

III  IYNT 2015

**Problem № 11**  
**«Puzzle in a beaker»**



**Team «MG 12»**

# The problem situation

A researcher decided to measure the diffusion rate of ammonia in gelatin. He added some magnesium sulfate in the hot gelatin solution which set on a gel on cooling. Then he poured some aqueous solution of ammonia onto the gel and left the beaker for two days. The researcher was surprised to discover to discover white layers of precipitate in the beaker, as depicted in figure. Explain this phenomenon and determine what does the number of bands depend on.

**Hypothesis:** if the diffusion happens in jelly, it is possible to determine the factors which affect this process.

**Purposes:** to explain the formation of the precipitate in jelly and determine some factors it depends on:

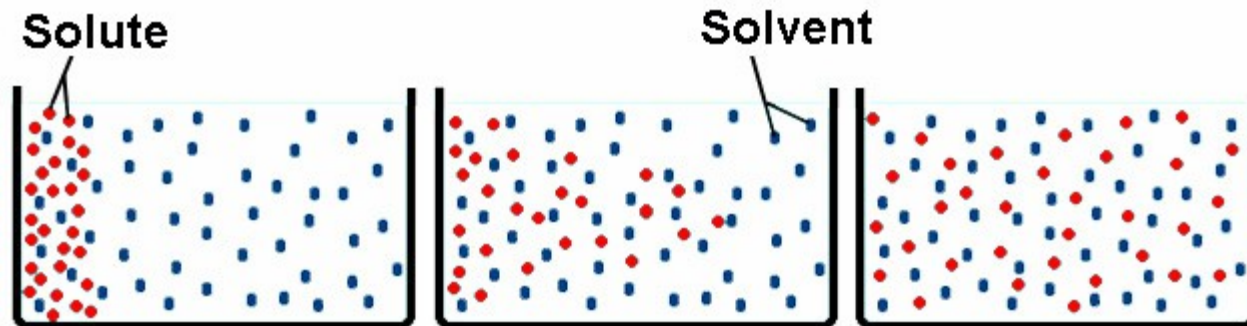
- Reacting substances
- Reagent concentration
- Density of gelly

# Aims

- To look into the literature about the problem
- To perform the experiments according to the problem
- To explain the phenomenon
- To draw a conclusion

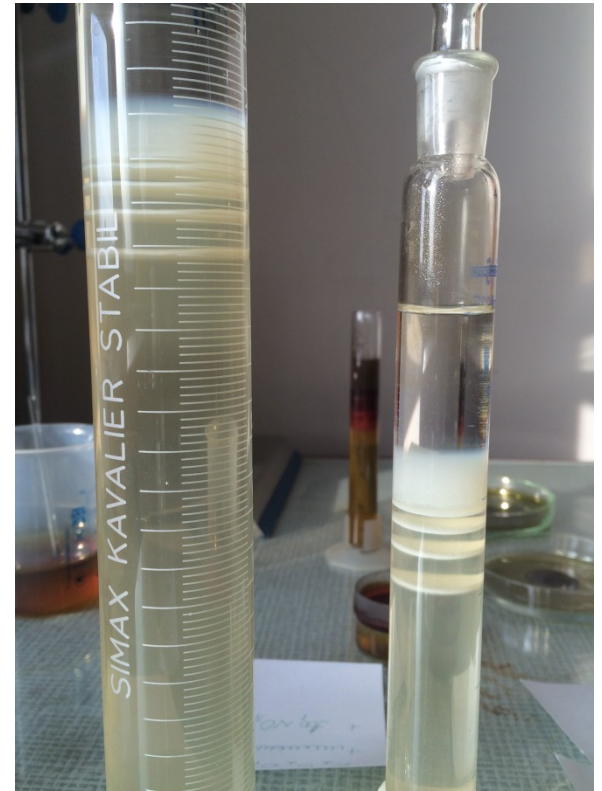
# Diffusion

A movement of molecules or atoms of a substance between particles of another substance which leads to leveling of concentration.

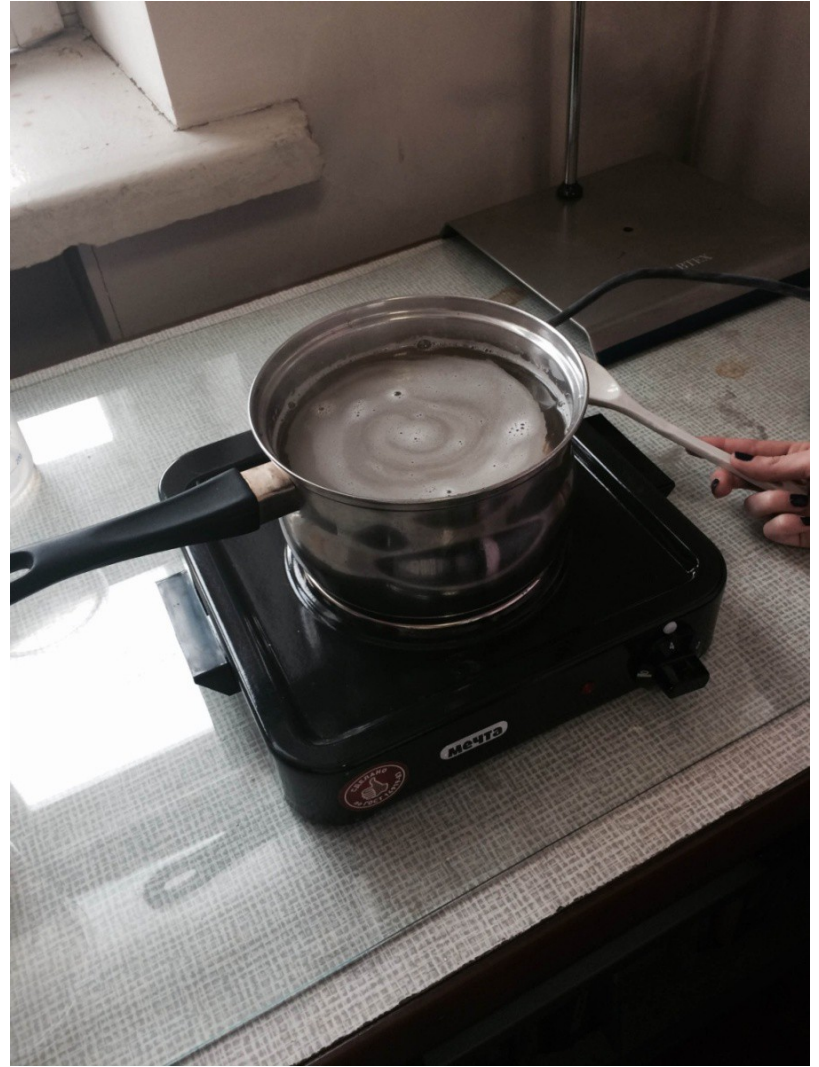


# Diffusion in jelly

Diffusion in jelly is different from diffusion in liquid because of no mixing and no convection which happens in liquids. Because of this the reaction process in jelly has its own peculiarities.



# Experimental part





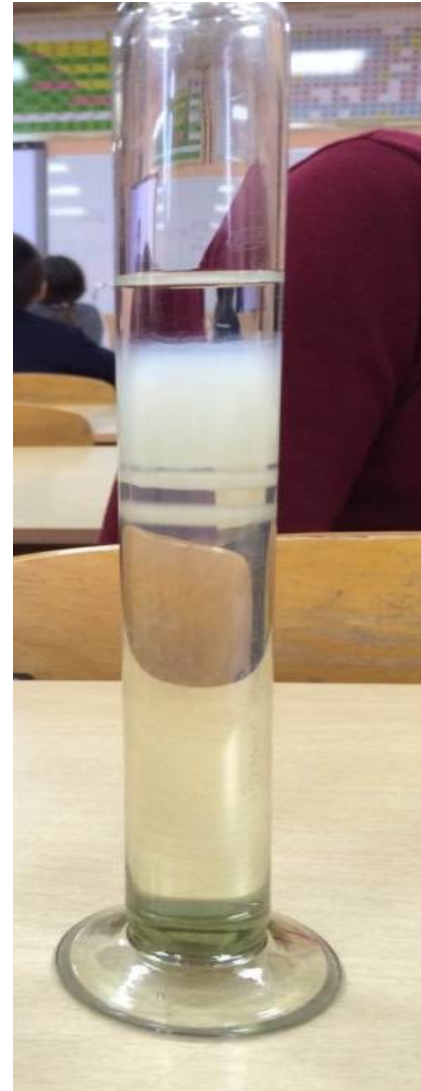
# **Dependence on reagents**



1

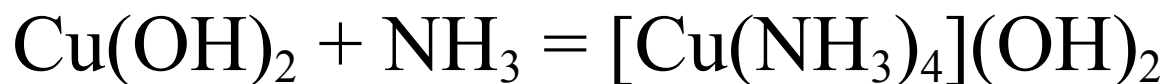
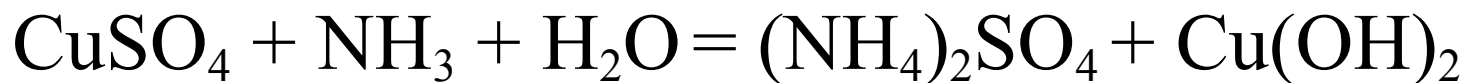


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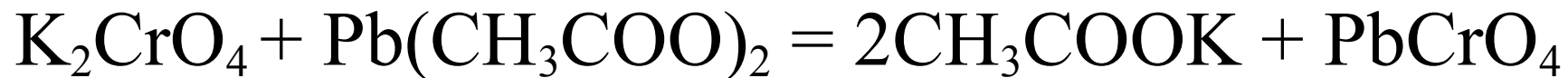
# Reactions of precipitate forming



We didn't get the rings



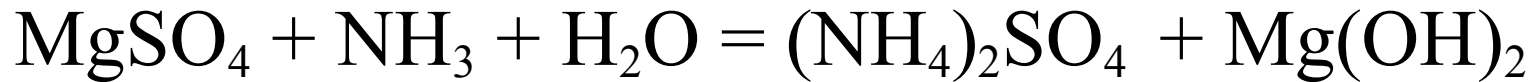
# Reaction of precipitate forming



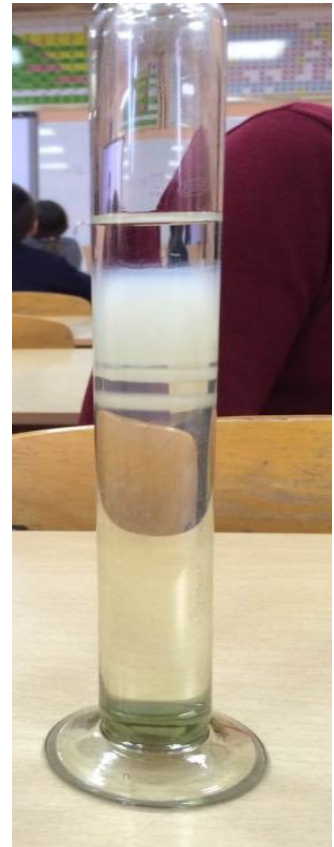
There were no rings



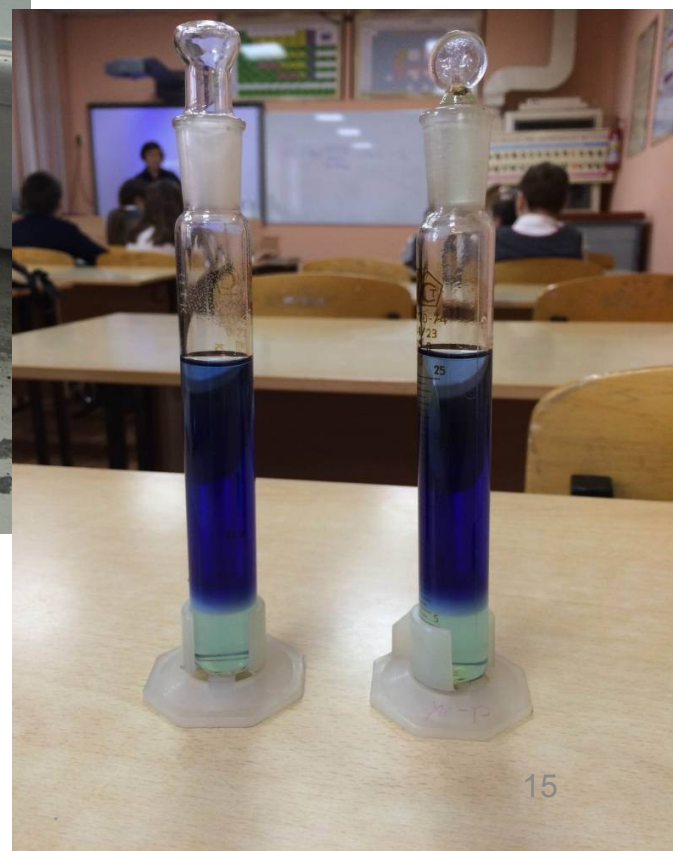
# Reaction of precipitate forming



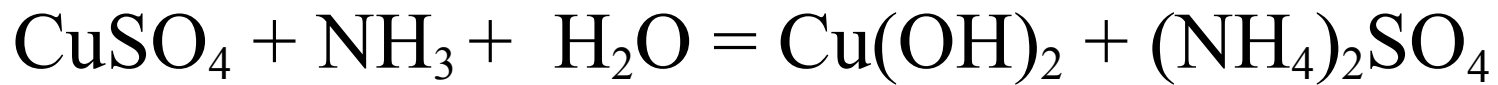
There were three rings in the beaker



# **Dependence on reagent concentration**



# Reaction of precipitate forming



The precipitate was identical

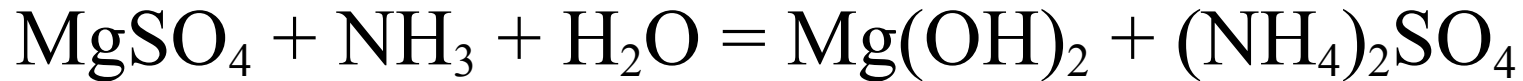




# **Dependence on density of jelly**



# Reaction of precipitate forming



The precipitates looked different



# Conclusion

- The structure of jelly prevents its components from mixing.
- Liesegang rings is a phenomenon of precipitate settling like rings.
- Their structure depends on reacting substances and solidity of jelly and does not depend on concentration of reagents.

# Liesegang rings

These rings are concentric rings or regular stripes which are the results of periodic precipitation of substances because of diffusion in jelly.



Liesegang rings in a sandstone

# The resources of information

- <https://ru.wikipedia.org/>
- Евстратова К.И., Купина Н.А., Малахова Е.Е. Физическая и коллоидная химия /под редакцией проф. К.И. Евстратовой. – М.: Высшая школа. 1990 г.
- Воюцкий С.С. Курс коллоидной химии. – М.: Химия, 1976. – 512 с.