# Assessment schedule: 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

## QUESTION ONE

| Part | Evidence | Achievement (u) | Merit (r) | Excellence (t) |
|---|---|---|---|---|
| (a) | positive ions in a lattice<br>delocalised electrons, free to move<br>metallic bonding | Describes positive ions in a lattice. Describes delocalised electrons. Describes metallic bonding as attraction between them. | | |
| (b) | delocalised electrons free to move<br>non-directional metallic bonding<br>layers of ions slide, still held by electrons | Describes delocalised electrons carrying the current. Describes layers of ions sliding. | Explains conduction by mobile delocalised electrons AND malleability or ductility by layers sliding while the non-directional metallic bonding holds them together. | |
| (c) | both conduct and are ductile<br>copper conducts better<br>aluminium density 2.70 vs 8.96 g $cm^{-3}$<br>overhead lines: weight matters<br>house wiring: thin wires, good connections | Describes copper as a better conductor. Describes aluminium as less dense (lighter). | Explains one choice using a property linked to particles (low density of aluminium for long lines, OR better conductivity of copper for thin house wires). | Evaluates both uses, comparing conductivity and density with the data and linking them to the particles in metals, to justify why each metal is chosen for each use. |

## QUESTION TWO

| Part | Evidence | Achievement (u) | Merit (r) | Excellence (t) |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| (a) | diamond<br>graphite<br>graphite: delocalised electrons; weak forces between layers | Describes diamond as each C bonded to four others in a 3D network AND graphite as layers with each C bonded to three others. | | |
| (b) | graphite: delocalised electrons<br>graphite: weak forces between layers<br>diamond: all electrons in bonds<br>diamond: strong bonds in 3D | Describes graphite's delocalised electrons.<br>Describes graphite's layers sliding.<br>Describes diamond's strong bonds. | Explains both properties of graphite (delocalised electrons; weak forces between layers) AND both properties of diamond (no free electrons; strong 3D covalent bonds). | |
| (c) | cutting: hardness, high melting point<br>graphite layers slide<br>electrodes: conduct, high melting point<br>diamond no free electrons<br>pencils: layers slide | Describes diamond as hard.<br>Describes graphite as conducting.<br>Describes graphite's layers sliding in a pencil. | Explains why diamond is used for cutting OR why graphite is used for electrodes, linking the property to structure and bonding. | Evaluates all the uses, justifying each with structure and bonding, AND explains why the other form of carbon would not suit each use. |

## QUESTION THREE

| Part | Evidence | Achievement (u) | Merit (r) | Excellence (t) |
|---|---|---|---|---|
| (a) | urea<br>ammonium nitrate<br>polythene | Correct type, particles and forces for all three materials. | | |

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|---|---|---|---|---|
| (b) | melting<br>little energy<br>urea polar, attracted to water | Describes melting as overcoming weak forces between molecules. Describes urea being attracted to water. | Explains the low melting point (only weak forces between molecules are overcome, covalent bonds stay) AND the solubility (urea molecules are attracted to water molecules strongly enough to separate). | |
| (c) | pipe needs: no corrosion, light, flexible, cold water only<br>polythene: long chains, weak forces between covalent bonds along chains<br>low softening point<br>copper: high melting point not needed; dense, costly, can corrode | Describes polythene as flexible or light. Describes polythene as not reacting with water. Describes copper's high melting point. | Explains one property of polythene from its long chains and weak forces between chains (flexibility, or low softening point). | Evaluates both materials against the needs of the pipe, explaining polythene's properties from its particles and forces, AND justifies that copper's high melting point is not needed, so polythene is more suitable. |

## Judgement for each question

| N0 | N1 | N2 | A3 | A4 | M5 | M6 | E7 | E8 |
|---|---|---|---|---|---|---|---|---|
| No response, or nothing relevant. | One Achievement point, partly described. | Two Achievement points. | Three Achievement points. | Four Achievement points. | One Merit point. | Two Merit points. | One Excellence point, with a minor error or omission. | One Excellence point, complete. |

Grade score out of 24 (each question's grade: N0 = 0 to E8 = 8): Not Achieved 0 to 6, Achieved 7 to 12, Merit 13 to 18, Excellence 19 to 24 (the 2025 exam's cut scores).