

Please find below 40 questions aimed at ascertaining your knowledge in Mathematics (10 questions), Chemistry and Biology (10 questions), Human and social sciences (10 questions), Logical and numerical abilities.

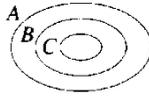
10 Mathematics

1) Solve the following equation: $4x^2 - 1 = 0$

- a) $x = \pm 4$
- b) $x = \pm 2$
- c) $x = \pm \frac{1}{4}$
- d) $x = \pm \frac{1}{2}$

Choose the correct letter (a-d) and write it within brackets: (d)

2) Consider the following Euler – Venn diagram and describe the relationship between the sets:



- a) $C \in B$
- b) $C \subseteq B \subseteq A$
- c) $A \subseteq B \subseteq C$
- d) $A \subseteq C \subseteq B$

Choose the correct letter (a-d) and write it within brackets: (b)

3) An equation is linear if:

- a) the second component is equal to zero
- b) it has only one variable
- c) it is a first degree equation
- d) it does not include fractions

Choose the correct letter (a-d) and write it within brackets: (c)

4) The slope of the straight line $-4x + 4y + 8 = 0$ is

- a) -2
- b) 2
- c) -1
- d) 1

Choose the correct letter (a-d) and write it within brackets: (d)

5) Which of the following equations holds?

- a) $\log(5 \times 3) = \log 5 \times \log 3$
- b) $\log \frac{4}{7} = \log 7 - \log 4$
- c) $\log 3^2 = 2 + \log 3$
- d) $\log \sqrt[3]{4} = \frac{1}{3} \log 4$

Choose the correct letter (a-d) and write it within brackets: (d)

6) In the Cartesian plane a point belongs to a straight line if and only if:

- a) its coordinates are equal to the coefficients of the equation variables of the straight line
- b) its coordinates are different from the coefficients of the equation variables of the straight line
- c) its coordinates satisfy the equation of the straight line
- d) its coordinates do not satisfy the equation of the straight line

Choose the correct letter (a-d) and write it within brackets: (c)

7) Powers with a *rational* exponent are defined by:

- a) roots of numbers greater than or equal to 0
- b) repeated multiplications
- c) repeated sums
- d) repeated divisions

Choose the correct letter (a-d) and write it within brackets: (a)

8) Suppose A and B are two non-empty sets. Which of the following statements is correct?

- a) The union of sets A and B is not empty
- b) The union of sets A and B is empty, provided the two sets are disjoint
- c) The union of sets is a not well-defined operation, if sets A and B do not have at least an element in common
- d) The union of sets A and B does not contain all elements of set A

Choose the correct letter (a-d) and write it within brackets: (a)

9) Given $A = \{0; 2; 4; 6; 8; 10\}$ and $B = \{1; 3; 4; 5; 7; 9\}$, what is $A \cup B$?

- a) \emptyset
- b) $\{4\}$
- c) $\{0; 1; 2; 3; 4; 5; 6; 7; 8; 9; 10\}$
- d) $\{0; 1; 2; 3; 4; \{4\}; 5; 6; 7; 8; 9; 10\}$

Choose the correct letter (a-d) and write it within brackets: (c)

10) Which of the following equations represents a parabola with the *vertex* at its origin?

- a) $y = -5x^2$
- b) $y = 2x^2 - x$
- c) $y = x^2 - 2x + 1$
- d) $y = -x^2 + 1$

Choose the correct letter (a-d) and write it within brackets: (a)

10 Chemistry and Biology

The alleles are...

- a) genetic mutations
- b) protein forms
- c) variant forms of a gene
- d) sex chromosomes

Choose the correct letter (a-d) and write it within brackets: (c)

A man with blood group O marries a woman with blood group A, whose father had blood group O. What is the percentage likelihood that their children have blood group O?

- a) 50%
- b) 75%
- c) 100%
- d) 25%

Choose the correct letter (a-d) and write it within brackets: (a)

Nitrogen has 5 electrons in its outer electron shell. How many covalent bonds can it form?

- a) 7
- b) 6
- c) 3
- d) None, because it is a noble gas

Choose the correct letter (a-d) and write it within brackets: (c)

The molecules characterized by the presence of the functional group -COOH are:

- a) called alcohols
- b) insoluble in water
- c) the main components of polysaccharides
- d) weak acids

Choose the correct letter (a-d) and write it within brackets: (d)

All the atoms of carbon have

- a) the same atomic mass
- b) the same number of protons
- c) the same number of neutrons
- d) the same total number of subatomic particles

Choose the correct letter (a-d) and write it within brackets: (b)

The procaryotic cells do not possess:

- a) nucleus
- b) ribosomes
- c) cell wall
- d) plasma membrane

Choose the correct letter (a-d) and write it within brackets: (a)

Lactose is formed by:

- a) a long chain of glucose molecules
- b) glucose and galactose
- c) a branched chain of glucose molecules
- d) it is a monosaccharide

Choose the correct letter (a-d) and write it within brackets: (b)

Which of the following chemical reactions schematizes the process by which animals obtain energy from glucose?

- a) $C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + 6CO_2$
- b) $6 C_6H_{12}O_6 + H_2O \rightarrow O_2 + CO_2$
- c) $C_6H_{12}O_6 + CO \rightarrow H_2O + CO_2$
- d) $6H_2O + 6CO_2 \rightarrow C_6H_{12}O_6 + 6O_2$

Choose the correct letter (a-d) and write it within brackets: (a)

Species belonging to the same class are included in:

- a) the same genus
- b) the same order
- c) the same phylum
- d) the same family

Choose the correct letter (a-d) and write it within brackets: (c)

Transcription is the synthesis of...

- a) the RNA promoted by DNA
- b) a polypeptide promoted by the RNA
- c) the RNA promoted by a polypeptide
- d) a polypeptide promoted by DNA

Choose the correct letter (a-d) and write it within brackets: (a)

10 Human and Social Sciences

The Logic of Scientific Discovery was written by

- a) Karl Popper
- b) Jean-Paul Sartre
- c) Martin Heidegger
- d) Edmund Husserl

Choose the correct letter (a-d) and write it within brackets: (a)

Positivism is a philosophical and cultural movement that originated during the second half of the 19th century in:

- a) Spain
- b) France
- c) United Kingdom
- d) Germany

Choose the correct letter (a-d) and write it within brackets: (b)

Which of the following ones is considered a major landmark in the birth of science?

- a) The publication of Copernicus' book *De revolutionibus orbium coelestium*
- b) The Fall of Constantinople
- c) The discovery that the *Donation of Constantine* was false
- d) The invention of the printing press

Choose the correct letter (a-d) and write it within brackets: (a)

Who already in the ancient thought – preceding by many centuries both Galileo Galilei and Locke – made a clear distinction between *objective* and *subjective properties* of the objects of knowledge?

- a) Aristotle
- b) Plato
- c) Democritus
- d) Pythagoras

Choose the correct letter (a-d) and write it within brackets: (c)

The word epistemology is a synonym of...

- a) philosophy of science
- b) philosophy of language
- c) methodology
- d) hermeneutics

Choose the correct letter (a-d) and write it within brackets: (a)

According to Mach's thought the notion of 'causality' in science should

- a) be replaced with the concept of 'mathematical function'
- b) be replaced with the concept of 'probability'
- c) keep a central role
- d) be added to the concept of 'mathematical function'

Choose the correct letter (a-d) and write it within brackets: (a)

Which of the following statements on *Pragmatism* is **NOT** correct?

- a) It is a philosophy based on practical life, on action
- b) It views thought in terms of its effectiveness, its practical effects
- c) It views future experience as a testing ground and check of knowledge
- d) It views experience as connected to the past, that is to the record of data gathered in the past

Choose the correct letter (a-d) and write it within brackets: (d)

Psychology **cannot** be a science according to:

- a) Herbert Spencer
- b) Auguste Comte
- c) John Stuart Mill
- d) Wilhelm Wundt

Choose the correct letter (a-d) and write it within brackets: (b)

The *scientific method* was introduced in the XVI century:

- a) due to geographical discoveries
- b) as instrument of the Counter-reformation
- c) as a free from ideological prejudices type of research
- d) as repositing Aristotle's ideas

Choose the correct letter (a-d) and write it within brackets: (c)

In the modern era, who made the distinction between *res cogitans* and *res extensa*?

- a) René Descartes
- b) Galileo Galilei
- c) Blaise Pascal
- d) Francis Bacon

Choose the correct letter (a-d) and write it within brackets: (a)

Logical and numerical abilities

A, B and C are three friends. If A is taller than C, B is not shorter than A and B is as tall as C, it can be concluded that:

- a) B and C are not the same height
- b) B is as tall as A
- c) B is shorter than A
- d) The three conditions are inconsistent

Choose the correct letter (a-d) and write it within brackets: (d)

Patients with major depressive episode have sleeping problems. We know that Jack has sleeping problems. We can infer that:

- a) Jack has a major depressive episode
- b) Jack probably has a major depressive episode
- c) Jack does not have a major depressive episode
- d) We cannot infer anything

Choose the correct letter (a-d) and write it within brackets: (d)

In a zoo there are parrots and zebras for a total of 30 heads and 80 paws. How many parrots and zebras are in the zoo?

- a) 10 parrots and 20 zebras
- b) 15 parrots and 15 zebras
- c) 20 parrots and 10 zebras
- d) 25 parrots and 5 zebras

Choose the correct letter (a-d) and write it within brackets: (c)

Local time in Padua is two hours behind Saint Petersburg. Local time in Saint Petersburg is eight hours ahead of New York, while local time in Melbourne is nine hours ahead of Padua. How many hours of time difference there are between New York and Melbourne?

- a) 17
- b) 13
- c) 16
- d) 15

Choose the correct letter (a-d) and write it within brackets: (d)

Hal, John and Jack share a university flat. Each one of them is enrolled in a different course and in a different year. Knowing that: a) the student of foreign languages enrolled a year before John; b) Hal, differently from the student of biology, is not a first year student; c) Jack is a third year student; d) the second year student is studying medicine; which of the following statements is correct?

- a) Jack is studying biology
- b) John is a third year student and is studying foreign languages
- c) Hal is a first year student and is studying biology
- d) Hal is the student of medicine

Choose the correct letter (a-d) and write it within brackets: (d)

A secretary must type a 300-page report. The first day she completes a third of the work, the second day she completes three-quarters of the rest. How many pages she has to type yet?

- a) 50
- b) 25
- c) 40
- d) 30

Choose the correct letter (a-d) and write it within brackets: (a)

Frank is whitewashing the walls of his bedroom and has already used up three paint boxes more than the half. Knowing that he has still 5 boxes to end the paint, how many boxes he has already used?

- a) 8
- b) 15
- c) 11
- d) 10

Choose the correct letter (a-d) and write it within brackets: (c)

Consider the following sequence of numbers and select the numbers replacing the question marks:

2, 4, 3, 6, 5, 10, ?, 18, 17, ?, 33, 66, 65, 130, 129...

- a) 6, 25
- b) 11, 18
- c) 20, 18
- d) 9, 34

Choose the correct letter (a-d) and write it within brackets: (c)

John looks at the CDs in his bedroom. Knowing that: a) each CD can be sung by a European or an American artist; b) each CD can be sung by a band or a single artist; c) if a CD is sung by a European artist then it is sung by a single artist, we can infer that...

- a) a CD sung by a single artist can be sung by an American artist
- b) a CD sung by a band can be sung by an American or a European artist
- c) any CD sung by a European artist is sung by a band
- d) any CD sung by a single artist is sung by a European artist

Choose the correct letter (a-d) and write it within brackets: (a)

A firm offers a 25% discount off the price of a computer that costs 4000 €. Another firm at first offers a 20% discount and afterwards a further 10% discount off the price of the same type of computer. What is the difference between the net prices?

- a) 20 €
- b) 220€
- c) 150 €
- d) 120 €

Choose the correct letter (a-d) and write it within brackets: (d)