

Solutions

Each answer shows the steps, then the **result**.

2.1

- any **two** of: a **physical structure** / **electrical components** / **programmable instructions**

2.2

- e.g. a **robotic vacuum cleaner**

2.3

- decision: a **diamond**
- input: a **parallelogram**

2.4

- **monitoring**: only reads and reports, or gives a warning
- **control**: also sends signals that **change the process**

2.5

- monitoring: a patient's heart rate / burglar alarm / pollution measurement
- control: central heating / greenhouse / traffic lights / automatic door

3.1 B

- a robot **cannot make independent decisions**
- A, C and D are not true limitations in the syllabus sense

3.2

(a)

- any **two** of: dull/dangerous jobs / quick and accurate / do not tire

(b)

- any **one** of: expensive to buy/maintain / replace human workers / cannot make its own decisions

3.3

(a)

- the temperature sensor sends readings continuously
- the ADC converts each reading to digital
- the microprocessor compares with the stored 30 °C and 35 °C
- above 35 °C it switches the cooler **on**; below 30 °C it switches it **off**
- the process **repeats continuously**

(b)

- it does not only record readings: it **switches the cooler** and changes the temperature
- that makes it a **control** system

(c)

- it converts the sensor's **analogue** signal into **digital** values the microprocessor can process

(d)

- compare each reading with 40 °C; if greater, sound the alarm
- a flowchart shows this as a **diamond** (decision) with Yes and No branches

(e)

- any **two** of: reacts faster / never gets tired / more accurate / can work in unsafe conditions