

# College entrance examination biology examination paper analysis and teaching enlightenment—Take the 2023 new curriculum standard paper as an example

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**Abstract:** High examination questions are an important reference for high school teaching. This paper analyzes the new curriculum standard biology examination questions in 2023 from the aspects of the structure of test questions, test site distribution, and characteristics of test questions, it also summarizes the teaching suggestions of returning to teaching materials, creating situation, practical application and constructing knowledge system, with the hope that these suggestions will contribute to role of future teaching and college entrance examination review.

**Keywords:** New curriculum standard; Biology; Test analysis; Teaching revelation

## 1. Introduction

The college entrance examination is an important way for the country to select talents, which is related to the future of every examinee and the vital interests of tens of millions of families. The proposition work of college entrance examination is carefully deliberated and studied by a special working group, so the examination questions are an important reference for the majority of students to learn, and also the baton of high school teachers' teaching.

## 2. Test Analysis

### 2.1. Overall analysis

From the level of difficulty, the biology test of the 2023 college entrance examination is relatively easy. From the perspective of the proposition, it comprehensively implements the requirements of the report of the 20th National Congress of the Communist Party of China, takes the Standard of the Biology Curriculum for Ordinary Senior Secondary Schools (2017 Edition) as the basis for the proposition, follows the requirements of the College Entrance Examination Evaluation System and the Explanation of the College Entrance Examination Evaluation System, takes the core literacy in the discipline of biology as the basic concept, takes the examination of key competencies as the main theme, takes the content of the teaching materials as the basis, pays attention to the connection with the actual production and life, and highlights the biological knowledge of "coming from the life, and going to the life" at multi-levels and from multi-dimensions. By creating a variety of teaching situations, carefully setting problems, students are guided to inherit the excellent traditional Chinese culture, establish the ecological concept of "clear water and green mountains are golden mountains and silver mountains", and realize the all-round development of morality, intelligence, physical education, beauty and labor, so that the fundamental task of moral education is truly implemented.

### 2.2. Test structure

In terms of the structure of the test questions, the new curriculum standard questions of the 2023 college entrance examination are the same and different compared with the old college entrance examination. The same: first, the question type is divided into multiple choice questions and non-multiple choice questions (comprehensive questions) two categories; Second, the score is set the same, the total score is 90 points, including 6 multiple choice questions, and each question is 6 points, a total of 36 points, non-multiple choice questions 5, a total of 54 points. Changes: First, the non-choice question number has changed, the old college entrance examination number is 29-32,37,38 (37 and 38), the new college

entrance examination choice questions are compulsory knowledge, there is 4 optional knowledge, optional questions 2 questions, answer, and in the new college entrance examination, cancel the optional questions and non-choice questions involve the compulsory knowledge and selective compulsory knowledge.

### 2.3. Test site analysis

The biology questions of 2023 are analyzed, as shown in Table 1. As can be seen from the table, the main test knowledge is from the textbook, most of the knowledge points are from the text, and there are other columns involving knowledge, such as thinking and discussion, biotechnology progress, etc.

Table 1 The 2023 New Curriculum Standard Paper Biology Test Site Analysis Table

Question types	Question number	value	Examine knowledge	Return to the textbook
Choice questions	First	Six	Regulation of blood glucose balance; Glucose; The way the material goes in and out of the cell	A: Selective compulsory repair 1 P <sub>50</sub> text; B Required 1 P <sub>23</sub> , P <sub>72</sub> text; C, D: Selective compulsory 1 P <sub>50</sub> text
	Second	Six	The application of cellular respiration principle; Vernalization; Water in cells; Regulation of plant growth and development by light; Application of the principles of photosynthesis	①: Compulsory 1 P <sub>95</sub> thinking and discussion; ②: Selective compulsory repair 1 P <sub>107</sub> thinking and discussion materials 2; ③: Compulsory 1 P <sub>21</sub> text; ④: Selective compulsory repair 1 P <sub>105</sub> thinking and discussion materials 3; ⑤⑥: Compulsory 1 P <sub>105</sub> text
	Third	Six	Humoral immunity and cellular immunity	①: Selective compulsory repair 1 P <sub>71</sub> text; ②: Selective compulsory repair 1 P <sub>68</sub> text; ③: Selective compulsory repair 1 P <sub>74</sub> text; ④: Selective compulsory repair 1 P <sub>72-73</sub> text; ⑤: Selective compulsory 1 P <sub>74</sub> text
	Fourth	Six	Other methods of investigating the population density; Richness; Marking-recapture method	A: Selective compulsory repair 2 P <sub>23</sub> , P <sub>6</sub> text, and progress in biotechnology; B, C, D: Progress in selective compulsory 2 P <sub>6</sub> biotechnology
	Fifth	Six	Law of independent assortment	A, B, C, D: Required 2 P <sub>9-13</sub> text
	Sixth	Six	Genetic engineering (DNA ligase, plasmid)	A, B, C, D: Selective compulsory 3 P <sub>72</sub> text
Non-multiple choice questions	Thirty-first	Ten	Cell cycle; Auxin and cytosin; Development by light	(1) Compulsory 1 P <sub>111</sub> text; (2) Selective compulsory repair 1 P <sub>98</sub> text; (3) Selective mandatory 1 P <sub>106</sub> main text
	Thirty-second	Ten	Autonomic nervous system; The relationship between neuromodulation and humoral regulation; Regulation of blood glucose balance; Water and salt balance regulation	(1) Selective compulsory repair 1 P <sub>19</sub> text; (2) Selective Required 1 P <sub>57</sub> text; (3) Selective compulsory repair 1 P <sub>51</sub> text; (4) Selective mandatory 1 P <sub>60-61</sub> main text
	Thirty-third	Ten	Energy flow in the ecosystem; Ecological niche	(1) Selective Required 2 P <sub>55</sub> text; (2) Selective compulsory 2 P <sub>27-28</sub> main text
	Thirty-fourth	Twelve	Judgement of dominance and recessive; Application of the law of segregation and law of independent assortment; Sex-linked inheritance	(1) Required repair 2 P <sub>4</sub> text; (2) Required 2 P <sub>30</sub> , P <sub>9</sub> text; (3) Required 2 P <sub>9-13</sub> main text
	Thirty-fifth	Twelve	Pure culture; Tissue culture of chrysanthemum; Totipotency of cells; Selective culture-medium; The application of fermentation engineering in agriculture and animal husbandry	(1) Selective compulsory repair 3 P <sub>11</sub> text; (2) (2) Selective compulsory repair 3 P <sub>34-35</sub> inquiry practice and text; (3) Selective compulsory repair 3 P <sub>16</sub> text; (4) Selective compulsory repair 3 P <sub>27</sub> text

### 2.4. The characteristics of the test

#### 2.4.1. Based on the content of the teaching materials, pay attention to the new test points

Teaching materials are the core teaching materials of the course, the carrier and the main source of

knowledge, and an important reference basis for the college entrance examination proposition. Therefore, they play an irreplaceable role in teaching. The test paper is based on the content of the teaching material, reflecting the idea of "from the teaching material and higher than the teaching material", focusing on the students' understanding and application of the core concept. From Table 1, it can be found that most of the knowledge comes from the text, and there are also other columns of the textbook, such as the third test knowledge points both from the text and from the biotechnology progress column. In addition, compared with the new textbook and the old textbook, some knowledge was added and deleted compared with the old textbook. In the process of analyzing the examination paper, it was found that the new knowledge points, such as the spring effect of the second question, the infrared trigger camera of the fourth question, the autonomic nervous system of the 32 question, and the role of aldosterone, all belong to the new content of the new textbook.

#### ***2.4.2. Create the teaching situation and infiltrate the core quality***

As we all know: eat salt alone, everyone is difficult to swallow, and the right amount of salt dissolved in the soup, in the process of drinking the salt is digested and absorbed by the human body. The relationship between knowledge and the situation is just like the relationship between salt and soup. With the situation as the carrier, the knowledge is integrated into it, making it easier for students to digest. At the same time, students should be taught to learn biological knowledge in real life situations, and also connected with the phenomena and problems in real life. The multiple choice questions are not a single "the following statement is correct or wrong" method, non-multiple choice questions do not directly present the question, but first integrate knowledge into the situation before asking questions. For example, the first question first briefly explains the glucose, create a knowledge situation, and then ask questions. The second question first briefly describes the accumulated and applied experience of the working people, and then puts forward the corresponding questions after creating the situation. Promote the understanding and application of knowledge by integrating knowledge into the situation.

#### ***2.4.3. Inherit the excellent culture and return to life practice***

Chinese excellent traditional culture is extensive and profound, and its existence makes us based in the forest of world culture. The continuation of the excellent traditional culture determines the development of the country and the destiny of the nation. Inheriting the excellent traditional Chinese culture is one of the main functions of education. School education is the backbone of education, and teachers, as the inheritors of school education, shoulder the bounden responsibility in inheriting the excellent traditional Chinese culture. They use school education to guide students to tell Chinese stories well and enhance their cultural confidence. The second question of this test is based on the production and living experience accumulated and applied by the working people in the long historical process, analyzes the biological knowledge and principles contained in agricultural production, permeates the excellent traditional culture through the form of teaching evaluation, and highlights the close attention to agricultural production.

#### ***2.4.4. Strengthen physical beauty education and promote all-round development***

In the party's 20th report, it is pointed out that to fully implement the party's educational policy and train socialist builders and successors with all-round development of morality, intelligence, physique, beauty and labor. This test questions in physical education, aesthetic education these two short board efforts, strengthen physical education, promote students' physical and mental health, such as the 32 questions to exercise as material, analysis of the biological principle, guide students through active physical exercise, enhance physical quality. Pay attention to aesthetic education and improve students' aesthetic quality. For example, question 33 takes the water birds living in the shallow water and the mudflats of the lake area as the carrier to give people the imagination of beauty and promote the development of students' aesthetic education, so as to serve the overall development of students<sup>[1]</sup>.

#### ***2.4.5. Select innovative talents with open questions***

Open-ended question refers to the question with no unique answer, the question without standard answer, and the basic idea of taking core literacy as the purpose. In teaching, with knowledge as the carrier, activities as the way, and questions as the engine, the purpose is to improve students' core quality. The non-choice part of the question appears 4 times to "answer 1 point" or "answer 2 points" or "answer 3 points" as the form of open or semi-open questions. Although there is no fixed answer to open questions, students are required to have correct answer ideas, which is conducive to the development of students' divergent thinking, so as to serve the selection of innovative talents.

#### ***2.4.6. Integrate into the ecological concept, reflect the harmonious development***

Man and nature are a community of life. To promote the harmonious development of man and nature is the clear requirement of the social responsibility of the core quality of the new curriculum standard, the requirement of China's modernization, and the inevitable guarantee for the long-term development of human beings. The test paper clearly highlights the ecological concept of "clear water and green mountains are golden mountains and silver mountains". For instance, as the carrier, question 4 is to study and protect wild mammals resources of a natural reserve in northeast China, and question 33 presents matters needing attention on observing waterbirds, which aim to examine the students' understanding and application of knowledge. At the same time, these questions also guide students to protect the nature and animals, and permeate the concept of harmonious development of man and nature.

### **3. Teaching Revelation**

#### ***3.1. Return to the teaching material knowledge***

Textbooks are the main source of knowledge and an important reference basis for the proposition of the college entrance examination. Teachers should take the teaching materials as the core to guide students to place themselves in the scientific world and return to the essence of science. Return to the basic way of teaching material: comprehensive and deeply read the textbook, because in recent years high examination questions not only examine the knowledge of the body, in other columns also have a part of the test, at the same time the current examination from "mechanical memory" to "understanding application", so read the teaching material to do comprehensive and in-depth. In the process of learning, find problems back to the textbook, to check the gaps<sup>[2]</sup>. On the basis of retaining the overall framework of the old college entrance examination, the biology test of the 2023 college entrance examination highlights the new content, which is difficult for students to understand, so teachers should strengthen the guidance of new knowledge.

#### ***3.2. With the help of the life situation, the organic penetration of the biological core literacy***

"Biology Curriculum Standards for General High Schools (2017 edition)" emphasizes that "effective teaching situation can stimulate students' curiosity and thirst for knowledge, ignite students' enthusiasm for learning, make students form a good psychology of seeking knowledge, actively participate in the exploration, discovery and cognitive process of the knowledge learned, and experience the fun of learning"<sup>[3]</sup>. To create a teaching situation, we must first clarify the source and screening of the teaching situation<sup>[4]</sup>. The situation comes from the remodeling of textbook related cases, social hot spots, frontier of biology, production and life phenomena, etc. In the face of different situations, teachers should screen scientific, real and reliable situations according to the characteristics of students and the requirements of curriculum standards, so as to take the essence and discard the dross, and play the effective role of situational teaching. The effective biology teaching situation should not only use the situation into the classroom, but also put the situation through the whole classroom. If multiple situations are involved in a class, it will destroy the coherence of students' thinking, lead to thinking confusion and scattered knowledge. Using a situation to connect fragmented knowledge is conducive to the construction of knowledge framework, deepening the understanding of knowledge and improving thinking.

#### ***3.3. Learn to apply, knowledge source and application to the production and life***

"Education is about life, and life is education." This is particularly true in biology. The ultimate goal of learning knowledge is to apply and serve knowledge to production and life, otherwise knowledge is meaningless<sup>[5]</sup>. How to do the knowledge from the life, to the life to go? First of all, students should be inspired to pay attention to life, and secondly, teachers should reasonably through the life situation through the teaching, with the knowledge learned to explain the various phenomena and problems in life. At the same time, in the teaching evaluation stage, knowledge will be integrated into the life situation for proposition. Over time, students' ability to use knowledge will be improved, and other knowledge will be gained in this process.

#### ***3.4. Pay attention to understanding knowledge, strengthen the ability and innovative thinking training***

The examination of students is transformed from the knowledge level to the ability level, but the cultivation of ability should be based on knowledge. In today's rapid development, the talent selection pays more attention to the examination of students' innovative thinking and innovative ability, so we

should take knowledge as the carrier, with the ability training and innovative thinking training as the purpose<sup>[6]</sup>. How to improve students' thinking and ability? The famous American educator John Dewey gave the answer: learning in doing. Turn consciousness and thinking into action, thinking guides action, action serves thinking, and constantly improve innovative thinking and ability, so as to produce more Chinese creation.

### 3.5. Conduct special review and build a knowledge system

In recent years, the examination of students' knowledge has shifted from a single to a systematic approach. Thus, on the basis of students' mastery of basic knowledge, it is necessary to strengthen the systematization and networking of the knowledge of the textbook. Specifically speaking, we should pay attention to the formation of a knowledge line from the knowledge points and then form a network of knowledge. Moreover, the integration, deepening and expansion of the internal logic of knowledge should be highlighted. In the review stage, it is not "fried rice", but the integration of knowledge and ability promotion, can use the form of special topics, micro topics. So-called project review is a specific problems or nouns as the breakthrough point, the textbook involved in the relevant knowledge and the application of production and life review of a method, which break the bondage of the teaching material structure and content, biological backbone knowledge as the main line, integrate all relevant knowledge, clean up the logical relationship of knowledge content, build a relatively complete knowledge system, supplemented with the necessary practice to consolidate.

## 4. Conclusion

To sum up, under the background of core literacy cultivation, the new college entrance examination highlights the following characteristics: First, based on the content of the teaching material, pay attention to the new test points. Second, create the teaching situation and permeate the core quality. Third, inherit the excellent culture and return to life practice. Fourth, strengthen physical beauty education and promote all-round development. Fifth, select innovative talents with the help of open questions. Sixth, integrate the ecological concept to reflect the harmonious development. The college entrance examination is the vane of teaching. The 2023 college entrance examination gives the following enlightenment: First, return to the teaching material knowledge, pay attention to the new teaching material new test points. Second, with the help of life situations, the organic penetration of biological core literacy. Third, learn to apply, knowledge source and application to the production and life. Fourth, pay attention to understanding knowledge, strengthen the ability and innovative thinking training. Fifth, conduct special review and build a knowledge system. The implementation of the new college entrance examination is bound to bring new challenges to high school teachers and students. Therefore, we should pay close attention to and study the new college entrance examination, and strive to explore the biology teaching path to adapt to the new college entrance examination, and improve the efficiency of education and teaching.

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