IMAT 2025
PROGRAM

TEST DI MEDICINA 2022 EXAM

TRANSLATED BY :
LOCOMOTIVE Group

PREPARED FOR :
IMAT Candidates

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A PLAN FOR THE 17TH OF SEPTEMBER

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TABLE OF CONTENTS

The TOLC-MED test is administered twice a year by the Italian Ministry of Education. While these exams are generally easier than the IMAT tests, they share the same syllabus and number of questions. To prepare effectively for the IMAT exams, it is advisable for students to practice with the TOLC-MED tests. We recommend that students solve tests from at least the past five years.

01 LOGIC

5 Questions
All types of question

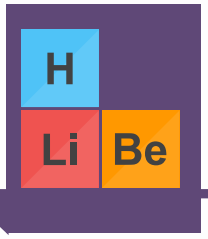
02 GK

4 Questions
All types of questions

03 BIOLOGY

23 Questions
All topics

04 CHEMISTRY

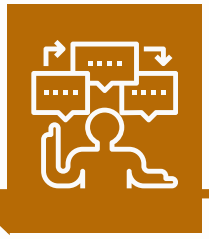


15Questions
All topics

05 PHYSICS

7 Questions
All topics

06 MATH



6 Questions
All topics

1. “Insulin resistance is not a disease in itself, but it is frequently associated with a series of cardiovascular risk factors included in the general definition of ‘metabolic syndrome’. These include visceral obesity, diabetes, increased triglycerides and cholesterol, and high blood pressure.

In conditions of insulin resistance, metabolic flexibility is altered: the ability of the muscle to use either carbohydrates or fats, depending on the availability of energy substrates, is insufficient.

Individuals affected by insulin resistance have a reduced ability to use fats during fasting conditions, and the increased production of insulin is still not able to stimulate the metabolism of sugars.”
(from the website of the Italian Ministry of Health: www.salute.gov.it)

According to the text, what is meant by “metabolic flexibility”?

A) The ability of muscle tissue to use energy, depending on the availability in the body, from fats or sugars
B) The guaranteed selectivity in a proper nutritional intake of fats and carbohydrates
C) The set of metabolic factors that can cause generalized muscle insufficiency
D) The inability of the muscular system to draw energy from carbohydrates ingested with food
E) The pathological reduction of the consumption of fats and sugars, accompanied by excessive insulin production

2. “The Constitutio de feudis (or Edictum de beneficiis) is the decree issued on May 28, 1037 by Emperor Conrad II the Salic. [...] With this edict, the irrevocability and heritability of their fiefs was recognized to the minor vassals (valvassors), thereby extending to them the rights already enjoyed by the major vassals under the Capitulary of Quierzy (877). It was also established that, in the absence of direct heirs, the fief could be inherited by the closest relatives up to the third degree, and that no feudal lord or count or bishop could deprive a valvassor of their fief without a serious and justified reason, which had to be approved by a council of valvassors. It was also prohibited for the great feudal lords to exchange, sell, or lease the benefits of their valvassors without their consent.”

(La storia. Dall’impero di Carlomagno al Trecento, series coordinated by Massimo Salvadori for UTET Cultura, vol. 5, 2004, p. 156)

What seems to have been the goal of the edict described in this text?

A) To deprive the great feudal lords of their lands and sources of income
B) To reduce the power of the great feudal lords by strengthening the position of the lesser feudal lords
C) To reinforce the subordinate relationship of minor feudal lords to the great feudal lords
D) To preserve the hereditary right of the entire feudal society as established by the Capitulary of Quierzy
E) To expand the feudal system in a way that guaranteed delegated management and lightened the emperor’s responsibilities.

3. "Rome, November 18

The good weather has returned; a clear day, with a pleasant warmth. At the Farnesina, I saw the story of Psyche, whose color reproductions have long cheered up my rooms; then the Transfiguration by Raphael at San Pietro in Montorio.

All old acquaintances, almost friendships, that we had acquired from afar through correspondence, but now we see in person."

What type of text is this excerpt taken from?

A) Historical novel
B) News report
C) Sonnet
D) Epic poem
E) Travel diary

4. "Allocating public resources to contain the rise in energy prices [...] is one of the commitments that the majority is asking of the government, within the resolution on the Def that was approved by both the Chamber and the Senate."

(La Repubblica, 20/04/2022)

What is the "Def" referred to in the text?

A) The Economic and Financial Document, which is the main planning tool of the government
B) The Dossier on Ecology and Finance, which is a planning tool for ecological transition
C) The Financial Balance Decree, which defines the tools to achieve a balanced state budget
D) The Financial Economy Dossier, which is the result of a compromise among the supporting political forces
E) The Financial Balancing Mechanism, which is the main tool for the economic-financial planning of the State

5. In June 2022, Franco spent 125% more on electricity compared to the same month of the previous year. What is the ratio between Franco's electricity expense in June 2022 and that in June 2021?

A) 5/4
B) 4/5
C) 9/4
D) 3/2
E) 0.25

6. Martina has planned a bicycle ride in such a way that exactly halfway along the route, there is a trattoria where she will stop. She starts riding and, after 30 kilometers, she still has a quarter of the distance to go before reaching the trattoria. What is the total length of the route in kilometers?

A) 37.5
B) 40
C) 120
D) 80
E) 75

7. How many digits from 1 to 8 (inclusive) have at least two of the following three properties?

- The digit is odd
- The digit is greater than or equal to 6
- The digit is less than or equal to 6

A) 2
B) 5
C) 6
D) 4
E) 3

8. Giulia writes on a blackboard a sequence of whole numbers. She starts with 3 in the first position and then builds each other number of the sequence from the one immediately preceding it in this way: she divides the previous number by 2, if it is even, otherwise she adds 5 to the previous number. What number will Giulia write in the twentieth position?

A) 8
B) 3
C) 5
D) 2
E) None of the numbers listed in the other answer choices

9. In a box, there are spheres and cubes. Each solid is either red or blue. 60% of the cubes are blue, 20% of the blue solids are cubes. If there are 20 red cubes, how many blue spheres are there?

A) 60
B) 180
C) 120
D) 90
E) 150

10. The examples listed below are determined by weak interactions EXCEPT ONE, which one?

A) Primary structure of proteins
B) Antigen–antibody binding
C) Secondary structure of proteins
D) Codon–anticodon pairing
E) Passage of H_2O through aquaporins

11. Which of the following statements regarding carbohydrates is FALSE?

A) They are oxidized by cells to produce CO_2, H_2O, and energy
B) They are reduced by cells to produce CO_2, H_2,O, and energy
C) They are composed of C, H, and O
D) They are also called saccharides
E) They are produced by plants through photosynthesis

12. Which of the following characteristics is exclusive to eukaryotic cells and is not found in prokaryotic cells?

A) Presence of the plasma membrane
B) Genome made up of double-stranded DNA
C) Presence of mitochondria
D) Presence of ribosomes
E) Genome replication

13. The CFTR gene encodes the synthesis of the CFTR protein, which regulates the movement of chloride, followed by the movement of water, from the inside to the outside of epithelial cells.

What is the result of the malfunction or absence of the CFTR protein?

A) Lack of chloride and a normal amount of water in the secretions
B) Accumulation of chloride and water in the secretions
C) Lack of chloride in the secretions and intracellular dehydration
D) Accumulation of chloride and lack of water in the secretions
E) Lack of chloride and water in the secretions

14. In eukaryotes, which of the following proteins forms the network of microfilaments of the cytoskeleton?

A) Myosin
B) Actin
C) Tubulin
D) Kinesin
E) Dynein

15. Aneuploidy is a common feature of cancer, and deciphering the mechanisms of chromosomal segregation is of great clinical interest. This segregation depends on the assembly/disassembly of which structures?

A) Desmosomes
B) Microfilaments
C) Nuclear laminae
D) Microtubules
E) Adhesion belts

16. Which phase of cell division is blocked in order to study the karyotype of an individual?

A) Anaphase
B) Prophase
C) Metaphase
D) Telophase
E) Cytokinesis

17. Which of the following statements about progesterone is FALSE?

A) It is produced by the ovary from the first day of the ovarian cycle
B) It is produced by the corpus luteum
C) It is produced by the placenta
D) Its production is controlled by the luteinizing hormone (LH)
E) It keeps the uterine musculature relaxed

18. From a cross between individuals with phenotypes AB and ab, offspring are obtained with 50% of phenotypes Ab and 50% of phenotypes aB. What is the genotype of the parents with phenotype AB?

A) AABb for linked traits
B) AABb for independent traits
C) AaBb for independent traits
D) AaBb for linked traits
E) Aabb for linked traits

19. If no mutations occur during the gametogenesis of the parents, which of the following situations CANNOT occur in monogenic recessive genetic diseases?

A) Two sick parents have a healthy child
B) Two healthy parents have a sick child
C) One sick parent and one healthy parent have a healthy child
D) Two healthy parents have a healthy child
E) One healthy parent and one sick parent have a sick child

20. If a single nitrogenous base is changed in a coding sequence of a eukaryotic gene, which of the following is NOT a possible result?

Obtaining a protein:

A) with multiple substituted amino acids
B) shorter
C) identical to the previous one
D) longer
E) with one substituted amino acid

21. In which of the following processes can the nucleotides AGU be paired with the nucleotides UCA?

1. **Transcription**
2. **Protein synthesis**
3. **Viral DNA replication**
4. **Viral RNA replication**

A) 1 and 3
B) 1 and 2
C) Only 3
D) 2 and 4
E) Only 2

22. The DNA denaturation cycles that occur in the PCR procedure correspond to a reaction which, under natural conditions, requires the involvement of one of the following enzymes. Which one?

A) Polymerase
B) Primase
C) Methyltransferase
D) Ligase
E) Helicase

23. Sickle cell anemia is a human genetic disease that manifests in individuals homozygous for the autosomal recessive allele HbS. Sickle cell anemia is lethal if left untreated. Which of the following statements is INCORRECT?

A) The change of an amino acid resulting from the point mutation leads, in the case of oxygen deficiency, to hydrophobic interactions in the β-globin molecules
B) The HbS allele differs from the wild-type allele by a point mutation affecting a single nucleotide
C) The HbS allele, since it causes a lethal pathological condition in homozygotes, has a low frequency in all human populations
D) Heterozygous individuals in populations subject to malaria have a higher probability of survival
E) The advantage of heterozygotes in malarial regions keeps the frequency of the HbS allele relatively high (15–20%)

24. Which of the following cells produces antibodies?

A) Neutrophil granulocyte
B) T-helper lymphocyte
C) Cytotoxic T-lymphocyte
D) Plasma cell
E) Basophil granulocyte

25. Which of the following organs has an internal lining made up of transitional epithelium?

A) Uterus
B) Bladder
C) Esophagus
D) Pharynx
E) Trachea

26. Which of the following muscle structures is striated?

A) The contractile myocardium
B) The dilator muscle of the iris
C) The piloerector muscle
D) The outer longitudinal muscle layer of the small intestine
E) The inner circular muscle layer of the small intestine

27. Which of the following is the necessary condition for a classical fermentation reaction?

A) The electron acceptor must be oxygen
B) The electron acceptor must be an inorganic molecule
C) The electron acceptor must be an organic molecule
D) Carbon must be oxidized
E) The redox coenzyme must be reduced

28. Which carbon atom of the sugar in the nucleotides of nucleic acids binds the nitrogenous base?

A) C 1′
B) C 2′
C) C 3′
D) C 4′
E) C 5′

29. Which of the following are characteristics attributable to mitochondria?

1. **Site of DNA molecule replication**
2. **Site of water molecule synthesis**
3. **Site of transport via simple diffusion**
4. **Present in autotrophic cells**

A) Only 1, 2
B) Only 1, 3, 4
C) Only 1, 2, 3
D) Only 2, 3, 4
E) All

30. What is the cause of the independent assortment of chromosomes of paternal and maternal origin during meiosis?

A) The production of recombinant chromosomes through crossing-over in prophase I
B) The random orientation of homologs with respect to the spindle poles at metaphase I
C) The random orientation of sister chromatids at metaphase II
D) The separation of centromeres at anaphase II
E) The number of chiasmata present in each bivalent

31. Which of the following statements is NOT consistent with Darwin's theory of evolution by natural selection?

A) The need for adaptation induces heritable variations in individuals of a population
B) Populations have a high reproductive potential
C) Natural resources are limited
D) Natural selection favors traits that improve individuals' survival and reproductive success
E) Individuals in a population show heritable variations independently of environmental needs

32. Which structure, among those listed, contains the greatest amount of glycogen deposits?

A) Cardiac muscle
B) Spleen
C) Liver
D) Kidney
E) Adipose tissue

33. Which, among the following pairs of substances, always forms a homogeneous mixture at ambient pressure and temperature?

A) Iron and carbon
B) Water and carbon dioxide
C) Water and oil
D) Water and sulfur
E) Dinitrogen and dioxygen

34. 20 mL of $CH_4(g)$ are burned together with 80 mL of $O_2(g)$, measured under the same conditions of temperature and pressure.

At the end of the reaction: $CH_4(g) + 2\ O_2(g) \rightarrow CO_2(g) + 2\ H_2O(g)$

What is the percentage composition by volume of the gaseous mixture?

A) 33% CO_2, 66% H_2O
B) 40% O_2, 20% CO_2, 40% H_2O
C) 40% CH_4, 20% CO_2, 40% H_2O
D) 25% CH_4, 25% O_2, 25% CO_2, 25% H_2O
E) 25% CH_4, 50% O_2, 25% CO_2

35. Which of the following species is isoelectronic with the ion N^{3-}?

A) C
B) F^+
C) P^{3+}
D) O^{2-}
E) Be

36. What is the reason why electronegativity decreases when going down a group of the periodic table?

A) Because the atomic radius decreases
B) Because the atomic radius increases
C) Because the tendency to lose electrons decreases
D) Because the attractive forces between the nucleus and the valence electrons increase
E) Because the metallic character decreases

37. Consider the elements: H, Li, B, O, F, Al, S, Cl. Which of the following pairs forms a bond with the greatest ionic character?

A) Li, O
B) H, S
C) B, H
D) Al, O
E) F, Cl

38. Which, among the following formulas, represents a stable compound?

A) CaCl
B) CaO
C) Ca_2Cl
D) $NaCl_2$
E) NaO

39. The stoichiometric coefficients of the reaction are

$$a\ Cu(s) + b\ H^+(aq) + c\ NO_3^-(aq) \rightleftharpoons d\ Cu^{2+}(aq) + e\ NO(g) + f\ H_2O(l)$$

A) a = 2; b = 8; c = 3; d = 2; e = 2; f = 4
B) a = 3; b = 8; c = 2; d = 3; e = 2; f = 4
C) a = 3; b = 5; c = 2; d = 2; e = 2; f = 5
D) a = 3; b = 8; c = 2; d = 2; e = 3; f = 4
E) a = 2; b = 5; c = 3; d = 3; e = 2; f = 4

40. By dissolving 18 g of glucose (molar mass: 180 g/mol) in 10 L of water, the resulting solution is:

A) 0.01 M
B) 0.1 M
C) 0.018 M
D) 1.8 M
E) 0.18 M

41. Which combination of factors definitely causes an increase in the rate of a reaction?

A) Addition of a catalyst and decrease in temperature
B) Increase in temperature and decrease in the concentration of reactants
C) Increase in temperature and increase in the concentration of reactants
D) Decrease in pressure and reduction in contact surface area
E) Increase in catalyst concentration and decrease in reactant concentration

42. When water is subjected to the action of a strong oxidizing agent, what is formed?

A) H_2
B) O_2
C) H_2 and O_2
D) H_2 and OH^-
E) H^+ and OH^-

43. Knowing that NaOH has a molar mass of 40 g/mol, how many grams of NaOH are needed to neutralize 10L of an aqueous solution of a strong monoprotic acid at pH 2?

A) 4 g
B) 40 g
C) 0.4 g
D) 0.2 g
E) 0.1 g

44. Which of the following compounds is an isomer of pentane?

A) 2-pentanone
B) 2-pentene
C) 2-methylbutane
D) 2-methylpentane
E) cyclopentane

45. In a rigid 1 L container containing solid carbon and gaseous dioxygen at 40 °C and 12 atm, the following reaction is carried out:

$$C(s) + O_2(g) \rightarrow CO_2(g)$$

Once the reaction is complete, the temperature is returned to 40 °C.
Neglecting the change in solid volume, what will the pressure in the container be, compared to the initial pressure?

A) Doubled
B) Halved
C) Increased
D) Decreased
E) Unchanged

46. Which of the following statements about atomic quantum numbers is FALSE?

A) The secondary quantum number depends on the principal quantum number
B) The secondary quantum number depends on the magnetic quantum number
C) The secondary quantum number can only take on values lower than the value of the principal quantum number
D) The spin quantum number of an electron can only assume half-integer values
E) The number of orbitals of a level depends on the principal quantum number

47. By dissolving 400 g of the strong electrolyte $CaBr_2$ in 10 L of water, what will be the concentration of Br^- ions? (atomic masses: Ca = 40 u, Br = 80 u)

A) 0.2 M
B) 0.4 M
C) 2 M
D) 4 M
E) 0.68 M

48. A laboratory centrifuge rotates at 6000 revolutions per minute. Let g be the acceleration due to gravity. What is, approximately and in terms of g (consider g = 10 m/s²), the magnitude of the centripetal acceleration of a sample rotating at a distance of 12.5 cm from the center of rotation?

A) 1250 g
B) 80 g
C) 125 g
D) 630 g
E) 5000 g

49. A magpie, flying horizontally at a speed of 12 m/s, drops a coin it is holding in its beak. The coin hits the ground with a speed of 20 m/s (magnitude). At what height is the magpie flying, approximately?

A) 8 m
B) 13 m
C) 20 m
D) 26 m
E) It is not possible to answer because the mass of the coin is not known

50. At the gym, you use an elastic band to strengthen your muscles. Suppose the elastic band behaves like an ideal spring with elastic constant K = 1 N/m. How much work is done by stretching the band by 50 cm?

A) 0.125 J
B) 0.25 J
C) 0.5 J
D) 1 J
E) 2 J

51. The water level contained in three identical glasses is exactly the same. However, while glass 1 contains only water, in glass 2 a cork stopper is floating, partially immersed, and at the bottom of glass 3 there is a steel sphere.
What can we say regarding the weights P_1, P_2, and P_3 of the three glasses measured by a scale?

A) $P_2 = P_1 > P_3$
B) $P_1 = P_2 = P_3$
C) $P_3 > P_2 > P_1$
D) $P_3 > P_1 > P_2$
E) $P_3 > P_1 = P_2$

52. A defibrillator momentarily interrupts the heartbeat by discharging onto the heart, through two electrodes, the energy accumulated in a capacitor.
If the capacitor has a capacitance of 50 μF and is charged to a voltage of 4 kV, what is the energy associated with such a discharge?

A) 800 J
B) 400 J
C) 100 mJ
D) 200 mJ
E) 100 J

53. Which of the following equations represents in the Cartesian plane the line that passes through the point (1, 1) and is perpendicular to the line with equation y = 3 − x?

A) y = x
B) y = x + 3
C) y = 2 − x
D) y = (1/3)x + 2/3
E) y = −(1/3)x + 4/3

54. What is the set of real solutions of the inequality:

$$\left(\frac{1}{2}\right)^{1-x} < \frac{1}{8}$$

A) The set of real numbers x such that x > −2
B) The set of real numbers x such that x < −2
C) The set of real numbers x such that x > 4
D) The set of real numbers x such that x < 4
E) The set of real numbers x such that x > 3

55. In the Cartesian plane, what is the area of the triangle defined by the coordinate axes and the line with equation y = 8x - 4?

A) -1
B) -2
C) 4
D) 1
E) 2

56. Circle passes through the four vertices of a rectangle with side lengths 6 and 12. What is the area of the circle bounded by this circumference?

A) 18 π
B) 90 π
C) $\sqrt{180}$ π
D) 45 π
E) 36 π

57. A loaded six-faced die, numbered from 1 to 6, lands on face 6 with probability 1/3, while the other faces all have the same probability. When this die is rolled, what is the probability of getting an even number?

A) 4/15
B) 1/2
C) 2/3
D) 5/6
E) 3/5

58. Some stones, each with a mass of one kilogram, are resting on the floor. With an energy amount equal to 4.2 kJ, how many of these stones can approximately be lifted onto a table one meter high?

A) 43
B) 430
C) 4,300
D) 43,000
E) 4

59. For which values of x, with $0 < x < \pi$, is $\sin(x) > \sin(5\pi/18)$?

A) $5\pi/18 < x < 13\pi/18$
B) $5\pi/18 < x < \pi/2$
C) $0 < x < 5\pi/18$ and $5\pi/18 < x < \pi$
D) $5\pi/18 < x < 7\pi/9$
E) $5\pi/18 < x < \pi$

60. What is the maximum value taken by the expression $6x^2 - 2y^2$ as the real numbers x and y vary in the interval [0, 1]?

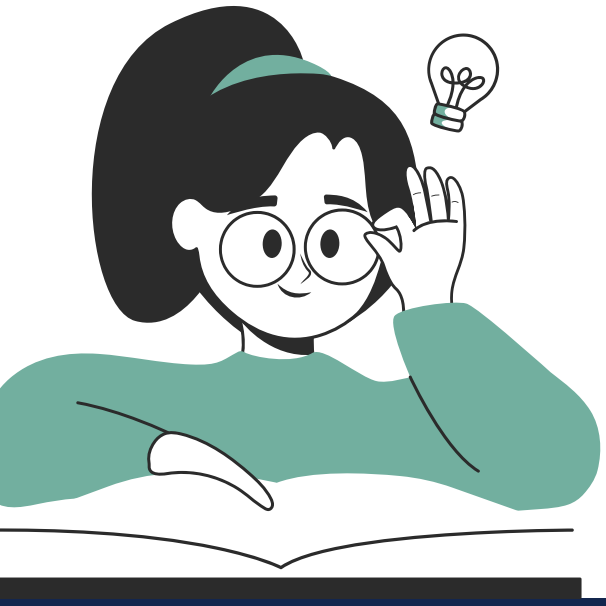
A) 3
B) 2
C) 6
D) 4
E) 8

• Answer

Total Points: ...../90

Correct answer:...../60
Wrong answer:...../60
Unanswered:...../60

Correct answer: +1.5 points
Wrong answer: -0.4
Unanswered: 0 points



1. A	26. A	51. E
2. B	27. C	52. B
3. E	28. A	53. A
4. A	29. E	54. B
5. C	30. B	55. D
6. D	31. A	56. D
7. B	32. C	57. E
8. A	33. E	58. B
9. C	34. B	59. A
10. A	35. E	60. C
11. B	36. B	
12. C	37. A	
13. E	38. B	
14. B	39. B	
15. D	40. A	
16. C	41. C	
17. A	42. B	
18. D	43. A	
19. A	44. C	
20. A	45. E	
21. D	46. B	
22. E	47. B	
23. C	48. E	
24. D	49. B	
25. B	50. A	