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

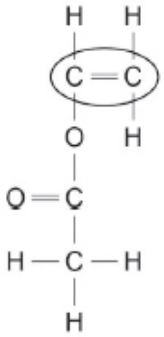
ignore (polymer) resin

1

[11]

Q2.

(a)



1

(b) orange (bromine water)

allow yellow / brown

1

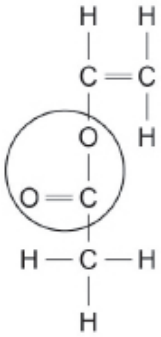
turns colourless

allow is decolourised

ignore clear

1

(c)



1

(d) $2\ C_4H_6O_2 + 9\ O_2 \rightarrow 8\ CO_2 + 6\ H_2O$

allow multiples

*allow **1** mark for*

$C_4H_6O_2 + O_2 \rightarrow$ with incorrect / no multipliers

*allow **1** mark for*

$\rightarrow CO_2 + H_2O$

with incorrect / no multipliers

ignore state symbols

3

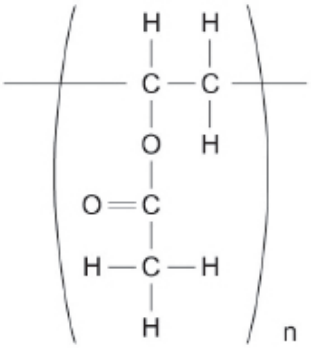
(e) single C-C bond in polymer repeating unit

*do **not** accept extra atoms added to trailing bonds*

1

n after polymer repeating unit

an answer of



*scores **2** marks*

1

(f) addition polymer

1

(g) thermosoftening

allow thermoplastic

1

(h) cross-links between (polymer) chains

allow covalent bonds between (polymer) chains

1

(so) too much energy needed to overcome the cross-links

allow (so) too much energy needed to overcome the covalent bonds between (polymer) chains

1

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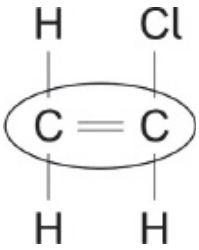
Q3.

(a)



1

(b) C-C bond

1

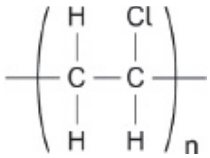
3x C-H **and** 1x C-Cl bonds

1

2x single bonds extending through brackets
and
n below halfway

1

an answer of



*scores **3** marks*

(c) composites

1

(d) water

allow H_2O

1

(e) (M_r of NH_2 and COOH) = (2 × 1) + 14 + 12 + (2 × 16) + 1 =) 61

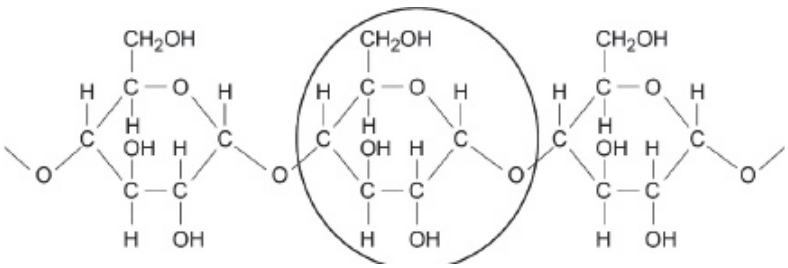
1

(M_r of section = 75 - 61) = 14

allow correct use of incorrectly determined M_r of NH_2 and COOH

1

(f)



1

(g) starch

allow cellulose
allow glycogen
allow polysaccharide

1

(h) nucleotides

1

(i) double helix

ignore DNA

1

[12]