**Fakultät für Naturwissenschaften und Technik**
**Facoltà di Scienze e Tecnologie**
**Faculty of Science and Technology**

ACADEMIC YEAR 2016 / 2017
ADMISSION TEST
BACHELOR IN AGRICULTURAL
AND AGRO-ENVIRONMENTAL SCIENCES
27th July 2016

Each of the following questions has only one correct answer among the proposed five. Mark in this way ⊠ the correct option (among (A), (B), (C), (D), (E)) on the answer sheet.

**Remark** The final grade of the admission test will be obtained by summing the points awarded to each answer using the following scheme:

- Right answer = 1 point.
- Wrong answer = −0.25 points.
- Unanswered question = 0 points.

**Question 1.** The atomic number of an atom represents:

(A) the number of neutrons in the atom

(B) the sum of the number of neutrons and protons in the atom

(C) the sum of the number of protons and electrons in the atom

(D) the electric charge of the atom

(E) the number of protons in the atom

**Question 2.** Which by-product is produced in the body of the cows when they produce milk?

(A) Fat

(B) Heat

(C) Mechanical energy

(D) Muscles

(E) Nitrogen

**Question 3.** Which livestock species plays the most important role for mountain farming in South Tyrol?

    (A) Cattle

    (B) Chicken

    (C) Pigs

    (D) Sheep

    (E) Goats

**Question 4.** What is a biological membrane?

    (A) Bark of trees

    (B) Skin of fruits

    (C) Separating membrane between organs in plants and animals

    (D) Separating membrane consisting of a phospholipid bilayer

    (E) Artificial membrane which is biologically degradable

**Question 5.** Which ecosystem harbours the most plant species?

    (A) Fertilized meadow

    (B) Unfertilized meadow

    (C) Pasture

    (D) Potato field

    (E) Wheat field

**Question 6.** An allele is:

    (A) a synonym of the chromosome

    (B) an identical gene

    (C) an alternative form of the same gene

    (D) the first generation of offspring

    (E) an apparatus of cell division

**Question 7.** We are living in the epoch of the Holocene which started:

    (A) 120.000 years ago

    (B) 65.000 years ago

    (C) 22.000 years ago

    (D) 12.000 years ago

    (E) 2.000 years ago

**Question 8.** What do black locust (Robinia pseudoacacia L.) and the tree of heaven (Ailanthus altissima MILL.) have in common?

    (A) They have evolved in Asia

    (B) They are endemic species in Europe

    (C) They are introduced species in Europe

    (D) They occur only on islands

    (E) They are toxic

**Question 9.** Micronutrients for plants are:

    (A) $N, P$

    (B) $P, K$

    (C) $Fe, P$

    (D) $Zn, Fe, Ni$

    (E) $Mg, Ca$

**Question 10.** Which tree species is most dependent on a warm climate?

    (A) Silver fir (Abies alba Mill.)

    (B) Spruce (Picea abies L.)

    (C) Larch (Larix decidua Mill.)

    (D) Field maple (Acer campestre L.)

    (E) Pubescent oak (Quercus pubescens Willd.)

**Question 11.** The police interrogate four suspects of robbery; they are sure that three of them are guilty. The accused make the following assertions:

        Angela: I am innocent.
       Benjamin: I am innocent.
        Clarissa: Angela and Benjamin are lying.
         Dylan: Only one of us is a liar.

How many of them are saying the truth?

    (A) No one

    (B) Exactly one

    (C) Exactly two

    (D) Exactly three

    (E) Either one or two

**Question 12.** The university campus where Andrea, Feray, Sarah and Jun study offers courses of tennis, climbing, basketball and hip hop.
Each of the students has chosen two courses and one of the courses has been chosen by three of them.
Sarah will play tennis and she is enrolled with Feray in the climbing course.
Andrea does not attend courses with Jun, but plays basketball with Feray.
Which of the following statements can be derived from the preceding facts?

  (A) Andrea and Sarah attend a course together.

  (B) Sarah and Jun do not attend courses together.

  (C) Andrea is enrolled in the climbing course.

  (D) One of the courses has been chosen only by one of them.

  (E) Jun has chosen the hip hop course.

**Question 13.** Let us consider the following inequalities:
$$\text{(i) } (x^2 + y^2)^n \geq (x + y)^n$$
$$\text{(ii) } (x^2 + y^2)^n \geq x^2 + y^2$$
$$\text{(iii) } (x^2 + y^2)^n \geq x^{n+2} + y^{n+2}$$
$$\text{(iv) } (x^2 + y^2)^n \geq x^{2n} + y^{2n}.$$

Which of them are true for any real $x$ and $y$ and any positive integer $n$?

  (A) All.

  (B) None

  (C) Only (iv).

  (D) Just (i) and (ii).

  (E) Just (ii) and (iv).

**Question 14.** Let $x$ and $y$ be two positive integers, such that $x$ is equal to 24% of $y$.
Which of the following statements is true?
(LCM = Lowest Common Multiple; GCD = Greatest Common Divisor)

  (A) $\text{LCM} = 150 \cdot \text{GCD}$

  (B) $\text{LCM} = 2400$

  (C) $\text{GCD} = 4$

  (D) $\text{GCD} = 24$

  (E) $\text{LCM} = 300$

**Question 15.** Since $\log_{10} 2 \approx 0.30103$, how many digits has the decimal expansion of the number $2^{250}$?

(A) 125

(B) 83

(C) 78

(D) 75

(E) 76

**Question 16.** Heron's formula states that the area $A$ of a triangle whose sides' measures are $a$, $b$ and $c$ is $A = \sqrt{p \cdot (p-a) \cdot (p-b) \cdot (p-c)}$, where $p = \dfrac{a+b+c}{2}$.
Let us consider an equilateral triangle of side $\ell$ and area $A$ and a square of side $\ell$. Which of the following formulas gives the area of the square?

(A) $\dfrac{4}{\sqrt{3}} A$

(B) $\dfrac{\sqrt{6}}{12} A^2$

(C) $2\sqrt{6}\, A$

(D) $\dfrac{16}{3} A$

(E) $\dfrac{4}{3} A$

**Question 17.** A triangular field has to be divided into two parts by a fence parallel to one of the sides (denoted by $\ell$) so that the two resulting fields (of triangular and trapezoidal shapes) have equal areas.
Let $r$ be the ratio between the distance of the fence from $\ell$ and the height of the field; which of the following statements is true?

(A) $r = \dfrac{1}{2}$

(B) $\dfrac{1}{3} < r < \dfrac{1}{2}$

(C) $r = \dfrac{1}{3}$

(D) $\dfrac{1}{4} < r < \dfrac{1}{3}$

(E) $r = \dfrac{1}{4}$

**Question 18.** The set of numbers from 1 to 8 has to be split into two sets $A$ and $B$ containing the same number of elements and in such a way that the sum of the numbers in $A$ equals the sum of the numbers in $B$.
How many ways are there to select $B$, if 1 and 7 belong to $A$?

   (A) 1

   (B) 2

   (C) 3

   (D) 4

   (E) 15

**Question 19.** An urn contains 70 balls numbered from 1 to 70. What is the probability that, extracting a ball at random, its number is divisible by 5 or by 7?

   (A) $\dfrac{19}{70}$

   (B) $\dfrac{12}{35}$

   (C) $\dfrac{3}{10}$

   (D) $\dfrac{23}{70}$

   (E) $\dfrac{11}{35}$

**Question 20.** Let us be given a test with 10 questions, each with only two possible answers (A and B). Suppose that it is known that exactly half of the right questions is A.
What is the probability that answering questions at random, but using the above information, all answers are correct?

   (A) $\dfrac{1}{2^5}$

   (B) $\dfrac{1}{5!}$

   (C) $\dfrac{5!}{10!}$

   (D) $\dfrac{5! \cdot 5!}{10!}$

   (E) $\dfrac{1}{2}$