Assessing Learning:
The June 2005 NYS Physics Regents Exam

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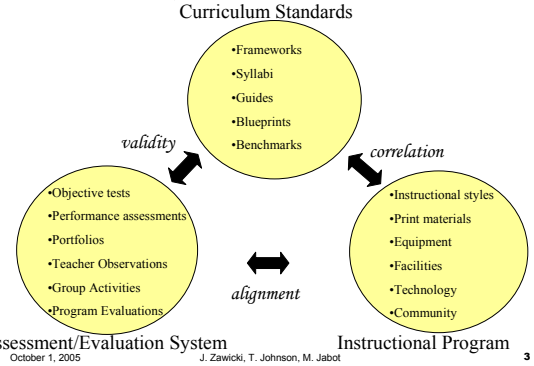
Assessment Purposes

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

Curriculum, Assessment and Instruction



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

- Validity – how well the item measures match the target construct. May be qualified as:
  - Construct
  - Content (Face)
  - Criterion Related
- Typically determined by a panel of experts

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”

Concepts (Continued)

- Latency – (How long do students take to complete the test?)
- Equitable (Fair)
- Timed tests (Power tests)

Data – Physics

NYS Physics Regents Data, 2005 (n=1505)

Item	*AK*	*Difficulty*	*1*	*2*	*3*	*4*	*No Response*	*2*	*1*	*0*
34-MC	1	0.92	1385	35	54	30	1			
46-MC	1	0.84	1260	124	67	51	3			
11-MC	2	0.83	73	1255	142	33	2			
21-MC	3	0.81	158	58	1219	69	1			
17-MC	4	0.79	112	34	160	1196	3			

Data – Physics

NYS Physics Regents Data, 2005 (n=1505)

Item	*AK*	*Difficulty*	*1*	*2*	*3*	*4*	*No Response*	*2*	*1*	*0*
48-CR	1	0.97					0		1464	41
49-CR	1	0.97					0		1455	50
50-CR	1	0.91					0		1371	134
68-CR	1	0.88					0		1330	175
54-CR	1	0.88					0		1319	186

Assessment Analysis Sheet				
Q #	Core Key Ideas and Labs	Student Difficulties? (content, literacy, interpretation, misconception, effort, other)	Test Difficulties? (Difficulty level, placement on exam, visual distraction, question style, flawed item, other)	Instruction Difficulties? (Didn't teach, taught wrong, other)

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

Discussion

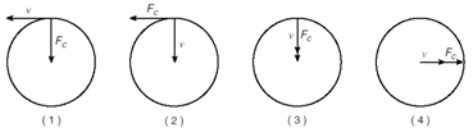
- Top and Bottom items
- Multiple Choice and Constructed Response Item Formats

Top MC Items

34 The tau neutrino, the muon neutrino, and the electron neutrino are all

(1) leptons
(2) hadrons
(3) baryons
(4) mesons

46 A 1.0×10^3-kilogram car travels at a constant speed of 20. meters per second around a horizontal circular track. Which diagram correctly represents the direction of the car's velocity (v) and the direction of the centripetal force (F_c) acting on the car at one particular moment?



11 The spring in a scale in the produce department of a supermarket stretches 0.025 meter when a watermelon weighing 1.0×10^2 newtons is placed on the scale. The spring constant for this spring is

(1) 3.2×10^5 N/m
(2) 4.0×10^3 N/m
(3) 2.5 N/m
(4) 3.1×10^{-2} N/m

21 An immersion heater has a resistance of 5.0 ohms while drawing a current of 3.0 amperes. How much electrical energy is delivered to the heater during 200. seconds of operation?

(1) 3.0×10^3 J
(2) 6.0×10^3 J
(3) 9.0×10^3 J
(4) 1.5×10^4 J

Bottom MC Items

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/s^2 upward
(2) 9.8 m/s^2 downward
(3) 6.9 m/s^2 horizontal
(4) 0.0 m/s^2

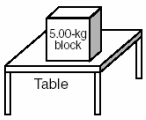
12 A satellite weighs 200 newtons on the surface of Earth. What is its weight at a distance of one Earth radius above the surface of Earth?

(1) 50 N
(2) 100 N
(3) 400 N
(4) 800 N

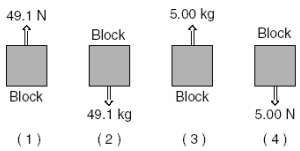
7 A ball is thrown horizontally at a speed of 24 meters per second from the top of a cliff. If the ball hits the ground 4.0 seconds later, approximately how high is the cliff?

(1) 6.0 m
(2) 39 m
(3) 78 m
(4) 96 m

13 The diagram below shows a 5.00-kilogram block at rest on a horizontal, frictionless table.

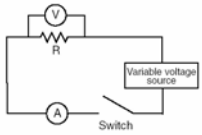


Which diagram best represents the force exerted on the block by the table?



Top CR Items

In a physics lab, a student used the circuit shown to measure the current through and the potential drop across a resistor of unknown resistance, *R*. The instructor told the student to use the switch to operate the circuit only long enough to take each reading. The student's measurements are recorded in the data table.



Data Table

Current (A)	Potential Drop (V)
0.80	21.4
1.20	35.8
1.90	56.0
2.30	72.4
3.20	98.4

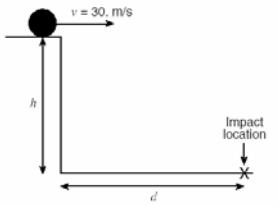
Directions (48–50): Using the information in the data table, construct a graph on the grid *in your answer booklet*, following the directions below.

48 Mark an appropriate scale on the axis labeled "Potential Drop (V)." [1]

49 Plot the data points for potential drop versus current. [1]

50 Draw the line or curve of best fit. [1]

A projectile is launched horizontally at a speed of 30. meters per second from a platform located a vertical distance *h* above the ground. The projectile strikes the ground after time *t* at horizontal distance *d* from the base of the platform. [Neglect friction.]

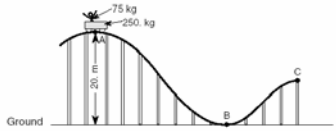


68 On the diagram *in your answer booklet*, sketch the theoretical path of the projectile. [1]

Bottom CR Items

Base your answers to questions 62 through 64 on the information and diagram below.

A 250.-kilogram car is initially at rest at point *A* on a roller coaster track. The car carries a 75-kilogram passenger and is 20. meters above the ground at point *A*. [Neglect friction.]

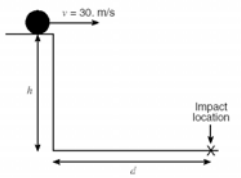


62 Calculate the total gravitational potential energy, relative to the ground, of the car and the passenger at point *A*. [Show all work, including the equation and substitution with units.] [2]

63 Calculate the speed of the car and passenger at point *B*. [Show all work, including the equation and substitution with units.] [2]

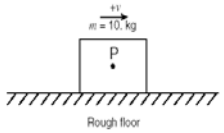
64 Compare the total mechanical energy of the car and passenger at points *A*, *B*, and *C*. [1]

A projectile is launched horizontally at a speed of 30. meters per second from a platform located a vertical distance *h* above the ground. The projectile strikes the ground after time *t* at horizontal distance *d* from the base of the platform. [Neglect friction.]



70 Express the projectile's total time of flight, *t*, in terms of the vertical distance, *h*, and the acceleration due to gravity, *g*. [Write an appropriate equation and solve it for *t*.] [2]

A 10.-kilogram box, sliding to the right across a rough horizontal floor, accelerates at –2.0 meters per second^2 due to the force of friction.



65 Calculate the magnitude of the net force acting on the box. [Show all work, including the equation and substitution with units.] [2]

66 On the diagram *in your answer booklet*, draw a vector representing the net force acting on the box. Begin the vector at point *P* and use a scale of 1.0 centimeter = 5.0 newtons. [2]

67 Calculate the coefficient of kinetic friction between the box and the floor. [Show all work, including the equation and substitution with units.] [2]

59 What are the sign and charge, in coulombs, of an antiproton? [1]

In Conclusion

- Summary of findings
- Future directions
- Next steps…

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