

Concepts/Topics

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|---|--------------------------------------|
| <input type="checkbox"/> Kinetic/molecular theory of temperature; temp. scales | (be able to use kelvins in problems) |
| <input type="checkbox"/> Zeroth Law of Thermodynamics | (concept) |
| <input type="checkbox"/> Thermal expansion (linear expansion, volume expansion) | (work problems) |
| <input type="checkbox"/> Ideal and combined gas laws | (review: work problems) |
| <input type="checkbox"/> Boltzmann's constant - dealing at the molecular level | (be able to use in probs.) |
| <input type="checkbox"/> Kinetic energy and average speed of molecules | (work probs.) |
| <input type="checkbox"/> Energy transfer (and Zeroth Law revisited) | (concept) |
| <input type="checkbox"/> Units: J, cal, Cal, Btu (1 cal = 4.186 J) | (be able to use in probs.) |
| <input type="checkbox"/> Specific heat and calorimetry | (work problems) |
| <input type="checkbox"/> Latent heat (heat of fusion, heat of vaporization) | (work problems/concept) |
| <input type="checkbox"/> Heat transfer: Conduction | (work problems) |
| <input type="checkbox"/> Heat transfer: Convection and radiation | (concept) |
| <input type="checkbox"/> Thermodynamic processes | (work problems/concept) |
| <input type="checkbox"/> Heat engines and efficiency | (work problems/concept) |

Formulas and constants

$$\Delta l = \alpha l_0 \Delta T \quad H = \frac{kA\Delta T}{L} \quad P = \frac{F}{A} \quad PV = nRT = Nk_B T \quad K_{avg} = \frac{3}{2} k_B T$$

$$v_{rms} = \sqrt{\frac{3RT}{M}} = \sqrt{\frac{3k_B T}{\mu}} \quad W = -P\Delta V \quad \Delta U = Q + W \quad e = \left| \frac{W}{Q_H} \right| \quad e_C = \frac{T_H - T_C}{T_H}$$

Readings

Physics: Principles with Applications (2009), Chpt. 13-15

Homework/Activities

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|--|------------|
| <input type="checkbox"/> Worksheets (Physics Kahuna) | Due: _____ |
| <input type="checkbox"/> TBA: _____ | Due: _____ |

Web Resources

- | | |
|--|--|
| Metric system - temperature | lamar.colostate.edu/~hillger/temps.htm |
| Temp scales and therm expansion (Walter Lewin - MIT) | www.youtube.com/watch?v=sr0yMwdWie0 |
| Thermal expansion (BrightStorm) | www.youtube.com/watch?v=hSeEUtGYg2A |
| Combined Gas Law | science.widener.edu/svb/tutorial/combinedgascsn7.html |
| Ideal Gas Equation | science.widener.edu/svb/tutorial/idealgascsn7.html |
| Specific Heat (Mr. Wafi) | www.youtube.com/watch?v=BcIB8UaSH4g |
| Heat Transfer (water + misc) | science.widener.edu/svb/tutorial/heatxfer2csn7.html |
| Heat Transfer (water only) | science.widener.edu/svb/tutorial/heatxfer1csn7.html |
| Specific and Latent Heat (Khan) | www.youtube.com/watch?v=zz4KbvF_X-0 |
| Conduction (BrightStorm) | www.youtube.com/watch?v=h7wXilu0We0 |
| Convection (BrightStorm) | www.youtube.com/watch?v=vzil7tDNuSw |
| Radiation (BrightStorm) | www.youtube.com/watch?v=Wy6Tewe8m1k |
| Thermodynamics (Physics4kids) | www.physics4kids.com/files/thermo_intro.html |
| Internal Energy (Khan) | www.youtube.com/watch?v=aOSIXuDO4UU |
| PV diagrams and work (Khan) | www.youtube.com/watch?v=M5uOly-JTmo |
| Heat engines (TutorVista) | www.youtube.com/watch?v=DHUwFuHuCdW |

Notes

Article to go with readings??

Emphasize that Bernoulli's problems are about cancelling things

Labs/Demonstrations

DEMO: bernoulli - blow dryer over tp roll, blow dryer with ping pong ball (even at tilt), fill bag with one breath

To do:

liquid nitrogen - shrinking VERY large balloon

put aluminum ring for magnetic launcher in liquid nitrogen to superconduct so flies higher

lycoperidium powder for heat transfer - demo for grain dust in grain tower (article for grain tower explosion?)

try to light some lycoperidium or flour sitting on bench top, then throw some in the air above flame (candle - don't ruin bunsen burner) (also remind throwing flour on kitchen fire BAD!!)

small paint can with tubing attached to bottom to blow air into. Put candle in can, dust on bottom in can, seal top on, blow air to mix dust up into air - BOOM!