

**LITHUANIAN UNIVERSITY  
OF HEALTH SCIENCES**

**ENTRANCE  
EXAMINATION  
TEST**

Chemistry and  
Biology

**Example No. 2,  
2022**

# INSTRUCTIONS

1. Only one option (answer) is correct.
2. Wrong answer, not answered question, marked two or more options results a failed question.
3. Mark correct answer on the answer sheet in this way:  
  
A B C ☒ D E - D is considered as correct one.
4. In case you need to correct you answer, do it in a clear way:  
  
☒ A B C ☒ D E - D was marked but now you change to A as correct one.
5. You may use a calculator. Calculators on smartphones are allowed as an exception with a condition that you declare this to officer before using it.
6. You may do any notes, marks, etc. on this textbook in any place and manner you like. None of these notes will be used for evaluation purposes.
7. Do not hesitate to address with questions university officer if you are in doubts.

## **Strictly not allowed:**

- Copying, photocopying of this textbook, in full or single questions, pictures, etc.
- Rewriting any of questions by hand or by any other means.
- Using mobile phone during the exam. It must be turned off or in a flight mode.

**Failing to obey any of restrictions above will result in an exemption from the exam without right to join it later.**

# CHEMISTRY

**1. Which substance can be decomposed chemically?**

- A. Ammonia
- B. Iron
- C. Neon
- D. Hydrogen

**2. When a salt dissolves in water, the water molecules are attracted by ions in solution. This attraction is called**

- A. Atom-atom
- B. Molecule-ion
- C. Molecule-molecule
- D. Ion-ion

**3. Which statement is incorrect regarding energy?**

- A. energy can be given off in a reaction
- B. energy can be gained in a reaction
- C. energy cannot be created or destroyed
- D. energy has mass and takes up space

**4. Which phase change is described correctly?**

- A. solid to gas is called deposition
- B. gas to solid is called sublimation
- C. liquid to solid is called freezing
- D. solid to liquid is called vaporization

**5. An atom has eight electrons in a 3d subshell. How many orbitals in this subshell have an unpaired electron?**

- A. 1
- B. 2
- C. 3
- D. 4

**6. The sublevel that has only one orbital is identified by the letter**

- A. *s*
- B. *p*
- C. *d*
- D. *f*

**7. Which atom is not paired with its correction and ionic charge?**

- A. Rb / Rb<sup>1-</sup>
- B. Mg / Mg<sup>2+</sup>
- C. F / F<sup>1-</sup>
- D. Li / Li<sup>1+</sup>

**8. Which two elements will display the most similar chemical properties?**

- A. Aluminum and calcium
- B. Nickel and phosphorus
- C. Lithium and potassium
- D. Chlorine and sulfur

**9. Which of the following statements is false regarding sub-atomic particles?**

- A. the proton has a positive one charge
- B. the neutron has no charge
- C. the electrons are found in regions of the atom called orbitals
- D. the electrons have a greater mass than the protons

**10. Which kinds of bonding can be found in a sample of H<sub>2</sub>O(l)?**

- A. Hydrogen bonds only
- B. Nonpolar covalent bonds only
- C. Ionic and nonpolar hydrogen bonds
- D. Both polar covalent and hydrogen bonds

**11. A substance on analysis, gave the following percentage composition:  
Na = 43.4%, C = 11.3%, O = 43.3%  
Calculate its empirical formula [Na = 23, C = 12, O = 16]**

- A.  $\text{Na}_2\text{CO}_3$
- B.  $\text{NaCO}_3$
- C.  $\text{Na}_2(\text{CO}_2)_3$
- D.  $\text{Na}_3\text{CO}_3$

**12.  $\text{K}_4\text{Fe}(\text{CN})_6 + \text{H}_2\text{SO}_4 + \text{H}_2\text{O} = \text{K}_2\text{SO}_4 + \text{FeSO}_4 + (\text{NH}_4)_2\text{SO}_4 + \text{CO}$   
The balancing numbers for the equation are:**

- A. 2, 6, 6, 2, 2, 3, 6
- B. 1, 3, 3, 1, 1, 6, 6
- C. 1, 6, 6, 2, 1, 3, 6
- D. 1, 6, 6, 2, 2, 3, 6

**13. What happens when a catalyst is added to a reaction at equilibrium?**

- A. the point of equilibrium is shifted to the right
- B. the point of equilibrium is shifted to the left
- C. the forward and reverse reactions rates are increased unequally
- D. the forward and reverse reactions rates are increased equally

**14. Litmus is red when the  $\text{H}^{1+}$  concentration in the solution is**

- A.  $1 \times 10^{-11} \text{ M}$
- B.  $1 \times 10^{-9} \text{ M}$
- C.  $1 \times 10^{-7} \text{ M}$
- D.  $1 \times 10^{-5} \text{ M}$

**15. As an acidic solution is titrated with drops of base, the pH value of the solution will**

- A. increase
- B. decrease
- C. remain the same
- D. approach zero

16. Out of the compounds below, in which one does chlorine have the highest oxidation number?

- A. HCl
- B.  $\text{KClO}_3$
- C.  $\text{HClO}_2$
- D.  $\text{KClO}_4$

17. 4.5g of urea (molar mass =  $60\text{g mol}^{-1}$ ) are dissolved in water and solution is made to 100 ml in a volumetric flask. Calculate the molarity of solution.

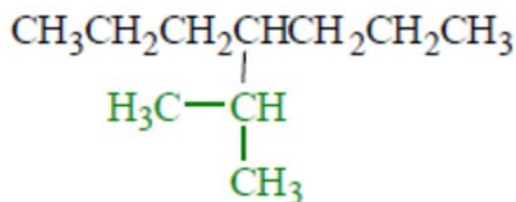
- A. 0.75M
- B. 1 M
- C. 1.25 M
- D. 1.5 M

18. What volume of 6 M HCl and 2 M HCl should be mixed to get one litre of 3 M HCl?

- A. volume of 6 M HCl required = 0.15 L and volume of 2 M HCl required = 0.85 L
- B. volume of 6 M HCl required = 0.35 L and volume of 2 M HCl required = 0.65 L
- C. volume of 6 M HCl required = 0.25 L and volume of 2 M HCl required = 0.75 L
- D. volume of 6 M HCl required = 0.55 L and volume of 2 M HCl required = 0.45 L

19. Name of the compound is

- A. 4-isopropylheptane
- B. 4-isodecane
- C. 1-di-propylbutane
- D. All names are correct



20. Which one of the following polymers is synthetic?

- A. Nucleic acids
- B. Plastic
- C. Proteins
- D. Cellulose

21. A carbonyl group is present in all of these functional groups except:

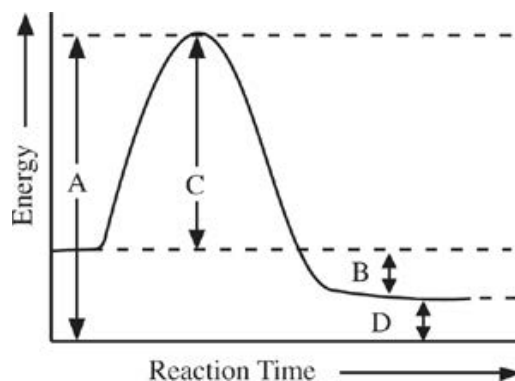
- A. Ketones
- B. Aldehydes
- C. Esters
- D. Ethers

22. Deoxyribose in DNA nucleotides belongs to this family of biologically important molecules

- A. Nucleic acids
- B. Proteins
- C. Carbohydrates
- D. Lipids

23.        is the enthalpy change of the forward reaction

- A. B
- B. C
- C. E
- D. C

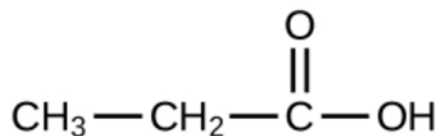


24. A 2.50 mg sample of magnesium powder is ignited with 2.00 mg oxygen in a sealed container. All of the magnesium is consumed, and 4.15 mg of a white solid, magnesium oxide, is formed. Find the mass of the unreacted oxygen.

- A. 0.65 mg
- B. 0.35 mg
- C. 0.25 mg
- D. 1.12 mg

25. The compound is

- A. Ester
- B. Ketone
- C. Carboxylic acid
- D. Alcohol



**26. Enzymes are large biological molecules mostly composed of**

- A. Proteins
- B. Amines
- C. Carbohydrates
- D. Lipids

**27. Which alcohol will undergo acid-catalyzed dehydration under the mildest conditions?**

- A.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
- B.  $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$
- C.  $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$
- D.  $(\text{CH}_3)_3\text{COH}$

**28. A 1.0 M aqueous solution of which compound has the lowest pH?**

- A.  $\text{CH}_3\text{CH}_2\text{OH}$
- B.  $\text{CH}_3\text{COOH}$
- C.  $\text{CH}_3\text{CHO}$
- D.  $\text{Cl}_3\text{CCHO}$

**29. Hydrogen peroxide,  $\text{H}_2\text{O}_2(\text{aq})$ , decomposes into water and oxygen. Adding a small amount of  $\text{FeCl}_3(\text{aq})$  increases the rate of gas evolution in this reaction. What is the best description of the role of  $\text{FeCl}_3$ ?**

- A. transition state
- B. reaction intermediate
- C. heterogeneous catalyst
- D. homogeneous catalyst

**30. Which combination of dilute aqueous reagents will not produce a precipitate?**

- A.  $\text{AgNO}_3 + \text{HCl}$
- B.  $\text{NaOH} + \text{HClO}_4$
- C.  $\text{BaBr}_2 + \text{Na}_2\text{SO}_4$
- D.  $\text{ZnI}_2 + \text{KOH}$



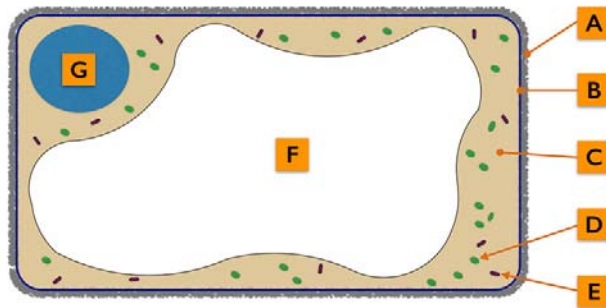
# BIOLOGY

1. Science about animals is called:

- A. zoology
- B. epidemiology
- C. geology
- D. botany

2. Which structure of a plant cell in this diagram controls what enters and leaves the cell?

- A. structure D
- B. structure A
- C. structure C
- D. structure B
- E. structure E



3. Which cell structure contains ribosomes?

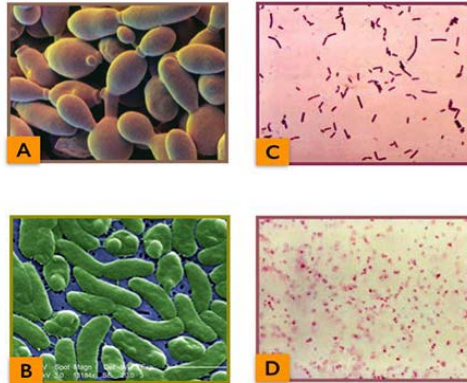
- A. endoplasmic reticulum
- B. Golgi apparatus
- C. mitochondria
- D. nucleus

4. What are the products of photosynthesis?

- A. water and oxygen
- B. sugar and water
- C. sugar and oxygen
- D. water and carbon dioxide

5. Which of the microorganisms in the diagram are NOT bacteria?

- A. A
- B. B
- C. C
- D. D



6. Which part of the cell is made from of a network of filaments that maintain the cell structure?

- A. cytoplasm
- B. endoplasmic reticulum
- C. cytoskeleton
- D. vacuoles

7. You are Gregor Mendel, interpret the following Punnett square to decipher sweet pea information.

- A. 25% of the sweet peas are homozygous
- B. there is a 1 in 4 chance for the sweet pea to be tall
- C. 50% of the sweet peas will have the same genotype
- D. the next generation of Tt sweet peas combining with Tt will all be tall

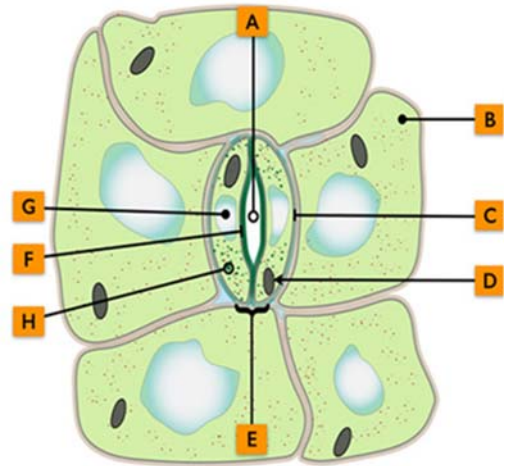
	T	t
T	TT	Tt
t	Tt	tt

8. There are \_\_\_\_\_ cells at the end of meiosis.

- A. two diploid
- B. four diploid
- C. two haploid
- D. four haploid

9. The diagram shows a part of the lower surface of a leaf as seen under a microscope. Which term describes the state of the cells labelled E as they are shown in the diagram the best?

- A. immatured
- B. plasmolysed
- C. turgid
- D. haemolysed



10. Enzymes are:

- A. fats
- B. lipids
- C. proteins
- D. carbohydrates

11. What is the function of ADP molecules in living cells?

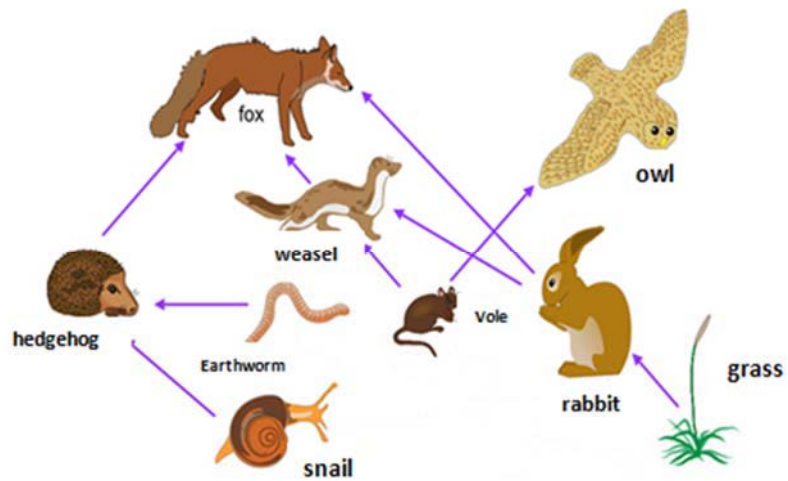
- A. they form a genetic material important for reproduction
- B. they act to "capture" energy from the oxidation of fuels to be used in other cell processes
- C. they act as coenzymes so that the fats can be synthesized
- D. they are an integral part of the cell membrane, important in the transport of water molecules

12. Genes are made out of:

- A. DNA
- B. RNA
- C. proteins
- D. enzymes

13. Which of the following organisms correspond to a secondary consumer according to this diagram?

- A. fox
- B. rabbit
- C. earthworm
- D. weasel



14. The process by which changes in organisms happen over number of generations is known as:

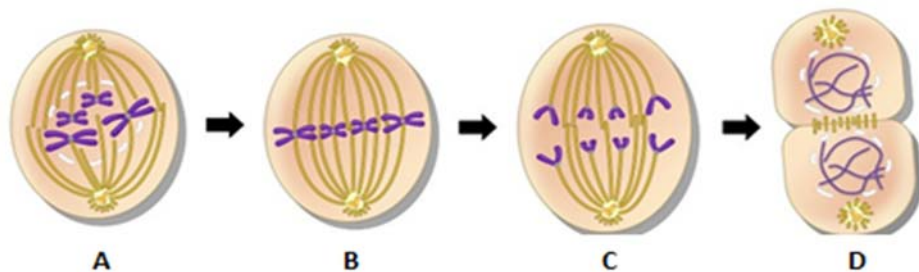
- A. variation
- B. evolution
- C. revolution
- D. survival

15. The double helix describes the shape of:

- A. DNA
- B. chromosome
- C. gene
- D. nucleus

16. Which one of the phases presented in the diagram corresponds to *anaphase*?

- A. D
- B. C
- C. A
- D. B

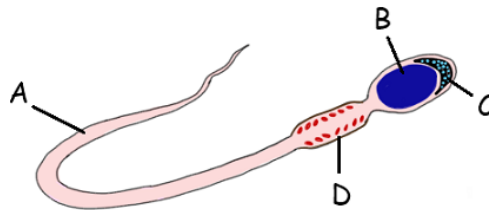


17. Osmosis is the diffusion of A. \_\_\_\_\_ from B. \_\_\_\_\_ to C. \_\_\_\_\_ concentration.

- A. A. any molecule, B. high, C. low
- B. A. water, B. high, C. low
- C. A. water, B. low, C. high
- D. A. any molecule, B. low, C. high

18. What does label B refer to in this diagram of the sex cell?

- A. nucleus
- B. acrosome
- C. filament
- D. flagellum



19. Where does the digestion of the starch *start*?

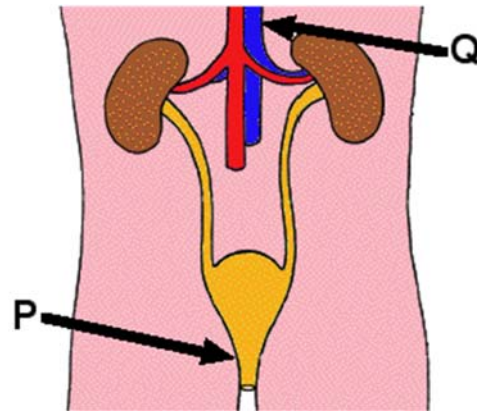
- A. in stomach
- B. in colon
- C. in ileum
- D. in mouth

20. What is the role of the hormone thyroxine?

- A. lowers blood water potential
- B. stimulates growth
- C. lowers blood pressure
- D. stimulates the rate of metabolism

**21. The diagram shows the urinary system. Name the parts labelled P and Q in the diagram.**

- A. P = urethra, Q = bladder
- B. P = urethra, Q = renal vein
- C. P = ureter, Q = kidney
- D. P = ureter, Q = renal vein



**22. Chemical messengers released by endocrine glands are called:**

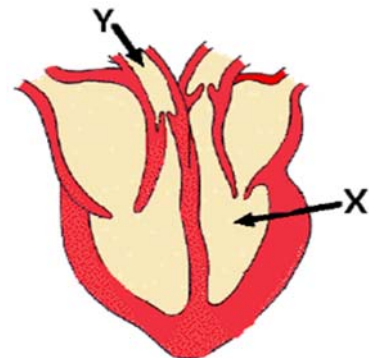
- A. hormones
- B. exocrine glands
- C. enzymes
- D. neurons

**23. Which of the following is related to a white blood cell?**

- A. phagocytosis
- B. oxygen transport
- C. hemoglobin
- D. bilirubin

**24. The diagram shows the heart. Name the parts labelled X and Y in the diagram.**

- A. X = left ventricle, Y = pulmonary artery
- B. X = left atrium, Y = pulmonary artery
- C. X = right ventricle, Y = pulmonary vein
- D. X = left ventricle, Y = mitral valve



**25. Which part of the nervous system contains the brain and the spinal cord?**

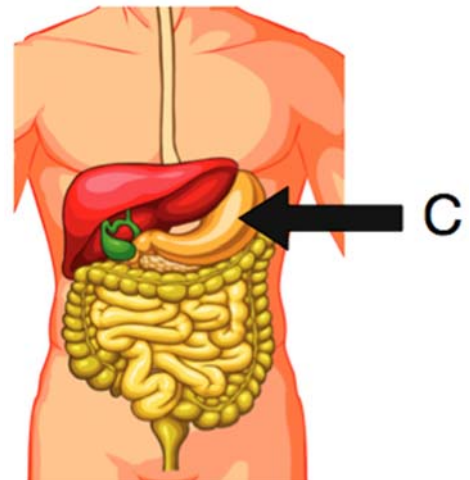
- A. central nervous system
- B. peripheral nervous system
- C. autonomic nervous system
- D. somatic nervous system

**26. Which of the following types of disease are caused when the immune system attacks the body?**

- A. autoimmune
- B. lifestyle
- C. heart disease
- D. disorder

**27. What happens in the part of the digestive system labelled C in the diagram?**

- A. digested food passes into the bloodstream
- B. bile is produced
- C. hydrochloric acid helps to digest food
- D. lipids (fats) are degraded into fatty acids and glycerol



**28. What does insulin do?**

- A. helps cells to absorb sugar in the blood
- B. raises blood sugar
- C. fights off diseases
- D. all of the above

**29. The protein in the red blood cells that carries oxygen is:**

- A. erythropoietin
- B. melatonin
- C. hemoglobin
- D. urobilinogen

**30. The diagram shows the respiratory system. Name the parts labelled A and B in the diagram.**

- A. A = trachea, B = bronchiole
- B. A = alveolus, B = bronchiole
- C. A = trachea, B = bronchus
- D. A = bronchiole, B = trachea

