

EXAMEN : BACCALAURÉAT GÉNÉRAL	SESSION 2011
ÉPREUVE : Évaluation spécifique de langue en section européenne	
PHYSIQUE-CHIMIE en langue ANGLAISE	SUJET N°6

## Breathalyser

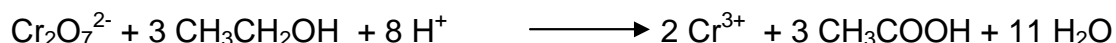
Alcohol that a person drinks shows up in the breath because it gets absorbed from the mouth, throat, stomach and intestines into the bloodstream.

Alcohol is not digested upon absorption, nor chemically changed in the bloodstream. As the blood goes through the lungs, some of the alcohol moves across the membranes of the lungs air sacs (alveoli) into the air, because alcohol will evaporate from a solution -- that is, it is volatile. The concentration of the alcohol in the



alveolar air is related to the concentration of the alcohol in the blood. As the alcohol in the alveolar air is exhaled, it can be detected by the breath alcohol testing device. Instead of having to draw a driver's blood to test his alcohol level, an officer can test the driver's breath on the spot and instantly know if there is a reason to arrest the driver.

Breathalyzer uses a chemical reaction involving alcohol that produces a color change. To measure alcohol, a suspect breathes into the device. The breath sample is bubbled in one vial through a mixture of sulfuric acid, potassium dichromate, silver nitrate and water. The principle of the measurement is based on the following chemical reaction:



In this reaction:

1. The sulfuric acid removes the alcohol from the air into a liquid solution and provides the acidic condition needed for this reaction.
2. The alcohol reacts with potassium dichromate to produce: chromium ion, acetic acid and water.

The silver nitrate is a catalyst

During this reaction, the reddish-orange dichromate ion changes color to the green chromium ion when it reacts with the alcohol; the degree of the color change is directly related to the level of alcohol in the expelled air.

Adapted from HowStuffworks

### Questions :

1. Present and comment on this document.
2. Do not forget to focus on at least one physics and/or chemistry topic as for example explaining oxydo-reduction reactions.
3. Do you know other ways to measure amounts of chemical substances?