Assessment Purposes

- Measure knowledge
- Measure gain in knowledge
- Measure preparation (predict success)
- Sorting (Grading)
- Degree requirements (benchmarks)
- ...

Curriculum, Assessment and Instruction

- Frameworks
- Syllabi
- Guides
- Blueprints
- Benchmarks

- Objective tests
- Performance assessments
- Portfolios
- Teacher Observations
- Group Activities
- Program Evaluations

Assessment/Evaluation System

- Instructional style
- Print materials
- Equipment
- Facilities
- Technology
- Community

Instructional Program

Curriculum Standards

validity

alignment

correlation
A Rich History

- First administered November 1865
- Science topics included (1879):
  - Physical geography
  - Physiology and hygiene
  - Zoology
  - Astronomy
  - Chemistry
  - Botany
  - Geology

NYSED Science Assessments

- **Elementary Science**
  - Elementary Science Program Evaluation Test (ESPET) Administered at Grade 4
- **Intermediate Science**
  - Intermediate Level Science Administered at Grade 8
- **Commencement Level**
  - Regents Science Exams
    - Living Environment
    - Physical Setting/Earth Science
    - Physical Setting/Chemistry
    - Physical Setting/Physics

NYSED Test Construction

- New York State teachers and content consultants, in coordination with Office of State Assessment and Curriculum and Instruction, determine test specifications
- A “test blueprint” determines the percentage of questions weighted for each standard and key ideas
**Examination Development**

<table>
<thead>
<tr>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>Item Writing</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
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<td>Pretests Printed &amp; Administered</td>
<td>Pretest Review</td>
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<td>Pretests Scored &amp; Review for Field Tests</td>
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</table>

**Difficulty and Discrimination**

![Graph showing item difficulty versus student ability]

**Regents Examinations Scoring**

- Test administration for each test form is "equated" so that the same "scale score" represents the same level of achievement.

- Test forms vary somewhat in the mix of easier and more difficult items, resulting in the relationship between the raw score and the scale score also varying from each test administration.
Concepts (Continued)

- Difficulty – (Percentage or proportion that are successful on an item)
  - Facility
  - Difficulty
- Discrimination – (How well does the item differentiate between students who understand the subject and those who do not?)

Concepts (Continued)

- Reliability – can the results be replicated?
  - Inter-rater (Do two or more raters agree on the score for an item?)
  - Test/Re-test (Will a student earn similar scores on different administrations?)
  - Internal Consistency
- Criterion referenced tests – have the students met the “standard”

Data – Physics

<table>
<thead>
<tr>
<th>Item</th>
<th>Difficulty</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Yes/No Response</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tr>
<td>1</td>
<td>0.60</td>
<td>180</td>
<td>50</td>
<td>50</td>
<td>20</td>
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<td></td>
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<td>2</td>
<td>0.66</td>
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<td>30</td>
<td>2</td>
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<td>3</td>
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<td>100</td>
<td>80</td>
<td>50</td>
<td>2</td>
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<td>4</td>
<td>0.65</td>
<td>100</td>
<td>60</td>
<td>40</td>
<td>30</td>
<td>2</td>
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<td>60</td>
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<td>30</td>
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### Data – Physics

**WNY Physics Regents Data, 2005 (n=1505)**

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<th>Item</th>
<th>Diff</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>No Response</th>
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<th>6</th>
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<td>0</td>
<td>1393</td>
<td>67</td>
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<tr>
<td>8B-2R</td>
<td>1</td>
<td>0.07%</td>
<td>0</td>
<td>1394</td>
<td>66</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>8A-3R</td>
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<td>1374</td>
<td>70</td>
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<tr>
<td>1A-1R</td>
<td>1</td>
<td>0.08%</td>
<td>0</td>
<td>1398</td>
<td>70</td>
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<tr>
<td>1A-2R</td>
<td>1</td>
<td>0.08%</td>
<td>0</td>
<td>1396</td>
<td>70</td>
<td></td>
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### Assessment Analysis Sheet

**Q # | Core | Student Difficulties? | Test Difficulties? | Instruction Difficulties?**

<table>
<thead>
<tr>
<th></th>
<th>Core</th>
<th>Student Difficulties?</th>
<th>Test Difficulties?</th>
<th>Instruction Difficulties?</th>
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<tr>
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<td></td>
<td></td>
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</tr>
<tr>
<td>02</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

---

### Student Difficulty?

- Content Knowledge?
- Literacy / Reading Comprehension?
- Question interpretation Skills?
- Misconception?
  - From previous instruction?
  - From culture contexts?
  - Insufficient reinforcement?
- Effort?
Test Difficulty?

- Difficulty (Facility) Level?
- Discrimination?
- Placement on exam?
- Visual distraction by nearby (graphic) items?
- Style of Question?
- Flawed item?

Instructional Difficulty?

- You didn’t teach the associated core major understandings.
- You didn’t reinforce the core understandings enough.
- You taught the core content wrong.

Test Data – Discussion and Analysis

- Collecting Data
- Analysis
  - Difficulty
  - Response Pattern
5 A golf ball is hit at an angle of 45° above the horizontal. What is the acceleration of the golf ball at the highest point in its trajectory? [Neglect friction.]
(1) 9.8 m/s² upward
(2) 9.8 m/s² downward
(3) 6.9 m/s² horizontal
(4) 0.0 m/s²

Item | AK | Difficulty | 1 | 2 | 3 | 4 | No Response
--- | --- | --- | --- | --- | --- | --- | ---
46-MC | 1 | 0.84 | 1260 | 124 | 67 | 51 | 3

50-MC | 2 | 0.39 | 592 | 581 | 114 | 616 | 2

Objectives (28-30): Using the information in the data table, construct a graph on the grid in your answer booklet following the directions below.
49 Mark an appropriate scale on the axis labeled “Potential Drop (V).” [3]
50 Plot the data points for potential difference against current. [4]
50 Draw the line or curve of best fit. [1]
62. Calculate the total gravitational potential energy relative to the ground, of the car and the passenger at point A. (Show all work, including the equation and substitution with units.) [6]

63. Calculate the speed of the car and passenger at point B. (Show all work, including the equation and substitution with units.) [6]

64. Compare the total mechanical energy of the car and passenger at points A, B, and C. [3]

<table>
<thead>
<tr>
<th>Item</th>
<th>Base</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>No Response</th>
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</thead>
<tbody>
<tr>
<td>72-CR</td>
<td>0.00</td>
<td>0</td>
<td>0.85</td>
<td>0.15</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

11. Which factor contributed most to the extinction of many species?

(1) changes in the environment
(2) lethal mutations
(3) inability to evolve into simple organisms
(4) changes in migration patterns

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>No Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-MC</td>
<td>0.09</td>
<td>0.09</td>
<td>0.04</td>
<td>0.04</td>
<td>0.03</td>
</tr>
</tbody>
</table>

72. Identify the substance that was used to treat the DNA to produce the fragments that were put into wells. [1]
35. The data table below shows elements Xe, Yp, and Zr. From the same group on the Periodic Table.

<table>
<thead>
<tr>
<th>Element</th>
<th>Atomic Mass</th>
<th>Atomic Radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xe</td>
<td>131.29</td>
<td>1.44 nm</td>
</tr>
<tr>
<td>Yp</td>
<td>194.86</td>
<td>1.30 nm</td>
</tr>
<tr>
<td>Zr</td>
<td>191.23</td>
<td>1.27 nm</td>
</tr>
</tbody>
</table>

What is the most likely atomic radius of element Yp?
(1) 1.05 pm  (3) 1.69 pm  
(2) 1.27 pm  (4) 1.85 pm

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>No Response</th>
<th>&quot;n&quot;</th>
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<tbody>
<tr>
<td>35-MC</td>
<td>0.96</td>
<td>0.01</td>
<td>0.02</td>
<td>0.96</td>
<td>0.00</td>
<td>3</td>
</tr>
</tbody>
</table>

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20. Systems in nature tend to undergo changes toward
(1) lower energy and lower entropy
(2) lower energy and higher entropy
(3) higher energy and lower entropy
(4) higher energy and higher entropy

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>No Response</th>
<th>&quot;n&quot;</th>
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</thead>
<tbody>
<tr>
<td>20-MC</td>
<td>0.32</td>
<td>0.15</td>
<td>0.00</td>
<td>0.25</td>
<td>0.29</td>
<td>5</td>
</tr>
</tbody>
</table>

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67. A student heated a sample of a solid substance and recorded the temperature at one minute intervals in the data table below.

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
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<tbody>
<tr>
<td>Temperature</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>40</td>
<td>45</td>
<td>50</td>
<td>55</td>
<td>58</td>
<td>55</td>
<td>53</td>
<td>50</td>
</tr>
</tbody>
</table>

68. Plot the data from the data table. Circle and incorrect the point(s).

Example

69. Based on the data table, what is the melting point of this substance?

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>No Response</th>
<th>0</th>
<th>1</th>
<th>&quot;n&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>67-CR</td>
<td>0.00</td>
<td>0.01</td>
<td>0.99</td>
<td>3867</td>
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</tbody>
</table>

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Base your answers to questions 57 and 58 on the information below.

Given the reaction at equilibrium:

\[ 2\text{NO}_2(g) + 7\text{H}_2(g) \rightleftharpoons 2\text{NH}_3(g) + 4\text{H}_2\text{O}(g) + 1127 \text{ kJ} \]

57. On the diagram in your answer booklet, complete the potential energy diagram for the forward reaction. Be sure your drawing shows the activation energy and the potential energy of the products.

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>No Response</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>&quot;a&quot;</th>
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<tr>
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<td>0.31</td>
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</tbody>
</table>

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38. The air pressure recorded at point D was used to:

(1) 986 atm
(2) 994 atm
(3) 1004 atm
(4) 1006 atm

39-MC

Difficulty | 1 | 2 | 3 | 4 | No Response | "a" |
<table>
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<td>0.01</td>
<td>0.06</td>
<td>0.00</td>
<td>0.02</td>
<td>23</td>
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</table>

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10. The diagram below shows the noon-time shadows cast by a student and a tree.

If the time is solar noon and the student is located in New York State, in what direction is the student facing?

(1) north
(2) south
(3) east
(4) west

10-MC

Difficulty | 1 | 2 | 3 | 4 | No Response | "a" |
<table>
<thead>
<tr>
<th></th>
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<tr>
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<td>0.00</td>
<td>0.13</td>
<td>0.19</td>
<td>0.38</td>
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</tbody>
</table>

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In Conclusion

- Summary of findings
- Future directions
- Next steps

jzawicki@buffalostate.edu