General and Inorganic Chemistry I – preliminary test

This test demonstrates the level of knowledge that students should know when starting the General and Inorganic Chemistry I course. Solve it, check your answers against the solution provided in the separate PDF file and see how many points you obtain:

80–100 points: a solid base, upon which GIC I can be build
60–80 points: minor gaps that should be filled easily
40–60 points: larger gaps but still possible to catch up with some effort
below 40: enrolment is possible but missing knowledge must be acquired beforehand (in the first lesson, ask your assistant where to find the necessary sources)

1. Calculate the oxidation number of the highlighted atom (4x1 p)

$H_4\mathbf{Si}O_4$ $(\mathbf{C}OOH)_2$ $\mathbf{N}O_2^+$ $\mathbf{B}_5O_8^-$

2. Name the following compounds (5x1 p):

H_2SeO_3

Na_2CO_3

NO_2

KHS

$[Co(H_2O)_4(NH_3)_2]^{2+}$

3. Write the formula (5x1 p):

perchlorate anion

tin tetrabromide

ammonium nitrate

strontium peroxide

tripotassium hexacyanidoferrate(III)

4. Balance the following three reactions (3x5 p.):

$Cr_2O_3 + CCl_4 \rightarrow CrCl_3 + COCl_2$

$KMnO_4 + (COOH)_2 + H_2SO_4 \rightarrow MnSO_4 + K_2SO_4 + CO_2 + H_2O$

$SeO_3^{2-} + Cl_2 + OH^- \rightarrow SeO_4^{2-} + Cl^- + H_2O$

5. Based on a balanced reaction, determine, whether the following reaction proceeds in acidic or alkali solution (5 p):

$MnO_4^- + NO_2^- + ??? \rightarrow MnO_4^{2-} + NO_3^- + H_2O$

6. Write electron configurations of caesium atom and Co^{2+} cation (2x5 p).

7. In each pair, choose the element with a higher electronegativity (3x1 p):

Mg vs Ba Si vs Cl F vs Sb

8. In each pair, choose the compound, whose bond is more ionic (3x1 p):

KF vs SO_2 SO_4^{2-} vs Na_3N BBr_3 vs $BaBr_2$

9. Read through the statements below and classify them as true or false (5 p each statement, i.e. 50 in total):

a) Maximum oxidation number of p-block elements is given as (number of the group–10).

b) The maximum oxidation number of manganese is +VII.

c) Iron is not a noble metal, therefore it forms cations readily.

d) All metals are inert towards water under normal conditions (101,325 Pa, 20 °C).

e) Molecule of oxygen (O_2) contains a triple bond.

f) All gaseous non-metals form diatomic molecules.

g) Water is a polar solvent.

h) A covalent bond is based on sharing valence electrons.

i) The molecule of nitrogen (N_2) is very stable and reacts only under specific conditions.

j) Most elements in the PT are gases.