1st China Youth Chemistry Olympiad

2025 Examiner's report

We could like to thank everybody that participate in this competition. The paper this year is 100% PUM. There is a clercial error on the question 7 that the total mark is 32 pts instead of 30 pts. Also, there is some errors in Question 1 that candidtates could not work out the correct answers. Also, it will affect the answers in 1-8,1-9,1-10. We are so sorry about that.

We were pleased to see that 117 candidates from all over the China had participate in this competition. The topist score is approxiamtely 37.1%. The Candidiate which is first position came from Tianjin Experimental High School. So, we give a 2000 CNY bonus to him as his distinciton performance in this competition. Also, we encourage more and more high school students to engage in this competition. The mean score for this competition is approximately between 8-9%. The most popular question is the Question 4, the least popular question is Question 7. The 10th

precentile is at nearly 11-12%. Most of the candidates get a score between 6-9%.

Question 1

This question is not the easiest quesiton. Only a small group of candidtates attempts this question. Most of the candidates that attempt this question had solved out that the elements is phosphrous and arsenic. However, it is difficult to draw out the strucure of realgar. Only one of the candidtates draw the correct strucure. There is only one of candidtates attempts the parts of the question after 1-1. Although there is a little wrong processes, but we give them marks of braveness.

The highest score in this question is 7 out of 32 pts

Question 2

This question only attempted by a small group of people too. However, only one of these candidtates entirely derive a roughly correct answer for 2-1. As the procedure needs to be written very very precisely, any small approximation will cause wrong answers. Most of the candidtates could derive the charge balance equation, but could not derive the numerical equation correctly. 2-4 is also a popular question that all the candidates

that attempt this question tried to tackle it. However, there is no correct answer due to the wrong applications of molar fractions or the unit errors. The highest score in this question is 12 out of 34 pts.

Question 3

A majority of candidates attempt this question. A large populations of these candidates tried question 3-1. However, many candidtates could not believe their result that the Molar Mass is negative!!! Most of the candidates that attempt question 3-2 could deduce the formula for kinetic energies and R.M.S speed. However, only two candidates attempt the rest of the 3-2. They are well done in this part. One thing is out of our expectations is that another candidate sketch out the correct shape for 3-3-2 and gain 2 pts. Maybe he do deep learning in AS Chemistry :).

The highest score in this question is 34 out of 64 pts.

Question 4

Almost all the candidates attempt this question. However only 10% of them could balance the correct equation for 4-1. 90% candidates work out question 4-2 and no candidates work out 4-3. It is so strange that every candidates that tried 4-3 gave out all different answers, but none of them

is correct. So, we gave the marks of formula for the candidates. 60% of peoples worked out 4-4, it is not a difficult question.

The highest score in this question is 14 out of 16 pts.

Question 5

This question, designed around the actual synthesis of the anti-influenza drug oseltamivir (Tamiflu), is of exceptional quality. Based on the real synthetic route of pharmaceutical R&D, it connects organic chemistry knowledge points—such as esterification, sulfonylation, and Lewis acid-catalyzed ring-opening—into a complete logical chain. Each step of deduction is supported by clear clues about functional group transformations, which not only aligns with the disciplinary rules of organic chemistry but also tests the solver's ability to apply knowledge systematically. With rigorous logic and practical relevance, it fully reflects the design value of an excellent chemistry question.

This question also witnessed a notable event: a candidate from Shanghai Guanghua Cambridge International School scored nearly full marks, successfully outperforming another candidate from Tianjin Experimental High School, who consistently ranked among the top performers in Tianjin in the CChO.

After in-depth analysis of this phenomenon, the marking team identified

that the core of the score gap lay in the titanium chloride-catalyzed acid-mediated ring-opening step from intermediate C to D, which was also the most difficult part of the question. In terms of reaction mechanism, titanium chloride (as a Lewis acid) must first coordinate with the oxygen atom in the substrate to activate the cyclic ether structure. The selection of this coordination mode and the nucleophilic attack site requires a strong grasp of detailed mechanisms. Meanwhile, the oxonium ion intermediate generated after ring-opening needs to be stabilized through proton transfer, but the source of the proton is not clearly indicated, demanding comprehensive inference based on the reaction system. More critically, there is ambiguity in the description of reagents for this step in reference literatures: some specify "titanium chloride or triethylsilane (Et_3SiH)", while others emphasize "titanium chloride and triethylsilane must be used together". This difference between "or" and "and" introduced great uncertainty in determining the proton transfer pathway, ultimately becoming the key factor that widened the score gap.

The highest score in this question is 13 out of 17 pts.

Question 6

Based on the classic research of legendary organic chemist Robert Burns Woodward and subsequent scholars, this question places high demands

on solvers' organic chemistry proficiency. In the structure derivation section (6-2), each step from intermediate A to K involves complex reaction types, including azidation, acid-catalyzed reactions, photochemical reactions, oxidation, and dehydrogenation. Many of these reactions lack the conventional "reagent-reaction type" correspondence, requiring solvers to comprehensively judge based on substrate structures (e.g. highly symmetric skeletons, spatial positions of functional groups) and reaction conditions (e.g. light irradiation, strong reducing agent $LiAlH_4$). For example, understanding the photochemical reaction from B to C requires in-depth knowledge of free radical cyclization and rearrangement mechanisms, while the sulfonylation from E to F necessitates linking to the logic of hydroxyl activation in substrates. Additionally, the question integrates the recognition and application of named reactions such as Woodward-type photochemical reactions, as well as the analysis of differences in reaction mechanisms. It comprehensively assesses solvers' knowledge reserves in organic synthesis, mechanism analysis capabilities, and understanding of chemical academic history. More than just a question, it serves as a comprehensive evaluation of a solver's organic chemistry knowledge system, logical reasoning skills, and academic perspective, effectively distinguishing learners of different proficiency levels and standing out as an outstanding question with high requirements for professional competence.

The highest score in this question is 6 out of 24 pts.

Question 7

Only 5% of the candidates attempt this question due to time stress and opportunity costs. Also, only one candidates attempt all the questions except 7-5. However, this candidate have a wrong approximation in 7-1 as he use equilibrium-state approximation instead of steady-rate approximation. But, the other parts are all correct. So, we only penalise the marks for K_m and steady-rate approximation. And we also apply the rule of ECF to his answer in 7-3 and 7-4.

The highest score in this question is 18 out of 32 pts.

Question 8

This question have the lowest maximun score. Most of the students have calculating errors in 8-1. Only one candidate attempt 8-2 and 8-3. We condone partial credits for these answers due to rewards of braveness.

The highest score in this question is 6 out of 37 pts.

At the end of the report, the distribution of scores for CYCHO is shown below.

	Mean	S.D	Top 10% Percentile
x-1<Score<x	8.40171	4.5234	11