

The Particle Model

Q1.(2019)

A student thinks about atoms placed side by side in a row.



Approximately, how many atoms would fit in a length of 1 m?

- A** 1×10^8
- B** 1×10^{10}
- C** 1×10^{12}
- D** 1×10^{14}

Your answer

[1]

Q2.a(2019)

A student has two metal cubes, **A** and **B**, as shown in **Fig. 12.1**.

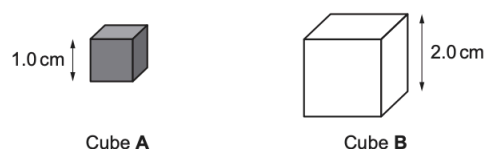


Fig. 12.1

Each side of metal cube **A** is 1.0 cm. Each side of metal cube **B** is 2.0 cm.

Both metal cubes have the same mass. The density of metal cube **A** is 16 g/cm^3 .

- (i) Calculate the density of metal cube **B**.

Use the equation: density = mass $\div$ volume

Density = g/cm^3 [3]

Q2.b(2019)

Metal cube **A** sinks when placed in water.

Explain why.

.....

..... [1]

Q2.c(2019)

The student hangs cube **A** from the end of a vertical spring and waits for the spring to become stationary, as shown in Fig. 12.2.

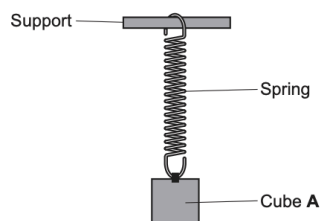


Fig. 12.2

- (i) Draw a labelled free body force diagram for the spring.

The spring is attached to the support at the top and has cube **A** attached at the bottom.



[2]

Q2.d(2019)

The resultant force on the spring is zero.

Explain why.

Use your answer to 12(b)(i) to help you.

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 [1]

Q2.e(2019)

More than one force is required to stretch the spring.

Describe what happens if only one force is applied.

.....
 [1]

Q2.f(2019)

The student removes cube **A** and places another cube, cube **C**, on the spring.

The extension of the spring due to cube **C** is 0.04 m.

The spring constant of the spring is 30 N/m.

Calculate the weight of cube **C**.

Weight = N [3]

Q3.(2020)

Which statement describes an atom?

- A** The nucleus is smaller than the atom and contains no mass.
- B** The nucleus is smaller than the atom and contains most of the mass.
- C** The nucleus orbits the electrons and contains most of the mass.
- D** The nucleus orbits the protons and contains electrons.

Your answer

☐

[1]

Q4.(2020)

An aerosol canister may contain a non-flammable gas at high pressure.



Aerosol canister containing a non-flammable gas

The aerosol canister should **not** be exposed to high temperatures.

Explain why.

Include ideas about gas particles in your answer.

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.....

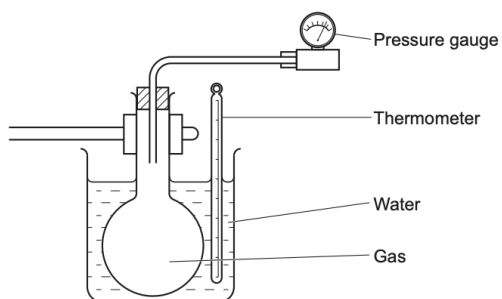
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..... [3]

Q5.(2021)

This apparatus is used to measure the pressure of a fixed volume of gas.



When the temperature of water increases what happens to the pressure and the speed of the gas particles?

	Pressure	Speed of gas particles
A	Decreases	Decreases
B	Decreases	Increases
C	Increases	Decreases
D	Increases	Increases

Your answer

[1]

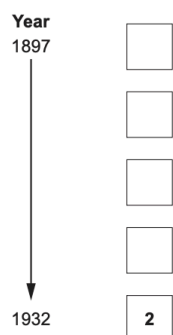
Q6.a(2021)

Here are some events in atomic theory:

1	Thomson	Discovered the electron. Published findings in a scientific journal.
2	Chadwick	Discovered the neutron.
3	Bohr	Suggested electron shells after a science conference.
4	Rutherford	Did experiments showing the atom had a nucleus.
5	Thomson	Published the 'plum pudding' model in a scientific journal.

(i) Place the events in the order they occurred.

Write the numbers in the boxes below. One has been done for you.



[2]

Q6.b(2021)

The events were peer reviewed **and** communicated to others.

Suggest why **both** are important in science.

Peer review

.....

Communication

.....

[2]

Q7.a(2021)

Table 11.1 gives the density of different materials.

Material	State	Density (kg/m^3)
Argon	Gas	1.45
Copper	Solid	8960
Ethanol	Liquid	789
Iron	Solid	7870
Oxygen	Gas	1.31
Water	Liquid	998

Table 11.1

(i) Describe any trends in the data in **Table 11.1**.

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.....

..... [2]

Q7.b(2021)

Explain the difference in density between solids and liquids.

You may draw diagrams to help your answer.

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.....

..... [2]

Q8.(2022)

A ball is inflated with air.

In which environment will the air inside the ball have the **highest** pressure?

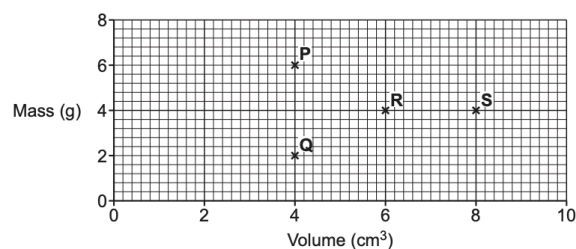
- A In a refrigerator (3 °C)
- B In a house (18 °C)
- C Outside on a cold day (5 °C)
- D Outside on a warm day (21 °C)

Your answer ☐

[1]

Q9.(2022)

A student measures the mass and volume of four blocks.
The graph shows their results.



Which two blocks have the **same** density?

Use the equation: density = $\frac{\text{mass}}{\text{volume}}$

- A P and Q
- B P and R
- C Q and S
- D R and S

Your answer ☐

[1]

Q10.(2022)

A student calculates the specific heat capacity of water.
The student does **one** experiment and gets this result:

- Student's value = 4250 J/kg °C.
- Textbook value = 4200 J/kg °C.

Complete the sentence below.
Use one of the words.

Accurate	Precise	Reliable	Repeatable	Systematic
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The student's value is

[1]

Q11.(2023)

Which new feature of the atomic model did Niels Bohr suggest?

- A Electrons are in stable shells.
- B Electrons orbit a nucleus.
- C The atom has a nucleus.
- D The nucleus is positive.

Your answer ☐

[1]

Q12.(2023)

Two rooms have the same fixed volume. They contain identical gases at the same pressure.

Room H is at a higher temperature than room L.

Which statement is correct?

- A The particles are moving at the same speed in both rooms.
- B The particles are moving faster in room H.
- C The particles are moving faster in room L.
- D The particles are not moving in either room.

Your answer ☐

[1]

Q13.(2023)

Which substance listed in the table has the **highest** density?

Substance	Mass (kg)	Volume (cm ³)
A	0.5	1.5
B	0.5	3.0
C	1.0	1.5
D	1.0	3.0

Your answer ☐

[1]

Q14.(2024)

Different scientists have contributed to the model of the atom.

What is the order of each scientist's contribution from the oldest to the newest?

Oldest  Newest

- A** Bohr, Rutherford, Thomson
- B** Rutherford, Bohr, Thomson
- C** Thomson, Bohr, Rutherford
- D** Thomson, Rutherford, Bohr

Your answer ☐

[1]

Q15.(2024)

A sealed rigid container of air is in a room at 20 °C. The container is then placed in a refrigerator at 4 °C.

Which row explains what happens to the speed of the air molecules and the pressure inside the container?

	Air molecules inside the container	Pressure on the inside of the container
A	move faster	decreases
B	move faster	increases
C	move slower	decreases
D	move slower	increases

Your answer ☐

[1]