

**Main Ideas, Key Points,  
Questions:**

*After watching the video segment, write down key points, main ideas and big questions.*

**Objective(s):**

- *To use the Kinetic Molecular Theory to explain the characteristics of gas particles.*
- *To use the Ideal Gas Law to calculate relationships between pressure, volume, temperature and number of moles of gas.*
- *To plan and carry out an engineering design challenge using the Ideal Gas Law.*

**Notes:**

*During the video segment, use words, phrases or drawings to take notes.*

**Summary:**

*After watching the video segment, write at least three sentences explaining what you learned.  
You can ask yourself: "If I was going to explain this to someone else, what would I say?"*

**After watching the video and performing any associated labs and/or experiments, you should be able to answer the following:**

1. Write a sentence to explain what you have drawn in your model to explain why a balloon or a marshmallow expands if air is removed.
2. According to the Ideal Gas Law, if the temperature of a gas increases, what will happen to the volume?
3. Explain why a balloon expands when attached to the top of a heated Erlenmeyer flask with water.
4. What happens to this balloon if the heated flask is then placed in an ice bath? Why?

*You will now begin planning an engineering design challenge to design an alternative air bag. You will need to know how to calculate pressure, volume, moles and temperature using the Ideal Gas Law. For example, to calculate number of moles, use this version of the Ideal Gas Law:  $n = PV/RT$*

5. What value for pressure will you use in your calculations?
6. What value for “room temperature” will you use in your calculations?
7. The value for the proportionality constant, R, is always the same: Pretend that your model air bag has a volume of 500 mL. Use the Ideal Gas Law to calculate the number of moles of gas that this model air bag will hold.

*For your engineering design challenge, your goal is to optimize the conditions for the chemical reaction between the acetic acid in vinegar and sodium bicarbonate powder so a plastic bag fully inflates as quickly as possible without rupturing.*

8. Write an experimental procedure, which must be approved by your teacher before starting your experiment. Include safety precautions as well as instructions for the procedure you will use to inflate and measure the airbags.

***You are expected to write an experimental procedure for the engineering design challenge before continuing to Unit 9F.***