



IYNT 2017 NANJING

Team BULGARIA

# Problem 15


## Water from the Air

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# WATER FROM THE AIR

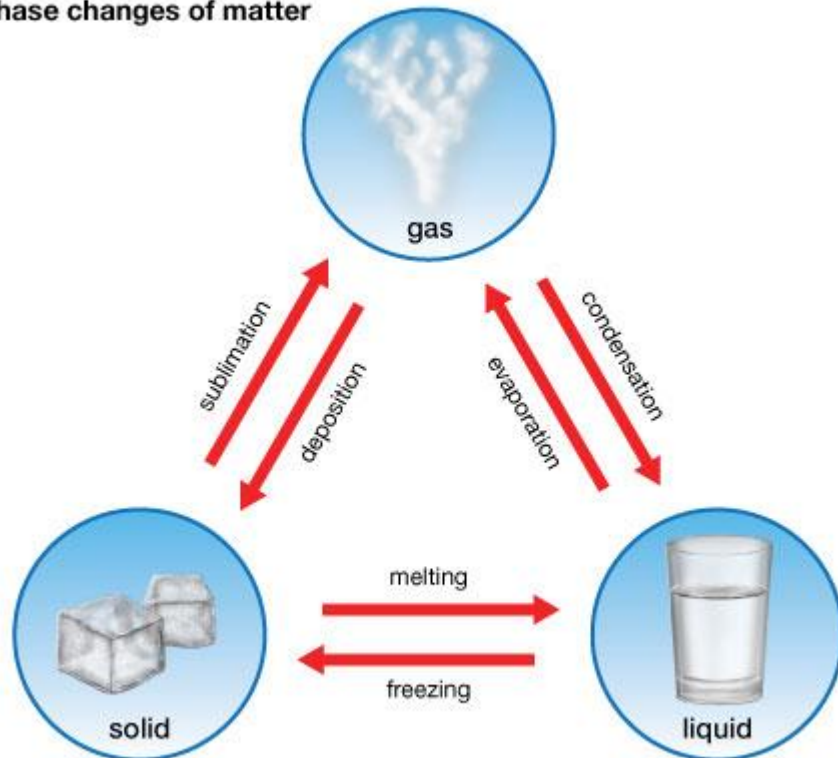
Design and construct a device allowing **collection of water by condensing moisture from air**. Determine if the water obtained with your device is **suitable for drinking**. What **amount of water** is possible to collect during one Science Fight?



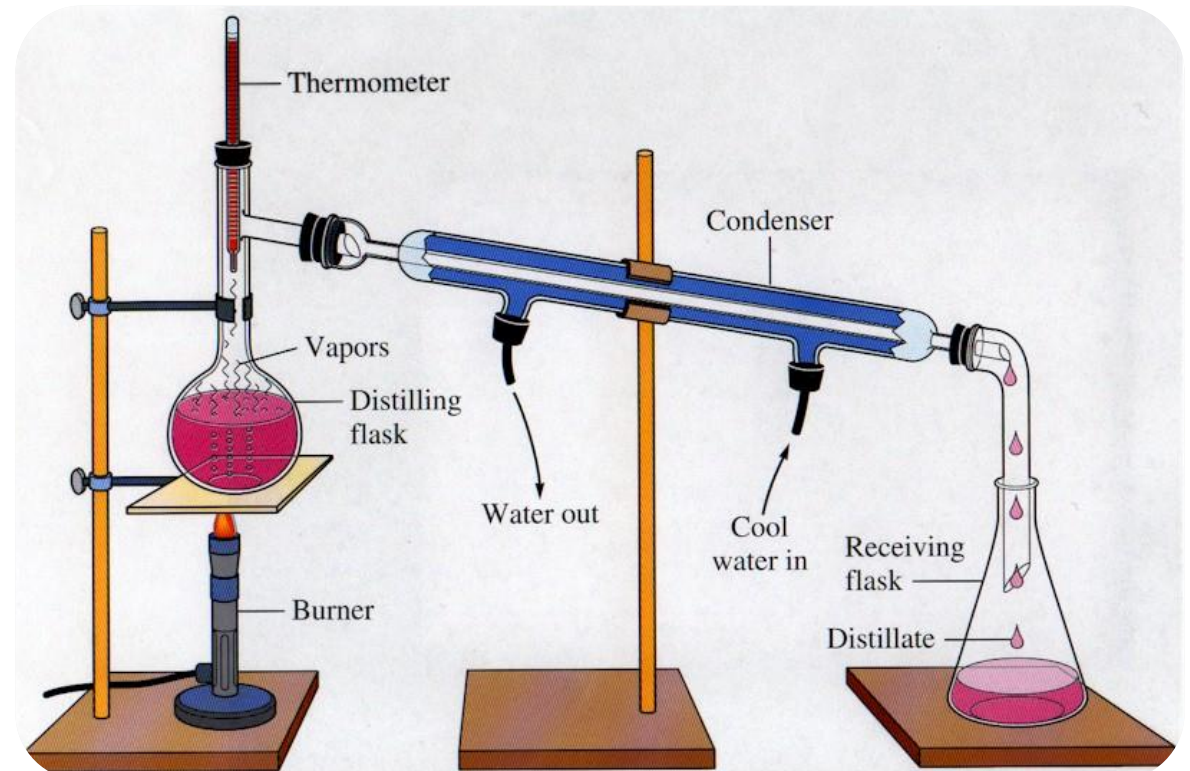
# WHAT IS CONDENSATION?

Condensation is the process in which water vapours turn into liquid water

Phase changes of matter



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# THEORETICAL MAXIMUM

The theoretical maximum can be reached only if the dry ice gains all the heat which water vapours have radiated

$$M_{\text{CO}_2} * r_{\text{CO}_2} = M_{\text{H}_2\text{O}} * r_{\text{H}_2\text{O}}$$

Where:

$M_{\text{CO}_2}$  is the mass of the dry ice

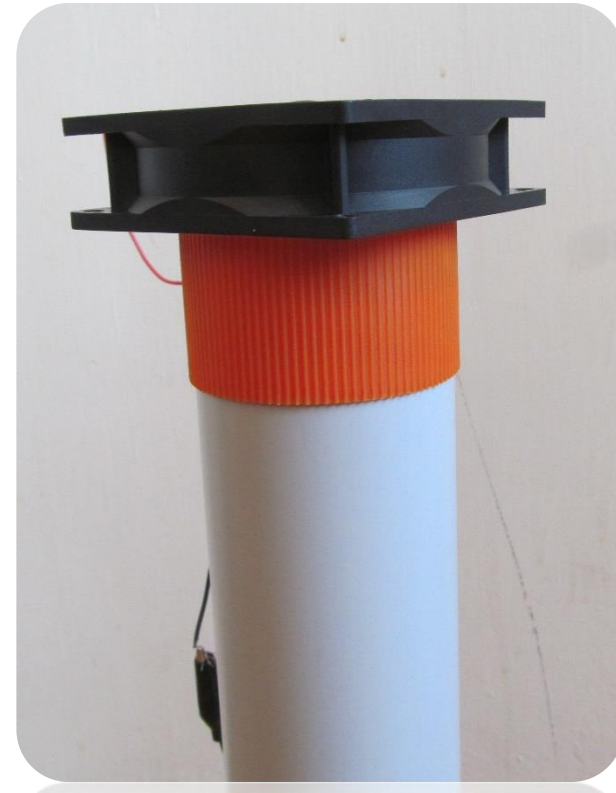
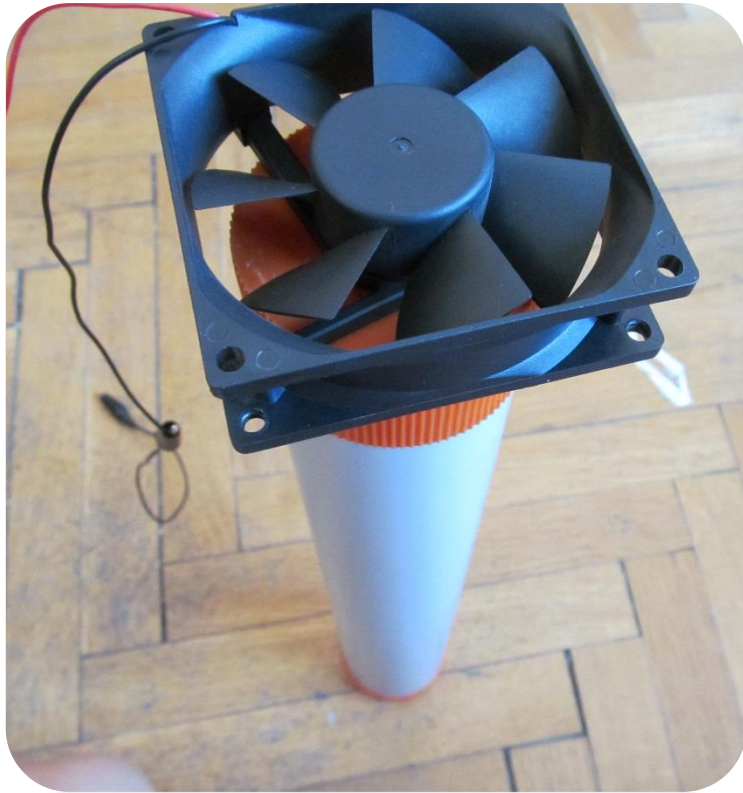
$r_{\text{CO}_2}$  is the specific sublimation heat of dry ice

$M_{\text{H}_2\text{O}}$  is the mass of the water collected

$r_{\text{H}_2\text{O}}$  is the latent heat of water

# EXPERIMENTAL SETUP

The device is made from a plastic cylinder and a computer fan on top



# OPERATION

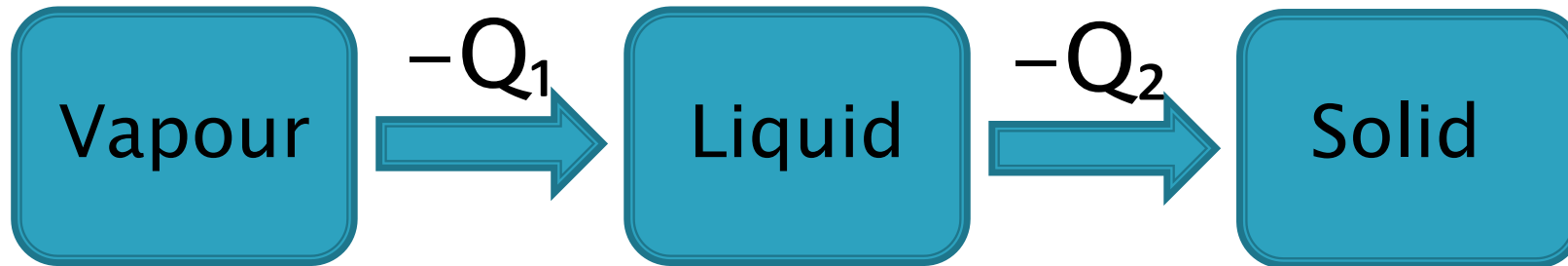
To operate the device you need to fill the cylinder with dry ice



Scraper

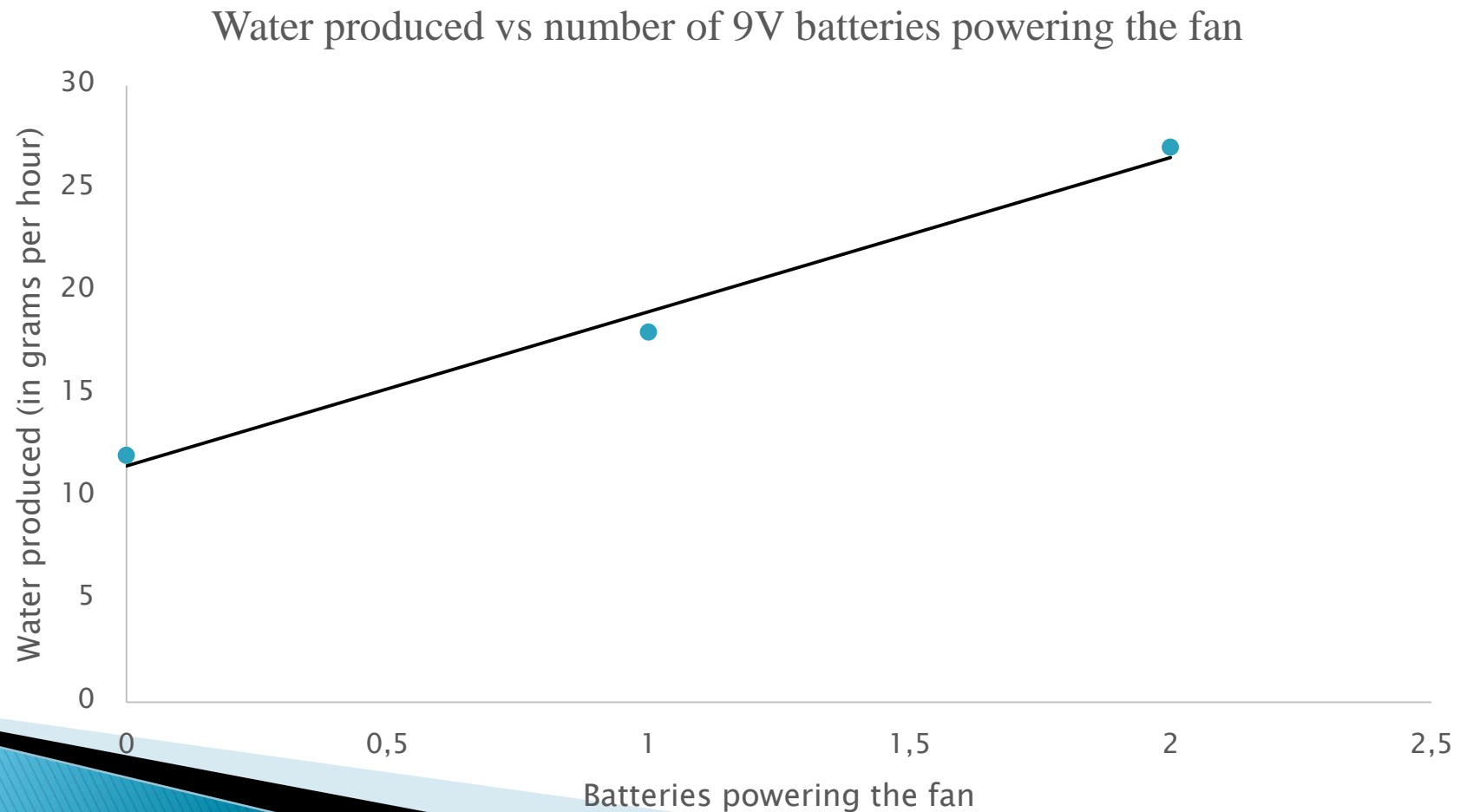
# HOW AND WHY IT WORKS

When the cylinder gets very cold, water vapour in the air turns into water and then, almost immediately, into water crystals



# EFFICIENCY

The productivity depends highly on the water vapour concentration in the air

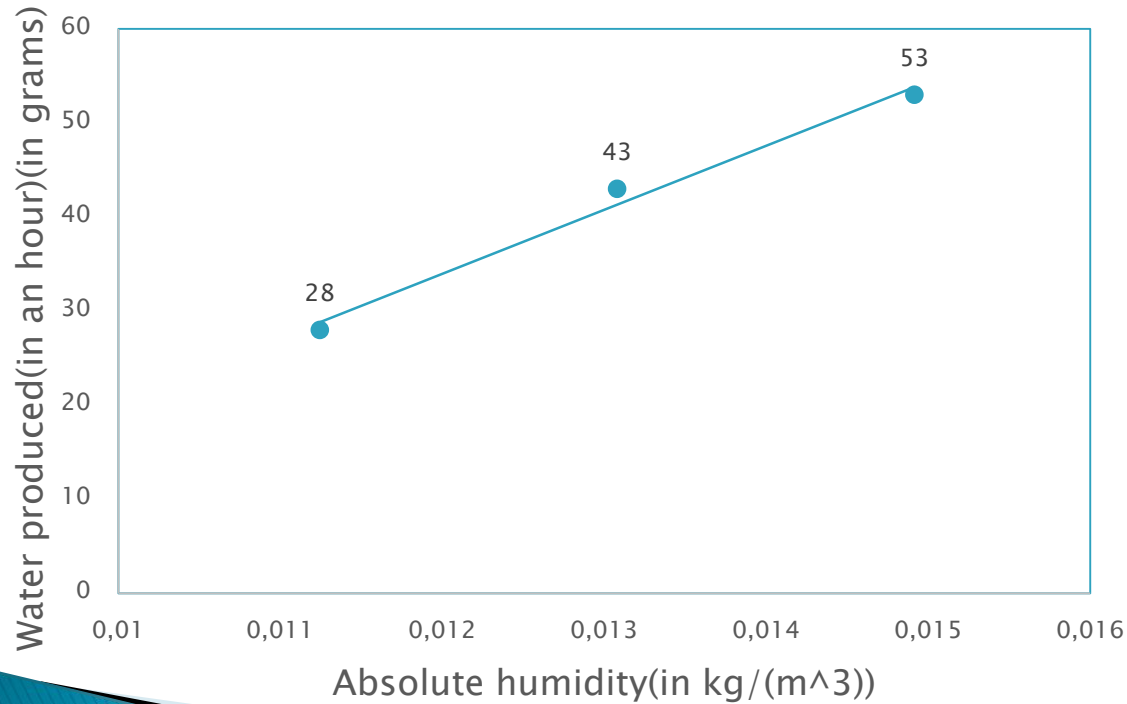




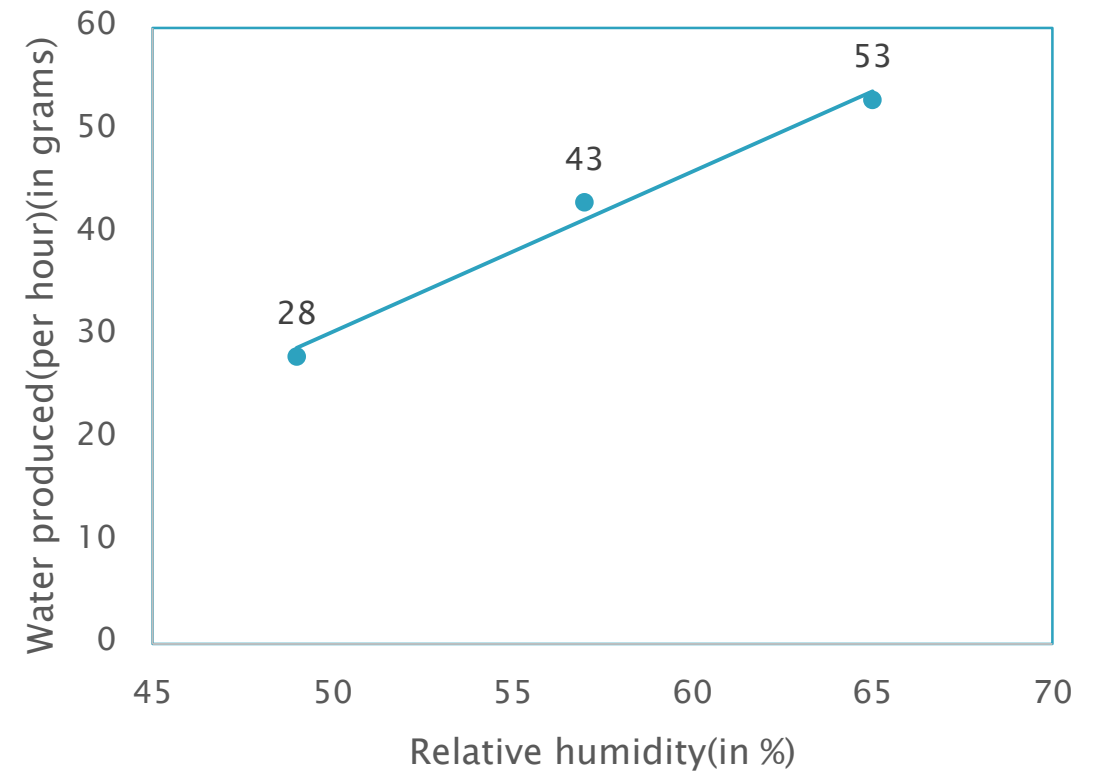
# EXPERIMENTAL RESULTS

The results follow a straight line very accurately, which was expected

Water produced vs absolute humidity



Water produced vs Relative humidity




# DRINKABILITY

The water collected with the device is suitable for drinking because it is basically distilled water and the device has been previously cleaned



# CONCLUSION

- ▶ Trying to extract water from the air by condensation is a process whose results are measurable and repeatable
  - ▶ The water obtained by condensation is suitable for drinking
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**THANK YOU FOR THE ATTENTION**

