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 subjects: Atomic structure, Periodic law and Chemical bonds.

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

The electron configuration of the $_{13}Al^{3+}$ ion is:

☐ **(A)** $1s^2 2s^2 2p^6 3s^2 3p^1$

☐ **(B)** $1s^2 2s^2 2p^6 3s^1 3p^2$

☐ **(C)** $1s^2 2s^2 2p^6$

☐ **(D)** $1s^2 2s^2 2p^5 3s^2$

The identity of an element is determined by...

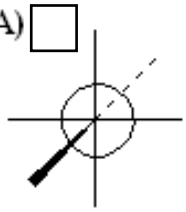
☐ **(A)** the number of its protons;

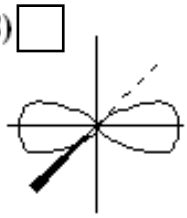
☐ **(B)** the number of its neutrons;

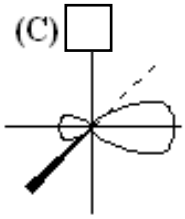
☐ **(C)** the number of its electrons;

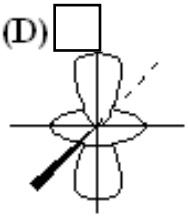
☐ **(D)** its atomic mass.

The probability area that best represents the shape of an atomic 3p orbital is...

(A) ☐ 

(B) ☐ 

(C) ☐ 

(D) ☐ 

Which statement about the four quantum numbers which describe electrons in atoms is INCORRECT?

☐ (**A**) n = principal quantum number, n = 1, 2, 3, ...

☐ (**B**) l = subsidiary (or azimuthal) quantum number, l = 1, 2, 3, ... , (n+1)

☐ (**C**) m_l = magnetic quantum number, m_l = (-l), ... , 0, ... , (+l)

☐ (**D**) m_s = spin quantum number, m_s = +1/2 or -1/2.

Example Test questions

Which of the following pairs of elements and valence electrons is incorrect?

- ☐ (**A**) Al - 3
- ☐ (**B**) Br - 7
- ☐ (**C**) S - 5
- ☐ (**D**) Sr - 2

Consider the species ^{72}Zn, ^{75}As and ^{74}Ge. These species have:

- ☐ (**A**) the same number of electrons.
- ☐ (**B**) the same number of protons.
- ☐ (**C**) the same number of neutrons.
- ☐ (**D**) the same number of protons and neutrons.

The atoms of an element contain an equal number of:

- ☐ (**A**) protons and neutrons
- ☐ (**B**) neutrons and different number of protons
- ☐ (**C**) protons
- ☐ (**D**) neutrons

Space direction is not characteristic for:

- ☐ (**A**) s- atom orbitals (AO)
- ☐ (**B**) p-AO
- ☐ (**C**) sp-AO
- ☐ (**D**) d-AO

Example Test questions

The element X has an atomic number of 8 and a mass number of 17. The atoms of this element contain:

☐ (**A**) 9 protons

☐ (**B**) 9 electrons

☐ (**C**) 9 neutrons

☐ (**D**) 9 protons and 9 electrons

The isotopes:

☐ **(A)** occupy one and the same location in the periodic table of elements,

☐ **(B)** occupy adjacent locations in the periodic table of elements,

☐ **(C)** are other atoms,

☐ **(D)** have different atomic numbers.

Which statement does not explain why elements in a group are placed together?

☐ (**A**) They tend to have the same number of valence electrons.

☐ (**B**) They tend to have a similar oxidation number.

☐ (**C**) They tend to have the same electronegativities.

☐ (**D**) They tend to have the same chemical reactivity.

The maximal oxidation state of the atoms of chemical elements is equal to:

☐ (**A**) the number of the period in which is the element in the periodic table

☐ **(B)** the number of the group in which is the element in the periodic table

☐ (**C**) the number the element in the periodic table

☐ (**D**) any positive integer number

Example Test questions

Which halogen has the greatest first ionization energy?

☐ (**A**) F;

☐ (**B**) Cl;

☐ (**C**) Br;

☐ (**D**) I.

Select the term best describing the series of elements: Mn, Fe, Co, Ni, Cu.

☐ (**A**) d-transition metals;

☐ (**B**) halogens;

☐ (**C**) metalloids;

☐ (**D**) alkaline earth metals.

Which is the correct order for the listed atoms with increase of the atomic radius?

☐ (**A**) Li, Be, B, Na

☐ (**B**) Li, Na, B, Be

☐ (**C**) Na, Li, Be, B

☐ (**D**) B, Be, Li, Na

Which of the following pairs of elements and valence electrons is incorrect?

☐ (**A**) Al - 3

☐ (**B**) Br - 7

☐ (**C**) S - 5

☐ (**D**) Sr - 2

Example Test questions

Which of the following is NOT true for the Group 1A elements?

☐ (**A**) Most of them are soft, silvery corrosive metals

☐ (**B**) Their atomic radii increases with increasing molecular weight

☐ (**C**) They are named the alkaline earth metals

☐ (**D**) They are excellent conductors of heat and electricity

Which of the following properties of the alkaline earth metals decreases with increasing the atomic weight?

☐ (**A**) ionic radii

☐ (**B**) ionization energy

☐ (**C**) atomic radii

☐ (**D**) atomic number

The chemical elements of Group IB have:

☐ **(A)** 1 electron in their outermost electronic shell

☐ **(B)** 18 electron in their outermost electronic shell

☐ **(C)** 2 electron in their outermost electronic shell

☐ **(D)** all answers are correct

σ - bonds are NOT formed between:

☐ **(A)** s - atomic orbitals;

☐ **(B)** p - atomic orbitals;

☐ **(C)** sp^3 – hybrid atomic orbitals;

☐ **(D)** no answer is correct

Example Test questions

Between the atoms of the elements K and Br is formed a compound with:

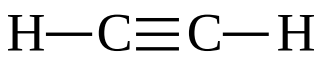
☐ **(A)** covalent nonpolar bond;

☐ **(B)** covalent polar bond;

☐ **(C)** metal bond;

☐ **(D)** ionic bond;

How many σ and π bonds are there in the ethyne molecule?



☐ (**A**) 3 σ and 2 π;

☐ (**B**) 2 σ and 3 π;

☐ (**C**) 3 σ and 4 π;

☐ (**D**) 4 σ and 3 π.

A π-bond is the result of:

☐ (**A**) overlap of two s-orbitals

☐ (**B**) overlap of an s- and a p-orbital

☐ (**C**) overlap of two p-orbitals

☐ (**D**) overlap of an s- and a d-orbital

What is the type of the chemical bond between an alkaline and a halogen element?

☐ (**A**) ionic

☐ (**B**) covalent polar

☐ (**C**) covalent nonpolar

☐ (**D**) donor-acceptor

Example Test questions

Between which of the suggested atoms (O, S, Na, K, Ca) a covalent polar bond is formed:

- ☐ **(A)** O and S;
- ☐ **(B)** O and K, S and Na;
- ☐ **(C)** Ca and S ;
- ☐ **(D)** all;

Select the compound with polar covalent bonds between the atoms:

- ☐ **(A)** KBr
- ☐ **(B)** Al_2O_3
- ☐ **(C)** P_4
- ☐ **(D)** CaO

Dipoles may be substances in which the chemical bond is:

- ☐ **(A)** polar covalent;
- ☐ **(B)** non-polar covalent;
- ☐ **(C)** ionic;
- ☐ **(D)** metallic.

Which of the following is NOT true for the Group 1A elements?

- ☐ (**A**) Most of them are soft, silvery corrosive metals
- ☐ (**B**) Their atomic radii increases with increasing molecular weight
- ☐ (**C**) They are named the alkaline earth metals
- ☐ (**D**) They are excellent conductors of heat and electricity

Example Test questions

Part B

Establish a match between the reaction and the oxidative-reductive state of the chlorine.

Column 1	**Column 2**
A) $MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$	1) oxidant
B) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$	2) reducer
C) $4KClO_3 \rightarrow 3KClO_4 + KCl$	3) oxidant and reducer
D) $Cl_2 + 2KOH \rightarrow KClO + KCl + H_2O$	4) does not change its oxidation state

A	**B**	**C**	**D**

Part C – mark the correct answer with colour.

A neutron has no net electric charge.

True	**False**
☐	☐

Neon is an example of a Halogen and it has achieved stability and so is unreactive.

True	**False**
☐	☐

A π covalent bond must be polar.

True	**False**
☐	☐

Part D

An atom is considered to be _____ when the number of protons and electrons are equal.

The ionic bond has _____ spatial orientation.

The ionic bond is strong, that's why the ionic compounds have _____ melting point.

The triple bond consists of _____ sigma- and _____. pi-bonds.

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