P1.3 Summary questions

1  a  pressure, faster, more
    b  Increases  Stays the same  Decreases

<table>
<thead>
<tr>
<th></th>
<th>Increases</th>
<th>Stays the same</th>
<th>Decreases</th>
</tr>
</thead>
<tbody>
<tr>
<td>The mass of the gas ...</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>The density of the gas ...</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>The speed of the molecules of the gas ...</td>
<td>✓</td>
<td></td>
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<tr>
<td>The pressure exerted by the gas ...</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td>The volume of the gas ...</td>
<td></td>
<td>✓</td>
<td></td>
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</tbody>
</table>

2  a  As the volume increases, the pressure decreases.
    There are fewer collisions with the sides of the container so there is less force.
    b  As the volume decreases, the pressure increases.
    There are more collisions with the sides of the container so there is more force.
    c  When you move the plunger you do work on the gas.
    This raises the internal energy so the gas gets hot.
    d  20 cm³
    e  Given:
        pressure = 200 kPa = 20 000 Pa
        original volume = 40 cm³
        new volume = 50 cm³
        pressure × volume = constant
        constant = 20 000 Pa × 40 cm³
        = 800 000 Pa cm³
        pressure = constant ÷ volume
        = 800 000 Pa cm³ ÷ 50 cm³
        = 16 000 Pa

3  a  In a simple model of the atmosphere, the air has a constant density, which is similar to an ocean, but the particles are further apart.
    b  As you come down a mountain the atmospheric pressure increases. There is more weight of air above you.

4  a  i Given:
    g = 10 N/kg
    height = 3 m
    density = 1000 kg/m³
    pressure = 3 m × 1000 kg/m³ × 10 N/kg
    = 30 000 N/m² or 30 kPa
    ii  Given:
        g = 10 N/kg
height = 22 cm = 0.22 m
density = 13 600 kg/m³
pressure = 0.22 m × 13 600 kg/m³ × 10 N/kg
= 30 000 N/m² or 30 kPa (1 sig. fig.)

b  depth of water in bath = 50 cm = 0.5 m
density of water = 1000 kg/m³
gravitational field strength = 10 N/kg
pressure = 0.5 m × 1000 kg/m³ × 10 N/kg
= 5000 Pa

5  a  i  The water pressure increases. The pressure due to a column of liquid is proportional to the depth/height.
ii  100 kPa
   The pressure due to a column of liquid is proportional to the depth/height.

iii  The pure water has a lower density so the pressure reading at any one depth would be lower.

b  i  The boat sinks to a specific level in the water. At that level the water exerts a pressure on the boat so that the force (= pressure × area) balances the weight of the boat which causes the boat to float.

Some objects have a weight that is too big for the water to balance, or have too small an area over which the water pressure can act, so they cannot float.

ii  If the ocean were made of pure water the boat would sink to a lower level in the water, where the pressure is the same, so that there is a large enough force to balance the weight of the boat.