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# Science Bridging Course

## Unit CH4 – Self-test

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**In this chapter you will find out:**

- Test for self-study

# Test for self-study: Chemistry

- I. The laboratory vessel for the storage, heating and reaction of liquids is:**
- 1) test tube;
  - 2) chemical beaker;
  - 3) measuring cylinder;
  - 4) dividing funnel;
  - 5) Wurtz flask.
- II. The device for measuring humidity is:**
- 1) hydrograph;
  - 2) hygrometer;
  - 3) barometer;
  - 4) anemometer;
  - 5) gnomon.
- III. Water hardens:**
- 1) sodium salts;
  - 2) calcium and magnesium salts;
  - 3) potassium salts;
  - 4) copper microparticles;
  - 5) organic substances.
- IV. A round bottomed flask with a neck branch for distilling liquids is:**
- 1) burette;
  - 2) Kipp's apparatus;
  - 3) Wurtz flask;
  - 4) measuring flask;
  - 5) Erlenmeyer flask.
- V. The most common method of water decontamination is:**
- 1) filtration;
  - 2) chlorination;
  - 3) exposure to ultraviolet rays;
  - 4) ozonation;
  - 5) distillation.
- VI. The ratio of the number of moles  $\nu$  to the volume  $V$  of a substance means:**
- 1) molar concentration;
  - 2) weight;
  - 3) density;
  - 4) status;
  - 5) degree of oxidation.
- VII. Pouring of reagent solution from the burette to the test solution, until the reaction is complete (while observing changes in the colour or pH) is:**
- 1) filtration;
  - 2) titration;
  - 3) distillation;
  - 4) evaporation;
  - 5) crystallization.

**VIII. The increase of mineral and organic resources in water bodies is:**

- 1) nitrification;
- 2) oxygenation;
- 3) eutrophication;
- 4) chemical treatment;
- 5) transpiration.

**IX. The horizontal rows of chemical elements in the periodic table are:**

- 1) lines;
- 2) columns;
- 3) clusters;
- 4) periods;
- 5) groups.

**X. Which statement is probably incorrect:**

- 1) during a chemical reaction, one bond is broken, the other formed;
- 2) the activation energy is always higher than the bond energy;
- 3) chemical reaction is a process, in which one substance is formed into another;
- 4) the rate of reactions depends on the number of chemical interactions per unit time;
- 5) the amount of both reacting and forming substances varies in the chemical reaction.

**XI. The transition of water from a liquid phase to the solid phase is:**

- 1) water flood;
- 2) water limit;
- 3) water freezing;
- 4) water yield;
- 5) water shed.

**XII. Which statement about the periodic table of elements is probably incorrect:**

- 1) group number indicates the number of electrons that can form chemical bonds;
- 2) in each period, as the number of electrons in the atom increases, its radius lengthens;
- 3) all elements of one period have the same number of electron levels;
- 4) from the location of elements in the periodic table depend their properties;
- 5) in the periodic table chemical elements are arranged in the order of their atomic number increase.

**XIII. The conversion of the reaction rate with catalysts is:**

- 1) reduction;
- 2) activation;
- 3) enthalpy;
- 4) optimization;
- 5) catalysis.

**XIV. Water evaporation from the plant is:**

- 1) osmosis;
- 2) turgor;
- 3) transpiration;
- 4) condensation;
- 5) sorption.

- XV. Which statement about the periodic table of elements is probably correct:**
- 1) making a transition from lithium li to fluorine f, regularly increase the metallic properties and decrease non-metallic properties;
  - 2) the radii of cations are longer than the radii of atoms;
  - 3) an ion with a positive charge is called an anion, and with a negative charge – a cation;
  - 4) the atomic mass increasing, the metallic properties of the main subgroup elements increase and non-metallic properties weaken;
  - 5) a high melting temperature is characteristic of non-metals, they are conductive to electricity and heat.
- XVI. Glass tube with divisions for measuring the volume of liquids or gas, for dripping liquid is:**
- 1) crucible;
  - 2) pipette;
  - 3) burette;
  - 4) flask;
  - 5) desiccator.
- XVII. The substance, that changes colour when the concentration of the test component in the solution changes, is:**
- 1) catalysts;
  - 2) inhibitors;
  - 3) indicators;
  - 4) activators;
  - 5) retardants.
- XVIII. The first invented device for air analysis was:**
- 1) thermometer;
  - 2) barometer;
  - 3) eudiometer;
  - 4) retort;
  - 5) manometer.
- XIX. Which statement about chemical reactions is probably incorrect:**
- 1) when heating a system in which chemical reaction occurs, reacting particles collide less frequently per unit time;
  - 2) the rate of chemical reactions occurring in homogeneous systems, depends on the concentration of substances, their nature, temperature and catalyst;
  - 3) each complex reaction is a set of simple reactions;
  - 4) bimolecular reactions are the most common;
  - 5) chemical reactions kinetically are classified according to the number of molecules.
- XX. The conditional charge that an atom acquires in a compound by losing and joining valence electrons, is:**
- 1) the equilibrium constant;
  - 2) electron balance;
  - 3) stoichiometric coefficient ;
  - 4) ionization degree;
  - 5) oxidation degree.

**XXI. Which statement about oxidising and reducing properties of chemical elements is probably incorrect:**

- 1) the oxidising and reducing properties of the elements and their compounds do not depend on the degree of oxidation and on the stability of the compound;
- 2) a lot of substances can be only reducers;
- 3) the oxidizing properties of elements increase from left to right along the period;
- 4) if the oxidation state of an element's atom is maximal, then such a compound can be only an oxidizer;
- 5) as the oxidation degree increases, the oxidising properties of that compound increase and its reducing ability decreases.

**XXII. Which statement about crystals is correct:**

- 1) crystals can grow from a saturated solution or a cooling magma;
- 2) crystals consist of disordered particles: atoms, ions or molecules;
- 3) pyrite (iron sulphide) crystallizes in a diamond-shaped system;
- 4) the crystal lattice does not scatter the X-rays;
- 5) the slower the solution cools, the smaller the growth of crystals.

**XXIII. Which statement about chemical reactions is probably incorrect:**

- 1) the rate of chemical reactions is very different;
- 2) the rate of chemical reactions depends on various factors;
- 3) chemical thermodynamics examines the rate of chemical reactions and the way they occur;
- 4) chemical reactions are divided into homogeneous and heterogeneous;
- 5) if the reacting substances are gases, the rate of the reaction depends on the pressure.

**XXIV. Increasing the temperature by 10<sup>0</sup>C, the reaction rate increases 2-4 times. This is:**

- 1) Avogadro's number;
- 2) Hund's rule;
- 3) Pauli exclusion principle;
- 4) Heisenberg uncertainty principle;
- 5) Van't Hoef rule.

**XXV. In what way are neutral salts probably not obtained:**

- 1) metals reacting with acids;
- 2) bases reacting with acids;
- 3) alkalis reacting with salts;
- 4) dissolving acid oxides in water;
- 5) metals reacting with non-metals.

**XXVI. You want to measure the viscosity of a liquid (e.g., oil). Which device is suitable for this:**

- 1) dosimeter;
- 2) viscometer;
- 3) barometer;
- 4) lag;
- 5) areometer.

**XXVII. Acids are not obtained:**

- 1) during the direct synthesis of elements;
- 2) reacting two water soluble salts;
- 3) dissolving in water acid oxides;
- 4) salts reacting with strong acids;
- 5) there is no correct answer.

**XXVIII. Which bond is not chemical:**

- 1) ionic;
- 2) peptide;
- 3) metallic;
- 4) covalent;
- 5) hydrogen.

**XXIX. Liquid conversion to vapour and vapour condensation is:**

- 1) distillation;
- 2) crystallisation;
- 3) evaporation;
- 4) filtration;
- 5) titration.

**XXX. Which statement about the structure of the atom is probably incorrect:**

- 1) the electrons orbiting the atomic nucleus form an electron shell;
- 2) a normal state atom can exist indefinitely;
- 3) the electrons of an atom move only around the nucleus;
- 4) the atomic mass of an element is the average value of the masses of all natural isotopes
- 5) the electrons of atoms are not equidistant from the atomic nuclei.

**XXXI. Which statement about the degree of oxidation is probably incorrect:**

- 1) the oxidation degree of single substances is equal to zero;
- 2) the oxidation degree of alkali metals is equal to +2;
- 3) the value of oxidation degree can be positive, negative or equal to zero;
- 4) if the compound consists of two elements, the negative oxidation degree is acquired by the one with the higher electrical negativity;
- 5) the degree of oxidation is used to compare oxidation-reduction reactions.

**XXXII. Oxides are not obtained:**

- 1) salts reacting with alkali;
- 2) by thermal decomposition of salts;
- 3) by burning composite materials;
- 4) dehydrating acids and bases;
- 5) by direct reaction of metals and non-metals with oxygen.

**XXXIII. Which statement about hydroxide obtainment is probably incorrect.**

**Hydroxides are obtained:**

- 1) by reacting active metal oxides with water;
- 2) salts reacting with alkali;
- 3) during the electrolysis of aqueous salts of alkali metals;
- 4) by thermal decomposition of salts;
- 5) by reacting alkali metals with water.

**XXXIV. Which statement about water is probably incorrect:**

- 1) water dissolves many gases, liquids and solids;
- 2) dissolved calcium and magnesium salts determine the hardness of water;
- 3) natural water is completely pure;
- 4) pure water is tasteless, colourless and odourless;
- 5) water reacts with single and composite substances.

**XXXV. The amount of heat, released or absorbed during a chemical reaction, is:**

- 1) dissociation degree;
- 2) cryoscopic constant
- 3) temperature depression;
- 4) ionization constant;
- 5) thermal reaction effect.

**XXXVI. What is probably not a measuring vessel:**

- 1) burette;
- 2) cuvette;
- 3) A syringe;
- 4) Petri dish;
- 5) pipette.

**XXXVII. For work at a high temperature is used:**

- 1) cuvette;
- 2) burette;
- 3) dropper;
- 4) Petri dish;
- 5) crucible.

**XXXVIII. Vacuum distillation uses:**

- 1) Wurtz flask;
- 2) Claisen flask;
- 3) Büchner flask;
- 4) Bunsen flask;
- 5) Erlenmeyer flask.

**XXXIX. For filtering hot solutions and for separating solids from liquids under reduced pressure, are used:**

- 1) Buchner funnels;
- 2) dividing funnels;
- 3) drip funnels;
- 4) simple laboratory funnels;
- 5) there is no correct answer.

**XL. Which statement about chemical reactions is probably incorrect:**

- 1) as the temperature rises most chemical reactions accelerate;
- 2) the same chemical reaction takes place in the same way under different conditions;
- 3) the course of reactions depends on the physical state of the products and reactants;
- 4) most chemical processes are reversible;
- 5) the rate of chemical processes and the effect of various factors on it are examined by chemical kinetics.

**XLI. Which statement is probably incorrect:**

- 1) the molar mass of molecular compounds is equal to their relative molecular mass, expressed in grams
- 2) the absolute mass (in grams) of an atom, molecule, ion is obtained by dividing the molar mass by Avogadro's number
- 3) the unit of measurement of molar mass is g/mol.;
- 4) the relative molecular masses of both molecular and ionic compounds are calculated differently;
- 5) relative molecular mass like relative atomic mass, is a dimensionless quantity.

**XLII. Molecular covalent compounds, dissociating into hydrogen cations and acidic residue anions, are:**

- 1) salts;
- 2) oxides;
- 3) acids;
- 4) hydroxides;
- 5) there is no correct answer.

**XLIII. Which statement is probably incorrect:**

- 1) chemical reactions are recorded by chemical equations;
- 2) physical processes taking place, new substances are formed;
- 3) after mixing two colourless solutions of silver nitrate and sodium chloride salts, a white precipitate is formed;
- 4) the physical state of reactants and reaction products is indicated by conventional symbols;
- 5) the atomic numbers of each type of chemical element must be the same on both sides of the reaction equation.

**XLIV. Which statement is probably incorrect:**

- 1) the mass of the substances involved in the reaction is not equal to the mass of the reaction products;
- 2) compounds of constant composition obtained by any means are always of the same composition;
- 3) when the temperature and pressure are the same, the same volumes of different gases contain different numbers of molecules;
- 4) the molar mass of element equivalents is calculated by multiplying the molar mass of its atoms by valence;
- 5) 1 mole of any gas under normal conditions occupies 42.4 litres.

**XLV. The work that needs to be done, extracting one electron from an atom is:**

- 1) ionization potential;
- 2) internal energy;
- 3) enthalpy;
- 4) entropy;
- 5) ionization energy.

**XLVI. The chemical bond, formed by electrostatic attraction of oppositely charged ions, is:**

- 1) nonpolar covalent;
- 2) hydrogen;
- 3) polar covalent;
- 4) metallic;
- 5) ionic.

**XLVII. Which of the following compounds is ionic:**

- 1) KCl;
- 2) ZnCl<sub>2</sub>;
- 3) NaF;
- 4) HCl;
- 5) NaOH.

**XLVIII. Which substance is probably not an oxidizer:**

- 1) H<sub>2</sub>O<sub>2</sub>;
- 2) CO;
- 3) BaO<sub>2</sub>;
- 4) Cl<sub>2</sub>;
- 5) O<sub>2</sub>.

**XLIX. A reversible chemical process is, when:**

- 1) both starting materials react completely ;
- 2) at least one starting material reacts completely;
- 3) the products formed do not self-react;
- 4) reagents are converted into products, which react with each other;
- 5) there is no correct answer.

**L. Which statement about chemical reactions is probably incorrect:**

- 1) chemical reactions usually occur at constant pressure;
- 2) when the system gives off heat, its enthalpy increases;
- 3) chemical reactions are usually isothermal isobaric processes;
- 4) heat can be consumed or released during chemical reactions;
- 5) the thermal effect of the reaction depends on the physical state and modification of the reactants and reaction products.

Key: 1-2; 2-2; 3-2; 4-3; 5-2; 6-1; 7-2; 8-3; 9-4; 10-2; 11-3; 12-2; 13-5; 14-3; 15-4; 16-3; 17-3; 18-3; 19-1; 20-5; 21-1; 22-1; 23-3; 24-5; 25-4; 26-2; 27-2; 28-2; 29-1; 30-3; 31-2; 32-1; 33-4; 35-5; 36-4; 37-5; 38-2; 39-1; 40-2; 41-4; 42-3; 43-2; 44-2; 45-5; 46-5; 47-4; 48-2; 49-4; 50-2.