20.65. **Model:** This is a wave traveling to the left at a constant speed of 50 cm/s.
Solve: The particles at positions between $x = 2$ cm and $x = 7$ cm have a speed of 10 cm/s, and the particles between $x = 7$ cm and $x = 9$ cm have a speed of −25 cm/s. That is, at the time the snapshot of the velocity is shown, the particles of the medium have upward motion for $2 \text{ cm} \le x \le 7$ cm, but downward motion for $7 \text{ cm} \le x \le 9$ cm. The width of the front section of the wave pulse is 7 cm – 2 cm = 5 cm and the width of the rear section is 9 cm – 7 cm = 2 cm. With a wave speed of 50 cm/s, the time taken by the front section to pass through a particular point is $5 \text{ cm}/50 \text{ cm/s} = 0.1 \text{ s}$ and the time taken by the rear section of the wave to pass through a point is $2 \text{ cm}/50 \text{ cm/s} = 0.04 \text{ s}$. Thus the wave causes the upward moving particles to go through a displacement of $A = (10 \text{ cm/s})(0.1 \text{ s}) = 1.0 \text{ cm}$. The downward moving particles have a maximum displacement of $(-25 \text{ cm/s})(0.04 \text{ s}) = -1.0 \text{ cm}$.