Mark schemes

Q1.

(a) **Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

5–6

Level 2: Some logically linked reasons are given. There may also be a simple judgement.

3–4

Level 1: Relevant points are made. They are not logically linked. 1–2

1–2

No relevant content

0

Indicative content

- bamboo is renewable
- aluminium is a finite resource

- growing bamboo uses up agricultural land
- mining aluminium ore is a polluting activity

- cost of aluminium alloy is lower
- (so) can be replaced more frequently

- aluminium alloy is stronger
- (so) can withstand larger forces

- aluminium alloy has lower mass
- (so) bicycle is faster
- (so) is easier to carry / transport

- the aluminium alloy frame lasts less long
- (so) bicycle must be replaced more frequently

- aluminium alloy is recyclable (so) aluminium ores are conserved

- bamboo can provide renewable heat energy
- (so) less overall contribution to global warming
- (and) is carbon neutral

- neither material may reach landfill
- both materials have a sustainable disposal method

Reasoned judgment

(b) aluminium (alloy) has an oxide coating

1

(so) contact between aluminium (alloy) and water / air / oxygen is prevented

*do **not** accept sacrificial protection*

1

(c) (coating with) grease

allow (coating with) oil

allow galvanise

allow use stainless steel as the alloy

1

(d) (carbon fibre) reinforcement

allow reinforces the polymer / resin

ignore (carbon) fibres

1

(polymer resin) matrix / binder

allow binds the fibres / fragments

ignore (polymer) resin

1

[11]

Q2.

(a) **Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

3-4

Level 2: Some logically linked reasons are given. There may also be a simple judgement.

1-2

No relevant content

0

Indicative content

reasons

- compound **A** (potassium chloride) only contains potassium
- compound **A** (potassium chloride) is the only source of potassium so is needed.

- compound **B** (ammonium nitrate) only contains nitrogen
- compound **B** (ammonium nitrate) contains more nitrogen than compound **C** (diammonium hydrogen phosphate) so is preferable
- compound **B** (ammonium nitrate) contains more nitrogen and is cheaper than compound **C** (diammonium hydrogen phosphate) and so is more cost effective

- compound **C** (diammonium hydrogen phosphate) contains phosphorus which is not needed

judgement

- none of the compounds contain both nitrogen and potassium so a mixture is needed
- (both) compound **A** (potassium chloride) and **B** (ammonium nitrate) should be used
- (both) compound **A** (potassium chloride) and **C** (diammonium phosphate) could be used

(b) mining

allow quarrying

1

(c) potassium sulfate

ignore potassium chloride

allow potassium nitrate

allow any other named potassium salt

1

(d) ammonia

allow water

1

(e) (phosphate rock is) insoluble (in water)

allow (phosphate rock) cannot be absorbed as a solid

1

(f) (sulfuric acid)
calcium sulfate

allow single superphosphate

allow calcium phosphate

1

(phosphoric acid)
calcium phosphate

allow triple superphosphate

1

[10]