1. Water has a density of 1000 kg / m^3.

Water of volume 1 m^3 is frozen. The volume of the ice formed is 1.09 m^3.

What is the density of the ice?

Use the Equation Sheet.

A 0.917 kg / m^3
B 1.09 kg / m^3
C 917 kg / m^3
D 1090 kg / m^3

Your answer ☐ **[1]**

2. Which sentence about an atom is correct?

A Most of the mass is in the nucleus.
B The nuclear radius is much larger than the rest of the atom.
C The nucleus has a neutral charge.
D The nucleus is surrounded by positively charged electrons.

Your answer ☐ **[1]**

3. A medical freezer is used to keep vaccines cool.

i. When the vaccine is used by doctors, it has to be changed back into a liquid. The temperature of the vaccine is first raised to its melting point but it remains as a solid.

Explain **two** reasons why more energy is needed to change the solid vaccine into a liquid at its melting point.

1 _____

_____

2 _____

_____

[2]

ii. Calculate the number of 5 mg vaccine doses which can be melted using 6800 J of energy.

Assume the specific latent heat of fusion for the vaccines is 340 000 J / kg.

Use the Equation Sheet June 23 J249-01-02-03-04.

Number of vaccine doses = ... **[6]**

4. What is the correct order of the three states of matter in increasing density?

A Gas → liquid → solid
B Liquid → gas → soli
C Liquid → solid → gas
D Solid → liquid → gas

Your answer ☐ **[1]**

5. A scientist wants to publish a new theory.

Which step should the scientist take before publishing the theory?

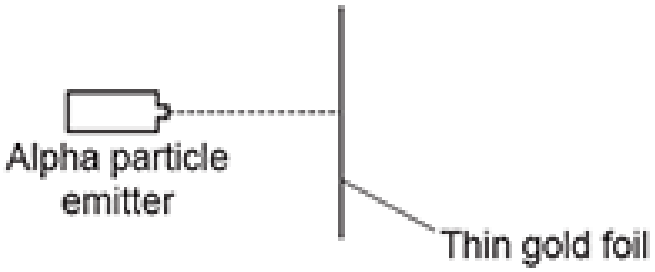
A Check the new theory with a friend.
B Have the new theory peer reviewed.
C Keep the new theory secret to avoid others copying.
D Publish the new theory in a local magazine.

Your answer ☐ **[1]**

6(a).

Between 1908 and 1913, two scientists did experiments to help understand the structure of atoms.

The diagram shows how the scientists fired alpha particles at a thin piece of gold foil and detected what happened to these particles.



i. The scientists detected that a very small number of particles reflected directly back, some particles were deflected, and most particles passed straight through the foil.

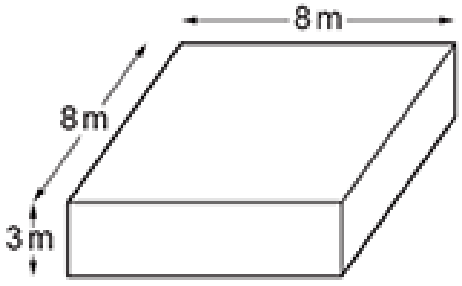
Describe the model of the atom following these observations.

[3]

ii. Explain why the previous model of the atom needed to change after this experiment.

[1]

(b). A classroom contains air particles. A drawing of the classroom is shown in the diagram.



i. Calculate the volume of the classroom.

Volume = ... m^3 **[1]**

ii. The density of air is 0.012 kg / m^3.
Calculate the mass of air in the classroom.

Use the equation: density = mass / volume

Mass =..... kg **[3]**

END OF QUESTION PAPER