1-1-2016

25.0.B Discussion Explosive Reactions

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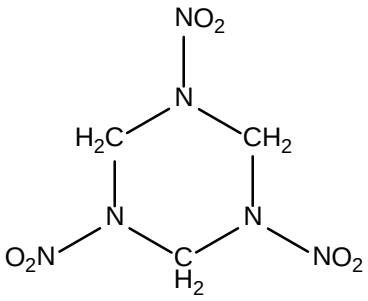
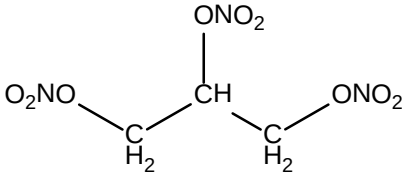
Task 5: These things explode

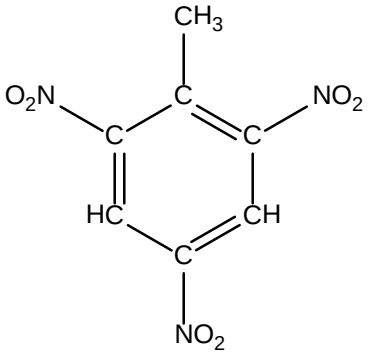
1. What characteristics make for a "good" explosive reaction?
2. What do most of the substances below have in common structurally?
3. Where does the energy come from?
4. Which one was Alfred Nobel associated with and how did he make it safer to use?
5. How was chemistry involved with economics and the geopolitics of war in the 18th century?

RDX
(90% of C4 plastic explosive)

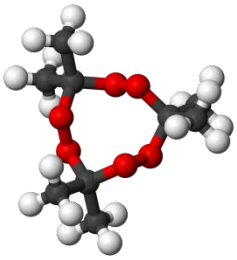


nitroglycerin





TNT (trinitrotoluene)



Acetone peroxide trimer ($C_9H_{18}O_6$)

AMFO: NH_4NO_3 + fuel oil (C_xH_y)
[Oklahoma City Fed Bldg bombing)

KNO_3 + S + charcoal (Gun powder)

Christopher F. Bauer, Principal Investigator.
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Group Member Name	Role	Date: 4/23
Taylor	Manager	
Calé	Ambassador	
Heather	Spokesperson	3
Emily D.	Recorder	

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(1) Explosive Reaction

- Exothermic → hot
- Loud
- Bright (orange, red, yellow
- Burning (smell)
- powerful (something is destroyed) ✓

(2) Common elements: C, N, O, H, some have "rings" ✓ of elements, nitrate molecules

(3) When the reaction (explosion) takes place, bonds are both broken and formed. Because the reaction is exothermic, we know that the energy of the products is greater than that of the reactants. The formation of bonds releases ~~and~~ energy and the breaking of bonds requires energy. The balance between the two determines the degree of energy output.

* At this point we ran out of time before class discussion. We spent a lot of time discussing question 3, and ~~5~~ are still unsure of our answer. We did not get to question 5.

Got it

From discussion: An exothermic reaction has reactants with weak bonds and products with strong bonds.

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Group Member Name	Role	Date: 4/23/15
Miriam	Manager	
Kaleigh	spokesperson	
Jon	Ambassador	
Marisa	Recorder	

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1) An explosion has to be exothermic, a lot of Joules released, big, fiery, loud...
Mixed with a substance that enhances it like fuel ✓

2) RDX, TNT, [redacted] and $C_9H_{18}O_6$ have ring structures. They all include nitrogen besides $C_9H_{18}O_6$. Carbon and hydrogen are also common. Molecules bonded with O_2 appear on the outsides of the structure. ✓

3) The bonds that are formed due to the reaction create energy.

5) Before World War I Chile was the main supplier of natural nitrate from their land. Nitrate consumption increased significantly when the war began because it was used in explosives. Germany tried to stop Chilean ships from bringing natural nitrate to the Allies. Germany couldn't keep the ship from delivering the nitrate and was then blockaded. Germany had to create ways to make synthetic nitrate, which involved chemistry because it was the result of chemical reactions. Once synthetic nitrate was produced there was no longer high demand for natural nitrate.

good

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Group Member Name | Role | Date: Apr 23

Emily K | Recorder
Mandy | Manager
Charles | Spokesperson
Jacob | Spokesperson

3

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(1) Exothermic reactions that release a lot of energy compared to other exothermic reactions. They have to react quickly. They combust and produce fire. ✓

(2) All but nitroglycerin are in ring structure. ✓
All but Acetone peroxide trimer have NO_2.

(3) The energy comes from the building of bonds. Something has to ignite the substance. This starts the reaction. This energy is what "gets you over the bump" = Activation Energy. ✓

(4) Chile had 90% of the world's nitrate, which was needed for fertilizer and explosives. This was because they won the War of the Pacific over Peru, Bolivia, and Britain. This gave Chile economic power because other countries wanted to buy nitrate.

Very good

During WWI, Britain took control over the Chilean nitrate and formed a blockade against Germany. Because of this, Chilean nitrates were sold in larger quantities to different countries, especially the US. However, Germany quickly developed synthetic

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Group Member Name	Role	Date: 4/23/15
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1) A good explosive reaction: fast, hot, loud, easy to react with ✓

2) carbon bonds (carbon ring), all have nitrogen except acetone ✓, hydrogen, oxygen

3) The energy comes from the rapid formation of bonds. exactly ✓

5) Nitrate was used for explosives and was easily traded for the purposes of war. The production boosted Chile's economy until nitrate was able to be made synthetically. ✓

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Group Member Name	Role	Date: 4/23/15
Tim	Manager	
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Emma	Ambassador	3
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1.) Mixing of fuel and oxygen (the right ratio) is a good characteristic for an explosive reaction.
- noise (bang)
- fire (hot)
- gas released
- scent
- ~~fast~~/sudden
- powerful
- exothermic

✓

2.) All the structures contain nitrogen, hydrogen, oxygen and carbon. Their shapes depend on carbon bonds, carbon ring, NO_2

3.) It takes energy to break bonds and releases energy when you form bonds, so the heat comes from the chemical reaction (bonds) - especially formation

4) —

5.) Economically there was a huge demand for nitrates in South America because of the war. Geopolitics: the US was close to Chile compared to Germany so Germany had a huge need for the nitrates but we could easily get it since we were right next to them. ✓

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