Properties of Materials – 2021/20 GCSE Gateway Chemistry A

1. Nov/2021/Paper_J248/01/No.2

Which change of state is described by the term **freezing**?

A Gas to liquid

B Liquid to gas

C Liquid to solid

D Solid to liquid

Your answer ☐ **[1]**

2. Nov/2021/Paper_J248/01/No.9

Which statement about the melting point of a substance is correct?

A A pure substance has a sharp melting point.

B A pure substance melts over a range of temperatures.

C The melting point of an impure substance is higher than a pure substance.

D The melting point of a pure substance is higher than the boiling point.

Your answer ☐ **[1]**

3. Nov/2021/Paper_J248/01/No.11

The melting point of iodine is 114 °C. The boiling point of iodine is 184 °C.

What is the state of iodine at room temperature?

A Aqueous

B Gas

C Liquid

D Solid

Your answer ☐ **[1]**

4. Nov/2021/Paper_J248/01/No.14

Quantum dots are a type of nanoparticle. Quantum dots can have a diameter of 6 nm.

What is 6 nm in metres?

A 6×10^{-6} m

B 6×10^{-8} m

C 6×10^{-9} m

D 6×10^{-10} m

Your answer ☐ **[1]**

5. Nov/2021/Paper_J248/01/No.20

Nanoparticles can be used as catalysts to speed up chemical reactions.

Some information about three nanoparticle catalysts is shown in the table.

Nanoparticle	Surface area to volume ratio	Length (nm)
A	5.0	22
B	0.5	13
C	2.5	48

(a) Which nanoparticle will be the best catalyst? Give a reason for your answer.

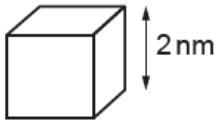
Nanoparticle .....

Reason .....

.....

..... **[2]**

(b) Another nanoparticle **D** is cube shaped. The sides are 2 nm in length.



D

(i) Calculate the **surface area** of nanoparticle **D**.

Surface area = ... nm^2 **[2]**

(ii) The volume of nanoparticle **D** is $8\,nm^3$.

Use your answer to question **(b)(i)** to calculate the surface area to volume ratio of nanoparticle **D**.

Use the equation, **ratio = surface area ÷ volume**.

Surface area to volume ratio of nanoparticle **D** = ... **[2]**

(c) It is possible to use nanoparticles to transport medication inside the body.

Explain why nanoparticles are not yet widely used for this purpose.

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..... **[1]**

6. Nov/2020/Paper_J248/01/No.15

Substance **Y** melts at −7 °C and boils at 59 °C.

What is the state of substance **Y** at room temperature?

A Gas

B Liquid

C Plasma

D Solid

Your answer ☐ **[1]**

7. Nov/2020/Paper_J248/01/No.16(b)

(b) The table shows the properties of different substances.

Substance	Melting point (°C)	Boiling point (°C)	Soluble in water?	Conducts electricity in solid state?	Conducts electricity in molten state?
A	−210	−196	No	No	No
B	1084	2562	No	Yes	Yes
C	605	1137	Yes	No	Yes
D	−78	−34	Yes	No	No

(i) Which **two** substances are gases at room temperature?

Tick (✓) **two** boxes.

A ☐

B ☐

C ☐

D ☐

[1]

(ii) Substance **C** is an ionic substance.

Use the information in the table to explain why.

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..... **[2]**

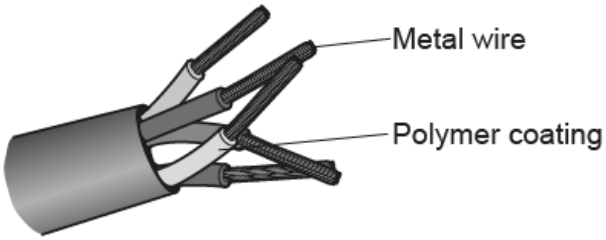
8. Nov/2020/Paper_J248/02/No.23(a)

This question is about the properties of materials.

(a) Look at the table. It shows information about two materials.

	Polymer	**Metal**
Melting Point (°C)	100–260	1100
Density (kg/m^3)	940	8940
Relative electrical conductivity (10 = good, 1 = poor)	2	10
Flexibility	high	high

Electrical cables are made of metal wires surrounded by a polymer coating.



Explain why

- the wire is made of metal
- the metal wire is coated with a polymer.

Use information from the table in your answer.

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..... **[3]**

9. Nov/2021/Paper_J248/03/No.8

Which statement is a reason that nanoparticles can be used as catalysts?

A Nanoparticles are safe and have no risks.

B Nanoparticles are smaller than atoms.

C Nanoparticles have a large surface area to volume ratio.

D Nanoparticles have a small surface area to volume ratio.

Your answer ☐ **[1]**

10. Nov/2021/Paper_J248/03/No.10

The table shows melting points and boiling points for some Group 7 elements.

Element	Melting point (°C)	Boiling point (°C)
Fluorine	−220	−188
Chlorine	−102	−34
Bromine	−7	59
Iodine	114	184

Which statement is correct at room temperature?

A Bromine is a liquid and chlorine is a solid.

B Fluorine is a gas and bromine is a liquid.

C Fluorine is a gas and iodine is a liquid.

D Iodine is a gas and fluorine is a solid.

Your answer ☐ **[1]**

11. Nov/2021/Paper_J248/03/No.16

The table shows carbon can exist as several different structures called allotropes.

Allotrope	Covalent bonds
Diamond	.....
Graphite	.....
Graphene	3

(a) Complete the table to show how many covalent bonds carbon forms in these allotropes. **[2]**

(b) **(i)** Diamond can be used as a cutting tool because it is so hard.

Explain why diamond is so hard.

Use ideas about structure and bonding in diamond in your answer.

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..... **[2]**

(ii) Graphite can be used as a lubricant because it is slippery.

Explain why graphite is slippery.

Use ideas about structure and bonding in graphite in your answer.

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(c) Explain why carbon forms many other compounds. Use ideas about the bonding in carbon compounds in your answer.

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..... **[2]**

12. Nov/2020/Paper_J248/03/No.9

Graphite is a form of carbon. Graphite can conduct electricity.

Why can graphite conduct electricity?

A Delocalised electrons are between layers.

B The ions can move.

C Layers have weak intermolecular forces.

D Strong covalent bonds are between the carbon atoms.

Your answer ☐ **[1]**

13. Nov/2020/Paper_J248/04/No.16(a)

This question is about the properties of materials.

(a) Look at the table. It shows information about two materials.

	Polymer	**Metal**
Melting Point (°C)	100–260	1100
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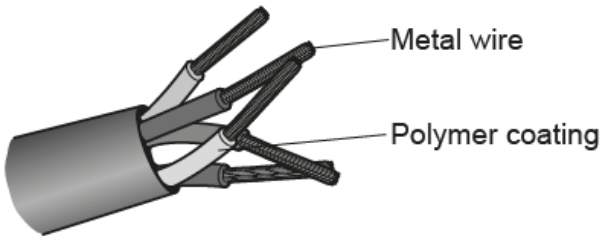

Explain why

- the wire is made of metal
- the metal wire is coated with a polymer.

Use information from the table in your answer.

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..... **[3]**