An Analysis of the New York State June 2008 Regents Physics Examination

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Easier Multiple Choice Items

Below are answers to questions 29 and 31 on the table below, which shows data about various subatomic particles:

Subatomic Particle Table

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Quark Count</th>
<th>Electric Charge</th>
<th>Mass (GeV/c^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>proton</td>
<td>1</td>
<td>+1</td>
<td>938.3</td>
</tr>
<tr>
<td>n</td>
<td>neutron</td>
<td>1</td>
<td>0</td>
<td>938.6</td>
</tr>
<tr>
<td>e</td>
<td>electron</td>
<td>1</td>
<td>0</td>
<td>0.511</td>
</tr>
<tr>
<td>( \nu_e )</td>
<td>neutrino</td>
<td>1</td>
<td>0</td>
<td>0.0002</td>
</tr>
</tbody>
</table>

30. Which particle listed on the table has the opposite charge and is more massive than a proton?
(1) antiproton
(2) electron
(3) neutrino
(4) omega

9. Which diagram represents a box in equilibrium?
(1) (1)
(2) (2)
(3) (3)
(4) (4)

27. The diagram below represents a transverse wave.

\[ \text{The wavelength of the wave is equal to the distance between points} \]
(1) A and G \quad (3) C and E
(2) B and F \quad (4) D and F

29. The speed of light in a piece of plastic is \( 2.00 \times 10^8 \) meters per second. What is the absolute index of refraction of this plastic?
(1) 1.00 \quad (3) 1.33
(2) 0.670 \quad (4) 1.50
2. A projectile launched at an angle of 45° above the horizontal travels through the air. Compared to the projectile's theoretical path with no air friction, the actual trajectory of the projectile with air friction is
   (1) lower and shorter  (3) higher and shorter
   (2) lower and longer   (4) higher and longer

14. A 0.45-kilogram football traveling at a speed of 22 meters per second is caught by an 84-kilogram stationary receiver. If the football comes to rest in the receiver's arms, the magnitude of the impulse imparted to the receiver by the ball is
   (1) 1800 N*s  (3) 4.4 N*s
   (2) 9.9 N*s    (4) 3.8 N*s

13. A 1750-kilogram car travels at a constant speed of 15.0 meters per second around a horizontal, circular track with a radius of 45.0 meters. The magnitude of the centripetal force acting on the car is
   (1) 5.00 N  (3) 8750 N
   (2) 583 N   (4) 3.94 × 10^5 N

20. The diagram below shows an object moving counterclockwise around a horizontal, circular track.

   ![Diagram of object moving counterclockwise](image)

Which diagram represents the direction of both the object's velocity and the centripetal force acting on the object when it's in the position shown?

   (1)  (2)  (3)  (4)

25. An object is thrown vertically upward. Which pair of graphs best represents the object's kinetic energy and gravitational potential energy as functions of its displacement while it moves?

   ![Graphs of kinetic and potential energy](image)

   (1)  (2)  (3)  (4)

26. An electromagnetic AM-band radio wave could have a wavelength of
   (1) 0.005 m  (3) 500 m
   (2) 5 m      (4) 5 000 000 m
More Difficult Multiple Choice Items

48. The diagram below represents a transverse wave traveling to the right through a medium. Point A represents a point of the medium.

In which direction will particle A move in the next instant of time?

(1) up
(2) down
(3) left
(4) right

35. The total conversion of 1.00 kilogram of the Sun's mass into energy yields

(1) $9.31 \times 10^2$ MeV
(2) $8.38 \times 10^{18}$ MeV
(3) $3.00 \times 10^8$ J
(4) $9.00 \times 10^{16}$ J

24. A circuit consists of a resistor and a battery. Increasing the voltage of the battery while keeping the temperature of the circuit constant would result in an increase in

(1) current, only
(2) resistance, only
(3) both current and resistance
(4) neither current nor resistance

A block weighing 500 N is on a ramp inclined at 30° to the horizontal. A 5.0 m/s² force of friction, F, acts on the block as it is pulled up the ramp at constant velocity with force F, which is parallel to the ramp, as shown in the diagram below.

What is the magnitude of force F?

(1) 7.0 N
(2) 16 N
(3) 5.0 N
(4) 13 N
44. Which combination of fundamental units can be used to express energy?

(1) kg m/s
(2) kg m/s^2
(3) kg m^2/s^2
(4) kg m^2/s

45. The diagram below represents two masses before and after they collide. Before the collision, mass m_1 is moving to the right with speed v_1, and mass m_2 is at rest. After collision, the two masses stick together.

Before Collision | After Collision

Which expression represents the speed v of the masses after the collision? Assume no outside force is acting on m_1 or m_2.

(1) \( v = \frac{v_1 m_1}{m_1 + m_2} \)
(2) \( v = \frac{v_1 m_1}{m_2} \)
(3) \( v = \frac{v_1 m_2}{m_1 + m_2} \)
(4) \( v = \frac{v_1 m_2}{m_1} \)

18. A car travels at constant speed v up a hill from point A to point B, as shown in the diagram below.

Horizontal

As the car travels from A to B, its gravitational potential energy

(1) increases and its kinetic energy decreases
(2) decreases and its kinetic energy remains the same
(3) remains the same and its kinetic energy decreases
(4) remains the same and its kinetic energy remains the same

33. A mercury atom in the ground state absorbs 20.00 electronvolts of energy and is ionized by losing an electron. How much kinetic energy does this electron have after the ionization?

(1) 6.40 eV
(2) 9.02 eV
(3) 10.96 eV
(4) 13.60 eV

12. An 80-kilogram skier slides on waxed skis along a horizontal surface of snow at constant velocity while pushing with his poles. What is the horizontal component of the force pushing him forward?

(1) 0.05 N
(2) 0.4 N
(3) 40 N
(4) 4 N
Base your answers to questions 49 through 53 on the information and data table below.

A spring is set in motion by compressing it, and a ball is launched. The distance the ball is launched is measured, and the spring compression is noted. The results of the testing are shown in the table below.

<table>
<thead>
<tr>
<th>Power Setting</th>
<th>Spring Compression (in)</th>
<th>Dart's Maximum Vertical Displacement (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.016</td>
<td>0.10</td>
</tr>
<tr>
<td>1</td>
<td>0.025</td>
<td>0.15</td>
</tr>
<tr>
<td>2</td>
<td>0.034</td>
<td>0.21</td>
</tr>
<tr>
<td>3</td>
<td>0.043</td>
<td>0.27</td>
</tr>
<tr>
<td>4</td>
<td>0.052</td>
<td>0.32</td>
</tr>
<tr>
<td>5</td>
<td>0.061</td>
<td>0.37</td>
</tr>
</tbody>
</table>

Directions: (10.40) Using the information in the data table, construct a graph on the grid in your answer booklet, following the directions below.

60. Plot the data points for the dart maximum vertical displacement versus spring compression. [1]

Base your answers to questions 55 through 57 on the information and vector diagram below.

A dog walks 8.0 meters due north and then 6.0 meters due east.

55. Using a metric ruler and the vector diagram, determine the scale used in the diagram. [1]
Some skill sets, such as inscription, remain more difficult for students. Mundane skill sets, such as plotting points and solving for commonly rehearsed variables, appear to be readily achieved.

For additional information:

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