Control and Monitoring Systems

1

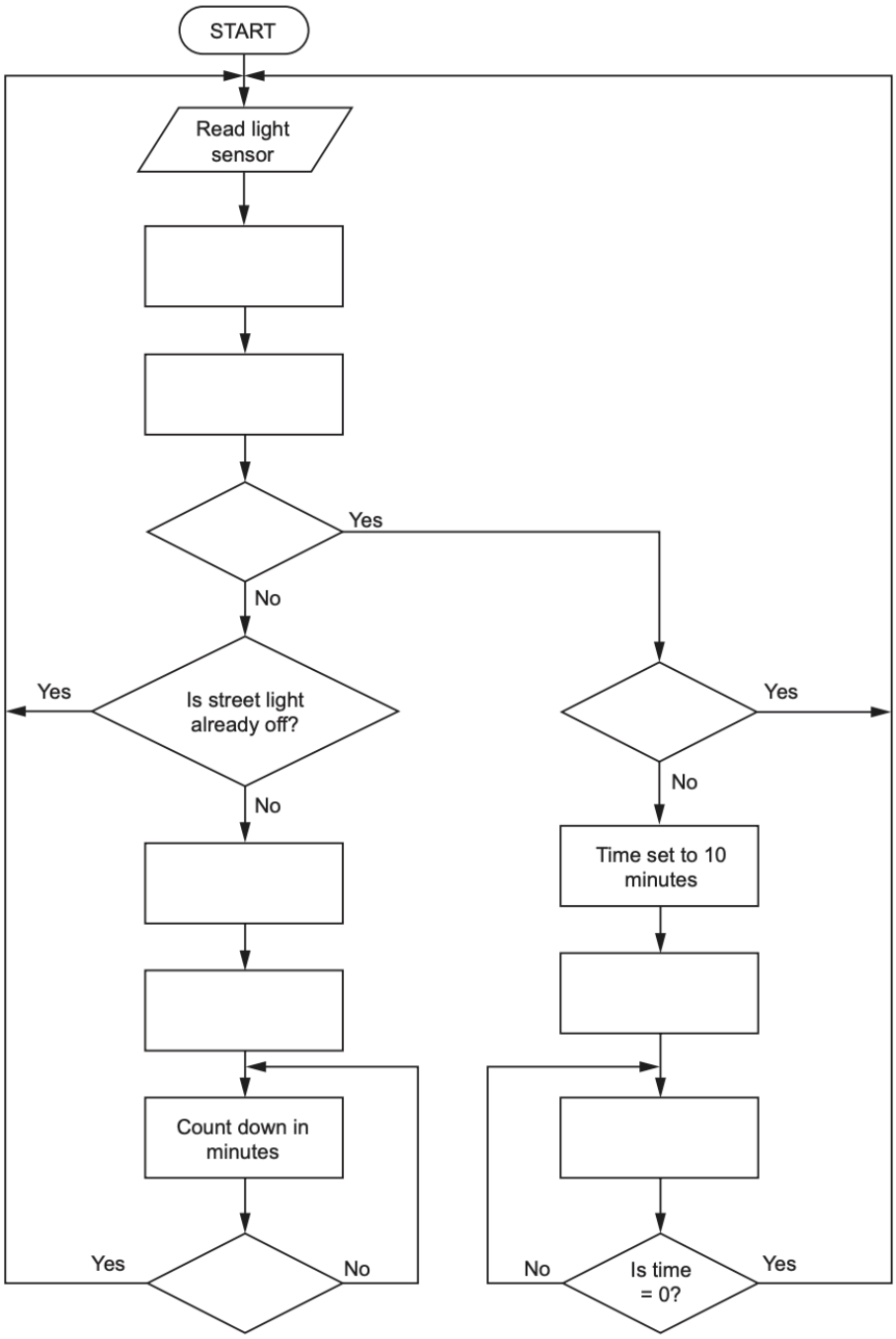
The flowchart on the opposite page shows how a light sensor and microprocessor are used to switch a street lamp on or off. When the sensor reading is <= 50 light units, the lamp is turned on automatically.

Several of the instructions have been omitted from the flowchart.

Using **item numbers only** from the list below, complete the flowchart:

Item number	Instruction
1	Count down in minutes
2	Is light reading <= 50?
3	Is street lamp already on?
4	Is time = 0?
5	The microprocessor compares the sensor reading with stored values
6	The sensor reading is sent to the microprocessor
7	Switch the street lamp off
8	Switch street lamp on
9	Time set to 10 minutes

[5]


START
Read light sensor
Yes
No
Yes
Is street light already off?
No
Count down in minutes
Yes
No
Yes
No
Time set to 10 minutes
No
Is time = 0?
Yes

2 Sensors and a microprocessor monitor a car exhaust for high temperature and high carbon monoxide (CO) levels.

Describe how the sensors and microprocessor are used to monitor the temperature and CO levels and warn the driver if either is out of range.

[5]

3

A temperature sensor is used in an automatic washing machine to help maintain the temperature of the water.

Outline the use of **one other** type of sensor used in an automatic washing machine.

[2]

4

A company is planning to transform its office building into a smart building. Among other things, a smart building can control the opening and closing of its doors.

(a) Outline **two** other operations that can be controlled by a smart building. [4]

Sensors, processors and output transducers are vital components of a smart building. They play an important role in the collection and management of data.

(b) Explain how a smart building can control the opening and closing of all its doors. You should refer to sensors, processors and output transducers. [4]