

Example Test questions

Name and surname	Fac. number	Group

Methodical instructions

Below you will find a **Representative test questions from:**

- **Part A – multiple choice** - The student should indicate the correct answer, which is **only one** of four options.
- **Part B – matching type questions** - The student is asked to pair items in one column to items in another column and match them in a table.
- **Part C – true or false type questions** - The student is asked to respond from two-choice answers for a statement that is either correct or incorrect.
- **Part D – fill in the blanks type questions** - The student should provide the missing word or words in a phrase, sentence, or paragraph with a blank space.

All test questions include knowledge from the rest of the subjects included in the program.

Each student should fulfill his/hers own individual test, following the above mentioned instructions. The identification of the correct answer in the multiple choice type questions should be done using the check box option. Students should keep in mind that there may be one and **only one correct answer**.

All correspondence regarding the presented material, the test and any other questions you may have on the subject of Inorganic chemistry should be send to:

assoc. prof. Maya Georgieva at the following e-mail:
georgm@mail.bg

Example Test questions

Part A

Which substance can be decomposed chemically?

- (A) Ammonia;
- (B) Iron;
- (C) Carbon dioxide;
- (D) Hydrogen;

Which of the following is not a physical property?

- (A) Color;
- (B) Odor;
- (C) Boiling point;
- (D) Reactivity with oxygen;

Alloys are mixtures of metallic substances. Which of the following pairs are matched INCORRECTLY?

- (A) Brass – copper and zinc
- (B) Steel – iron and copper
- (C) Bronze – copper, zinc, and others
- (D) Constantan – nickel and copper

Mark the WRONG statement:

- (A) calcium reacts with water with release of hydrogen, reacts with chlorine, sulfur and oxygen;
- (B) magnesium burns in presence of oxygen, but does not interact with sulphuric and hydrochloric acid;
- (C) sodium easily interacts with most of the non metals, but does interact with methane;
- (D) a strong oxide layer on the aluminum surface prevents it from further oxidation;

Example Test questions

Which of the following oxides are amphoteric:

- (A) K_2O ;
- (B) Al_2O_3 ;
- (C) CaO ;
- (D) N_2O_5

Which of the following oxides gives an acid by interaction with water:

- (A) CO_2 ;
- (B) CaO ;
- (C) NO ;
- (D) Na_2O

In laboratory conditions CO_2 may be obtained by an interaction of:

- (A) calcium hydroxide and acid;
- (B) calcium carbonate and water;
- (C) calcium oxide and water;
- (D) calcium carbonate and acid;

Which of the following would produce a basic aqueous solution?

- (A) Na_2O ;
- (B) KCl ;
- (C) NH_4Cl ;
- (D) CO_2

Example Test questions

Quartz, SiO_2 , is the most common mineral found on the surface of the earth. What is the best explanation for the fact that quartz is hard and has a high melting point?

- (A) Quartz crystals are extended structures in which each atom forms strong covalent bonds with all of its neighboring atoms.
- (B) Quartz crystals consist of positive and negative ions that are attracted to one another.
- (C) Quartz crystals are formed under extremes of temperature and pressure.
- (D) Silicon and oxygen atoms are especially hard because of their electronic structure.

Mark the list of substances which includes only acid oxides:

- (A) P_2O_5 , SO_2 , Li_2O , CuO , Cl_2O_7 ;
- (B) CO_2 , SO_3 , SiO_2 , NO_2 , SO_2 ;
- (C) HgO , CaO , FeO , CuO , MgO ;
- (D) ZnO , Al_2O_3 , BaO , Cr_2O_3 , Ag_2O

ZnO may be obtained from:

- (A) thermal decomposition of $\text{Zn}(\text{OH})_2$,
- (B) thermal decomposition of $\text{Zn}(\text{NO}_3)_2$,
- (C) thermal decomposition of ZnCO_3 ,
- (D) all answers are correct,

After interaction of ferric hydroxide ($\text{Fe}(\text{OH})_3$) and H_2SO_4 are obtained:

- (A) iron (III) sulphate and water;
- (B) iron (III) sulphite and water;
- (C) iron (III) sulphide and water;
- (D) iron (III) sulphide and hydrogen;

Example Test questions

All of the reactions below represent oxidation-reduction processes EXCEPT the

- (A) combustion of iron in chlorine gas
- (B) decomposition of hydrogen peroxide
- (C) reaction of zinc with hydrochloric acid
- (D) neutralization of potassium hydroxide

What happens when a fluorine atom becomes a fluoride ion in a chemical reaction?

- (A) a proton is gained by the nucleus;
- (B) a proton is lost by the nucleus;
- (C) an electron is lost from one of the outer orbitals;
- (D) an electron is added to one of the outer orbitals

Which of the listed simple substances can participate in a chemical reaction only as an oxidant?

- (A) nitrogen;
- (B) sodium;
- (C) iron;
- (D) fluorine;

Oxidation of iron (II) sulfate with an acidic aqueous solution of potassium dichromate yields:

- (A) $\text{Cr}_2(\text{SO}_4)_3$, $\text{Fe}_2(\text{SO}_4)_3$, K_2SO_4 ;
- (B) CrSO_4 , $\text{Fe}_2(\text{SO}_4)_3$, K_2SO_4 ;
- (C) $\text{K}_3[\text{Cr}(\text{OH})_6]$ и $\text{Fe}_2(\text{SO}_4)_3$;
- (D) CrO_2 , $\text{Fe}_2(\text{SO}_4)_3$ и K_2SO_4 ;

Example Test questions

The oxidation number for hydrogen in NaH is:

- (A) $+1$
- (B) $+2$
- (C) 0
- (D) -1

Which of the following interactions is IMPOSSIBLE?

- (A) zinc and sodium hydroxide
- (B) magnesium and sodium hydroxide
- (C) chlorine and sodium hydroxide
- (D) aluminum and hydrochloric acid

Upon contact of the concentrated solutions of H_2SO_4 , HCl and NaOH with aluminum the reaction will proceed:

- (A) only with hydrochloric acid;
- (B) with hydrochloric acid and sodium hydroxide;
- (C) with sulphuric acid and sodium hydroxide;
- (D) only with sodium hydroxide

In the reaction $\text{Al} + \text{Fe}^{3+} \rightarrow \text{Al}^{3+} + \text{Fe}$, the oxidizing agent is:

- (A) Al
- (B) Fe
- (C) Al^{3+}
- (D) Fe^{3+}

Example Test questions

The chemical elements presented are arranged in order of decrease in their reactivity, according to the activity series of metals.

Ca, Na, Mg, Zn, Fe, H, Cu, Hg, Ag, Au

Which is the best reducing agent, which is oxidized the easiest?

- (A) Ca
- (B) Au
- (C) H
- (D) Fe

When nonspontaneous redox reactions occur by use of a direct electric current, the process is called:

- (A) neutralization
- (B) eterification
- (C) electrolysis
- (D) hydrolysis

Which is formed at the cathode during the electrolysis of aqueous AgNO_3 ?

- (A) Ag(s)
- (B) $\text{H}_2(\text{g})$
- (C) $\text{O}_2(\text{g})$
- (D) $\text{N}_2(\text{g})$

If the pressure for the reaction $\text{A(s)} + \text{B(g)} = \text{AB(s)}$ is increased 4 times, then the rate of the reaction:

- (A) will not change;
- (B) will increase 8 times;
- (C) will increase 4 times;
- (D) will increase 16 times;

Example Test questions

Which of the presented factors does NOT affect the reaction rate?

- (A) nature of the reactants
- (B) concentration
- (C) temperature
- (D) time

With addition of a catalyst to a system 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

A catalyst is added to a system at equilibrium. The concentration of the reactants will:

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

For the process $\text{CaO}_{(s)} + \text{CO}_{2(g)} \rightleftharpoons \text{CaCO}_{3(s)}$ the rate of the straight reaction is:

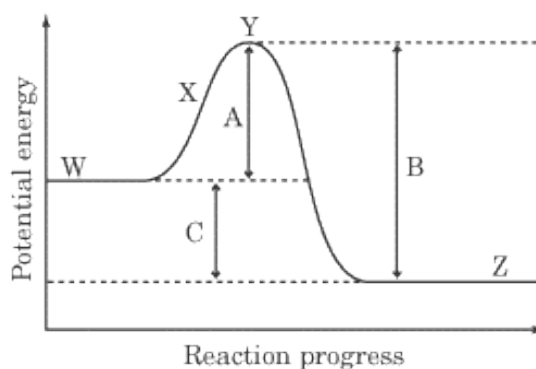
- (A) $v = k \cdot [\text{CaO}] \cdot [\text{CO}_2] \cdot [\text{CaCO}_3]$
- (B) $v = k \cdot [\text{CaO}] \cdot [\text{CO}_2]$
- (C) $v = k \cdot [\text{CaO}]$
- (D) $v = k \cdot [\text{CO}_2]$

Example Test questions

The reaction rate of a multistage reaction is determined by:

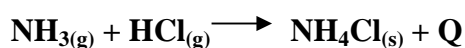
- (A) the rate of the first stage
- (B) the rate of the last stage
- (C) the rate of the fastest stage
- (D) the rate of the slowest stage

Which letter corresponds to the activation energy of the reaction?



- (A) A;
- (B) B;
- (C) C;
- (D) Y.

Point the correct equation for calculation of the thermal effect of the reaction:



where Q_1 is the heat of formation of $\text{NH}_3(\text{g})$, Q_2 – of $\text{HCl}(\text{g})$ and Q_3 – of $\text{NH}_4\text{Cl}(\text{s})$:

- (A) $Q = Q_3 + Q_2 + Q_1$
- (B) $Q = Q_3 - (Q_2 + Q_1)$
- (C) $Q = Q_2 - Q_3 - Q_1$
- (D) $Q = Q_1 - Q_3 + Q_2$

Example Test questions

Indicate the wrong statement:

- (A) the equilibrium constant depends on the presence of catalysts;
- (B) the equilibrium constant does not depend on the concentrations of the reactants;
- (C) the equilibrium constant does not depend on the pressure;
- (D) the equilibrium constant depends on the temperature.

For the equilibrium gas system at a given temperature, the following expression is given for the equilibrium constant:

$$K_c = \frac{C_{CO_2} \cdot C_{H_2}}{C_{CO} \cdot C_{H_2O}}$$

Which of the listed chemical equations corresponds to the expression for the equilibrium constant?

- (A) $CO + H_2O \rightleftharpoons CO_2 + H_2$
- (B) $CO + H_2 \rightleftharpoons CO_2 + H_2O$
- (C) $CO_2 + H_2 \rightleftharpoons CO + H_2O$
- (D) $H_2O + CO_2 \rightleftharpoons H_2 + CO$

Which of the following gases would be the densest at standard temperature and pressure?

- (A) Helium
- (B) Argon
- (C) Carbon dioxide
- (D) Xenon

Example Test questions

Which of the listed substances are electrolytes (A-aluminium oxide, B-sodium chloride, C-barium hydroxide, D-glucose, E-iron, F-hydrochloric acid)

- (A) A,B,E;
- (B) B, C, F;
- (C) C, D, F;
- (D) A, C, F;

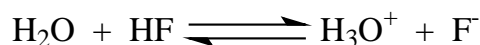
The largest number of sodium ions are formed by dissociation of 1 mole:

- (A) sodium carbonate;
- (B) sodium nitrate;
- (C) sodium sulphate;
- (D) sodium phosphate;

In a given solution the concentration of OH^- ions is 1.10^{-3} mol/l. Therefore for this solution:

- (A) pH = 3,
- (B) pH = 10,
- (C) pH = 11,
- (D) pH = 7.

In the equation:



- (A) H_2O is a base and HF is its conjugate acid.
- (B) H_2O is an acid and HF is the conjugate base.
- (C) HF is an acid and F^- is its conjugate base.
- (D) HF is a base and H_3O^+ is its conjugate acid.

Example Test questions

Part B

Establish a match between the reaction and the formula of the oxidant in the reaction.

Column 1	Column 2
A) $K_2CO_3 + Br_2 \rightarrow KBr + KBrO_3 + CO_2$	1) K_2CO_3
B) $HBr + HBrO_3 \rightarrow Br_2 + H_2O$	2) Br_2
C) $NaH + HCl \rightarrow NaCl + H_2$	3) Cl_2
D) $Br_2 + Cl_2 \rightarrow 2BrCl$	4) HBr
	5) HCl
	6) $HBrO_3$
	7) NaH

A	B	C	D

Establish a match between the reaction and the degree of oxidation of the reducer

Column 1	Column 2
A) $Mg + HNO_3 \rightarrow Mg(NO_3)_2 + NH_4NO_3 + H_2O$	1) -3
B) $NH_3 + O_2 \rightarrow NO + H_2O$	2) -2
C) $KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$	3) 0
D) $Br_2 + KOH \rightarrow KBr + KBrO_3 + H_2O$	4) 4

A	B	C	D

Example Test questions

Part C

Chemical kinetics is a part of chemistry that studies the rate and the mechanism of a chemical reaction, as well as the factors that affect the rate of the reaction.

True	False
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In reversible reaction the catalysts do not affect the rate of the straight and the reverse reactions.

True	False
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The rate of a chemical reaction increases with increase of the activation energy.

True	False
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OH^- is a stronger base than H_2O

True	False
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Part D

Polar and charged substances dissolve well in _____ solvents because of the electrostatic attraction between opposite charges.

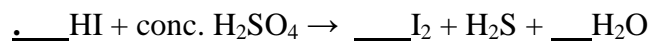
For _____ changes, the release of energy is represented as writing the energy term as a product in the chemical equation.

Adding solute to a solvent lowers the _____ pressure of the solvent.

The rate of a chemical reaction is defined as _____ in _____ of any of the initial reactants per unit of _____.

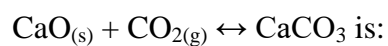
Example Test questions

Balance the presented reaction:



Balanced chemical equations contain important information about the amount of reactants required to produce given products. These amounts are represented by _____.

The rate equation for the straight reaction



_____.