Education and Psychology: Second-round Sample Tasks for the Open Doors Bachelor's Track

This sample test comprises 30 tasks, including 18 entry-level tasks with a single correct answer (each correct answer is assigned 1 – 3 points), 9 intermediate-level tasks with multiple correct answers (the correct answer is assigned 3 – 7 points), and 3 advanced-level tasks requiring a detailed answer (the answer is assigned 8 – 15 points depending on its correctness and completeness).

For advanced-level tasks requiring a detailed answer, assessment criteria and a standard answer are provided.

Field of Science 1. Education and Psychology

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' learning styles preferences. In a class of 30 students, 20% of them prefer 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.

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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 $\log_{15}5 + \log_{15}45$:
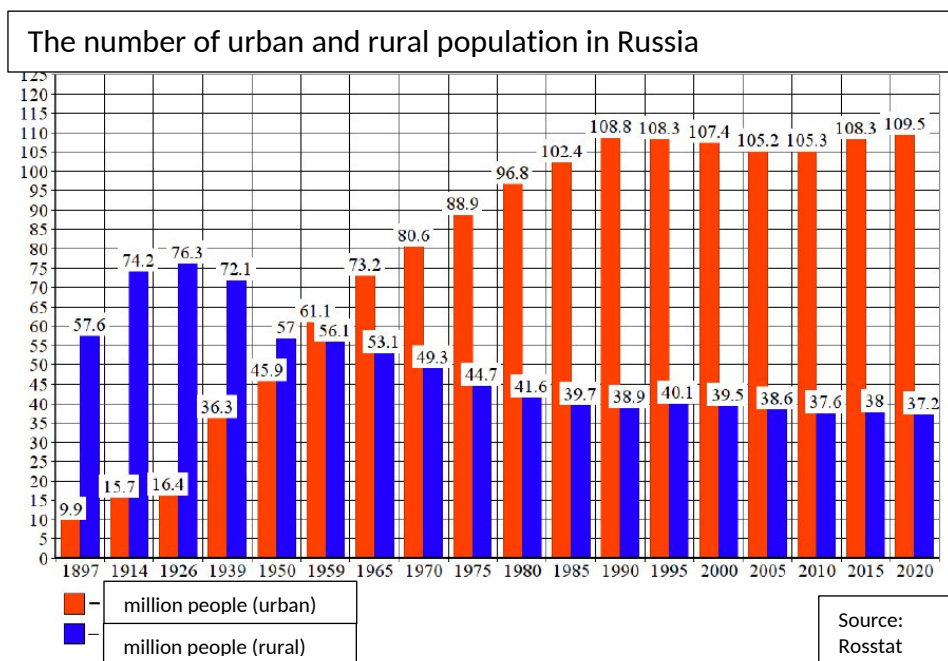
a) 2
b) 3
c) 5
d) 6
Answer: a.

Task 6
Advanced level (9 points)

Examine the "Population Size" graph below and answer the following questions:

1. What socio-demographic process is illustrated in the graph?
2. Provide a comprehensive definition of the process identified.
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: A complete solution must include your method and reasoning. Providing the final answer alone will not suffice.

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The number of urban and rural population in Russia

■ – million people (urban)

■ – million people (rural)

Source: Rosstat

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.

Solution:

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.

Assessment criteria:

Criterion 1 – Understanding the Core Concept: the answer demonstrates a clear grasp of the fundamental nature of the concept – 2 Points.

Criterion 2 – Definition of the Concept: an accurate and concise definition of the concept is provided – 2 Points.

Criterion 3 – Structure and Logic of the Response: the answer is well-organized, presenting thoughts and arguments in a logical sequence – 2 Points.

Criterion 4 – Content and Comprehensiveness of the Topic: a thorough analysis of the topic, addressing all significant aspects in depth – 3 Points.

Field of Science 2: Special Pedagogy

Task 7
Entry level (2 points)

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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 8
Entry level (1 point)

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

a) Having pets
b) **Parental education level**
c) Family size
d) Frequency of family vacations
e) Presence of a TV at home
f) Time spent at the computer
Answer: b.

Task 9
Entry level (1 point)

The focus of genetics, as a branch of biology, is on:

a) **Mechanisms of heredity and variation in organisms**
b) Patterns of functioning and regulation of biological systems
c) Interactions among organisms and the environment
d) Processes of deviation from the norm
Answer: a.

Task 10
Entry level (2 points)

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

a) The inner wall 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 11
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

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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 12
Intermediate level (7 points)

The following traits, except for three, are used to describe a recessive autosomal allele. Identify three traits that "fall out" from the general list, and write down the numbers under which they are indicated.
1) **Expressed in the genotype of heterozygotes**
2) Present in heterozygotes
3) Manifests itself in the phenotype of a recessive pure line
4) Is suppressed by the dominant allele
5) **Is on the Y chromosome**
6) **Forms a lethal effect in a heterozygote**
Answer: 1, 5, 6.

Field of Science 3: Educational Psychology

Task 13
Entry level (1 point)

The forms of sensory cognition include:

a) Sensation
b) Judgment
c) Inference
Answer: a.

Task 14
Entry level (1 point)

Select the accurate statement regarding rational cognition:

a) The visibility and objectivity of the images resulting from cognition.
b) One of the forms of rational cognition is representation.
c) **The reproduction of objects based on intrinsic natural connections and relationships.**
d) The reproduction of the external characteristics and properties of objects.
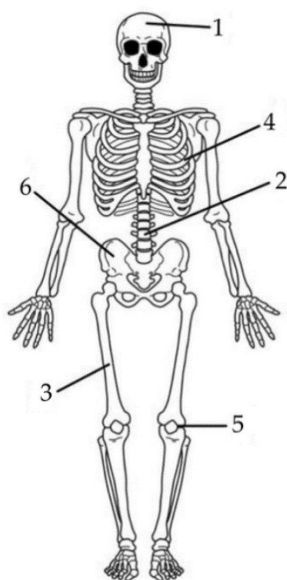**Answer:** c.

Task 15
Entry level (1 point)

What is the number of tRNA molecules involved in the synthesis of a protein fragment if the fragment of an iRNA molecule involved in translation contains 20 codons? Write only the corresponding number in your answer.

a) 47
b) 28
c) 20
d) 40
Answer: c.

Task 16
Entry level (1 point)

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

a) 1
b) 2
c) 3
d) 4
e) 5
Answer: d.

Task 17
Intermediate level (3 points)

Identify the channels for social mobility (social lifts):

a) **Family social status**

b) **Physical and mental abilities**
c) **Education**
d) **Military service**
e) Material prosperity
f) Political beliefs
Answer: a, b, c, d.

Task 18
Advanced level (13 points)

Proteins perform the widest range of functions and have different localisation in the cell. Some are located entirely in the cytoplasm, others are partially bound to membranes or completely permeate them, sometimes multiple times. Approximately 27% of all human proteins belong to the latter type. These include a variety of receptors, enzymes, and transporters. Examples of transporters are potential-dependent potassium channels in the membrane. They transport potassium ions, thus participating in the conduction of the nerve impulse. One kind of potassium channels is formed by four molecules of KCNQ1 protein. One molecule of KCNQ1 protein has 6 alpha-helical sites, each of which crosses the membrane through, perpendicular to the membrane plane. The molecular mass of KCNQ1 is 74.7 kDa.

Calculate the proportion of amino acid residues of the KCNQ1 protein involved in the formation of transmembrane alpha-helix sites. Express your answer as a percentage.

Background: an alpha-helix has a pitch of 5.4 angstroms and contains 3.6 amino acid residues per coil. The thickness of the membrane is 7 nm. The average mass of an amino acid residue in a protein is 110 Da, 1 angstrom =0.1 nm =10-10m.

Note: A complete solution must include your method and reasoning. Providing the final answer alone will not suffice.

Solution:
1. Let's bring the data to one dimension: 5.4 Å = 0.54 nm (or 7 nm = 70 Å).
2. 7 nm /0.54 nm = 12.96 (~13) turns of the helix are completely in the membrane. Rounding the results at any stage of the solution does not affect the estimate.
*3. 12,96 * 3,6 = 46,66 . In the case of rounding in the previous step: 13*3.6 = 47 amino acids in one transmembrane site of the alpha helix.*
*4. 46, 66 * 6 = 279.9 or, rounding up, 47* 6 = 282 amino acid residues in 6 alpha-helixes located in the membrane.*
*5. 282*110 = 31020 Da is the mass of the transmembrane regions of the protein*
6. 31020 / 74 700 = 41.5 %
Answer: the share of amino acid residues of KCNQ1 protein involved in the formation of transmembrane sites of alpha-helices is 41.5 %.

Assessment Criteria:
1. Criterion 1 – Correct conversion of measurements (e.g., 7 nm = 70 Å or 5.4 Å = 0.54 nm) – 1 point.
2. Criterion 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. Criterion 3 – Structure and logic of the response: the answer should be well-organized, presenting thoughts and arguments in a logical sequence – 1 point.
4. Criterion 4 – Content and thoroughness of the topic: the depth of analysis should cover all significant aspects – 1 point.

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Field of Science 4: *Applied Psychology*

Task 19
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 think
b) Individualism
c) Social identity
d) Conformity
Answer: a.

Task 20
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 21
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) Camel thorn elongated root
Answer: c.

Task 22
Intermediate level (5 points)

Choose the correct judgements about socialisation and write the numbers underneath them:

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) **In the process of socialisation a person becomes an individual.**
Answer: 1, 3, 5.

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Task 23
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 24
Intermediate level (6 points)

Which glands are classified as internal secretion glands? Choose three correct answers out of six and write down the numbers

1) **Pituitary gland**
2) Sex glands
3**) Adrenal glands**
4) **Thyroid**
5) Gastric
6) Lactic
Answer: 1, 3, 4.

Field of Science 5: Psychology

Task 25
Entry level (1 point)

The researcher studied the conditions of action of saliva enzymes. Saliva was added to a test tube with pre-boiled starch glue, followed by a few drops of iodine water. How did the colour of the contents of the test tube change after the addition of iodine water?
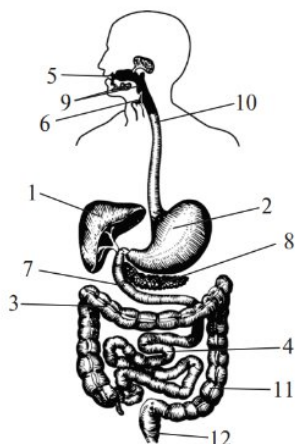
a) Turned blue
b) Became red
c) Turned green
d) **Remained unchanged**
Answer: d.

Task 26
Entry level (1 point)

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

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Answer: 1.

Task 27
Entry level (1 point)

The summer camp has 249 children and 28 carers. A maximum of 45 passengers can be carried on one bus. What is the smallest number of such buses that would be needed to transport everyone from the camp to the city at one time?

a) 9
b) 15
c) 12
d) 7
Answer: d.

Task 28
Intermediate level (3 points)

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

1) Hybridisation of uniform offspring
2) Crossing of parental individuals with alternative traits
3) Selection of pure lines
4) Quantitative accounting of the obtained results of splitting
5) Production of F1 hybrid generation
Answer: 3, 2, 5, 1, 4.

Task 29
Intermediate level (4 points)

There will be 30 tickets on the exam, Sergei has not learnt 9 of them. Find the probability that he will get a learnt ticket.

a) 3
b) 1
c) 0,7

d) 0,5

Answer: c.

Task 30
Advanced level (10 points)

Each natural number is assigned one of three colors: red, blue, or green, and all three colors occur. Is it possible that the sum of any two numbers of different colours is the number of the remaining colour?
Note: A complete solution must include your method and reasoning. Providing the final answer alone will not suffice.

Solution:
Let us assume that this is possible. Without restriction of generality, we can assume that number 1 is painted in the first colour. Let us choose an arbitrary number x of the second colour. Note that then $x + 1$ must be of the third colour, $x + 2$ of the second colour, $x + 3$ of the third colour, and so on. Thus, all numbers greater than x are coloured in the second or third colour. 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

Assessment criteria:
The highest scoring criteria are as follows:
Criterion 1 – A complete solution to the problem is provided – 10 points.
Criterion 2 – It is demonstrated that from a certain point onward, the numbers of two colors alternat – 9 points.
Criterion 3 – 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 – 8 points.

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 are deducted for the following deficiencies in an otherwise correct solution:
-2 points – It is stated, but not justified in any way, that from a certain moment the numbers of two colours alternate.