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Science Mastery

# P4.1 Mastery Quiz: Matter

## Section A

1. In which state of matter do particles have the greatest internal energy? [1]

   Tick (✓) **one** box.

   A. Solid ☐

   B. Liquid ☐

   C. Gas ☐

2. Which state(s) of matter can be compressed? [1]

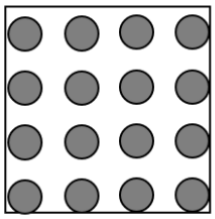
   Tick (✓) **one** box.

   A. Only solids ☐

   B. Liquids and gases ☐

   C. Only gases ☐

3. The diagram shows a particle diagram that a student has drawn to represent the particles in a gas.



   Which explains a problem with the student's diagram?

   Tick (✓) **one** box.

   A. The particles in a gas are randomly arranged rather than in a regular pattern ☐

   B. Gases do not contain many particles, so there should be fewer circles ☐

   C. The particles of a gas should be drawn as white circles ☐

4. Gas pressure is caused… [1]

Tick (✓) **one** box.

A. by collisions of particles with each other. ☐

B. by collisions of particles with the walls of a container. ☐

C. only when particles in a gas are moving. ☐

5. Which statement is correct about energy of particles when substances are heated? [1]

Tick (✓) **one** box.

A. Kinetic energy always increases ☐

B. Potential energy always increases ☐

C. Internal energy always increases ☐

6. A student wanted to determine the density of an irregularly shaped piece of rock.

The method they used is shown below.

1. Fill a measuring cylinder with water
2. Add the rock to the cylinder
3. Measure the volume of water on the cylinder
4. Use this volume and the mass to calculate density.

Choose why this method will not allow density to be determined. [1]

Tick (✓) **one** box.

A. A beaker should be used to more accurately measure volume ☐

B. The measuring cylinder should not be filled because water will spill out ☐

C. The length, width and height of the rock must be measured ☐

7. Select the unit that could be used to describe density.

Tick (✓) **one** box.

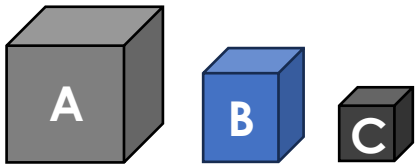
A. $m^3/kg$ ☐

B. $kg\ m^3$ ☐

C. $m/kg$ ☐

D. $kg/m^3$ ☐

8. The cubes below all have the same mass.




Which of the cubes has the highest density?

Tick (✓) **one** box.

A. A ☐

B. All cubes have the same density ☐

C. C ☐

9. There is 1 kg of oxygen in a sealed container.

The temperature of the oxygen is increased from 18 °C to 100 °C.

Choose the best description of the effect of the temperature change. [1]

Tick (✓) **one** box.

A. Oxygen becomes a gas at the boiling point of 100 °C ☐

B. Particles of oxygen move more quickly causing a higher pressure ☐

C. Particles of oxygen have a lower thermal energy as the temperature has increased ☐

**Physics Only**

10. Choose where atmospheric pressure is greatest. [1]

Tick (✓) **one** box.

A. 1 m above sea level ☐

B. 200 m above sea level ☐

C. Atmospheric pressure is the same at different heights. ☐

11. 2 $m^3$ of a gas had a pressure of 50 Pa.

The gas was compressed, and the final pressure was 400 Pa.

Calculate the volume of the compressed gas. [1]

Tick (✓) **one** box.

A. 4 $m^3$ ☐

B. 100 $m^3$ ☐

C. 0.25 $m^3$ ☐

**Higher tier only**

12. The deeper a fish swims in water, the greater the pressure becomes because … [1]

Tick (✓) **one** box.

A. water is more dense near the surface. ☐

B. the fish weighs more the deeper it goes. ☐

C. there is a greater weight of water above the fish. ☐

13. There is 20 kg of nitrogen in a sealed container.

The temperature is constant.

When the volume increases, the pressure … [1]

Tick (✓) **one** box.

A. increases. ☐

B. decreases. ☐

C. stays the same. ☐

14. In a column of liquid, the pressure is greatest at the deepest point because… [1]

Tick (✓) **one** box.

A. there are more particles exerting a downwards force. ☐

B. there is more gravity the greater the height. ☐

C. the density is greater. ☐

15. A toy boat floats on the water in a bath.

The water exerts a greater pressure on the bottom of the toy boat than the top surface which causes… [1]

Tick (✓) **one** box.

A. a resultant force downwards. ☐

B. upthrust. ☐

C. sinking. ☐

16. A marble is released into a 5 m tall column filled with water.

Calculate the pressure on the marble when it is half way down the column.

The density of water is 998.2 kg/m$^3$.

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The gravitational field strength on Earth is 10 N/kg.

Below shows how to calculate the pressure due to a column of liquid:

pressure due to a column of liquid = height of column × density of liquid x gravitational field strength

$$p = h \rho g$$

[1]

Tick (✓) **one** box.

A. 25 kPa ☐

B. 40 kPa ☐

C. 50 kPa ☐

## Section B

1. A student measured the volume and mass of a material. The results are shown below.

Mass = 18 g
Volume = 45 $cm^3$

Calculate the density of this material. Include units. [3]

2. Describe a method that could be used to determine the density of this toy. [6]

3. Compare the arrangement of particles in solids and liquids. [4]

**Physics only**

4. A pump is used to inflate a car tyre as shown in the photo below.

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Image source – Andrea Piacquaido/Pexels

Explain why the internal energy of the air increases as the tyre is inflated. [4]