Catalyze Your Success

Understand Concepts and Improve Your Scores

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Learning strategies

- Workshop 1: Preview and Interact
- Workshop 2: Interact, Review and Study
- Workshop 3: Check
Learning strategy #1: Interact

Today’s strategies

• Interact:
  • Paraphrase each piece of information
  • Highlight, take notes, make flashcards while attending lecture
  • ask questions
Going to class and taking notes

> **come** to class: the more you interact with material, the better you understand it!

> take **notes** by hand

> **record** the lecture and listen to it at a later time

> **listen to yourself**: what is the most efficient way for **YOU** to grasp information
Learning strategy #2: Review

Today’s strategies

- Review:
  - read lecture notes
  - Highlight, take new notes, make flashcards while reading
  - make cheat sheets
Using textbook (even if not required)

> lecture notes may not have all the information needed to understand the concept

\[ C_T \] cat or cot?

> Use **Index/Table of contents** to help you navigate the book
Using textbook. Examples

TOPIC 1A  The perfect gas

Why do you need to know this material?
Equations related to perfect gases provide the basis for the development of many relations in thermodynamics. The perfect gas law is also a good first approximation for accounting for the properties of real gases.

What is the key idea?
The perfect gas law, which is based on a series of empirical observations, is a limiting law that is obeyed increasingly well as the pressure of a gas tends to zero.

What do you need to know already?
You need to know how to handle quantities and units in calculations, as reviewed in The chemist's toolkit 1. You also need to be aware of the concepts of pressure, volume, amount of substance, and temperature, all reviewed in The chemist's toolkit 2.

The properties of gases were among the first to be established quantitatively (largely during the seventeenth and eighteenth centuries) when the technological requirements of travel in balloons stimulated their investigation. These properties set the stage for the development of the kinetic model of gases, as discussed in Topic 1B.

The data in Table 1A.1 are useful for the practical handling of gaseous substances. The most important units are the pascal and the bar. Other units, such as the atmosphere and the torr, are used in some parts of the world.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Symbol</th>
<th>Conversion Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>pascal</td>
<td>Pa</td>
<td>1 Pa = 1 N m⁻², 1 kg m⁻¹ s⁻²</td>
</tr>
<tr>
<td>bar</td>
<td>bar</td>
<td>1 bar = 10⁵ Pa</td>
</tr>
<tr>
<td>atmosphere</td>
<td>atm</td>
<td>1 atm = 101.325 kPa</td>
</tr>
<tr>
<td>torr</td>
<td>Torr</td>
<td>1 Torr = (101.325/760) Pa = 133.322... Pa</td>
</tr>
<tr>
<td>millimetres of mercury</td>
<td>mmHg</td>
<td>1 mmHg = 133.322... Pa</td>
</tr>
<tr>
<td>pounds per square inch</td>
<td>psi</td>
<td>1 psi = 6.894757... kPa</td>
</tr>
</tbody>
</table>

* Values in bold are exact.

of pressure, the pascal (Pa, 1 Pa = 1 N m⁻²), is introduced in The chemist's toolkit 1. Several other units are still widely used (Table 1A.1). A pressure of 1 bar is the standard pressure for reporting data; it is denoted p⁰.

If two gases are in separate containers that share a common movable wall (Fig. 1A.1), the gas that has the higher pressure will tend to compress (reduce the volume of) the gas that has lower pressure. The pressure of the high-pressure gas will fall as it expands and that of the low-pressure gas will rise as it is compressed. There will come a stage when the two pressures are equal and the wall has no further tendency to move. This condition of equality of pressure on either side of a movable wall is a state of mechanical equilibrium between the two gases. The pressure of a gas is therefore an indication of whether a container that contains the gas will be in mechanical equilibrium with another gas with which it shares a movable wall.
Using textbook. Examples

The molecules present in the gas and the resulting current of ions is interpreted in terms of the pressure. In a capacitance manometer, the deflection of a diaphragm relative to a fixed electrode is monitored through its effect on the capacitance of the arrangement. Certain semiconductors also respond to pressure and are used as transducers in solid-state pressure gauges.

(b) Temperature

The concept of temperature is introduced in The chemist’s toolkit 2. In the early days of thermometry (and still in laboratory practice today), temperatures were related to the length of a column of liquid, and the difference in lengths shown when the thermometer was first in contact with melting ice and then with boiling water was divided into 100 steps called ‘degrees’, the lower point being labelled 0. This procedure led

On the thermodynamic temperature scale, temperatures are denoted $T$ and are normally reported in kelvins (K; not °K). Thermodynamic and Celsius temperatures are related by the exact expression

$$\frac{T}{K} = \frac{\theta}{°C} + 273.15$$

(1A.1)

This relation is the current definition of the Celsius scale in terms of the more fundamental Kelvin scale. It implies that a difference in temperature of 1 °C is equivalent to a difference of 1 K.

**Brief illustration 1A.1**

To express 25.00 °C as a temperature in kelvins, eqn 1A.1 is used to write

$$\frac{T}{K} = \frac{(25.00 \, °C)}{°C} + 273.15 = 25.00 + 273.15 = 298.15$$

$p = 0$, regardless of the size of the units, such as bar or pascal. However, it is appropriate to write 0 °C because the Celsius scale is not absolute.

1A.2 Equations of state

Although in principle the state of a pure substance is specified by giving the values of $n$, $V$, $p$, and $T$, it has been established experimentally that it is sufficient to specify only three of these variables since doing so fixes the value of the fourth variable.
Using textbook. Examples

Learning strategy #3: Study

Today’s strategies

• Study:
  • set study goals
  • focused study sessions
How to be efficient?

**FOCUSED STUDY SESSION**

- **PLAN** 1-2 minutes
  - Set a specific goal.

- **STUDY** 30-50 minutes
  - Engage with material.
  - Utilize effective learning strategies.
  - Think critically.

- **BREAK** 5-10 minutes
  - Step away.
  - Clear your mind.

- **RECAP** 5 minutes
  - Summarize.
  - Wrap-up.

**CHOOSE**
- Continue studying?
- Take a longer break?
- Change tasks or subjects?
Doing homework

**FOCUS**
on the *process* of solving problems, rather than the final answer.

**REVIEW**
text and notes before starting homework.

**REWORK**
examples from class/text *without* looking at the solution.

**WORK**
homework problems *without* looking at solutions to similar problems.

**LOG**
questions and steps for working each problem.
Doing homework (NOT using solved examples as a guide)

> Homework and example problems are the **opportunities** to **test yourself**

> treat each problem as a **test** question, and/or **quest**

> **learn** from your mistakes – you won’t lose points if you make a mistake **now**
Is that all?

Upcoming workshops
  – Solidify Knowledge and Improve your Scores

Last thing: if you don’t implement a new strategy in 48 hours, you’ll probably not use the strategy
Cookie lab manual
Test anxiety

> studies show that stress can lead to short-term memory loss and impede long-term memory retrieval (Frodl & O`Keane, 2013; Kim, Lee, Han, Packard 2001; Phelps 2004)

> how to reduce anxiety and build confidence?

> let`s see what the connection between emotions and motivation is
Connection between emotions and motivation

- Positive emotions
- Increased motivation
- Increased learning
- Increased success
What affects motivation?

> **Value.** How important do I find this goal?

> **Nature of the environment.** Do I feel supported?

> **Belief in the ability to succeed.** Do I feel I can design and follow a course of action to meet this goal?
How to improve motivation?

> use learning strategies to build academic success
How to improve motivation?

> use learning strategies to build academic success
> cultivate a mindset that your intelligence can grow
How to improve motivation?

> cultivate a mindset that your intelligence can grow

<table>
<thead>
<tr>
<th>“Fixed” Mindset</th>
<th>“Growth” Mindset</th>
</tr>
</thead>
<tbody>
<tr>
<td>I'm not good at this.</td>
<td>What am I missing?</td>
</tr>
<tr>
<td>I give up.</td>
<td>I'll use a different strategy.</td>
</tr>
<tr>
<td>It's just good enough.</td>
<td>Is this my best work?</td>
</tr>
<tr>
<td>This is too hard.</td>
<td>This may take some time.</td>
</tr>
<tr>
<td>Who am I to be smart, talented ...?</td>
<td>Who am I not to be?</td>
</tr>
<tr>
<td>My plan failed. It's over.</td>
<td>There's always a Plan B.</td>
</tr>
<tr>
<td>Why can't I do it like [someone else you admire]?</td>
<td>What do they know that I don't know? I will learn from them.</td>
</tr>
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How to improve motivation?

> use learning strategies to build academic success
> cultivate a mindset that your intelligence can grow
> engage in positive, healthy self-talk
How to improve motivation?

**Automatic Negative Thoughts**
- I'm a loser
- Nobody likes me
- Nobody cares
- It's all my fault that she's upset
- I always get in trouble
- Everyone hates me
- I can't do this
- I'm so dumb
- I hate myself
- Everyone is always out to get me
- She always tries to control me
- Now everything is ruined
- I will never be any good
- My life is terrible

**Ways to Challenge Negative Thoughts**
- What is a more helpful thought?
- What is another possibility?
- What would the people who care about me say?
- What is the worst that could really happen?
- If my friend had this thought, what would I tell them?
- Can I be 100% sure this is true?
- If the worst really did happen, what could I do to deal with it and who could help me?

How to improve motivation?

> use learning strategies to build academic success
> cultivate a mindset that your intelligence can grow
> engage in positive, healthy self-talk
> hard to improve external circumstances – easier to work on things that you can control. Attribute positive and negative results to your behavior
How to improve motivation?

> use learning strategies to build academic success
> cultivate a mindset that your intelligence can grow
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> hard to improve external circumstances – easier to work on things that you can control. Attribute positive and negative results to your behavior
> know your learning style preferences (visual, auditory, read/write, kinesthetic)
How to improve motivation?

> know your learning style preferences (visual, auditory, read/write, kinesthetic)

https://nursing.lsuhsc.edu/AcademicSuccessProgram/LearningStyles.aspx
Study strategies for different learning style preferences

<table>
<thead>
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<th>Visual Learner (prefers pictures, charts, diagrams, graphs, etc.)</th>
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<tr>
<td><strong>In Class</strong></td>
</tr>
<tr>
<td>• Underline important points</td>
</tr>
<tr>
<td>• Highlight with different colors</td>
</tr>
<tr>
<td>• Use symbols, charts, graphs</td>
</tr>
<tr>
<td><strong>While Studying</strong></td>
</tr>
<tr>
<td>• Underline notes and text</td>
</tr>
<tr>
<td>• Highlight notes and text (in color)</td>
</tr>
<tr>
<td>• Summarize with images and concept maps</td>
</tr>
<tr>
<td><strong>During Exams</strong></td>
</tr>
<tr>
<td>• Recall pictures</td>
</tr>
<tr>
<td>• Draw concept map of essay</td>
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<td>• “Dump” formulas/diagrams</td>
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How to improve motivation?

- use learning strategies to build academic success
- cultivate a mindset that your intelligence can grow
- engage in positive, healthy self-talk
- hard to improve external circumstances – easier to work on things that you can control. Attribute positive and negative results to your behavior
- know your learning style preferences (visual, auditory, read/write, kinesthetic)
- get adequate rest, nutrition, and exercise
## Study strategies for different learning style preferences

**Visual Learner**  
(prefers pictures, charts, diagrams, graphs, etc.)

<table>
<thead>
<tr>
<th>In Class</th>
<th>While Studying</th>
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# Study strategies for different learning style preferences

<table>
<thead>
<tr>
<th>Aural or Auditory Learner (prefers hearing information)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In Class</strong></td>
</tr>
<tr>
<td>• Attend lectures, discussions, and tutorials</td>
</tr>
<tr>
<td>• Tape lecture for later</td>
</tr>
<tr>
<td><strong>While Studying</strong></td>
</tr>
<tr>
<td>• Discuss material in study group</td>
</tr>
<tr>
<td>• Summarize notes, then read out loud</td>
</tr>
<tr>
<td>• Read onto tape, then listen back</td>
</tr>
<tr>
<td><strong>During Exams</strong></td>
</tr>
<tr>
<td>• Listen to inner voice to recall information</td>
</tr>
<tr>
<td>• Talk out question under breath</td>
</tr>
</tbody>
</table>
# Study strategies for different learning style preferences

| Reading/Writing Learner (prefers reading or writing about information) |
|---|---|---|
| **In Class** | **While Studying** | **During Exams** |
| • Create lists and headings  
• Take complete lecture notes | • Identify key words and associate them with details  
• Reread notes and text and summarize them in writing  
• Reread and summarize old tests  
• Answer (in writing) the review questions | • Use key words to trigger more complete answers  
• At the beginning of the exam, write out important lists  
• Essay – write thesis, then outline |
Study strategies for different learning style preferences

**Kinesthetic Learner**
(prefers moving, touching, visualizing movement, or hands-on activities to learn information)

<table>
<thead>
<tr>
<th>In Class</th>
<th>While Studying</th>
<th>During Exams</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use all senses</td>
<td>• Trial and error is important – can learn from mistakes</td>
<td>• Remember examples</td>
</tr>
<tr>
<td>• Participate in labs and field trips</td>
<td>• Create personal examples</td>
<td>• Stretch or move to jog memory</td>
</tr>
<tr>
<td></td>
<td>• Use pictures to illustrate notes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Stand, move, walk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Study in an exam-like environment</td>
<td></td>
</tr>
</tbody>
</table>