Physics 2010, Adam Johnston

As always, show all your work and circle your final answer (both numerical and multiple choice). Ignore friction and air resistance on this quiz, but pay attention to it when you leave this classroom. Possibly useful equations:

\[
\Delta x = v_i t + \frac{1}{2} a t^2, \quad v^2 - v_i^2 = 2a\Delta x, \quad v = v_i + at, \quad \Delta x = \frac{1}{2}(v + v_i)t, \quad g = 9.80 \text{ m/s}^2
\]

1. [3 pts.] A ball is thrown upwards. Its acceleration after it has been released and while it is moving upwards is

<table>
<thead>
<tr>
<th>Option</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>the same as when it will fall down.</td>
</tr>
<tr>
<td>B.</td>
<td>greater than when it will fall down.</td>
</tr>
<tr>
<td>C.</td>
<td>less than when it will fall down.</td>
</tr>
</tbody>
</table>

2. [3 pts.] A physicist describes your motion in one dimension with the following features: \( v < 0 \) and \( a > 0 \). You conclude that:

<table>
<thead>
<tr>
<th>Option</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>your speed is constant.</td>
</tr>
<tr>
<td>B.</td>
<td>you are going faster as time passes.</td>
</tr>
<tr>
<td>C.</td>
<td>you are going slower as time passes.</td>
</tr>
</tbody>
</table>

3. [6 pts.] In a cathode ray tube, electrons are accelerated from rest with a constant acceleration of magnitude \( 5.50 \times 10^3 \text{ m/s}^2 \) during the first \( 1.50 \text{ cm} \) of the tube’s length; then they move at a constant velocity another \( 40.0 \text{ cm} \) before hitting a screen. What is the speed of the electrons when they hit the screen?

\[
N^2 - N_i^2 = 2a\Delta x
\]

\[
N = \sqrt{2 \left( 5.50 \times 10^3 \frac{\text{m}}{\text{s}^2} \right) \left( 0.150 \text{ m} \right)}
\]

\[
N = 1.28 \times 10^6 \text{ m/s}
\]

4. [3 pts.] In the above problem, what is the acceleration of the electrons during the last \( 40.0 \text{ cm} \) of their travel?

\[
a = \frac{\text{Constant velocity}}{	ext{Constant velocity}}
\]

5. [5 points] A botanist accidentally drops a plant from the roof of the science building, so that it falls \( 18.0 \text{ m} \) to the ground. How long is the plant in the air during this fall?

\[
\Delta y = y_f \Delta t + \frac{1}{2} a \Delta t^2
\]

\[
\Delta t = \sqrt{\frac{2\Delta y}{a}} = \sqrt{\frac{2(-18.0 \text{ m})}{-9.80 \text{ m/s}^2}} = 1.92 \text{ s}
\]