OCR GCSE GATEWAY PHYSICS A · J249

PHYSICS



EXAM QUESTION PACK

P1.1 THE PARTICLE MODEL

SCORE	PERCENTAGE
/43	%

STEMUP

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Gateway Physics A (9-1)

The particle model

Please note that you may see slight differences between this paper and the original.

Candidates answer on the Question paper.

OCR supplied materials:
Additional resources may be supplied with this paper.

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: Not set

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions, unless your teacher tells you otherwise.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Where space is provided below the question, please write your answer there.
- You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

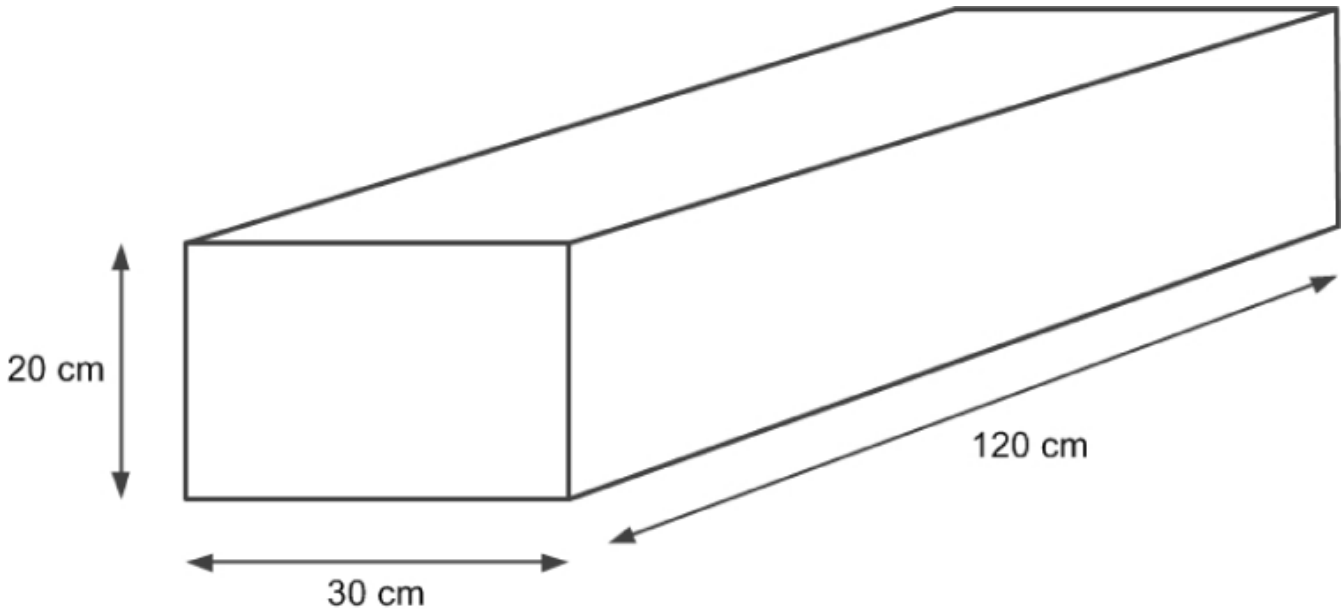
- The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and grammar and the use of specialist terminology* is assessed.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **43**.
- The total number of marks may take into account some 'either/or' question choices.

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1 Wood has a density of 180 kg/m^3.



Calculate the mass of this piece of wood.

Show your working and give the units.

answer: _____ units:____ [6]

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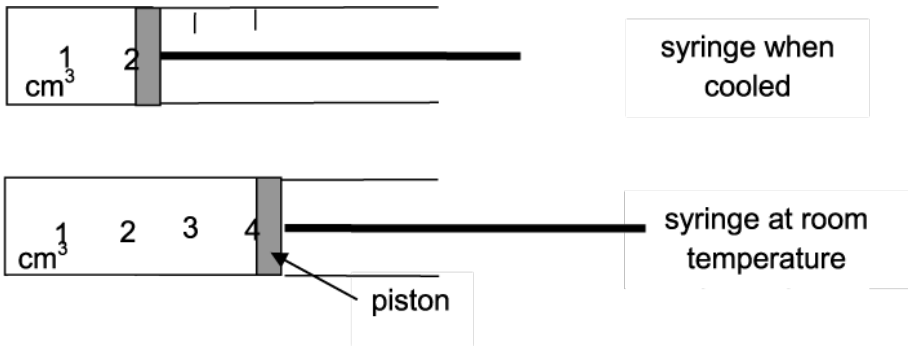
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2 A graduated syringe contains air.

It is put in a freezer to cool it down.

When it is removed from the freezer the piston has moved inwards.



The density of the air in the syringe when cooled is 2.4 kg/m^3.

What was the density of the air at room temperature?

A 0.6 kg/m^3
B 1.2 kg/m^3
C 2.4 kg/m^3
D 4.8 kg/m^3

Your answer ☐

[1]

3 A piece of metal has a volume of 2.0×10^{-5} m^3.

The density of it is 8.0×10^3 kg/m^3.

What is its mass?

A 2.5×10^{-3} kg
B 4.0×10^{-2} kg
C 1.6×10^{-1} kg
D 1.6×10^3 kg

Your answer ☐

[1]

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4(a) Roxanne investigates the density of different materials.

She calculates the density using this equation:

$$\textbf{density}\ (\text{in g/cm}^3) = \frac{\textbf{mass}}{\textbf{volume}}$$

Look at her results.

Material	State	Volume in cm^3	Mass in g	Density in g / cm^3
Water	liquid	1.0	1.0	1.0
Glass	solid	3.0	5.8	
Liquid X	liquid	1.0	1.2	1.2
Oil	liquid	3.0		0.9
Liquid Y	liquid	1.0	0.7	0.7
Liquid Z	liquid	1.0	0.8	0.8

Calculate the density of glass.

---

answer _____ g / cm^3

[1]

(b) Roxanne has lost the measurement for the mass of oil.

Calculate the mass of oil.

---

answer _____ g

[2]

(c)

Roxanne experiments with different liquids from the table.

She has two identical beakers and puts one litre of water into each of them.

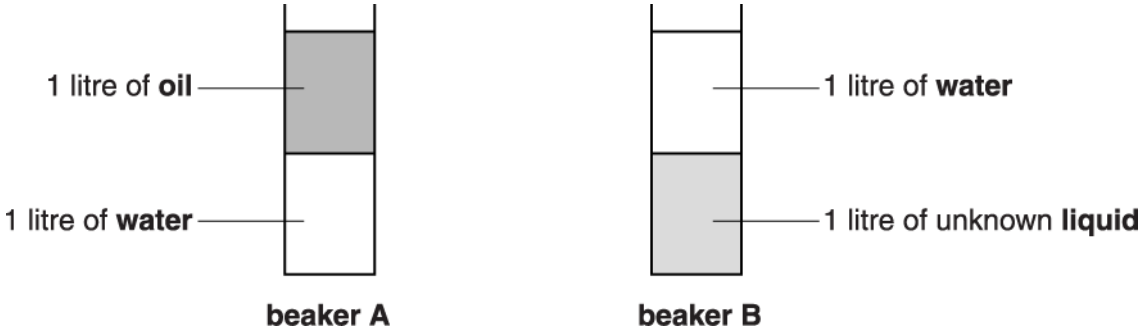
She puts one litre of oil into beaker **A**.

The oil floats on the water because of their densities.

Roxanne puts one litre of another of the liquids into beaker **B**.

The liquids do not mix together.

Look at the diagrams.



Which beaker of liquids is heavier, **A** or **B**?

_____

Explain your answer and suggest which liquid from the table is the **unknown liquid**.

_____

_____

_____

_____

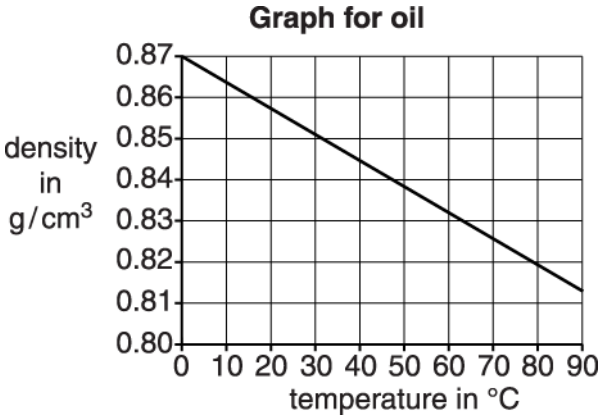
[3]

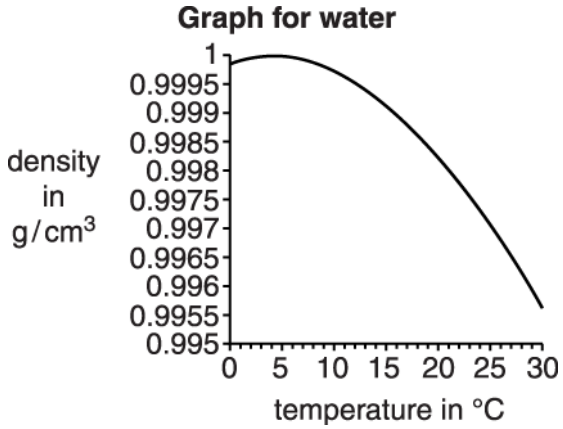
(d) The state of water is affected by temperature.

Water freezes and becomes ice at 0°C.

The density of liquids is also affected by temperature.

Look at the graphs for oil and water.





(i) Describe how the density varies with temperature for **oil**.

--- [1]

(ii) Describe how the density varies with temperature for **water**.

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[1]

(iii) Water freezes at 0°C and ice floats on water. The density of ice is 0.92 g / cm^3 at 0°C.

Use the data in the graph for water to explain why ice floats on water, and suggest how this protects fish at the bottoms of lakes which have frozen over.

---

[2]

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5 Atomic models have changed over time.

Old atomic model – Atoms are a positive mass with negative electrons fixed in it.

Current atomic model – Atoms are made from protons, neutrons and electrons.
Protons and neutrons are in a central nucleus surrounded by a cloud of electrons.

(i) Write down **two** differences between these models.

1 ----------

---

2 ----------

---[2]

(ii) Why did the atomic model change?

---[2]

6 The atomic model has changed over time.

Why did the model need to change over time?

A Models only have a finite lifetime

B Computers were invented

C The older models could not explain new evidence

D Peer review

Your answer [ ] [1]

7 A radio wave has a wavelength of 100 m. It has a speed of 3×10^8 m/s.

Use the equation: Wave speed = Frequency × Wavelength

Calculate the frequency of the wave.

A 3 MHz

B 30 MHz

C 300 MHz

D 3000 MHz

Your answer [ ] [1]

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8 What is the typical diameter of an atom?

A 1.0×10^{-15} m

B 1.0×10^{-10} m

C 1.0 μm

D 1.0 mm

Your answer [1]

9 A liquid has a volume of 0.01 m^3 and a mass of 12 kg.

What is the density of the liquid?

Use the equation: density = mass × volume

A 0.12 kg / m^3

B 12 kg / m^3

C 120 kg / m^3

D 1200 kg / m^3

Your answer [1]

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10 Different states of matter have different densities.

Which of the following shows the states of matter in density order, starting with the lowest density?

A Solid – liquid – gas

B Solid – gas – liquid

C Gas – liquid – solid

D Liquid – gas – solid

Your answer ☐ **[1]**

11 An object has a volume of 1.5 m^3 and a mass of 3.0 kg.

What is the density of the object?

Use the equation: density = mass ÷ volume

A 0.5 kg/m^3

B 2.0 kg/m^3

C 4.5 kg/m^3

D 6.0 kg/m^3

Your answer ☐ **[1]**

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12 A student investigates what happens when she heats a beaker of water.

	The temperature increases	The state changes	The energy stored in the water changes
A	✓	✓	✓
B	✓	*x*	*x*
C	*x*	✓	*x*
D	*x*	*x*	✓

Which row in the table describes what **could** happen when the water is heated?

Your answer [ ] [1]

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13(a) A student uses a ruler to determine the volume of a cube, **A**. The length of one side of the cube is 0.100 m.

(i) Calculate the volume of cube **A**.

Volume of cube **A** = ... m^3 **[2]**

(ii) Cube **B** has the same volume as cube **A**.

The mass of cube **B** is ten times greater than the mass of cube **A**.

Compare the density of cube **B** with cube **A**.

Use the equation for density to help your explanation.

---

[2]

(b) Give **one** reason why a solid is more dense than a gas.

---

[1]

14 What is the typical size for a small molecule?

A 0.1 cm
B 0.1 km
C 0.1 m
D 0.1 nm

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Your answer 

[1]

15(a) Complete the sentences about an atom.

Use words from the list.

You may use each word once, more than once, or not at all.

Atom	Electrons	Negatively	Neutrons
Nucleus	Orbits	Positively	Protons

An atom has a ..... charged nucleus surrounded by .....

charged electrons.

The nucleus contains protons and ..... .

Almost all of the mass of an atom is in the ..... .

[4]

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(b)

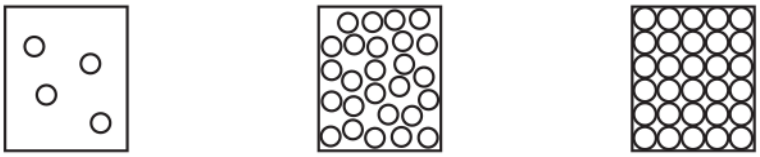
(i) A swimming pool contains 9970 kg of water in 10 m^3.

Calculate the density of water.

Use the equation: density = mass ÷ volume

Density = ... kg / m^3 **[1]**

(ii) The diagrams, **A**, **B** and **C**, show the particles in three states of matter.



A **B** **C**

Write the letters in the boxes to give the correct order of density, from **most** to **least dense**.

Most dense → **Least dense**

☐ ☐ ☐

[1]

(iii) Explain why you chose the order in **(ii)**.

---

[1]

END OF QUESTION PAPER

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