

Solutions

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

2.1

- a NIC is the network hardware in a device
- it lets the device **join a network and send/receive data**

2.2

- a router **connects different networks** and forwards packets towards the right one

2.3

- automatic door: **infrared / motion / pressure** sensor
- greenhouse watering: **moisture / humidity** sensor
- burglar alarm: **infrared / pressure / motion** sensor

2.4

- sensors give analogue readings; the microprocessor needs binary
- the ADC **converts analogue readings into digital values**

2.5

- a **monitoring** system only records readings or gives a warning
- a **control** system also sends signals that **change the process**

3.1 B

- a MAC address is a **unique number set by the maker**
- A is an IP address; C is packet numbering; D is a URL

3.2

(a)

- MAC: set by the maker and does **not** change
- IP: given by the network and **can change**

(b)

- the router reads the receiver's IP address in the packet header
- it **forwards the packet towards that network**

3.3

(a)

- arriving car: **pressure** sensor in the road, or **infrared** across the entrance
- ticket: **barcode / magnetic-stripe reader**, or a keypad

(b)

- an **LED display** (or monitor/screen) showing free spaces

(c)

- the sensor sends readings continuously to the microprocessor
- the ADC converts them to digital
- the microprocessor compares the reading with "a car is waiting" and checks that free spaces > 0
- if both are true it signals the actuator to **raise the barrier** and subtracts one from the count

(d)

- the sensor produces a continuously varying **analogue** signal
- the microprocessor can only work with **digital** values, so the signal must be converted

(e)

- **control** system
- it does not only record data: it operates the barrier and **changes what happens**

(f)

- **ANPR** (automatic number plate recognition), a form of OCR
- benefit: no ticket so entry is faster / automatic charging / detect a stolen car