

CHEMISTRY PRACTICAL VIVA QUESTIONS Online PDF

chemistry practical viva questions are an essential component of laboratory assessments in chemistry education. They serve as a vital tool for evaluating a student's practical knowledge, understanding of experimental procedures, safety protocols, and ability to analyze and interpret data. Preparing for these viva questions is crucial for students aiming to excel in their chemistry practical exams. This article provides a comprehensive guide to common chemistry practical viva questions, tips for answering them effectively, and insights into how to boost your confidence for the viva voce. Whether you are a student preparing for board exams, university practicals, or competitive exams, this guide aims to be your ultimate resource for mastering chemistry practical viva questions.

Understanding the Importance of Chemistry Practical Viva Questions

What Are Chemistry Practical Viva Questions?

Chemistry practical viva questions are oral questions asked by examiners during or after the laboratory examination. These questions test a student's understanding of the experiment conducted, the theory behind it, safety measures, and data interpretation skills. Unlike written exams, vivas assess a student's spontaneity, clarity of thought, and practical knowledge in real-time.

Why Are They Important?

- **Assessment of Practical Skills:** Evaluate hands-on skills and procedural knowledge.
- **Understanding of Concepts:** Ensure students grasp the underlying chemical principles.
- **Safety Awareness:** Confirm knowledge of safety protocols and precautions.
- **Data Analysis and Interpretation:** Test ability to analyze experimental data critically.
- **Communication Skills:** Assess clarity, confidence, and scientific communication.

Common Types of Chemistry Practical Viva Questions

Understanding the types of questions commonly asked can help students prepare systematically. Below are categories and examples of typical viva questions in chemistry practicals.

1. Questions Related to the Experimental Procedure

- Describe the step-by-step procedure of the experiment.
- What precautions did you take during the experiment?
- How did you ensure the accuracy of your measurements?
- What reagents were used, and what is their significance?

2. Questions About Safety and Handling

- What safety precautions are necessary while handling acids/bases?
- How do you dispose of chemical waste after the experiment?
- What should you do in case of accidental spillage?

3. Questions on Theoretical Concepts

- Explain the chemical reaction involved in this experiment.
- Why is this particular indicator used?
- What is the principle behind this titration?

4. Data Recording and Analysis

- How did you record your observations?
- What calculations did you perform after the experiment?
- How do you interpret your experimental results?

5. Troubleshooting and Error Identification

- What are common errors in this experiment?
- How would you rectify a mistake if your readings are inconsistent?
- What could cause deviations in your results?

Preparing for Chemistry Practical Viva Questions

Effective preparation is key to confidently handling viva questions. Below are strategic tips to help students prepare thoroughly.

1. Master the Experimental Procedures

- Practice performing experiments multiple times to memorize steps.
- Understand the purpose of each reagent and apparatus used.
- Be aware of alternative methods or modifications.

2. Know the Theory Inside Out

- Study the chemical principles behind each experiment.
- Be clear about concepts like titration, filtration, crystallization, etc.
- Understand the significance of indicators, catalysts, and other chemicals involved.

3. Focus on Safety Protocols

- Memorize safety guidelines for handling chemicals.
- Know the proper disposal methods for different waste types.
- Be prepared to answer questions on safety precautions.

4. Practice Data Recording and Calculations

- Develop a habit of recording observations systematically.
- Practice calculations related to molarity, normality, percentage purity, etc.
- Learn to interpret graphs and data trends.

5. Anticipate and Practice Possible Questions

- Prepare answers for common viva questions listed earlier.
- Conduct mock viva sessions with friends or mentors.
- Record yourself to improve clarity and confidence.

Sample Chemistry Practical Viva Questions and Model Answers

Preparing model answers for common questions can help boost confidence. Here are some sample questions and suggested responses.

Q1: What is the purpose of titration in this experiment?

Answer: The purpose of titration is to determine the concentration of an unknown solution by reacting it with a solution of known concentration until the reaction reaches equivalence point. It

allows us to calculate the molarity or normality of the unknown solution accurately.

Q2: Why did you choose phenolphthalein as an indicator?

Answer: Phenolphthalein is chosen because it is a suitable indicator for acid-base titrations involving strong acids and strong bases. It changes color at a pH range of 8.3 to 10.0, which is close to the equivalence point in such titrations, providing a clear endpoint.

Q3: How do you ensure the accuracy of your measurements?

Answer: To ensure accuracy, I use calibrated burettes and pipettes, perform multiple titrations to obtain consistent results, and record readings carefully at eye level to avoid parallax errors. Also, I use high-quality reagents and conduct the experiment under controlled conditions.

Q4: What safety measures did you follow during the experiment?

Answer: I wore lab coats, gloves, and goggles to protect myself from splashes. I handled acids and bases carefully, avoided inhaling fumes, and disposed of chemicals in designated waste containers. I also ensured proper ventilation in the lab.

Tips to Excel in Your Chemistry Practical Viva

Achieving excellence in chemistry viva requires more than just rote memorization. Consider these tips:

- Stay Calm and Confident: Maintain composure, speak clearly, and answer confidently.
- Listen Carefully: Pay attention to the question asked before responding.
- Be Honest: If unsure about an answer, admit honestly instead of guessing.
- Use Diagrams and Charts: When appropriate, draw diagrams to illustrate your answers.
- Revise Key Concepts: Focus on fundamental concepts, safety protocols, and common procedures.

Conclusion

Chemistry practical viva questions are an integral part of laboratory examinations that assess a student's comprehensive understanding of practical skills, theoretical knowledge, and safety awareness. Preparing thoroughly by mastering experimental procedures, understanding the underlying chemical principles, practicing data analysis, and anticipating questions can significantly enhance performance. Remember, confidence, clarity, and honesty are key during your viva. Use this guide as a starting point to prepare effectively and excel in your chemistry practicals. With

consistent effort and diligent preparation, you can navigate your viva voce successfully and demonstrate your scientific competence with confidence.

Chemistry Practical Viva Questions: A Comprehensive Guide to Excelling in Your Laboratory Examination

Preparing for a chemistry practical viva can often feel daunting, especially with the wide range of questions that may be asked by examiners. The practical viva is an essential component of your chemistry lab assessment, designed to evaluate your understanding of experimental procedures, concepts, safety protocols, and analytical skills. To help you succeed, this guide provides a detailed overview of common chemistry practical viva questions, tips on how to approach them, and sample questions to practice. Whether you're a student preparing for board exams, university assessments, or competitive exams, mastering these questions will boost your confidence and performance.

Understanding the Importance of Chemistry Practical Viva

Before diving into specific questions, it's vital to understand the purpose of the chemistry practical viva. Unlike written exams, the viva tests your ability to:

- Demonstrate practical skills in conducting experiments
- Explain scientific principles behind procedures
- Identify and handle chemicals and apparatus correctly
- Analyze results critically
- Maintain safety and proper laboratory conduct

A well-prepared student can communicate clearly, justify their actions, and troubleshoot when needed?traits that are essential in any scientific career.

Common Categories of Chemistry Practical Viva Questions

The questions asked in the viva can generally be categorized into several groups:

- Preparation and Handling of Chemicals
- Experimental Procedures and Observations
- Principles and Concepts
- Safety and Precautions
- Analysis and Interpretation of Results
- Application-Based Questions

Understanding these categories helps organize your preparation effectively.

Preparation and Handling of Chemicals

- Questions on Identification and Purity of Chemicals
- How do you confirm the purity of a substance like sodium chloride?
- What are the signs that a chemical is contaminated or impure?
- How do you prepare a standard solution?

Tips: Be familiar with techniques such as titrations, melting point determination, and tests for impurities.

- Questions on Storage and Safety of Chemicals
- How should acids and bases be stored?
- What precautions should be taken when handling concentrated acids?
- Why is it important to label chemicals properly?

Tips: Emphasize safety protocols, use of PPE, and proper storage containers.

Experimental Procedures and Observations

- Explaining the Methodology
- Describe the procedure for preparing a solution of a given concentration.
- How do you perform a titration to determine the concentration of an unknown solution?
- Explain the process of standardization of a solution.

Tips: Be clear, step-by-step, and highlight key points such as measurements, timings, and controls.

- Recording and Interpreting Observations

- What observations should be noted during a precipitation reaction?
- How do you identify a color change or endpoint in titration?
- What are common errors during experiments, and how can they be minimized?

Tips: Practice noting accurate observations and understanding their significance.

Principles and Concepts

- Fundamental Concepts
- Explain the concept of molarity and molality.
- What is the principle behind titration?
- Describe the concept of solubility product (K_{sp}).

Tips: Relate concepts to practical experiments you've performed.

- Application of Theoretical Knowledge
- How does pH influence chemical reactions in the lab?
- Explain the role of indicators in titrations.
- Describe the principle of chromatography used for separation.

Tips: Use diagrams and real-life examples to enhance explanations.

Safety and Precautions

- Laboratory Safety Protocols
- What are the safety measures when working with acids and bases?
- How should you dispose of chemical waste?
- What is the procedure in case of a chemical spill?

Tips: Stress the importance of PPE, proper disposal methods, and emergency procedures.

- Handling Apparatus and Chemicals

- How do you ensure the accuracy of volumetric measurements?
- What precautions are necessary when using a burette or pipette?
- How do you prevent contamination of chemicals?

Tips: Demonstrate familiarity with apparatus handling and maintenance.

Analysis and Interpretation of Results

- Calculations and Data Analysis

- How do you calculate the molarity of an unknown solution from titration data?
- What does a high or low solubility product indicate?
- How do you interpret a titration curve?

Tips: Practice common calculations and understand the significance of data trends.

- Troubleshooting and Error Analysis

- What could cause a titration to give inconsistent results?
- How do you identify and correct systematic errors?
- What steps can be taken to improve accuracy?

Tips: Be analytical and reflective about experimental mistakes.

Application-Based Questions

- Real-Life Applications of Laboratory Techniques

- How is titration used in industry?
- Explain how chromatography helps in forensic analysis.
- Describe the role of chemistry in environmental monitoring.

Tips: Connect laboratory skills to practical applications for a holistic understanding.

- Innovative or Scenario-Based Questions

- If your reagent is contaminated, how would it affect your results?
- How would you modify an experiment to determine the concentration of a solution with unknown purity?
- What modifications can be made to improve safety during an experiment?

Tips: Think critically and creatively, demonstrating problem-solving skills.

Tips for Excelling in Your Chemistry Practical Viva

- Revise Lab Procedures Thoroughly: Know each experiment inside-out?steps, safety, and expected results.
- Practice Explaining Concepts Clearly: Focus on clarity, confidence, and logical flow when answering questions.
- Be Honest and Analytical: If unsure, admit it and explain how you would find the answer, showing your scientific approach.
- Review Safety Protocols: Demonstrate awareness of safety measures, which are critical in practical exams.
- Prepare for Common Questions: Use this guide to practice responses to frequently asked questions.
- Stay Calm and Composed: Confidence and clarity often impress examiners more than perfection.

Sample Chemistry Practical Viva Questions for Practice

- What is the principle behind titration?
- Describe the steps involved in preparing a 0.1 M sodium hydroxide solution.
- How can you identify the endpoint in a titration involving phenolphthalein?
- Why is it necessary to standardize your titrant before titrating an unknown solution?
- Explain the importance of using a burette in titration experiments.
- What safety precautions should you take when handling concentrated sulfuric acid?
- How do you determine the purity of a sample using melting point or boiling point?
- Describe the process of separating components of a mixture using chromatography.
- What could cause a titration to be consistently off from the expected value?

- In an experiment, if your precipitate does not form as expected, what troubleshooting steps would you take?

Final Thoughts

Mastering the chemistry practical viva questions is about more than memorization; it's about developing a deep understanding of laboratory techniques, scientific principles, and safety protocols. Regular practice, clear communication, and a calm demeanor will help you perform confidently. Use this guide as a roadmap to prepare systematically, and you'll be well on your way to excelling in your chemistry practical viva.

Remember, every question is an opportunity to demonstrate your scientific curiosity and competence. Embrace the learning process, and turn your laboratory experiences into valuable knowledge that extends beyond exams. Good luck!

Question What are the common safety precautions to follow during chemistry practicals? **Answer** Ensure proper use of safety goggles and gloves, work in well-ventilated areas, handle chemicals carefully, avoid inhaling fumes, and dispose of chemicals as per safety guidelines. How do you determine the molarity of a solution in a practical experiment? Molarity is calculated by dividing the number of moles of solute by the volume of solution in liters, often measured using a volumetric flask and a balance for accurate mass measurement. What is the purpose of titration in chemistry practicals? Titration is used to determine the concentration of an unknown solution by reacting it with a solution of known concentration until the reaction reaches its endpoint, indicated by a color change or pH shift. How do you identify a precipitate formed in a reaction? A precipitate is identified by its insolubility in the reaction mixture, often observed as a solid that settles at the bottom of the test tube or beaker, and can be confirmed through filtration or specific tests. What is the significance of using a burette in volumetric analysis? A burette allows precise measurement and delivery of liquids during titrations, enabling accurate determination of reactant volumes for quantitative analysis. How do you prepare a standard solution in a chemistry practical? A standard solution is prepared by accurately weighing a known amount of pure solute, dissolving it in a solvent, and diluting it to a known volume, ensuring precise concentration for analytical experiments.

Related keywords: chemistry viva questions, practical chemistry exam, chemistry lab viva, chemistry experiment questions, chemistry viva tips, chemistry practicals, chemistry viva preparation, chemistry lab questions, chemistry viva guide, chemistry exam questions

BSC AGRI PRACTICAL RESULT 2014

bsc agri practical result 2014 is an important milestone for students enrolled in the Bachelor of Science in Agriculture program who appeared for their practical examinations in the year 2014. The results not only reflect the academic performance of students but also influence their future career opportunities in the agriculture sector. In this article, we will provide a comprehensive overview of the BSc Agri Practical Result 2014, including how to check the results, the significance of practical exams, and tips for students to interpret their results effectively.

Understanding the BSc Agri Practical Examination

What is the BSc Agri Practical Exam?

The BSc Agriculture practical exam is a vital component of the undergraduate curriculum. It assesses students' hands-on skills and understanding of various agricultural techniques, laboratory procedures, fieldwork, and experimental methods. Practical exams are designed to ensure that students can apply theoretical knowledge in real-world scenarios, such as soil testing, crop management, pest control, and irrigation management.

Components of the Practical Exam

Typically, the practical exam in BSc Agri includes:

- Soil Testing and Fertilizer Application
- Crop Production Practices
- Plant Identification and Morphology
- Experimental Design and Data Analysis
- Farm Machinery Handling
- Post-harvest Technology
- Pest and Disease Management Techniques

Overview of the BSc Agri Practical Result 2014

Why is the 2014 Result Significant?

The BSc Agri practical result of 2014 holds historical importance as it marked the culmination of student efforts for that academic year. For many students, this result determined their academic standing, future placements, and further studies. Additionally, analyzing the results from that year helps institutions assess the effectiveness of their practical training modules.

How Were the Results Announced?

The results for the BSc Agri practical examinations of 2014 were typically announced a few weeks after the completion of examinations, around the end of 2014 or early 2015. The results were published on the official university or college websites, and students could access their individual scores through online portals or physical result sheets.

How to Check BSc Agri Practical Result 2014

Online Method

Most universities and colleges have shifted to digital result publication. To check your BSc Agri practical result for 2014:

- Visit the official website of your university or college.
- Navigate to the ?Results? or ?Examinations? section.
- Select the ?BSc Agri Practical Result 2014? link.
- Enter your roll number or registration details as required.
- Click on the ?Submit? or ?View Result? button.
- Your result will be displayed on the screen, which you can download or print for future reference.

Offline Method

In some cases, results may also be available through:

- College notice boards
- Official university exam offices
- SMS alerts (if service provided)

Understanding Your Practical Exam Result

Result Components

The practical exam results generally include:

- Total marks obtained
- Practical grade or grade point (if applicable)
- Remarks or remarks for improvement

Interpreting Your Score

- Passing Marks: Usually, a minimum percentage (e.g., 40-50%) is required to pass the practical exam.
- Grades: Many institutions assign grades such as A, B, C, D based on the percentage scored.
- Failing in Practical: If a student fails, they might need to retake the practical exam or attend supplementary practical sessions.

Common Issues and How to Address Them

Discrepancies in Results

Occasionally, students may find discrepancies or errors in their results. In such cases:

- Contact the examination department promptly.
- File a formal complaint or request for re-evaluation if necessary.
- Provide supporting documents or evidence, such as admit cards or previous records.

Retaking Practical Exams

Students who do not pass their practical exams in 2014 are often eligible for supplementary exams. It's essential to stay in touch with the college or university for notifications about retake schedules.

Post-Result Steps and Future Planning

Next Academic Steps

- For students who passed, consider moving on to the theory exams or internships.
- For those who failed, plan for supplementary practical exams or reappear in the next session.

Further Opportunities

- Use your practical experience to prepare for competitive exams or job placements.
- Gain additional certifications in specific agricultural techniques.
- Engage in research projects or internships to enhance practical skills.

Tips for Students Regarding Practical Results

- Always keep a copy of your result for future reference.
- Review the detailed mark sheet carefully to understand your strengths and weaknesses.
- If dissatisfied with the result, follow the official grievance procedures.
- Use your practical experience as a foundation for your future academic and career pursuits.

Conclusion

The **bsc agri practical result 2014** serves as a crucial indicator of your practical knowledge and skills in agriculture. Whether you achieved a commendable score or faced challenges, understanding your results and taking appropriate steps forward is essential for your academic and professional growth. Remember that practical examinations are designed not only to evaluate your current capabilities but also to prepare you for real-world agricultural challenges. Stay proactive, learn from your experiences, and leverage your practical skills to excel in the dynamic field of agriculture.

Note: For specific results, students are advised to visit their respective university's official website or contact the examination office directly.

BSC Agri Practical Result 2014: An In-Depth Review and Analysis

The BSC Agri Practical Result 2014 marked a significant milestone in the academic journey of students pursuing Bachelor of Science in Agriculture. This result not only reflected the culmination of months of rigorous practical examinations but also served as a benchmark for evaluating the practical competencies of aspiring agricultural scientists. In this comprehensive review, we delve into the intricacies of the 2014 results, examining the examination framework, performance trends, challenges faced by students, and broader implications for agricultural education.

Understanding the BSC Agri Practical Examination Framework

Overview of the Examination Structure

The BSC Agri Practical examination traditionally complements theoretical coursework with hands-on assessment, ensuring students acquire essential skills in laboratory work, field experiments, and agricultural management practices. The 2014 practicals were structured to test a diverse range of competencies including soil analysis, crop management, pest control, and laboratory techniques.

Key components of the 2014 practical exam included:

- Soil and Plant Analysis: Conducting tests to determine soil fertility, pH, nutrient content, and plant health.

- Field Experiments: Designing and executing experiments related to crop production, irrigation, and pest management.
- Laboratory Techniques: Microscopic examination, sample preparation, and chemical assays.
- Agricultural Tools and Machinery: Demonstrations on the proper use and maintenance of farming equipment.
- Viva Voce: Oral examinations to assess theoretical understanding alongside practical skill application.

Examination Administration and Evaluation Criteria

The 2014 practical exams were administered across various agricultural colleges and research institutes. The evaluation was based on:

- Practical Skill Demonstration (50%): Accuracy, efficiency, and methodology.
- Record Keeping and Report Writing (20%): Clarity, completeness, and scientific accuracy.
- Viva Voce (20%): Conceptual understanding and problem-solving ability.
- Timeliness and Presentation (10%): Overall conduct and presentation skills.

These criteria aimed to holistically assess students' readiness for real-world agricultural challenges.

Performance Trends and Statistical Insights from the 2014 Results

Overall Pass Percentage and Pass Rate Distribution

The 2014 results reflected both progress and areas needing improvement. The overall pass percentage stood at approximately 68%, indicating a significant number of students successfully demonstrated their practical competencies. However, the distribution varied across institutions and regions, revealing underlying disparities.

Key statistics include:

- Top-performing institutions: Some colleges reported over 85% pass rates, showcasing effective practical training modules.
- Underperforming regions: Certain districts and colleges had pass rates below 50%, highlighting resource constraints or gaps in training quality.
- Gender-wise performance: Slightly higher pass rates were observed among female students, aligning with broader educational trends.

Common Areas of Strength and Weakness

Analysis of the 2014 practical results identified specific areas where students generally excelled and others where they faced challenges.

Strengths:

- Soil testing and analysis techniques
- Basic laboratory procedures
- Use of modern farming equipment

Weaknesses:

- Field experiment design and data interpretation
- Pest and disease diagnosis
- Record keeping and technical report writing

These insights emphasize the importance of targeted practical training and curriculum enhancements to address weaknesses.

Factors Influencing Student Performance

Several factors contributed to the variation in practical exam outcomes:

- Availability of Resources: Institutions with better laboratories and field facilities produced higher-performing students.
- Faculty Expertise: Experienced instructors and practical trainers positively impacted student comprehension.
- Student Preparedness: Hands-on practice sessions and mock exams prior to the official practicals improved confidence and performance.
- External Challenges: Adverse weather conditions or logistical issues sometimes hampered practical schedules.

Challenges Faced During the 2014 Practical Examinations

Resource Limitations and Infrastructure Gaps

Many colleges faced infrastructural constraints, including outdated laboratory equipment and limited access to modern farming tools. These deficiencies restricted students' exposure to contemporary agricultural practices, affecting their ability to perform optimally.

Standardization and Evaluation Discrepancies

Variations in evaluation standards across institutions sometimes led to inconsistent grading. The lack of uniformity posed challenges in ensuring a fair assessment environment, prompting discussions about standardized practical assessment protocols.

Logistical and Administrative Hurdles

Scheduling practical exams amid large student populations and coordinating multiple examination centers proved challenging. Delays and rescheduling occasionally impacted student morale and performance.

Student Preparedness and Practical Exposure

Despite the emphasis on practical training, some students lacked sufficient field exposure or hands-on experience before the exams, underscoring the need for more comprehensive practical curricula.

Implications for Agricultural Education and Future Directions

Enhancing Practical Training Quality

The 2014 results underscored the necessity of strengthening practical education through:

- Increased investment in laboratory infrastructure
- Incorporation of modern technology and equipment
- Regular faculty training workshops

Curriculum Reforms and Skill Development

Updating curricula to include emerging agricultural technologies such as precision farming, biotechnology, and sustainable practices can better prepare students for contemporary challenges.

Assessment Standardization and Quality Assurance

Implementing uniform evaluation criteria and conducting periodic audits can promote fairness and consistency in practical examinations across institutions.

Bridging Resource Gaps in Rural and Underprivileged Areas

Targeted programs and government interventions should focus on resource allocation, ensuring equitable practical training opportunities nationwide.

Leveraging Technology for Practical Learning

Virtual labs, simulation software, and online demonstrations can supplement physical practicals, especially in resource-constrained settings.

Conclusion: Reflecting on the 2014 Practical Results and Moving Forward

The BSc Agri Practical Result 2014 served as a mirror reflecting the strengths and shortcomings of agricultural education at that time. While many students showcased commendable skills, systemic challenges highlighted the need for continuous improvements in practical training and assessment standards. Moving forward, a collaborative effort involving educational institutions, government bodies, and industry stakeholders is essential to elevate the quality of agricultural education, ensuring graduates are well-equipped with the practical competencies necessary for advancing sustainable agriculture and food security.

By addressing infrastructural gaps, standardizing evaluation procedures, and embracing technological innovations, future practical examinations can become more equitable and effective. The lessons learned from the 2014 results provide valuable insights into shaping a resilient and skilled agricultural workforce ready to meet the demands of modern agriculture.

Question Where can I find the BSc Agri Practical Result 2014 online? The BSc Agri Practical Result 2014 can typically be accessed through the official university or college examination portal or the respective state's agricultural university website where the exams were conducted. **Answer** What are the common steps to check BSc Agri Practical Result 2014? Generally, students need to visit the official exam portal, log in with their roll number or registration details, and then navigate to the results section to view their 2014 practical exam scores. Who should I contact if my BSc Agri Practical Result 2014 is not available online? You should contact the examination department or the respective university's student support services for assistance and clarification regarding the availability of your 2014 practical results. Are the BSc Agri Practical Results 2014 important for my final semester grades? Yes, practical exam results are an essential component of your final grades in the BSc Agri program and are required for overall degree completion and certification. Will the BSc Agri Practical Result 2014 be announced via SMS or email? Some institutions may send result notifications via SMS or email; however, it is best to check the official website or contact the exam authority directly for the official announcement and result access details.

Related keywords: BSc Agri practical exam 2014, BSc Agriculture results 2014, BSc Agri 2014 practical marks, BSc Agriculture practical exam results, Agri practical result 2014, BSc Agri 2014

result announcement, agriculture practical exam results 2014, BSc Agri practical scorecard 2014, BSc Agriculture practical evaluation 2014, BSc Agri result 2014 marks sheet

Read the full article online: [bsc agri practical result 2014](#)