_8 , the possibilities include:

- Chain isomers (e.g., but-1-ene vs. but-2-ene)
- Geometric isomers (cis/trans) in alkenes like but-2-ene
- Ring structures like cyclobutane

Key points for students:

Be familiar with nomenclature rules, such as identifying the longest chain, the position of double bonds, and substituents. Recognizing types of isomerism is critical for full credit.

Section 3: Physical Chemistry ? Reaction Kinetics and Equilibrium

Question 3: Factors Affecting Reaction Rate

Sample Question: Discuss the effect of temperature and concentration on the rate of a chemical reaction.

Answer Analysis:

Effect of Temperature:

- Increasing temperature provides reactant molecules with more kinetic energy.
- This results in a higher proportion of molecules possessing energy above the activation energy barrier.
- Consequently, the frequency of successful collisions increases, accelerating the reaction rate.
- The Arrhenius equation ($k = A e^{(-E_a/RT)}$) mathematically illustrates this relationship, where a rise in temperature increases the rate constant (k).

Effect of Concentration:

- Higher concentration implies more reactant particles per unit volume.
- This leads to more frequent collisions, increasing the probability of successful interactions.
- For reactions with simple mechanisms, this often results in a proportional increase in rate.

Important considerations:

- The rate law depends on the order of reaction with respect to each reactant.
- Catalysts lower the activation energy, thus increasing reaction rate without affecting equilibrium position.

Section 4: Quantitative Chemistry ? Calculations and Data Interpretation

Question 4: Empirical and Molecular Formulas

Sample Question: Given the mass composition of a compound, determine its empirical and molecular formulas.

Answer Analysis:

Suppose a compound contains 40% carbon, 6.7% hydrogen, and 53.3% oxygen.

Steps to determine empirical formula:

- Convert percentages to grams (assuming 100 g sample):

- C: 40 g
- H: 6.7 g
- O: 53.3 g

- Convert grams to moles:

- C: $40 / 12.01 \approx 3.33$ mol
- H: $6.7 / 1.008 \approx 6.65$ mol
- O: $53.3 / 16.00 \approx 3.33$ mol

- Divide by the smallest number of moles:

- C: $3.33 / 3.33 = 1$

- H: $6.65 / 3.33 = 2$

- O: $3.33 / 3.33 = 1$

- Empirical formula: CH_2O

Determining molecular formula:

If the molar mass of the compound is known (e.g., 180 g/mol),

- Calculate empirical formula mass: $12 + 2(1) + 16 = 30 \text{ g/mol}$

- Divide molecular mass by empirical formula mass: $180 / 30 = 6$

- Multiply subscripts by 6: $(\text{CH}_2\text{O})_6 = \text{C}_6\text{H}_{12}\text{O}_6$

Key points:

Proper unit conversions and understanding molar ratios are essential. Examiners look for clear, step-by-step calculations.

Section 5: Practical Skills and Data Analysis

Question 5: Titration and Purity Calculations

Sample Question: A student titrates a sample of impure sodium carbonate with hydrochloric acid. The titration requires 25.0 cm^3 of HCl solution. Calculate the purity of the sodium carbonate sample, given the concentration of HCl is 0.100 mol/dm^3 .

Answer Analysis:

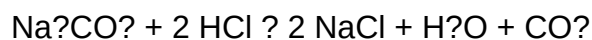
- Convert titration volume to liters:

$$25.0 \text{ cm}^3 = 0.0250 \text{ dm}^3$$

- Calculate moles of HCl used:

Moles = concentration $\times$ volume = $0.100 \text{ mol/dm}^3 \times 0.0250 \text{ dm}^3 = 2.50 \times 10^{-3} \text{ mol}$

- Reaction:



- Moles of Na_2CO_3 = moles of HCl / 2

- Moles of Na_2CO_3 = $1.25 \times 10^{-3} \text{ mol}$

- Calculate the mass of pure sodium carbonate:

Molar mass of Na_2CO_3 = $(2 \times 23) + 12 + (3 \times 16) = 106 \text{ g/mol}$

Mass = moles $\times$ molar mass = $1.25 \times 10^{-3} \text{ mol} \times 106 \text{ g/mol} = 0.1325 \text{ g}$

- Purity calculation:

If the original sample weighed, say, 0.200 g,

Purity = (mass of pure Na_2CO_3 / total mass) $\times 100\%$ = $(0.1325 / 0.200) \times 100\% = 66.25\%$

Examiner's focus:

Accurate titration calculations, understanding stoichiometry, and conveying calculations neatly are vital.

Conclusion: Mastery of Chemistry 9701 June 11 Paper 2

The detailed answers and explanations for the June 11 Paper 2 of the Chemistry 9701 syllabus reveal that success hinges on a thorough understanding of fundamental concepts, precise calculations, and clear communication.

Question What are the key topics covered in the Chemistry 9701 June 11 Paper 2 answers? The key topics include atomic structure, chemical bonding, periodic table trends, acids and bases, organic chemistry, energetics, and electrochemistry. How can I effectively review the Chemistry 9701 June 11 Paper 2 answers for exam preparation? Focus on understanding the concepts behind each answer, practice solving similar questions, and review mark schemes to

grasp the examiner's expectations. Are there any common mistakes to watch out for when answering questions from the Chemistry 9701 June 11 Paper 2? Yes, common mistakes include misinterpreting questions, incorrect units, overlooking key details in calculations, and providing incomplete explanations. What is the significance of practicing past papers like the Chemistry 9701 June 11 Paper 2? Practicing past papers helps familiarize you with exam patterns, improves time management, and boosts confidence by understanding the types of questions frequently asked. Where can I find reliable solutions or model answers for the Chemistry 9701 June 11 Paper 2? Reliable solutions can be found on official examination board websites, educational forums, tutoring platforms, and through teachers or qualified tutors who provide model answers. How should I approach answering long-answer questions in the Chemistry 9701 June 11 Paper 2? Plan your answers before writing, include relevant diagrams and equations, structure your response clearly, and ensure your explanations are detailed yet concise. What tips can help improve my score on Chemistry Paper 2 based on the June 11 answers? Focus on understanding core concepts, practice applying knowledge to different contexts, review examiner reports for common weaknesses, and ensure clarity and accuracy in your answers.

Related keywords: chemistry 9701, june 11 paper 2, chemistry answers, chemistry paper 2 solutions, 9701 chemistry exam, chemistry revision, chemistry past paper, chemistry exam answers, chemistry question paper, chemistry grade 11 solutions

Scipad Biology Answers

scipad biology answers are essential tools for students and educators seeking to excel in biology coursework and assessments. Scipad, a popular digital learning platform, offers a variety of resources, including practice questions, quizzes, and detailed answer explanations that aid in mastering complex biological concepts. This article provides a comprehensive overview of scipad biology answers, their importance, how to utilize them effectively, and tips for maximizing learning outcomes.

Understanding Scipad Biology Answers

What Are Scipad Biology Answers?

Scipad biology answers are the solutions and explanations provided for questions found within the Scipad platform's biology modules. These answers are carefully curated by educators and subject matter experts to ensure accuracy and clarity. They serve as a valuable reference for students to verify their responses, understand the reasoning behind correct answers, and reinforce their learning.

The Role of Scipad Biology Answers in Learning

Using scipad biology answers enhances the learning experience by:

- Providing immediate feedback on practice questions
- Clarifying complex biological processes and terminology
- Helping students identify areas that need improvement
- Facilitating self-paced learning outside the classroom
- Preparing effectively for exams and quizzes

Benefits of Using Scipad Biology Answers

1. Accurate and Reliable Content

One of the primary advantages of scipad biology answers is their accuracy. Developed by qualified educators, these answers are aligned with current biology curricula and standards, ensuring students receive trustworthy information.

2. Enhanced Understanding of Concepts

Detailed explanations accompanying answers help students grasp underlying biological principles, promoting deeper understanding beyond rote memorization.

3. Time-Efficient Study Sessions

Quick access to correct answers allows students to assess their performance swiftly, enabling more efficient review sessions.

4. Support for Different Learning Styles

Whether visual, auditory, or kinesthetic learners, students can benefit from diverse explanations and interactive content available through scipad.

How to Effectively Use Scipad Biology Answers

1. Attempt Questions First

Before consulting the answers, attempt to solve questions independently. This practice encourages critical thinking and problem-solving skills.

2. Review Correct Answers Carefully

After completing questions, compare your responses with the provided answers. Pay attention to explanations to understand why certain options are correct or incorrect.

3. Focus on Explanation Details

Go beyond the correct answer and study the detailed breakdowns. This will deepen your comprehension of biological concepts and processes.

4. Use Answers as Learning Tools

Instead of passively copying answers, use them as learning tools to explore related topics, clarify doubts, and reinforce your knowledge.

5. Incorporate Practice Tests

Regularly use scipad biology practice tests with answers to simulate exam conditions and build confidence.

Tips for Maximizing the Benefits of Scipad Biology Answers

1. Create a Study Schedule

Consistency is key. Dedicate specific times for practicing with scipad resources, ensuring steady progress.

2. Take Notes While Reviewing Answers

Summarize explanations in your own words, which aids retention and understanding.

3. Engage with Interactive Features

Leverage interactive diagrams, videos, and quizzes available on scipad to diversify your learning methods.

4. Clarify Doubts Promptly

If certain answers or explanations are unclear, seek help from teachers or online forums to ensure comprehension.

5. Track Your Progress

Maintain a record of questions answered and concepts mastered to identify strengths and areas needing improvement.

Common Topics Covered by Scipad Biology Answers

Scipad biology answers span a wide range of topics, reflecting the diverse curriculum of biology courses. Some of the most common areas include:

- Cell Structure and Function
- Genetics and Heredity
- Evolution and Natural Selection
- Human Anatomy and Physiology
- Plant Biology and Photosynthesis
- Microorganisms and Diseases
- Ecology and Environment
- Biological Processes and Cycles

Each topic has associated practice questions with detailed answers, enabling comprehensive review and mastery.

Challenges and Considerations When Using Scipad Answers

1. Dependence on Answers

While answers are valuable, over-reliance can hinder the development of problem-solving skills. It's important to attempt questions independently first.

2. Ensuring Up-to-Date Content

Biology is an evolving science. Ensure that the scipad content is current and aligns with the latest curriculum standards.

3. Verifying Correctness

Occasionally, errors might occur. Cross-reference answers with textbooks or trusted online resources for confirmation.

Conclusion

In summary, scipad biology answers are a powerful resource for students aiming to excel in biology. They provide accurate, detailed explanations that foster understanding, support effective revision, and boost exam readiness. By integrating scipad answers into a structured study plan, students can enhance their grasp of biological concepts, develop critical thinking skills, and achieve academic success. Remember to use these answers as a supplement to active learning strategies, ensuring a well-rounded and effective approach to mastering biology.

Scipad Biology Answers: A Comprehensive Guide to Mastering Scipad's Resources

In the realm of biology education, students constantly seek effective tools to enhance their understanding and retention of complex concepts. Among these tools, Scipad Biology Answers stand out as a vital resource for learners aiming to excel in their studies. Whether you're preparing for exams, revising key topics, or seeking clarification on challenging concepts, accessing accurate and detailed answers from Scipad can make a significant difference. This guide aims to explore the importance of Scipad Biology answers, how to utilize them effectively, and tips for maximizing their benefits to foster a deeper comprehension of biological sciences.

Understanding Scipad and Its Role in Biology Education

What is Scipad?

Scipad is an educational platform designed to offer comprehensive resources for students across various subjects, with a strong focus on biology. It provides a wide range of study materials, including notes, quizzes, and most notably, detailed answers to textbook exercises and questions. These answers are curated to align with curriculum standards, making them reliable tools for learning and revision.

Why Are Scipad Biology Answers Important?

- Clarify Difficult Concepts: They help break down complex biological processes into understandable explanations.
- Aid in Exam Preparation: Well-structured answers serve as excellent revision tools for exams.
- Ensure Accuracy: Reliable answers minimize misunderstandings that could arise from incorrect or incomplete information.
- Enhance Critical Thinking: Comparing your answers with Scipad's encourages analytical thinking and self-assessment.

How to Effectively Use Scipad Biology Answers

Maximizing the benefits of Scipad answers involves more than just reading. It's about strategic

engagement to deepen understanding and develop exam skills.

Step 1: Use Answers as a Learning Tool, Not Just a Shortcut

While it might be tempting to copy answers directly, the true value lies in understanding the reasoning behind each response.

- Read Carefully: Analyze the explanations provided.
- Identify Key Points: Highlight essential concepts, definitions, and processes.
- Compare Your Work: Assess where your answers align or differ, and understand why.

Step 2: Practice Active Learning

- Attempt Questions First: Before consulting the answers, try solving questions independently.
- Use Answers to Check and Correct: After attempting, compare with Scipad's solutions to identify gaps in knowledge.
- Rewrite or Summarize: Paraphrase answers to reinforce comprehension.

Step 3: Incorporate into Study Routines

- Regular Revision: Use answers to review topics periodically.
- Focused Study Sessions: Target areas where your answers and Scipad's diverge.
- Create Summaries: Develop concise notes based on detailed answers to aid quick revision.

Navigating Common Challenges with Scipad Biology Answers

While Scipad offers valuable resources, users may encounter some challenges. Here are common issues and strategies to overcome them:

Challenge 1: Over-Reliance on Answers

Solution: Use answers as a guide rather than a crutch. Always aim to understand the why behind each response.

Challenge 2: Outdated or Incomplete Answers

Solution: Cross-reference answers with textbooks, class notes, or reputable online resources to ensure accuracy and completeness.

Challenge 3: Difficulty in Understanding Explanations

Solution: Break down complex explanations into simpler parts, and seek additional resources or videos for clarification.

Best Practices for Using Scipad Biology Answers Effectively

To truly benefit from Scipad, students should adopt best practices, including:

- Active Engagement: Don't passively read answers; interact with them.
- Contextual Learning: Relate answers to real-life examples or practical applications for better retention.
- Question Development: Use answers to generate your own questions for further exploration.
- Group Study: Discuss answers with peers to gain different perspectives and deepen understanding.

Enhancing Learning with Supplementary Resources

While Scipad answers are valuable, supplement your study with other resources:

- Biology Textbooks: For detailed explanations and diagrams.
- Online Tutorials and Videos: Platforms like Khan Academy or YouTube channels specializing in biology.
- Practice Tests: To simulate exam conditions and test your knowledge.
- Flashcards: For memorizing definitions, processes, and terminology.

Ethical Use and Academic Integrity

While leveraging Scipad biology answers can be highly beneficial, it's crucial to uphold academic integrity:

- Avoid Plagiarism: Use answers for learning, not for submitting as your own work.
- Develop Your Own Responses: Use answered questions to guide your understanding and craft original responses.
- Cite Resources: When referencing information from Scipad, give appropriate acknowledgment if required.

Final Thoughts: Mastering Biology with Scipad Answers

Scipad Biology Answers are an invaluable resource for students striving to excel in their biological sciences coursework. They serve as guides, clarifiers, and confidence boosters when used correctly. Remember, the goal is not just to memorize answers but to develop a genuine understanding of biology's fundamental principles. By integrating Scipad answers into a strategic study plan?complemented with other resources, active learning techniques, and ethical practices?you can unlock your full potential and achieve academic success in biology. Embrace these answers as stepping stones towards mastery, and let them inspire curiosity and a lifelong passion for understanding the living world.

QuestionAnswer What is Scipad Biology and how can it help students? Scipad Biology is an educational resource that provides concise summaries and answers to biology topics, helping students prepare for exams and understand complex concepts more easily. Where can I find accurate Scipad Biology answers for my coursework? You can find accurate Scipad Biology answers on official educational websites, authorized study guides, or through reputable online platforms that offer verified solutions and explanations. How do I effectively use Scipad Biology answers for exam preparation? Use Scipad Biology answers as a supplement to your study materials by reviewing concepts, practicing questions, and ensuring you understand the explanations to reinforce your learning. Are Scipad Biology answers suitable for all grade levels? Yes, Scipad Biology offers content tailored for various grade levels, from secondary education to college, making it a versatile resource for different learners. Can I rely solely on Scipad Biology answers for my exams? While Scipad Biology answers are helpful, it's best to use them alongside textbooks, class notes, and practical exercises to achieve a comprehensive understanding of the subject. What are the common topics covered in Scipad Biology answers? Common topics include cell biology, genetics, ecology, human anatomy, plant biology, and evolution, among others, all explained in a simplified and accessible manner.

Related keywords: scipad biology solutions, scipad biology answers key, scipad biology homework help, scipad biology quiz answers, scipad biology practice questions, scipad biology review, scipad biology module answers, scipad biology guide, scipad biology assessments, scipad biology worksheets

Read the full article online: [SCIPAD BIOLOGY ANSWERS](#)