

CHEMISTRY

ENTRY EXAMS

FOR THE MEDICAL DEGREE ENGLISH PROGRAM
OF THE UNIVERSITY OF THESSALY

The Chemistry test for the entrance exam in the *Medical Degree English Program* is thoughtfully crafted to align with the syllabus of IB (International Baccalaureate) Chemistry (Standard level). It thoroughly covers the following topics:

1. Stoichiometric relationships
2. Atomic structure
3. Periodicity
4. Chemical bonding and structure
5. Energetics/thermochemistry
6. Chemical kinetics
7. Equilibrium
8. Acids and bases
9. Redox processes
10. Organic chemistry
11. Measurement, data processing and analysis

Relevant Textbook:

Pearson Bacculaureate: Higher Level Chemistry by Catrin Brown & Mike Ford. 2nd edition.

EXAMPLES OF TEST QUESTIONS

1. How many oxygen atoms are in 0.100 mol of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$?
A. 5.42×10^{22}
B. 6.02×10^{22}
C. 2.41×10^{23}
D. 5.42×10^{23}
2. The relative molecular mass of a gas is 56 and its empirical formula is CH_2 . What is the molecular formula of the gas?
A. CH_2
B. C_2H_4
C. C_3H_6
D. C_4H_8
3. 300 cm^3 of water is added to a solution of 200 cm^3 of 0.5 mol dm^{-3} sodium chloride. What is the concentration of sodium chloride in the new solution?
A. 0.05 mol dm^{-3}
B. 0.1 mol dm^{-3}
C. 0.2 mol dm^{-3}
D. 0.3 mol dm^{-3}

4. Which statement about the numbers of protons, electrons, and neutrons in an atom is always correct?

- A. The number of neutrons minus the number of electrons is zero.
- B. The number of protons plus the number of neutrons equals the number of electrons.
- C. The number of protons equals the number of electrons.
- D. The number of neutrons equals the number of protons.

5. How many electrons does the ion $^{31}_{15}\text{P}^{3-}$ contain?

- A. 12
- B. 15
- C. 16
- D. 18

6. Which is the best definition of electronegativity?

- A. Electronegativity is the energy required for a gaseous atom to gain an electron.
- B. Electronegativity is the attraction of an atom for a bonding pair of electrons.
- C. Electronegativity is the attraction between the nucleus and the valence electrons of an atom.
- D. Electronegativity is the ability of an atom to attract electrons from another atom.

7. Which statements are correct for the complex ion $[\text{CuCl}_4]^{2-}$?

I The oxidation number of Cu in the complex ion is +2.

II The coordination number of the copper ion is 4.

III Chloride ions are behaving as ligands.

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II, and III

8. Which bonds are arranged in order of increasing polarity?

- A. $\text{H-F} < \text{H-Cl} < \text{H-Br} < \text{H-I}$
- B. $\text{H-I} < \text{H-Br} < \text{H-F} < \text{H-Cl}$
- C. $\text{H-I} < \text{H-Br} < \text{H-Cl} < \text{H-F}$
- D. $\text{H-Br} < \text{H-I} < \text{H-Cl} < \text{H-F}$

9. Which compound forms hydrogen bonds in the liquid state?

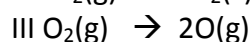
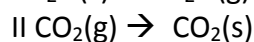
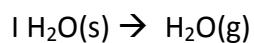
- A. $\text{C}_2\text{H}_5\text{OH}$
- B. CHCl_3
- C. CH_3CHO
- D. $(\text{CH}_3\text{CH}_2)_3\text{N}$

10. Ammonium chloride dissolves in water spontaneously in an endothermic process. Identify the best explanation for these observations.

- A. Endothermic processes are energetically favourable.
- B. The bonds in solid NH_4Cl are very weak.

- C. The entropy change of the system drives the process.
- D. The entropy change of the surroundings drives the process

11. Which of the following processes are endothermic?



- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II, and III

12. Which step is the rate-determining step of a reaction?

- A. the step with the lowest activation energy
- B. the final step
- C. the step with the highest activation energy
- D. the first step

13. What happens when the temperature of a reaction increases?

- A. the activation energy increases
- B. the rate constant increases
- C. the enthalpy change increases
- D. the order of the reaction increases

14. Which statement about chemical equilibria implies they are dynamic?

- A. The position of equilibrium constantly changes.
- B. The rates of forward and backward reactions change.
- C. The reactants and products continue to react.
- D. The concentrations of the reactants and products continue to change.

15. Which salt dissolves in water to form an acidic solution?

- A. ammonium nitrate
- B. sodium ethanoate
- C. potassium chloride
- D. sodium hydrogen carbonate

16. Equal volumes and concentrations of hydrochloric acid and ethanoic acid are titrated with sodium hydroxide solutions of the same concentration. Which statement is correct?

- A. The initial pH values of both acids are equal.
- B. At the equivalence points, the solutions of both titrations have pH values of 7.
- C. The same volume of sodium hydroxide is needed to reach the equivalence point.
- D. The pH values of both acids increase equally until the equivalence points are reached.

17. Which species could be reduced to form NO_2 ?

- A. N_2O

- B. NO_3^-
- C. HNO_2
- D. NO

18. Which compound could rotate the plane of polarization of polarized light?

- A. $(\text{CH}_3)_2\text{CHCH}_2\text{Cl}$
- B. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$
- C. $\text{CH}_3\text{CH}_2\text{CHClCH}_3$
- D. $(\text{CH}_3)_3\text{CCl}$

19. Which reaction type is typical for halogenoalkanes?

- A. electrophilic substitution
- B. electrophilic addition
- C. nucleophilic substitution
- D. nucleophilic addition

20. How many isomers can exist for a compound with the molecular formula $\text{C}_2\text{H}_2\text{Cl}_2$?

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

ANSWERS

- 1. D
- 2. D
- 3. C
- 4. C
- 5. D
- 6. B
- 7. D
- 8. C
- 9. A
- 10. C
- 11. B
- 12. C
- 13. B
- 14. C
- 15. A
- 16. C
- 17. B
- 18. C
- 19. C
- 20. C