

Education and Psychology: Second-round sample tasks for the Open Doors undergraduate track

You will be asked to complete 30 tasks, including:

- 18 entry-level tasks, each correct answer worth 1-3 point;
- 9 intermediate-level tasks, each correctly answered task worth 3-7 points;
- 3 advanced tasks (constructed response), each correctly completed task valued at 8–15 points.

Evaluation criteria and standard answers are provided for the advanced tasks requiring constructed responses.

Education & Educational Research

Task 1 Entry level (1 point)

What is the primary role of education in society?

- a) reinforcement of social inequality
- b) **individual socialization**
- c) implementation of strict discipline
- d) development of rational thought

Answer: b.

Task 2 Entry level (1 point)

Which of the following is not a function of education?

- a) individual socialization
- b) preservation and transmission of culture
- c) **promoting economic growth**
- d) fostering students' creativity
- e) providing social security

Answer: c.

Task 3 Entry level (1 point)

The teacher carried out a survey to determine students' preferred learning styles. In a class of 30 students, 20% selected the auditory style, while 60% opted for the visual style. How many students chose the kinesthetic learning style?

- a) 8
- b) **6**
- c) 4
- d) 10

Answer: b.

Task 4
Entry level (1 point)

Find the sum of all natural divisors of 2024.

- a) 4919
- b) 3891
- c) 5243
- d) 6112

Answer: a.

Task 5
Intermediate level (7 points)

Calculate the value of the expression $\log_{15}5 + \log_{15}45$:

- a) 2.
- b) 3.
- c) 5.
- d) 6.

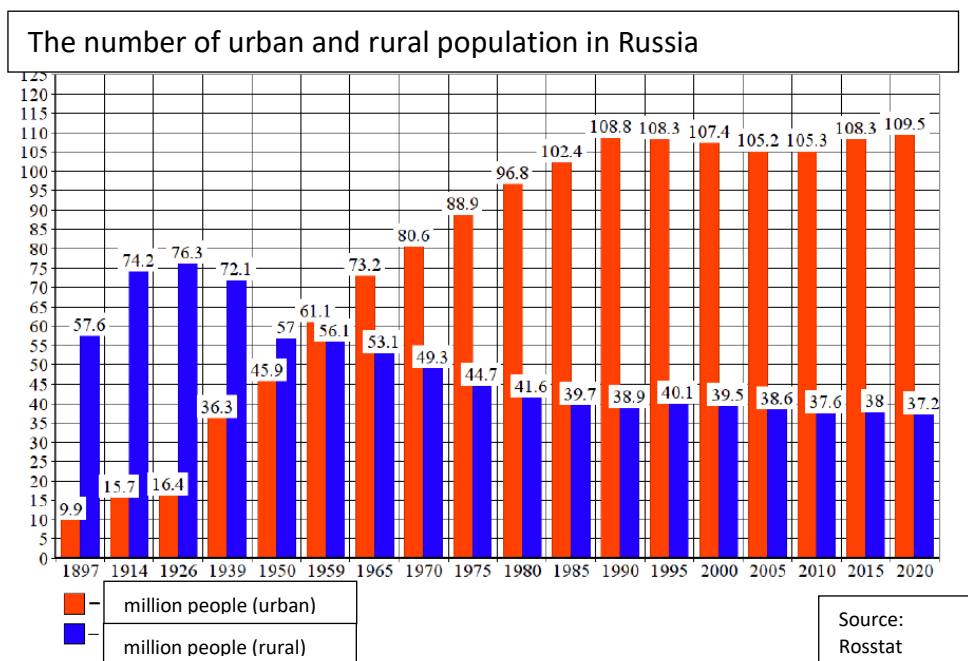
Answer: a.

Task 6
Advanced level (9 points)

Examine the graph titled "Population Size" below and respond to the following questions:

1. What socio-demographic process is illustrated in the graph?
2. Provide a comprehensive definition of the identified process.
3. In what way is the Second Demographic Transition connected to this process? Justify your response by explaining what researchers mean by the Second Demographic Transition. Be careful: the assessment will take into account the progress of solving the task; writing only the right answer is not enough

Note that the evaluation will consider how you solve the task; providing only the final answer is not sufficient.



Answer:

1. Urbanization.
2. Urbanization refers to the process in which populations increasingly concentrate in urban areas, enhancing the significance of cities in socio-economic development and promoting an urban lifestyle across various regions.
3. The Second Demographic Transition is linked to urbanization as it often leads to a slowdown or halt in urban population growth, particularly when external migration is limited and urbanization levels exceed 75%. This transition is characterized by trends such as delayed marriage and childbirth, longer intervals between births, a rise in children born outside of marriage, and an increase in individuals who have never married or had children. It can ultimately result in ultra-low fertility rates, where the average number of children per woman falls to one or fewer.

Evaluation criteria:

Criterion 1: Understanding the Core Concept – 2 Points

- The answer demonstrates a clear grasp of the fundamental nature of the concept.

Criterion 2: Definition of the Concept – 2 Points

- An accurate and concise definition of the concept is provided.

Criterion 3: Structure and Logic of the Response – 2 Points

- The answer is well-organized, presenting thoughts and arguments in a logical sequence.

Criterion 4: Content and Comprehensiveness of the Topic – 3 Points

- A thorough analysis of the topic, addressing all significant aspects in depth.

Special Education

Task 1

Entry level (2 points)

ONE CLICK TO OPEN ALL DOORS

Which of the following elements of communication is crucial for building trusting relationships?

- a) **active listening**
- b) regularity of communication
- c) use of formal language
- d) shared interests
- e) educational background of the conversation partner

Answer: a.

Task 2
Entry level (1 point)

Which family factor do you think most significantly influences children's academic performance?

- a) having pets
- b) **parents' education level**
- c) family size
- d) frequency of family vacations
- e) availability of a television at home
- f) time spent using a computer

Answer: b.

Task 3
Entry level (1 point)

The focus of genetics, as a branch of biology, includes:

- a) **mechanisms of heredity and variation in organisms**
- b) patterns of operation and regulation within biological systems
- c) interactions among organisms and their environment
- d) processes that lead to deviations from the norm

Answer: a.

Task 4
Entry level (2 points)

The link between the human fetus and the mother occurs directly through:

- a) the inner lining of the uterus
- b) the interlinked blood vessels of both mother and fetus
- c) **the placenta and umbilical cord of the fetus**
- d) the interconnected digestive and respiratory systems of the mother and fetus

Answer: c.

Task 5
Intermediate level (7 points)

Select the accurate statements regarding social conflict:

- 1) **Compromise resolves social conflict through mutual concessions.**
 - 2) Social conflicts do not necessarily start with armed confrontation.
 - 3) **Social conflict represents a particular type of interaction between groups and communities, often linked to the unequal distribution of limited resources and advantages.**
 - 4) **Social conflicts can be categorized based on their origins, such as conflicts of interest, values, and identity.**
 - 5) While social conflicts may emerge spontaneously, society has the capacity to regulate or mitigate them.
- Answer:** 1, 3, 4

Task 6
Intermediate level (7 points)

All but three of the following characteristics describe a recessive autosomal allele. Identify three features that do not apply from the general list and note the corresponding numbers.

- 1) **expressed in the genotype of heterozygotes**
- 2) present in heterozygotes
- 3) expressed in the phenotype of a pure recessive line
- 4) masked by the dominant allele
- 5) **found on the Y chromosome**
- 6) **causes a lethal effect in heterozygotes**

Answer: 1, 5, 6

Educational Psychology

Task 1
Entry level (1 point)

The forms of sensory cognition include:

- a) **sensation**
- b) judgment
- c) inference

Answer: a.

Task 2
Entry level (1 point)

Select the accurate statement regarding rational cognition:

- a) the clarity and objectivity of images that emerge from the process of cognition.
- b) representation is a form of rational cognition.
- c) **the reproduction of objects based on intrinsic natural connections and relationships.**
- d) the reproduction of the external characteristics and properties of objects.

Answer: c.

Task 3
Entry level (1 point)

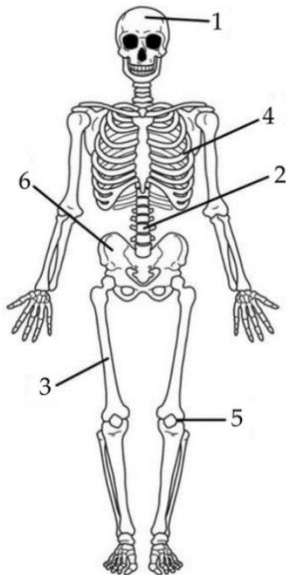
How many tRNA molecules were involved in the synthesis of a protein fragment if the mRNA segment participating in translation has 20 codons?

- a)47
- b)28
- c)20**
- d)40

Answer: c.

Task 4
Entry level (1 point)

Which number in the illustration indicates the section of the human skeleton that safeguards the internal organs?



- a) 1
- b) 2
- c) 3
- d) 4**
- e) 5

Answer: d.

Task 5
Intermediate level (3 points)

Identify the avenues for social mobility (social lifts):

ONE CLICK TO OPEN ALL DOORS

- a) **family social status**
- b) **physical and mental capabilities**
- c) **education**
- d) **military service**
- e) financial resources
- f) political beliefs

Answer: a, b, c, d.

Task 6 **Advanced level (13 points)**

Proteins serve a variety of functions and can be found in different locations within the cell. Some proteins reside entirely in the cytoplasm, while others are partially associated with membranes or fully traverse them multiple times. Approximately 27% of all human proteins fall into this latter category, which includes various receptors, enzymes, and transporters. For instance, voltage-dependent potassium channels in the membrane facilitate the transport of potassium ions, playing a crucial role in nerve impulse conduction. One specific type of potassium channel is made up of four KCNQ1 protein molecules. Each KCNQ1 protein contains six alpha-helical regions that span the membrane perpendicularly. The molecular weight of KCNQ1 is 74.7 kDa.

To determine the percentage of amino acid residues in the KCNQ1 protein that contribute to the formation of transmembrane alpha-helical regions, we can use the following information: an alpha helix has a pitch of 5.4 angstroms and consists of 3.6 amino acid residues per turn, while the membrane thickness is 7 nm. The average mass of an amino acid residue is 110 Da, and 1 angstrom is equal to 0.1 nm (or 10⁻¹⁰ m).

Note that the evaluation will consider how you solve the task; providing only the final answer is not sufficient.

Solution

1. Let's reduce the data to one dimension: $5.4 \text{ \AA} = 0.54 \text{ nm}$ (or $7 \text{ nm} = 70 \text{ \AA}$).
2. $7 \text{ nm} / 0.54 \text{ nm} = 12.96$ (~ 13) turns of the helix are completely in the membrane. Rounding off the results at any stage of the solution does not affect the evaluation.
3. $12.96 * 3.6 = 46.66$. In case of rounding in the previous action: $13 * 3.6 = 47$ amino acids in one transmembrane region of the alpha helix.
4. $46, 66 * 6 = 279.9$ or, rounding, $47 * 6 = 282$ amino acid residues in 6 alpha helices are located in the membrane.
5. $282 * 110 = 31020 \text{ Da}$ is the mass of the transmembrane regions of the protein
6. $31020 / 74700 = 41.5 \%$

Answer: The percentage of amino acid residues in the KCNQ1 protein that contribute to the formation of the transmembrane alpha-helical regions is 41.5%.

Evaluation Criteria:

1. Correct conversion of measurements (e.g., $7 \text{ nm} = 70 \text{ \AA}$ or $5.4 \text{ \AA} = 0.54 \text{ nm}$): 1 point.
2. Two points for each correct subsequent step in the solution process, as well as for the correct final answer. If any intermediate answer is incorrect, further calculations will not be graded: 10 points total.
3. Structure and logic of the response: The answer should be well-organized, presenting thoughts and arguments in a logical sequence: 1 point.

4. Content and thoroughness of the topic: The depth of analysis should cover all significant aspects: 1 point.

Applied Psychology

Task 1

Entry level (1 point)

Which of the following terms refers to the situation where a group of individuals starts to behave according to shared norms and values, disregarding personal viewpoints?

- a) **Group thinking**
- b) Individualism
- c) Social identity
- d) Conformity

Answer: a.

Task 2

Entry level (1 point)

Which of the following cell types is responsible for transmitting nerve impulses in the body?

- a) Epithelial cells
- b) Blood cells
- c) **Neurons**
- d) Muscle cells

Answer: c.

Task 3

Entry level (1 point)

Which evolutionary adaptation can be categorized as an aromorphosis?

- a) the streamlined body shape of fish
- b) the wide, swarming limbs of the honeybee
- c) **the development of an anal opening in the human ascarid**
- d) the elongated root of the camel thorn

Answer: c.

Task 4

Intermediate level (5 points)

Select one or more correct answers:

- 1) **An individual undergoes socialization in both spontaneous and structured ways.**
- 2) Primary socialization is facilitated by the state, mass media, and various social institutions.
- 3) **Social institutions enable individuals to internalize social values, norms, and roles.**
- 4) All agents of socialization are integral to a person's immediate surroundings.
- 5) **Through the process of socialization, an individual develops into a fully realized person.**

Answer: 1, 3, 5

Task 5
Intermediate level (6 points)

Read the excerpt from the article and respond to the questions: “Education is a vital social institution that facilitates the transmission of knowledge, skills, and values between generations. It is essential for both individual and societal development, shaping the intellectual and cultural capacity of the nation. What strategies are suggested for enhancing the education system to address contemporary challenges?”

- a) **implementation of innovative teaching methods**
- b) **leveraging the potential of digital technologies**
- c) **enhanced training for educators**
- d) **fostering personal development and value formation**

Answer: a, b, c, d

Task 6
Intermediate level (6 points)

Which glands are categorized as internal secretion glands? Select three correct answers from the list below and note the corresponding numbers.

- 1) **pituitary gland**
- 2) sex glands
- 3) **adrenal glands**
- 4) **thyroid**
- 5) gastric
- 6) lactic

Answer: 1, 3, 4

Psychology

Task 1
Entry level (1 point)

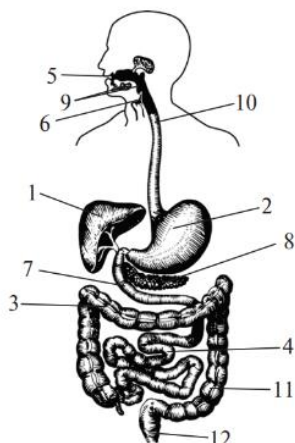
The researcher examined the conditions under which saliva enzymes operate. Saliva was introduced into a test tube containing pre-boiled starch solution, and then a few drops of iodine solution were added. What happened to the color of the mixture in the test tube after the iodine solution was added?

- a) turned blue
- b) became red
- c) turned green
- d) **remained unchanged**

Answer: d.

Task 2
Entry level (1 point)

Which number in the diagram indicates the structure responsible for bile synthesis?



Answer: 1

Task 3
Entry level (1 point)

The summer camp has 249 children and 28 carers. Since each bus can hold a maximum of 45 passengers, what is the minimum number of buses required to transport everyone to the city at once?

- a) 9
- b) 15
- c) 12
- d) 7

Answer: d.

Task 4
Intermediate level (3 points)

Outline the steps a researcher follows when utilizing the hybridological method. Record the appropriate order of numbers.

- 1) hybridization of uniform offspring
- 2) crossing parent individuals with different traits
- 3) selection of pure lines
- 4) quantitative accounting of the obtained results of splitting
- 5) obtaining a hybrid generation F1

Answer: 3, 2, 5, 1, 4.

Task 5
Intermediate level (4 points)

There are 30 tickets in the exam, and Sergei has not studied 9 of them. Calculate the probability that he will draw a ticket he has studied.

- a) 3
- b) 1
- c) 0,7
- d) 0,5

Answer: c.

Task 6 Advanced level (10 points)

Each natural number is assigned one of three colors: red, blue, or green, and all three colors are represented. Is it possible for the sum of any two numbers of different colors to equal the number of the remaining color?

Note that the evaluation will consider how you solve the task; providing only the final answer is not sufficient.

Solution:

Let's assume that this scenario is indeed possible. Without loss of generality, we can say that the number 1 is colored with the first color. Now, let's select an arbitrary number x that is colored with the second color. It follows that $x + 1$ must be colored with the third color, $x + 2$ with the second color, $x + 3$ with the third color, and so on. Consequently, all numbers greater than x will be colored either with the second or third color.

However, since x is colored with the second color and $x + 1$ with the third color, it implies that $2x + 1$ must be colored with the first color. This leads to a contradiction.

Answer: no

Evaluation criteria:

The highest scoring criteria are as follows:

10 points: A complete solution to the problem is provided.

9 points: It is demonstrated that from a certain point onward, the numbers of two colors alternate.

8 points: The scenario is examined where numbers 1 and 2 share the same color, or where they are of different colors, leading to a contradiction with smaller numbers.

The following submissions will not receive any points:

0 points: Only a few specific cases of coloring the natural numbers are explored.

0 points: Only the final answer is presented.

Points will be deducted for these specific issues in an otherwise correct solution:

−2 points: A claim is made, but not supported, that from a certain point onward, the numbers of two colors alternate.