

## Multiple Choice Answers

Q16: C

## Multiple Choice Answers

Q17: D

## Multiple Choice Answers

Q17: B

|          |                                                                                                                                                                  |       |      |      |      |      |      |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|------|------|------|------|
| 2(a)(i)  | <b>M1</b> nuclear charge increases (across period) <b>AND</b> similar shielding<br><b>M2</b> greater / stronger attraction to nucleus                            |       |      |      |      |      |      |
| 2(a)(ii) | <b>M1</b> Al loses (3) electrons / Al is 3+, and P gains (3) electrons / P is 3–<br><b>M2</b> Al <sup>(3+)</sup> has (one) fewer shell (than P <sup>(3–)</sup> ) |       |      |      |      |      |      |
| 2(b)(i)  | <b>M1</b>                                                                                                                                                        | (+)1  | (+)2 | (+)3 | (+)4 | (+)5 | (+)6 |
|          | <b>M2</b>                                                                                                                                                        | 12-14 | 8-10 | —    | —    | 0-4  | 0-4  |
| 2(b)(ii) | they are insoluble                                                                                                                                               |       |      |      |      |      |      |
| 2(c)(i)  | $\text{Na}_2\text{O} + 2\text{HCl} \rightarrow 2\text{NaCl} + \text{H}_2\text{O}$                                                                                |       |      |      |      |      |      |
| 2(c)(ii) | $\text{Al}_2\text{O}_3 + 2\text{NaOH} \rightarrow 2\text{NaAlO}_2 + \text{H}_2\text{O}$                                                                          |       |      |      |      |      |      |
| 2(d)(i)  | (thermal stability) increases (down the group)                                                                                                                   |       |      |      |      |      |      |
| 2(d)(ii) | <b>NO<sub>2</sub> AND O<sub>2</sub></b>                                                                                                                          |       |      |      |      |      |      |

|          |                                                                                                                                |
|----------|--------------------------------------------------------------------------------------------------------------------------------|
| 2(a)(i)  | delocalised electrons move (through the structure / between layers)                                                            |
| 2(a)(ii) | P / S / Cl have no charge carriers<br><b>OR</b> (no ions and) no delocalised electrons<br><b>OR</b> no mobile / moving ions    |
| 2(b)     | <b>M1</b> Si has (lots of) strong covalent bonds broken<br><b>M2</b> P / S / Cl (only) has weak Van der Waals' (forces) broken |

|           |                                                                                                                                                                                                                                                                                                                                                                                        |           |     |     |     |    |    |           |   |     |     |     |     |           |   |   |   |   |   |           |   |   |   |   |   |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----|-----|-----|----|----|-----------|---|-----|-----|-----|-----|-----------|---|---|---|---|---|-----------|---|---|---|---|---|
| 2(c)      | <table><tr><td><b>M1</b></td><td>+1</td><td>+2</td><td>+3</td><td>+4</td><td>+5</td></tr><tr><td><b>M2</b></td><td>7</td><td>6.5</td><td>0–4</td><td>0–4</td><td>0–4</td></tr><tr><td><b>M3</b></td><td>I</td><td>I</td><td>I</td><td>C</td><td>C</td></tr><tr><td><b>M4</b></td><td>G</td><td>G</td><td>G</td><td>S</td><td>S</td></tr></table>                                       | <b>M1</b> | +1  | +2  | +3  | +4 | +5 | <b>M2</b> | 7 | 6.5 | 0–4 | 0–4 | 0–4 | <b>M3</b> | I | I | I | C | C | <b>M4</b> | G | G | G | S | S |
| <b>M1</b> | +1                                                                                                                                                                                                                                                                                                                                                                                     | +2        | +3  | +4  | +5  |    |    |           |   |     |     |     |     |           |   |   |   |   |   |           |   |   |   |   |   |
| <b>M2</b> | 7                                                                                                                                                                                                                                                                                                                                                                                      | 6.5       | 0–4 | 0–4 | 0–4 |    |    |           |   |     |     |     |     |           |   |   |   |   |   |           |   |   |   |   |   |
| <b>M3</b> | I                                                                                                                                                                                                                                                                                                                                                                                      | I         | I   | C   | C   |    |    |           |   |     |     |     |     |           |   |   |   |   |   |           |   |   |   |   |   |
| <b>M4</b> | G                                                                                                                                                                                                                                                                                                                                                                                      | G         | G   | S   | S   |    |    |           |   |     |     |     |     |           |   |   |   |   |   |           |   |   |   |   |   |
| 2(d)(i)   | $2\text{Al} + 3\text{Cl}_2 \rightarrow 2\text{AlCl}_3$                                                                                                                                                                                                                                                                                                                                 |           |     |     |     |    |    |           |   |     |     |     |     |           |   |   |   |   |   |           |   |   |   |   |   |
| 2(d)(ii)  | $\text{PCl}_5 + 4\text{H}_2\text{O} \rightarrow \text{H}_3\text{PO}_4 + 5\text{HCl}$                                                                                                                                                                                                                                                                                                   |           |     |     |     |    |    |           |   |     |     |     |     |           |   |   |   |   |   |           |   |   |   |   |   |
| 2(e)(i)   | rate of forward and backward (reaction) are the same / equal<br><b>OR</b> (ratio of) concentrations of reactants and products are constant                                                                                                                                                                                                                                             |           |     |     |     |    |    |           |   |     |     |     |     |           |   |   |   |   |   |           |   |   |   |   |   |
| 2(e)(ii)  | closed system                                                                                                                                                                                                                                                                                                                                                                          |           |     |     |     |    |    |           |   |     |     |     |     |           |   |   |   |   |   |           |   |   |   |   |   |
| 2(e)(iii) | <b>M1</b> (mixture / solution becomes more) yellow<br><br><b>M2</b> (forward) reaction is exothermic (equilibrium shifts left)<br><b>OR</b> equilibrium / reaction shifts (left) to absorb (additional) heat / energy<br><br><b>M3</b> (mixture / solution becomes more) red<br><br><b>M4</b> fewer moles of gas on right-hand side<br><b>OR</b> (gas on left and) no gas on the right |           |     |     |     |    |    |           |   |     |     |     |     |           |   |   |   |   |   |           |   |   |   |   |   |
| 2(f)(i)   | $\text{MgCl}_2(\text{aq}) + \text{Na}_2\text{CO}_3(\text{aq}) \rightarrow \text{MgCO}_3(\text{s}) + 2\text{NaCl}(\text{aq})$<br><b>M1</b> formulae in balanced equation<br><b>M2</b> state symbols                                                                                                                                                                                     |           |     |     |     |    |    |           |   |     |     |     |     |           |   |   |   |   |   |           |   |   |   |   |   |
| 2(f)(ii)  | MgO / magnesium oxide <b>AND</b> CO <sub>2</sub> / carbon dioxide                                                                                                                                                                                                                                                                                                                      |           |     |     |     |    |    |           |   |     |     |     |     |           |   |   |   |   |   |           |   |   |   |   |   |
| 2(f)(iii) | (thermal stability) increases (down the group)                                                                                                                                                                                                                                                                                                                                         |           |     |     |     |    |    |           |   |     |     |     |     |           |   |   |   |   |   |           |   |   |   |   |   |