

# Staying alive ! ha, ha, ha, ha haaaa... aaaahh...

## Is there enough air in this ZE car ?...

### 1 Assignment and final task.

This is a team work between mathematics and biology students. Feel free to share roles according questions on a voluntary basis. All members of the team have to speak equally when filming. Be creative !

### 2 The problem.

ZE car is designed by Renault, French car manufacturer to be used by 4 persons for the maximum.

1. Calculate the total volume of air needed by 4 passengers of ZE car under the assumption that all doors are hermitically closed.
2. Complete the data below by viewing the film in order to finish the task.
3. It has been strictly forbidden unanimously by the Bulgarian, French and Italian school headmasters for the students to travel in these conditions. **Why ?**
4. What is the obvious alternative used by everybody to travel by car ? Explain.

Comment, explain, raise questions, give reasoning, convincing argument and a final solution. Remember, YOU are the experts in sciences stating the problem and finally solving it for an international audience of your presentation. Don't be boring ! Audience surely appreciates clear reasonings as well as creativity when listening to you !

### 3 You will need ....

Extract from the 2 first minutes of the video the data needed to solve this task, answering the following questions. Film is "Biology made simple; lung volumes and capacities" to see at link <https://www.youtube.com/watch?v=QJcAJHFqXZg>

1. What is the average total volume in an adult male's lungs ? in an adult female's lungs ?
2. Calculate the average total volume in a human being's lungs ?
3. What is the residual volume of lungs expressed in percentage of lungs' volume ?
4. What is the percentage of tidal volume ?
5. Calculate the average volume of lungs in percentage implicated while breathing quietly ?
6. What proportion of this volume is effectively renewed at each ventilation cycle ?

At the moment we are speaking we don't know the average number of ventilation cycles a passenger proceeds during one minute. To find out this data realistically lead a statical survey by collecting each individual's ventilation cycles number and then calculating the average of all persons present in this room.

Moreover, a human being breathes air to renew cell energy in his body. To convert it to his entire body the human being will die without air within approximately 7 minutes.

answers for data

1. 6 l male, 4.2 l female
2. 5.1 l lung volume
3. residual volume is 20%
4. tidal volume is 78%
5. 58%

These needs of air depend on physical exercise at that moment. A person sitting quietly fills 60% of the total volume available in his lungs at each ventilation cycle.

6. The average volume available in a passenger lungs is 2.96 litres.

after 13 minutes every body starts apnaea

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Last but not least : the teachers are very anxious!