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Fire and Ice

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### 3 Table of Contents for Class Video Segments

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## Fire & Ice: Table of Contents for Daily Class Video Segments

Major Action or Purpose of segment	Content/Topic first; then pedagogic focus
<b>Day 1 – Jan 20</b>	<b>Introduction to inquiry. Temperature perception.</b>
1.1 First Day: Modeling, Setting expectations	
1.2 First Day: Syllabus review, Student centered	
1.3 First Day: Syllabus review, Student centered	
1.4 First Day: Syllabus review, Video documentation	
1.5 Perception of temperature: Hands-on exploration	
1.6 Perception of temperature: Team discussion	
1.7 Perception of temperature: Question generation	
1.8 Nature of science	
<b>Day 2 – Jan 22</b>	<b>Sixteenth Century Ideas. Physiology of temperature sensation.</b>
2.1 Historical ideas of heat and temperature: Instructions	
2.2 Historical ideas of heat and temperature: Readings discussion	
2.3 Historical ideas of heat and temperature: Readings discussion	
2.4 Historical ideas of heat and temperature: Readings discussion	
2.5 Historical ideas of heat and temperature: Readings discussion	
2.6 Physiology of temperature sensation: Instructions	
2.7 Physiology of temperature sensation: Reading jigsaw	
2.8 Physiology of temperature sensation: Reading jigsaw	
2.9 Physiology of temperature sensation: Reading jigsaw	
<b>Day 3 – Jan 29</b>	<b>The thermometer. Chemothermal sensation.</b>
3.1 Housekeeping	
3.2 Historical development of thermometer: Readings discussion	
3.3 Historical development of thermometer: Reporting	
3.4 Physiology of temperature sensation: Reading jigsaw	
3.5 Neural response to temperature change or chemical exposure: Poster preparation	
3.6 Neural response to temperature change or chemical exposure: Poster preparation	
3.7 Liquid nitrogen: Hands-on exploration	
3.8 Liquid nitrogen: Hands-on exploration	
<b>Day 4 – Feb 03</b>	<b>Chemothermal sensation. Properties of gases.</b>
4.1 Housekeeping, Assessment	
4.2 Neural response to temperature change or chemical exposure: Presentation	
4.3 Neural response to temperature change or chemical exposure: Presentation	
4.4 Neural response to temperature change or chemical exposure: Self-assessment	
4.5 Neural response to temperature change or chemical exposure: Closure	
4.6 Particulate gas simulation: Instructions	
4.7 Particulate gas simulation: Hands-on exploration	
4.8 Particulate gas simulation: Hands-on exploration	
<b>Day 5 – Feb 05</b>	<b>Simulation of articulate model for gases. Kinetic Molecular Theory</b>
5.1 Particulate gas simulation: Team discussion	
5.2 Particulate gas simulation: Team discussion	
5.3 Kinetic molecular theory: Model development	
5.4 Kinetic molecular theory: Model development	

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5.5 Gas laws: Instructions	
5.6 Gas laws: Hands-on exploration	
5.7 Gas laws: Hands-on exploration	
5.8 Gas laws: Hands-on exploration	
<b>Day 6 – Feb 10</b>	<b>Gas properties and laws. Historical ideas about heat.</b>
6.1 Gas laws: Team discussion	
6.2 Gas laws: Team discussion	
6.3 Gas laws: Team discussion	
6.4 Team process feedback	
6.5 Gas laws: Class discussion	
6.6 Gas laws: Class discussion	
6.7 Historical ideas about heat: Readings discussion	
6.8 Historical ideas about heat: Readings discussion	
6.9 Historical ideas about heat: Rumford fun facts	
<b>Day 7 – Feb 12</b>	<b>Heating and cooling curves</b>
7.1 Phase change and latent heat: Instructions	
7.2 Phase change and latent heat: Instructions	
7.3 Phase change and latent heat: Hands-on exploration	
7.4 Phase change and latent heat: Hands-on exploration	
7.5 Phase change and latent heat: Graphing	
7.6 Phase change and latent heat: Graphing	
7.7 Phase change and latent heat: Graphing	
<b>Day 8 – Feb 17</b>	<b>Latent heat of phase change</b>
8.1 Phase change, heat, temperature: Instructions, Research symposium	
8.2 Phase change, heat, temperature: Hands-on exploration, Synthesis	
8.3 Phase change, heat, temperature: Hands-on exploration, Synthesis	
8.4 Phase change, heat, temperature: Hands-on exploration, Synthesis	
8.5 Phase change, heat, temperature: Hands-on exploration, Synthesis	
8.6 Phase change, heat, temperature: Hands-on exploration, Synthesis	
8.7 Phase change, heat, temperature: Hands-on exploration, Synthesis	
8.8 Phase change, heat, temperature: Presentation, Synthesis	
8.9 Phase change, heat, temperature: Presentation, Synthesis	
<b>Day 9 – Feb 19</b>	<b>Phase change, intermolecular forces, and heat</b>
9.1 Evaporative cooling, intermolecular forces: Hands-on exploration	
9.2 Evaporative cooling, intermolecular forces: Hands-on exploration	
9.3 Evaporative cooling, intermolecular forces: Hands-on exploration	
9.4 Evaporative cooling, intermolecular forces: Hands-on exploration	
9.5 Evaporative cooling, intermolecular forces: Hands-on exploration	
9.6 Evaporative cooling, intermolecular forces: Hands-on exploration	
9.7 Evaporative cooling, intermolecular forces: Hands-on exploration	
9.8 Evaporative cooling, intermolecular forces: Reporting	
<b>Day 10 – Feb 24</b>	<b>Phase change, intermolecular forces, and heat</b>
10.1 Evaporative cooling, intermolecular forces: Team discussion	

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10.2 Evaporative cooling, intermolecular forces: Team discussion	
10.3 Evaporative cooling, intermolecular forces: Team discussion	
10.4 Evaporative cooling, intermolecular forces: Team discussion	
10.5 Assessment: Exam overview	
10.6 Phase change and heat: Readings	
10.7 Phase change and heat: Reporting	
10.8 Phase change and heat: Synthesis	
10.9 Phase change and heat: Synthesis	
<b>Day 11 – Feb 26</b>	<b>Phase change, intermolecular forces, and molecular structure</b>
11.1 Phase change and energy: Team discussion	
11.2 Gas properties: Reporting	
11.3 Intermolecular forces, structure: Reporting	
11.4 Structure and properties: Simulation	
11.5 Structure and properties: Simulation	
11.6 Structure and properties: Simulation	
11.7 Structure and properties: Simulation	
11.8 Phase diagram: Lecture	
Day 12	
<b>Exam day</b>	
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13.1 Heat transfer: Experiment	
13.2 Heat transfer: Experiment	
13.3 Heat transfer: Graphing	
13.4 Heat transfer: Graphing	
13.5 Heat transfer: Sense-making	
13.6 Heat transfer: Model development	
13.7 Heat transfer: Model development	
13.8 Thermal equilibrium: Model testing	
13.9 Thermal equilibrium: Model testing, Graphing	
<b>Day 14 – Mar 10</b>	<b>Heat transfer by conduction</b>
14.1 Thermal equilibrium: Graphing	
14.2 Thermal equilibrium: Sense-making	
14.3 Thermal equilibrium: Concept invention	
14.4 Thermal equilibrium: Concept invention	
14.5 Thermal equilibrium: Concept invention	
14.6 Thermal equilibrium: Research	
14.7 Thermal equilibrium: Research	
14.8 Thermal equilibrium: Research	
14.9 Thermal equilibrium: Research	
<b>Day 15 – Mar 12</b>	<b>Heat and energy. Heat capacity relationship.</b>
15.1 Thermal equilibrium: Research	
15.2 Thermal equilibrium: Research	
15.3 Thermal equilibrium: Data analysis	
15.4 Heat and energy, Rumford and Joule	

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15.7 Thermal equilibrium: Research symposium	
15.8 Assessment: Exam return	
<b>Day 16 – Mar 24</b>	<b>Heat transfer by convection and radiation</b>
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16.2 Heat transfer mechanisms: Hands-on exploration	
16.3 Heat transfer mechanisms: Hands-on exploration	
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16.6 Heat transfer mechanisms: Hands-on exploration	
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17.1 Consumer product defrosting investigation: Instructions	
17.2 Consumer product defrosting investigation: Experiment design	
17.3 Consumer product defrosting investigation: Experiment design	
17.4 Consumer product defrosting investigation: Hands-on exploration	
17.5 Consumer product defrosting investigation: Hands-on exploration	
17.6 Consumer product defrosting investigation: Hands-on exploration	
17.7 Consumer product defrosting investigation: Hands-on exploration	
17.8 Consumer product defrosting investigation: Hands-on exploration	
17.9 Consumer product defrosting investigation: Hands-on exploration	
17.10 Consumer product defrosting investigation: Hands-on exploration	
<b>Day 18 – Mar 31</b>	<b>Consumer product investigation synthesis</b>
18.1 Housekeeping	
18.2 Consumer product defrosting investigation: Data analysis, Interpretation	
18.3 Consumer product defrosting investigation: Data analysis, Interpretation	
18.4 Consumer product defrosting investigation: Research symposium	
18.5 Consumer product defrosting investigation: Research symposium	
18.6 Consumer product defrosting investigation: Research symposium	
18.7 Consumer product defrosting investigation: Research, Synthesis	
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19.2 Refractory materials: Intern class, Reading jigsaw	
19.3 Refractory materials: Intern class, Reading jigsaw, Team discussion	
19.4 Refractory materials: Intern class, Team discussion, Poster	
19.5 Refractory materials: Intern class, Team discussion, Poster	
19.6 Refractory materials: Intern class, Team discussion	
19.7 Refractory materials: Intern class, Reporting	
19.8 Refractory materials: Intern class, Lecture	
<b>Day 20 – Apr 07</b>	<b>Heat transfer application</b>
20.1 Housekeeping	

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20.5 Heat transfer applications: Readings discussion
20.6 Heat transfer applications: Readings discussion
20.7 Heat transfer applications: Readings discussion
20.8 Heat transfer applications: Experiment
20.9 Heat transfer applications: Presentation
20.10 Heat transfer applications: Presentation
<b>Day 21 – Apr 09</b> <span style="float: right;"><b>Intern: Animal biological adaptations to thermal environment</b></span>
21.1 Biology applications: Intern class, Readings discussion
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21.3 Biology applications: Intern class, Readings discussion
21.4 Biology applications: Intern class, Readings discussion
21.5 Biology applications: Intern class, Readings discussion
21.6 Biology applications: Intern class, Readings discussion
21.7 Biology applications: Intern class, Readings discussion
21.8 Biology applications: Intern class, Presentation
21.9 Biology applications: Intern class, Closure
<b>Day 22 – Apr 14</b> <span style="float: right;"><b>Intern: Chemical reactions and energy</b></span>
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22.2 Chemistry reaction heat: Intern class, Hands-on exploration
22.3 Chemistry reaction heat: Intern class, Hands-on exploration
22.4 Chemistry reaction heat: Intern class, Hands-on exploration
22.5 Chemistry reaction heat: Intern class, Hands-on exploration
22.6 Chemistry reaction heat: Intern class, Hands-on exploration
22.7 Chemistry reaction heat: Intern class, Presentation, Synthesis
22.8 Chemistry reaction heat: Intern class, Presentation, Synthesis
<b>Day 23 – Apr 16</b> <span style="float: right;"><b>Intern: Energy production and environmental consequences</b></span>
23.1 Housekeeping
23.2 Chemistry reaction heat: Intern class, Readings discussion
23.3 Chemistry reaction heat: Intern class, Readings discussion
23.4 Chemistry reaction heat: Intern class, Readings discussion
23.5 Chemistry reaction heat: Intern class, Readings discussion
23.6 Chemistry reaction heat: Intern class, Readings discussion
23.7 Chemistry reaction heat: Intern class, Readings discussion
23.8 Chemistry reaction heat: Intern class, Conference
23.8 Chemistry reaction heat: Intern class, Closure
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24.1 Chemistry reaction energy: Hands-on exploration
24.2 Chemistry reaction energy: Hands-on exploration
24.3 Chemistry reaction energy: Connections
24.4 Chemistry reaction energy: Model development
24.5 Chemistry reaction energy: Model development
24.6 Chemistry reaction energy: Model development

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24.8 Housekeeping	
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25.2 Chemical reaction heat: Model development	
25.3 Chemical reaction heat: Model development	
25.4 Chemical reaction heat: Model application	
25.5 Chemical reaction heat: Model application	
25.6 Explosives: Team discussion	
25.7 Explosives: Reporting, Lecture	
25.8 Explosives: Reporting, Lecture	
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26.1 Poster session: Overview	
26.2 Poster session: Student 3, Presentation	
26.3 Poster session: Student 1, Presentation	
26.4 Poster session: Student 5, Presentation	
26.5 Poster session: Student 9, Presentation	
26.6 Poster session: Student 7, Presentation	
26.7 Poster session: Student 4, Presentation	
26.8 Poster session: Student 2, Presentation	
26.9 Poster session: Student 6, Presentation	
26.10 Poster session: Student 8, Presentation	
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<b>Day 27 – Apr 30</b>	<b>Entropy, energy transfer. Consumer products. Wrap up.</b>
27.1 Consumer product: Hands-on exploration	
27.2 Consumer product: Reporting, Class discussion	
27.3 Entropy: Readings discussion	
27.4 Entropy: Demonstration	
27.5 Entropy: Lecture	
27.6 Liquid nitrogen ice cream	
27.8 Closure: Questions	