Level 1 Chemistry and Biology: practice paper 2026

AS 92023 Demonstrate understanding of how the physical properties of materials inform their use · Vertex Academy practice paper, not an NZQA paper

Attempt ALL the questions. Show ALL working. Write your answers on lined paper, or in the space under each question.

QUESTION ONE

(a) Copper is used for the electrical wiring in houses. Most overhead power lines in New Zealand use aluminium conductors.
Describe the particles in a metal such as copper and the forces that hold them together.

(b) Explain why metals such as copper conduct electricity, and why they can be bent and drawn into wires (malleable and ductile) without breaking.

(c) The table compares copper and aluminium.
Evaluate why aluminium is used for long overhead power lines, while copper is used for wiring inside houses, using the data and the particles and forces in metals.

Property	Copper	Aluminium
Density (g cm^{-3})	8.96	2.70
Electrical conductivity (copper = 100)	100	61
Melting point (°C)	1085	660

QUESTION TWO

(a) Diamond and graphite are both made only of carbon atoms. Diamond-tipped saw blades are used to cut tiles and concrete, and graphite is used in pencils and as electrodes.
Describe the structure of diamond and of graphite.

(b) Explain why graphite conducts electricity and is soft and slippery, while diamond does not conduct and is extremely hard.

(c) Evaluate why diamond is used for the cutting edge of saw blades for tiles and concrete, while graphite is used as electrodes (which carry current into a liquid) and in pencils. Refer to the structure and bonding of both.

QUESTION THREE

(a) On a Waikato dairy farm, the farmer uses urea fertiliser ($CO(NH_2)_2$, made at Kapuni), ammonium nitrate fertiliser (NH_4NO_3) and polythene irrigation pipes.
For each material, name the type of material and describe its particles and the forces between them.

(b) Urea melts at 133 °C and ammonium nitrate at 170 °C. Both dissolve well in water, which lets them reach plant roots.
Explain why urea has a low melting point for a solid, and why urea dissolves in water.

(c) The farmer is choosing between polythene and copper pipes for the farm's irrigation system, which carries cold water across paddocks. Polythene softens at about 110 to 135 °C; copper melts at 1085 °C.

Evaluate which material is more suitable, using the properties needed and the particles and forces in each material.

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