



MULTIPLE CHOICE QUESTIONS WITH A SINGLE CORRECT ANSWER
(Answer by circling **just one** of the options A, B, C or D)

Part I

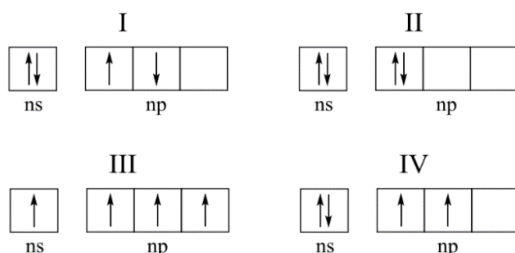
1. During reaction of which of the following substances an acid is formed?
A) MgO and H₂O
B) CaO and HNO₃
C) P₄O₆ and H₂O
D) H₂O₂ and H₂O
2. Upon addition of HCl(aq) to a solution containing which of the following cations (see below) no precipitate will be formed?
A) Ag⁺
B) Pb²⁺
C) Hg²⁺
D) All of the listed cations form precipitates with HCl
3. By analysis of an aqueous solution of a compound, the following results are obtained:
– when H₂S is added to the solution (in an acidic medium) no precipitate is formed;
– the oxidizing part of the flame is colored green, in the presence of the compound;
– when AgNO₃ is added to the solution, a light yellow precipitate is formed;
– when chloroform and chlorine water are added to the solution, the chloroform layer turns purple.

Which compound is it?

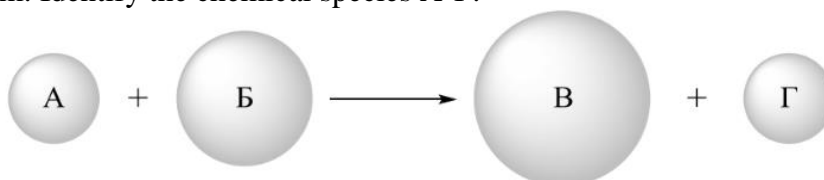
- A) BaI₂**
B) CuCl₂
C) Cu(NO₃)₂
D) NaI
4. Which of the following compounds are amphoteric:
NaOH, NaCl, HCl, Al(OH)₃, Zn(OH)₂, Mg(OH)₂?
A) All the listed compounds are amphoteric.
B) Al(OH)₃ and Zn(OH)₂
C) Al(OH)₃, Zn(OH)₂ and Mg(OH)₂
D) NaOH, Al(OH)₃, Zn(OH)₂, Mg(OH)₂
5. Which of the following statements is true?
A) Zinc has a higher electronegativity than calcium.
B) Mercury is a better thermal conductor than gold.
C) Caesium has the highest ionization energy of all chemical elements.
D) Calcium has a larger atomic radius than potassium.

6. Below is a graphic representation of the distribution of valence electrons in an atom of a chemical element. Which of the following electron configurations corresponds to the ground state of the atom of the element?

- A) I
B) II
C) III
D) IV



7. What is the largest number of electrons in an atom that can simultaneously have the following values of the quantum numbers: $n = 4$ and $m_s = -1/2$?
- A) 1
B) 16
 C) 2
 D) 32
8. The ratio of the number of neutrons and protons in the isotopes of a chemical element is a good indicator of the stability of their nuclei. For most of the stable nuclei this ratio has a value between 1 and 1,5. Considering this, which of the following isotopes are most likely unstable, i.e. radioactive?
- I) ${}^{44}_{20}\text{Ca}$ II) ${}^{94}_{36}\text{Kr}$ III) ${}^{133}_{55}\text{Cs}$ IV) ${}^{122}_{48}\text{Cd}$ V) ${}^{167}_{68}\text{Er}$ VI) ${}^{214}_{82}\text{Pb}$
- A) II, IV, VI.**
 B) II, IV, V, VI.
 C) I, II, V, VI.
 D) Probably all of them are radioactive.
9. Arrange the following substances in an increasing order of their boiling temperatures: NaF ; CO_2 ; CH_3OH ; CH_3Cl .
- A) $\text{NaF} < \text{CH}_3\text{OH} < \text{CH}_3\text{Cl} < \text{CO}_2$
B) $\text{CO}_2 < \text{CH}_3\text{Cl} < \text{CH}_3\text{OH} < \text{NaF}$
 C) $\text{CO}_2 < \text{CH}_3\text{Cl} < \text{NaF} < \text{CH}_3\text{OH}$
 D) $\text{NaF} < \text{CO}_2 < \text{CH}_3\text{Cl} < \text{CH}_3\text{OH}$
10. Arrange sodium ($Z = 11$), aluminium ($Z = 13$) and magnesium ($Z = 12$) according to the increasing values of their second ionization energy:
- A) $\text{Mg} < \text{Al} < \text{Na}$**
 B) $\text{Mg} < \text{Na} < \text{Al}$
 C) $\text{Al} < \text{Na} < \text{Mg}$
 D) $\text{Na} < \text{Al} < \text{Mg}$
11. Which of the following can be considered as a homogeneous mixture?
- I) bronze; II) wine; III) soil; IV) ordinary sugar; V) soup; VI) graphite
- A) I, II and VI.
 B) II, III, IV and VI.
C) I and II.
 D) All are heterogeneous mixtures.
12. Given below is a schematic representation of the reaction between one sodium atom and one chlorine atom. Identify the chemical species A-Г.



- A) A – Cl B – Na B – Cl^- Г – Na^+
 B) A – Na B – Cl B – Cl^- Г – Na^+
 C) A – Cl B – Na B – Na^+ Г – Cl^-
 D) A – Na B – Cl B – Na^+ Г – Cl^-



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13. Elements X and Y form an ionic compound. Element X is in the second group and third period in the Periodic table, and element Y is in the sixteenth group and third period in the Periodic table. What will be the total number of protons in one cation and one anion of this ionic compound, how many electrons will the cation, and how many will the anion have?
- A) 28, 10, 18.
B) 26, 10, 6.
C) 28, 18, 18.
D) It cannot be answered with certainty.
14. Which electron configuration corresponds to the configuration of the valence electrons of a metal whose oxide has a formula E_2O_3 ?
- A) ns^2
B) $ns^2 np^1$
C) ns^1
D) $ns^2 np^2$
15. In a cation
- A) the number of protons is equal to the number of electrons.
B) the number of electrons is always greater than the number of protons.
C) the number of electrons is less than the number of protons.
D) the number of electrons is sometimes greater than the number of protons.

Part II

1. Write the chemical formulae or the names of the following compounds:
(10 x 0,5 points = 5 points)

HBrO ₄	Perbromic acid
H ₂ S ₂ O ₇	Pyrosulfuric (or disulfuric) acid
CaCl(ClO)	Calcium chloride hypochlorite
H ₃ SbO ₃	Antimonous acid
FeNH ₄ (SO ₄) ₂ ·12H ₂ O	Ammonium iron(III) sulfate dodecahydrate
Manganese(IV) hydrogenarsenite	Mn(HAsO ₃) ₂
Chromium(III) selenate	Cr ₂ (SeO ₄) ₃
Molybdenum(VI) sulfide dihydrate	MoS ₃ · 2H ₂ O
Mercury(I) chloride	HgCl или Hg ₂ Cl ₂
Rubidium selenate	Rb ₂ SeO ₄

2. The pyrolysis of 1,62 g of a compound containing calcium, hydrogen, carbon and oxygen yields 224 mL of carbon dioxide (at standard conditions), 1 g of calcium carbonate and 180 mg of water. Determine the empirical formula of this compound. (10 points)

See the Macedonian version for the correct answers.

3. Write down the electron configurations for X, X²⁺ and X⁴⁻ and determine in which group and period the element X is located if the quantum numbers of the unpaired electrons are: $n = 4$, $l = 1$, $m_l = 0$, $m_l = -1$ and $m_s = 1/2$. Show schematically the arrangement of electrons in the last sublevel of X. (5 points)Pyro

X _____, schematic representation:

X²⁺ _____

X⁴⁻ _____

See the Macedonian version for the correct answers.