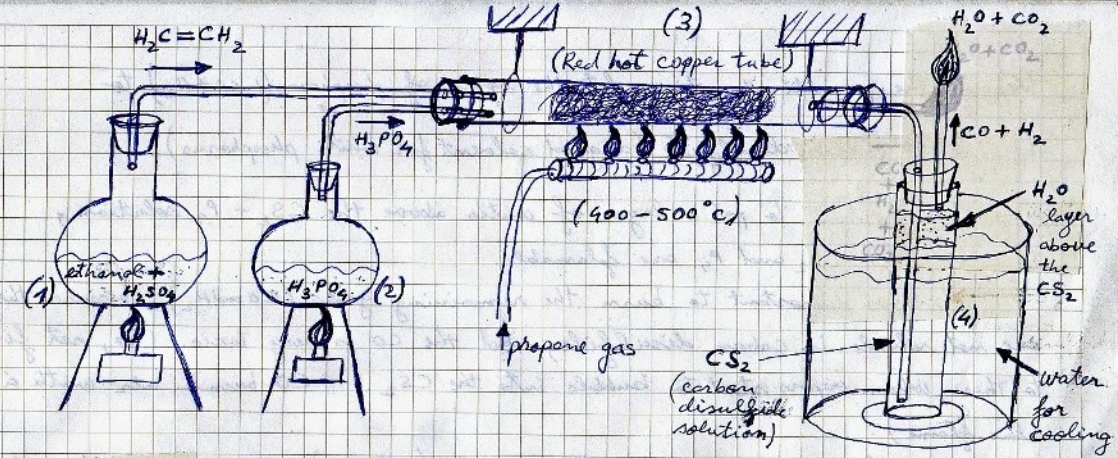


(1) In the first step, H_2SO_4 dehidrate the ethanol. $\left(H_3C-\underset{OH}{\underset{|}{CH_2}}\right)$ to form ethylene $(H_2C=CH_2)$ at 150 – 170 °C.

(2) Step two: while ethylene is bubbling, boil the phosphoric acid (pure acid)

(3) In the third step, pass the mixture of ethylene and phosphoric acid vapors through a red hot copper tube with some copper wool in it:

$$2\,H_2C=CH_2 + H_3PO_4 \xrightarrow[Cu;CuO]{400-500\,^\circ C} P + 4CO + \frac{11}{2}H_2$$

(4) In the penultimate step, let the vapors of phosphorus ($+ CO + H_2$) to bubble in carbon disulfide (a good solvent for white phosphorus).

It's important to put a layer of water above the $CS_2 + P_4$ solution, because both CS_2 and P_4 are flamable.

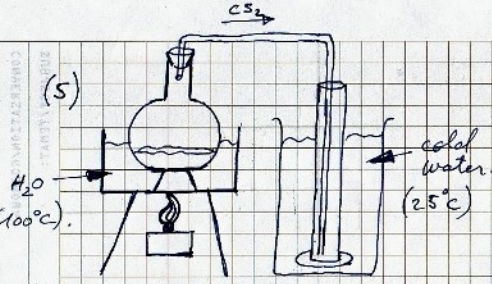
It's also important to burn the remaining gases (CO and H_2), because they are not soluble in caban disulfide, and the CO is very toxic. (So, set fire to these, when vapors start to bubble into the CS_2. CO burn in air with a blue flame).

Do not forget to put a pot of cold water (with ice) around the beaker, to prevent the boiling of the carbon disulfide solution.

Notice that the co-products of the reaction aren't just CO and H_2. They are also, in little quantities: formaldehide, ethilene oxide, CO_2, H_2O, acetaldehide ... and so on.

ROK SZKOLNY TIME 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
DZIEŃ DAY 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
MIESIĄC MONTH 1 2 3 4 5 6 7 8 9 10 11 12
CONVERSATION/ROZMOWA:
SUBJECT/TEMAT:
WITH/Z:
PLACE/MIEJSCE:

(5)



In the last step, to obtain pure phosphorus, you need to distil the CS_2 and other impurities on a water bath. (100°C).

CS_2 boil at about 46 – 50 °C.
(formaldehide, ethylene oxide and acetaldehide boil below 20°C).

P_4 (white) { melts at ≈ 44–45 °C
boil at 280 °C.

At the end of the process, let the P_4 to crystallize at the bottom of the flask.

This white phosphorus should be highly pure (99,9 % P).

It must be store under water.

Worning!!! Don't let the copper tube to become bright-red. (≥ 800° C)
If the temperature jump over 800°C, the P_4 gas molecules will split into 2 P_2 who will reacts with H_2 to form phosphine. (PH_3) – a toxic gas.
If the copper become bright red, remove the flame! (the reaction is also exothermic).

GODZINA TIME
DZIEŃ DAY
MIESIĄC MONTH
CONVERSATION/ROZMOWA:
SUBJECT/TEMAT:
WITH/Z:
PLACE/MIEJSCE: