

YEAR 2 | MODULE 5 | PACK 01

# Temperature, matter and internal energy

Official past-paper mark scheme

2017-2023 | OCR A H556 | 5.1.1; 5.1.2

**20 marks | 6 question entries**

One practice session

Match each extract using its question number and stable TP identifier. Original OCR answers, examiner guidance, alternatives, diagrams and level descriptors are preserved.

The heading gives the maximum marks for the assigned subparts. Alternative methods and "any n from" lists offer routes to those marks; do not add every printed point together.

Click a source reference to open OCR's full official mark scheme. Keep this file closed while attempting the questions.

**Reserved:** all 2024 and 2025 papers are excluded. These files contain official examination questions only; no sample, specimen or practice papers.

# Question index

TP identifiers are stable across the question packs and mark schemes; Q numbers refer to this pack.

| Question / source                 | Marks    | Page     |
|-----------------------------------|----------|----------|
| <b>Q01   TP05</b>                 | <b>1</b> | <b>3</b> |
| June 2019   H556/01   Q9          |          |          |
| <b>Q02   TP12</b>                 | <b>1</b> | <b>3</b> |
| June 2023   H556/01   Q9          |          |          |
| <b>Q03   TP18A</b>                | <b>2</b> | <b>4</b> |
| June 2017   H556/01   Q17(a)      |          |          |
| <b>Q04   TP20</b>                 | <b>5</b> | <b>5</b> |
| June 2017   H556/01   Q22         |          |          |
| <b>Q05   TP24AC</b>               | <b>5</b> | <b>6</b> |
| June 2019   H556/01   Q21(a), (c) |          |          |
| <b>Q06   TP30B</b>                | <b>6</b> | <b>7</b> |
| November 2021   H556/01   Q18(b)  |          |          |

## Q01 | TP05

1 mark

June 2019 | H556/01 | Q9

| Question | Answer | Marks | Guidance |
|----------|--------|-------|----------|
| 9        | C      | 1     |          |

## Q02 | TP12

1 mark

June 2023 | H556/01 | Q9

| Question | Answer | Marks | Guidance |
|----------|--------|-------|----------|
| 9        | D      | 1     |          |

## Q03 | TP18A

2 marks

June 2017 | H556/01 | Q17(a)

| Question |     |  | Answer                                                    | Marks | Guidance                                                                                                                                                                                                                                                                                         |
|----------|-----|--|-----------------------------------------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17       | (a) |  | Use a thermometer (with $\pm 1\text{ }^{\circ}\text{C}$ ) | B1    | <b>Allow</b> 'temperature sensor/gauge'                                                                                                                                                                                                                                                          |
|          |     |  | Stir water bath / avoid parallax (for glass thermometer)  | B1    | <b>Allow</b> 'avoid touching sides of water bath with thermometer'<br><b>Allow</b> 'take temperature in several places/times and average'<br><b>Allow</b> idea of 'leave thermometer for long time (to reach thermal equilibrium)'<br><b>Not</b> idea of 'use thermometer with finer resolution' |

## Q04 | TP20

5 marks

June 2017 | H556/01 | Q22

| Question |     |  | Answer                                                                                                                                                                      | Marks                                                               | Guidance                                                                                                                                                                  |
|----------|-----|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22       | (a) |  | The sum of (the random distribution of) the KE and PE of (its) molecules                                                                                                    | <b>B1</b>                                                           | <b>Not</b> if no clear indication of particulate nature, i.e. allow particles or atoms for molecules                                                                      |
|          | (b) |  | <p>No change in KE</p> <p>because temperature is constant (during melting)</p> <p>PE of (the molecules) increases (during melting)</p> <p>The internal energy increases</p> | <p><b>M1</b></p> <p><b>A1</b></p> <p><b>M1</b></p> <p><b>A1</b></p> | <p><b>Allow</b> 'KE is not changing'</p> <p><b>Not</b> 'KE is not increasing'</p> <p><b>Note:</b> This A1 mark can only be scored if both M1 marks have been awarded.</p> |

## Q05 | TP24AC

5 marks

June 2019 | H556/01 | Q21(a), (c)

| Question |     |  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Marks                                     | Guidance                           |
|----------|-----|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|------------------------------------|
| 21       | (a) |  | <p><b>Section AB</b><br/>Any <u>two</u> from</p> <ul style="list-style-type: none"> <li>• Particles close together</li> <li>• Particle spacing increase with increasing time or increasing temperature</li> <li>• Particles in a fixed structure/(regular) lattice</li> <li>• Particles vibrate/perform SHM</li> <li>• Particles vibrate with increasing amplitude (from A to B)</li> </ul> <p><b>Section CD</b><br/>Any <u>two</u> from</p> <ul style="list-style-type: none"> <li>• Particles close together /(slightly) further apart (than in AB)</li> <li>• No regular structure /AW</li> <li>• Particles (are free to) move around / move past each other / flow</li> <li>• Particles move with increasing speed from C to D / greater KE</li> </ul> | <p><b>B1 × 2</b></p> <p><b>B1 × 2</b></p> | <p><b>Not:</b> “vibrates more”</p> |

| Question |     |  | Answer                                                                                           | Marks     | Guidance                 |
|----------|-----|--|--------------------------------------------------------------------------------------------------|-----------|--------------------------|
|          | (c) |  | The sum of the (random) kinetic <u>and</u> potential energy of atoms or molecules in a substance | <b>B1</b> | <b>Allow</b> ‘particles’ |

## Q06 | TP30B

6 marks

November 2021 | H556/01 | Q18(b)

| Question |     |     | Answer                                                                                                          | Marks                      | Guidance                                                                                                                                                                                                                                                                                                                                                                       |
|----------|-----|-----|-----------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | (b) | (i) | Molecules in <b>X</b> vibrate about fixed positions /AW<br><br>Molecules in <b>Z</b> are free to move/random/AW | <b>B1</b><br><br><b>B1</b> | <b>Allow</b> references to ice for <b>X</b> and water / liquid for <b>Z</b><br><br><b>Allow one</b> correct for <b>B1</b> from: <ul style="list-style-type: none"> <li>Molecules in <b>X</b> have lower <u>KE</u>/speed/velocity</li> <li>Speed/velocity of molecules increases with temp/time</li> <li>Amplitude or frequency increases with temp/time in <b>X</b></li> </ul> |

| Question |                                                                   |                                                                          | Answer                                                                                                                                                                                                                                                                                                                  | Marks  | Guidance                                                          |                                                                          |   |   |   |   |   |   |   |   |   |      |                                                                                          |
|----------|-------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------|--------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|------|------------------------------------------------------------------------------------------|
|          |                                                                   | (ii)                                                                     | <table><tr><th>Region</th><th>Physical quantity, or quantities, that increase as time increases</th><th>Physical quantity, or quantities, that remain constant as time increases</th></tr><tr><td>X</td><td>K</td><td>P</td></tr><tr><td>Y</td><td>P</td><td>K</td></tr><tr><td>Z</td><td>K</td><td>P</td></tr></table> | Region | Physical quantity, or quantities, that increase as time increases | Physical quantity, or quantities, that remain constant as time increases | X | K | P | Y | P | K | Z | K | P | B1×3 | <b>Note</b> that each B1 mark is for a correct row<br><b>Allow</b> KP/- for both X and Z |
| Region   | Physical quantity, or quantities, that increase as time increases | Physical quantity, or quantities, that remain constant as time increases |                                                                                                                                                                                                                                                                                                                         |        |                                                                   |                                                                          |   |   |   |   |   |   |   |   |   |      |                                                                                          |
| X        | K                                                                 | P                                                                        |                                                                                                                                                                                                                                                                                                                         |        |                                                                   |                                                                          |   |   |   |   |   |   |   |   |   |      |                                                                                          |
| Y        | P                                                                 | K                                                                        |                                                                                                                                                                                                                                                                                                                         |        |                                                                   |                                                                          |   |   |   |   |   |   |   |   |   |      |                                                                                          |
| Z        | K                                                                 | P                                                                        |                                                                                                                                                                                                                                                                                                                         |        |                                                                   |                                                                          |   |   |   |   |   |   |   |   |   |      |                                                                                          |
|          |                                                                   | (iii)                                                                    | Absolute zero / 0 <u>K</u> / - 273 <u>°C</u>                                                                                                                                                                                                                                                                            | B1     |                                                                   |                                                                          |   |   |   |   |   |   |   |   |   |      |                                                                                          |