

Всероссийский межпредметный командный проект  
«Изучаем химию с Агатой Кристи»



**МБОУ СОШ № 10 г. Вязьмы Смоленской области**

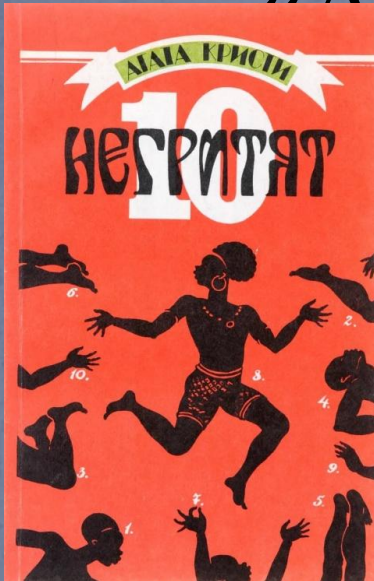
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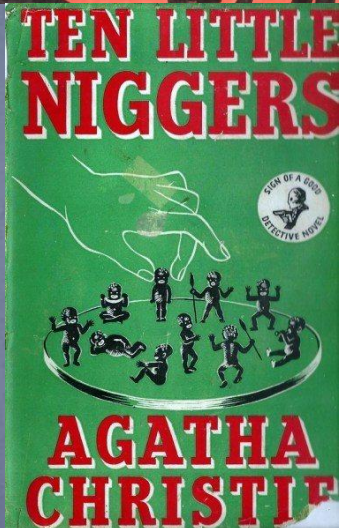
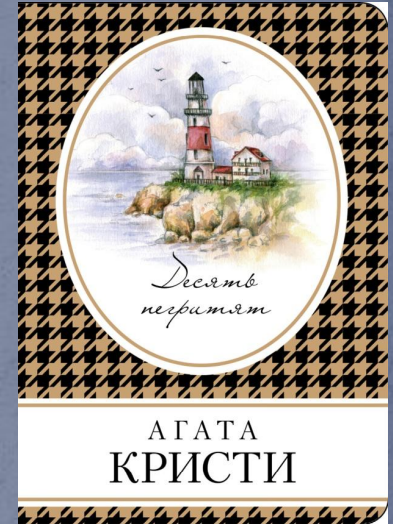
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# The name of the novel: «And Then There Were None»



The detective novel by Agatha Christie was written in 1939. It is the author's best-seller, and, as she says, it is the most difficult book in filming. The novel was filmed 8 times. It is one of 100 novels of all the times.





# Summary.

On a Negro Island an unknown millionaire built a luxurious mansion. Later it was sold to Mr and Mrs Owen. They invited 10 people to the island. Someone was given a job, others were invited as guests. They didn't know each other. But the Owens weren't on the island, the guests were met by servants. Each of the guests was given a separate room. A framed copy of the old rhyme hung on the wall. It said about ten niggers who were dead after each other. After the guests settled down and laid their things, they were invited to the dining room. To their surprise they found the same rhyme there. Besides, they found 10 porcelain figures in the middle of the table.





# Summary.

People in the dining room were waiting for the host, but then the butler came to them. Following Mr Owen's instructions he turned on the phonograph. The recording accused each visitor of having committed crimes. The guests after listening to the list of sins to the end wanted to leave the island and to get back to the continent immediately. But there was nothing to sail on. They had to wait for the morning. However, they couldn't leave the island. In the evening Marston finished his drink and promptly died of cyanide poisoning. Mrs Rogers was found dead in her bed, poisoned by hypnotic. Somebody killed General Mac Arthur. The butler was dead. Emily Brent was found dead having been injected with potassium cyanide. Suspicious fell on Armstrong. Everybody ran to the doctor, but by that time he had already sunk in the sea. The judge was shot, policeman Bloore was killed by a marble clock that was pushed from the window. Vera shot Phillip and then she hung herself. Every death was done according to the rhyme.





# The Riddle

Here it becomes clear that someone is making his own judgment. He has passed a death sentence on everyone present on the island, and he is carrying out his sentence in accordance with a child's rhyme. But who is this man? Everyone can be suspected, except the invited guests, there is no one on the island.

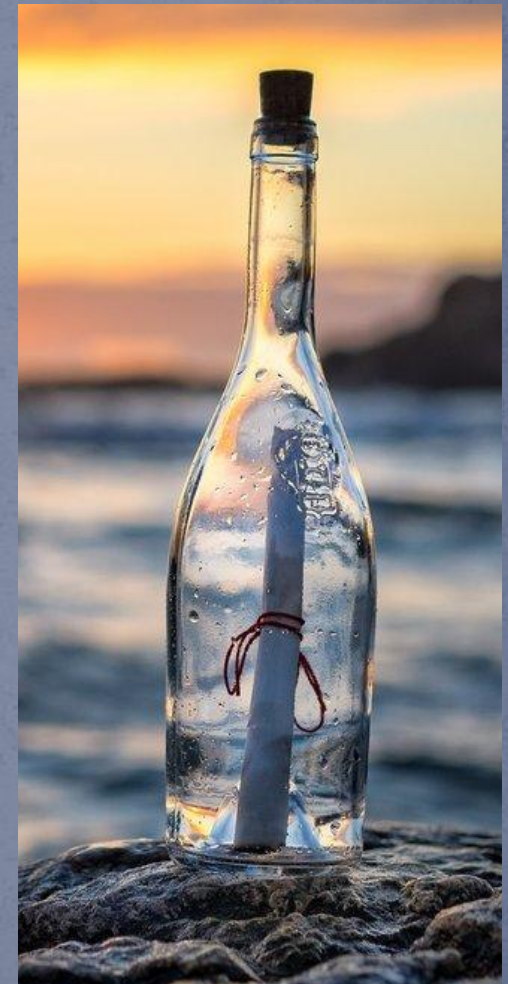
There are fewer suspects every day: murders happen every day. The police arrived on the island and found 10 corpses. Inspector Main and Sir Thomas Legg of Scotland Yard are trying to restore the chronology of events and solve the mystery of the murders on the Negro Island, in the end, they come to a dead end.





# The Solution

Readers will learn the answer from a letter found by fishermen in a corked bottle and handed over to Scotland Yard. The author of the letter is Judge Wargrave (the sixth victim). Even in his youth, he dreamed of murder, but he was hindered by the desire for justice, because of what he became a lawyer. Being terminally ill, he decided to satisfy his passion and chose ten people who had committed murders, but for some reason escaped punishment. He has conspired with Armstrong, saying he suspects Lombard. Armstrong helped the judge fake his death, after which the killer lured him to a cliff at night and dumped him into the sea. Convinced that Vera had hanged herself, Wargrave went up to his room and shot himself, tying the revolver with an elastic band to the door and to the glasses that he put under himself. After the shot, the elastic band got loose from the door and hung on the arm of the glasses, the revolver fell at the threshold. Wargrave carried out his terrible sentence.



# The Chemical Mystery

But we, as chemists, are interested in two stories in this work related to cyanide poisoning. Marston dies first: potassium cyanide was added to a glass of whiskey. And Miss Brent was pricked with a syringe containing poison.





# How Anthony Marston died (excerpt from the book)

He knocked over his glass.

Obviously, the whiskey got down the wrong throat. Anthony choked. His face was distorted, bloodshot. He gasped for air, then slid off the chair, his arm weakened, the glass rolled on the carpet.

Armstrong nodded:

– «No, a man can't die choking on a sip of whiskey.» I can't say for sure, but it looks like some kind of cyanide was mixed in there. I didn't feel the characteristic smell of prussic acid. Most likely, it is potassium cyanide. It works instantly.





# How Emily Brent died

Before she died, she heard a bee buzzing.  
"And the bee buzzed and buzzed on the window. And then she felt something prick her. A bee stung her in the neck."

«Emily Brent was still sitting in the chair... True, she did not pay attention to their arrival, but otherwise they did not notice anything suspicious. It was only when they walked around the chair that they saw her face-swollen, with blue lips and bulging eyes.»

-- But it's not a bite mark, Armstrong said gloomily. -- Miss Brent was given an injection.

-- What poison was injected into her? – The judge asked.

-- Most likely potassium cyanide, but this is just a guess. Probably the same poison that killed Marston. She must have almost died of suffocation right away.



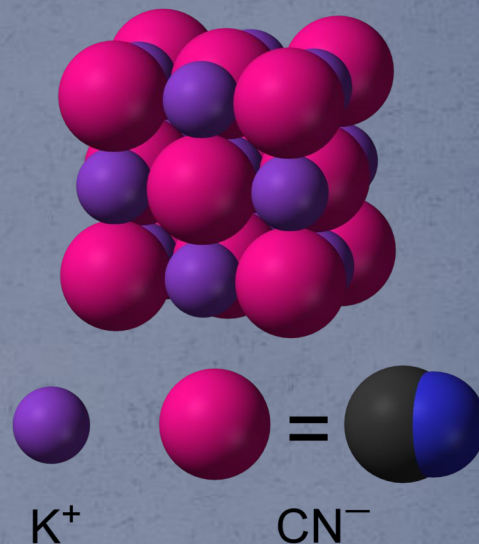


# Chemistry and potassium cyanide

**Potassium cyanide** is the potassium salt of prussic acid, the chemical formula is KCN.

Colorless crystals that resemble granulated sugar in texture and size. In high concentrations, it is extremely toxic, like all cyanides. It is well soluble in water (41.7% by weight at 25 °C, 55% at 100 °C). Poorly soluble in ethanol, does not dissolve in hydrocarbons.

Hydrogen cyanide, released during the hydrolysis of potassium cyanide, for some people has the smell of bitter almonds, for some it remains odorless. It is assumed that this difference is caused genetically.





# Biology and potassium cyanide

The toxic substance is found in peaches and 250 varieties of plum culture. When eating fruits, poisoning does not occur, since the poison is contained in the bones. As a result of metabolism, amygdalin from the group of natural glycosides is broken down by the action of hydrochloric acid in the stomach, forming a toxin. The remains of the substance break down into glucose, benzaldehyde and prussic acid. Sugar instantly neutralizes the resulting amount of cyanide, as a result of which nothing threatens human health. In nature, potassium cyanide crystals cannot be detected. A dangerous substance is produced by the cells of poisonous plants. It is present in small quantities in the seeds of apricots, plums, peaches, cherries.



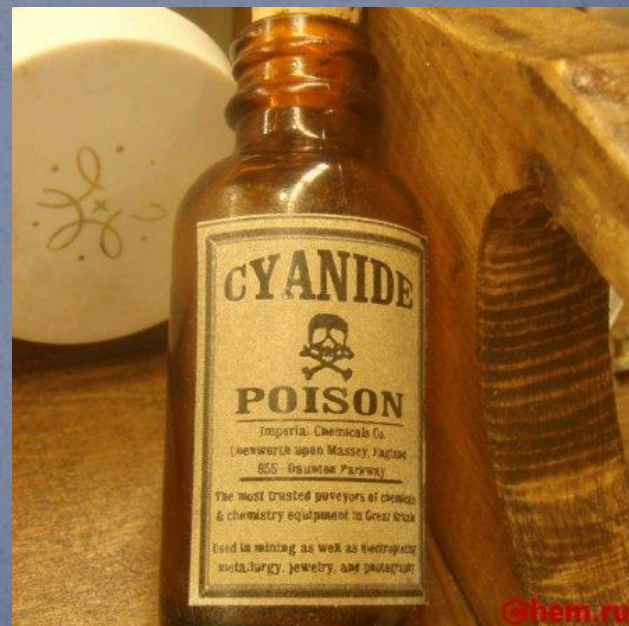


# Medicine and potassium cyanide

The clinical picture of cyanide poisoning has several stages. The main signs of poisoning: rapid breathing, dizziness, a feeling of compression in the chest, nausea and vomiting, a taste of metal in the mouth, tickling.

With a further increase in hypoxia, there is: increasing bradycardia, anxiety and fear of death, dilation of the pupils, bulging of the eyeballs, pronounced shortness of breath, convulsions.

If ingested through the digestive tract, the lethal dose for humans is 1.7 mg / kg (in 50% of cases). As a result of consumption, cells lose the ability to absorb oxygen from the blood and the body dies from interstitial oxygen starvation. At a dose of 150 - 250 mg, a person falls in convulsions after 30 seconds, loses consciousness after 90 seconds, and after 120-150 seconds dies due to the appearance of prussic acid in the tissues.





# Comparison of signs of poisoning

	Miss Brent	Marston
<b>Description of poisoning in the book</b>	The face is swollen, with blue lips and bulging eyes	His face was distorted, bloodshot. He gasped for air, then slid off the chair, his hand opened, the glass rolled on the carpet
<b>Substance - poison</b>	Injection of potassium cyanide	Potassium cyanide in wine
<b>Signs indicating cyanide poisoning</b>	Oxygen starvation, blue lips, bulging eyes	Oxygen starvation, shortness of breath
<b>The smell of prussic acid</b>	Absent	Absent
<b>The onset of death</b>	Not specified	Quickly



# Conclusion

Some details of poisoning are not fully described in the work. Some of them remain a mystery. In general, the picture of the crime corresponds to reality.

The writer possessed certain chemical knowledge in the field of the action of toxic substances on the human body and sought to use her writing talent to create a plausible detective intrigue.





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