ALKALI METALS

11.1. Choose the characteristics of alkaline metals:
A. high melting point
B. flexibility
C. metallic lustrous
D. high density
E. electrical conductibility
F. is easily cut in pieces with a knife
G. yellow color
H. inactive

11.2. Alkali metals easily oxidize in air; how these metals are stored?
A. under plant oil
B. under a petroleum product
C. under alcohol
D. under water

11.3. Characterize the atomic structure of alkaline metals. Explain how and why the chemical activity varies as the charge of nucleus increases.

11.4. Explain why are the elements of group 1A found exclusively in a form of compounds, and not purely. List down the substances that contain elements like sodium or potassium:
A. in daily life
B. from chemistry lessons
Write down their formulas.

11.5. Complete following the equations:
A. $Na + S \rightarrow$ B. $K + H_2O \rightarrow$ C. $K + Cl_2 \rightarrow$ D. $K + H_2 \rightarrow$ E. $Li + N_2 \rightarrow$ F. $Na + O_2 \rightarrow$

11.6. Choose elements which react with alkaline metals (Na, K)
A. Cl_2, Ne, H_2O, H_2;
B. HCl, NaOH, Br_2, P;
C. S, N_2, Li, H_2SO_4.

11.7. Characterize three chemical properties of:
A. sodium hydroxide
B. potassium hydroxide
C. lithium hydroxide
Explain why are alkaline metal hydroxides contained in firmly closed containers.

11.8. Which of the following substances will react with:
I. CO_2, $Ca(OH)_2$, $Zn(OH)_2$, HCl, $Cu(NO_3)_2$, Cl_2, Mg, FeO, $BaCl_2$;
II. Cu, Cl_2, SO_3, MaO, $Ba(OH)_2$, Al_2O_3, $Fe(OH)_2$, HNO_3, $Fe_2(SO_4)_3$, KBr
A. sodium hydroxide
B. potassium hydroxide
C. lithium hydroxide
Write down the equations, name the products.

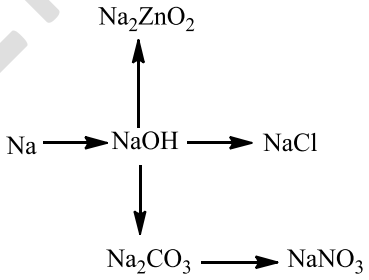
11.9. Select the group in which all substances react with sodium hydroxide solution. Write down the equations in the molecular and ionic form.
A. H_2SO_4, CO_2, KCl
B. $Fe(NO_3)_2$, SO_2, $Zn(OH)_2$
C. Cl_2, $CuCl_2$, H_2PO_4,
D. SO_3, $BaSO_4$, HCl

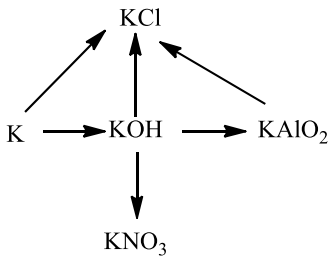
11.10. Write two preparation reactions for each of the following substances:
A. sodium hydroxide
B. potassium hydroxide

11.11. Write down the possible results of the following reactions:

I	II
A. $Na + H_2O \rightarrow$	A. $KOH + Cl_2 \rightarrow$
B. $NaOH + Al(OH)_3 \rightarrow$	B. $KOH + P_2O_5 \rightarrow$
C. $NaOH + H_2SO_4 \rightarrow$	C. $KOH + ZnO \rightarrow$
D. $NaOH + KNO_3 \rightarrow$	D. $KOH + HNO_3 \rightarrow$
E. $NaOH + CuCl_2 \rightarrow$	E. $K_2CO_3 + HCl \rightarrow$
F. $NaCl + H_2O \rightarrow$	F. $KCl + Ba(NO_3)_2 \rightarrow$
G. $NaNO_3 + K_2CO_3 \rightarrow$	G. $K_2SO_4 + H_3PO_4 \rightarrow$

11.12. Write down the equations for the following transformations:





11.13. Match the following items in each of the column given about technical name, chemical name and most important usages of alkaline metals compounds:

Technical name	**Chemical name**	**Most important usages**
Table salt	Sodium carbonate	Chemical glass, liquid soap
Potash	Potassium carbonate	Ripening of dough, extinguisher
Caustic soda	Sodium chloride	Production of glass, softening of water, mineral fertilizer
Calcinated soda	Sodium hydroxide	Pyrotechnics, industry, alimentation
Saltpeter	Potassium nitrate	conservation, paper production, purification of products
Baking powder	Sodium hydrogen carbonate	Petroleum products

11.14. Calculate the mass of sodium hydroxide and water necessary to prepare a 400 g of 15% base solution by mass.

11.15. Potassium hydroxide is often used in alkaline accumulators (30% KOH by mass, with a density of 1.29 g/mL). Calculate the mass of potassium hydroxide and water necessary to prepare a 5 L solution.

11.16. A 2% solution of hydrogen carbonate is used for medication if acid accidentally spills on a part of the body. Calculate the mass of salt and volume of water necessary to prepare such kind of solution with a volume of 3 L. (density solution is considered equal to water's density).

11.17. $NaNO_2$ is used in exceptional cases such as stenocardia treatment and brain vessels spasms as a dilatants material in blood vessels. Calculate the sodium nitrate doze for a single usage if 20-40 g of 0.5% solution by mass.

11.18. Potassium ion is one of the most important intracellular ions in our organism, like sodium ion. Interaction of these ions plays an important role in tension (so-called 'sodium-potassium pump'). At the same time, potassium chloride is often used with precaution and only in a form of solution. A 1 g potassium chloride pill is dissolved in 100 ml (half a glass). Calculate the mass percent of potassium chloride in the solution. Calculate how many swallows are needed to drink a 100 ml glass of water, as well as how many potassium ions can be consumed in one swallow.

11.19. Gheizer salt can be substituted with Karlovy Vary Salt that contains 18% sodium chloride, 2% potassium sulfate, 36% sodium hydrogen carbonate, 44% sodium sulfate. Calculate the mass and quantity of the substance of each component found in human organism if a spoon of salt with a mass of 30 g is consumed.

11.20. Metallic sodium is used to obtain elements like titanium and its compounds like $TiCl_4$ in metallurgy. Write down equations of the reaction and calculate the mass of sodium necessary to obtain metallic 1 kg titanium.

11.21. Calculate the mass of salt formed in :
A. 8 g sodium hydroxide and 10.95 g hydrochloric acid.
B. 16.8 g potassium hydroxide and 9.8 g sulfuric acid.

11.22. Determine the mass of precipitate formed by the reaction of 20 g of 10% potassium hydroxide by mass with 80 g of 10% copper (II) sulfate solution by mass.

11.23. A 9.6 g sample of technical sodium, containing 24% of impurities, was immersed in water. Determine the volume of eliminated gas.