FOR OFFICIAL USE

N5 National Qualifications ADDITIONAL QP RESOURCE

Mark

X860/75/01 Practical Electronics

Duration — 1 hour

X86075 01

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day Month Year

Scottish candidate number

Total marks — 60

Attempt ALL questions.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.

X8607501 01

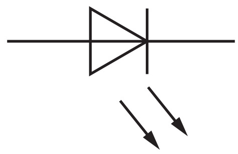
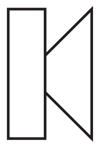
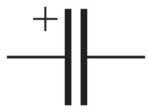
Total marks — 60

Attempt ALL questions

1. The table below gives information about some circuit components.

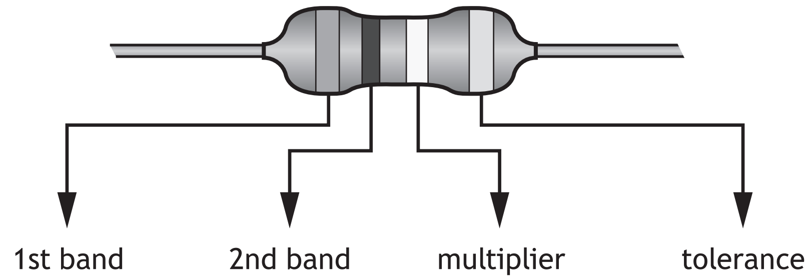
Some of the boxes have been left blank.

(a) Complete the table for the missing entries. **3**

Component name	Symbol	Function
Light emitting diode		Emits light indicating a current flow
Speaker		
		Stores charge
Variable resistor		A resistor whose resistance value can be adjusted

1. (continued)

(b) The diagram below shows the colour coding for a resistor.



Use the information in the data sheet to answer the question below.

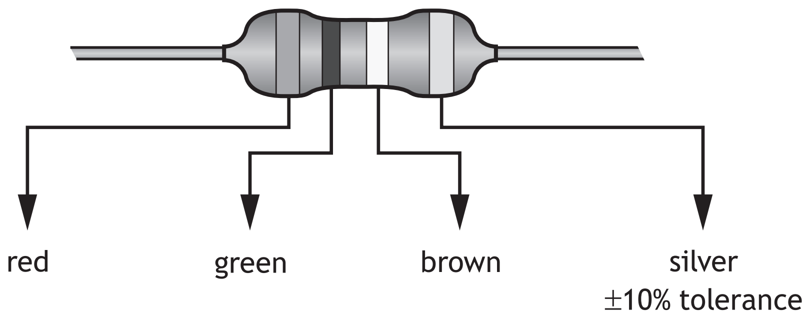
Determine the colour codes for a resistor of value 4K7 with a ±1% tolerance. **2**

	1st band	2nd band	Multiplier	Tolerance
Colour code				brown

[Turn over

1. (continued)

(c) The diagram below shows the colour coding for a second resistor.



Use the information in the data sheet to answer the questions below.

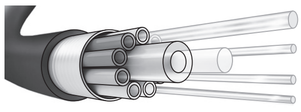
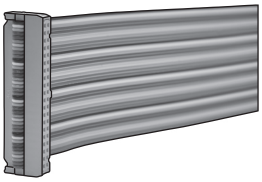
(i) Determine the resistance of the second resistor. **1**

Space for working and answer

(ii) Determine the minimum and maximum resistance of the second resistor. **2**

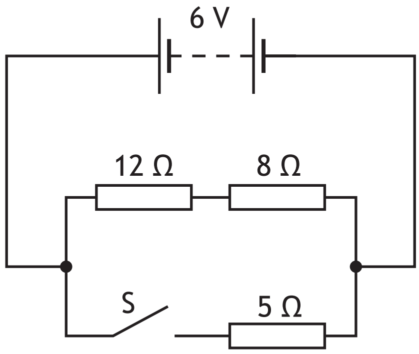
Space for working and answer

2. Complete the table below by stating a typical use for each cable type shown. **2**

	Cable type	Typical use
	fibre optic	
	ribbon cable	

[Turn over

3. A circuit diagram is shown below.



(a) Switch S is **open**.

(i) Calculate the total resistance of the circuit. **1**

Space for working and answer

(ii) Calculate the current in the circuit. **3**

Space for working and answer

3. (continued)

(b) Switch S is now **closed**.

(i) Calculate the total resistance of the circuit. **3**

Space for working and answer

(ii) State the voltage across the 5 Ω resistor. **1**

(iii) Calculate the power dissipated in the 5 Ω resistor. **3**

Space for working and answer

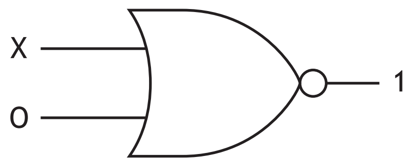
4. Logic gates are widely used in electronic circuits.

(a) Complete the truth table for a NAND gate. **1**

A	B	Output
0	0	
0	1	
1	0	
1	1	

(An additional truth table, if required, can be found on *page 22*)

(b) A logic gate is shown below.

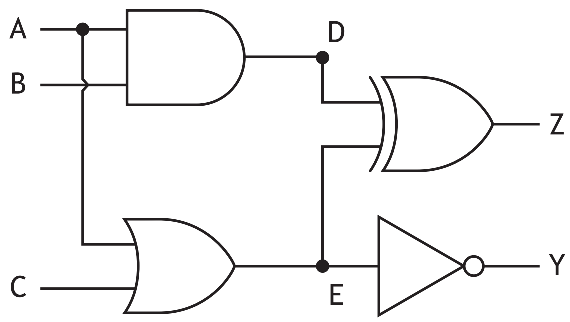


Determine the logic state at X that would produce the output shown. **1**

4. (continued)

(c) Many electronic devices use a combination of interconnected logic gates.

Complete the truth table for the logic circuit shown below. **4**



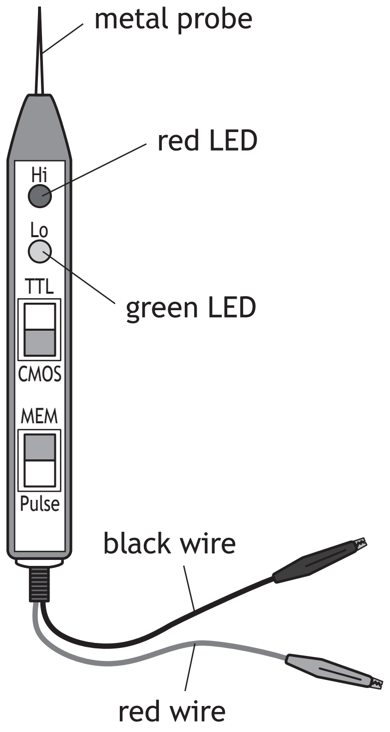
A	B	C	D	E	Y	Z
0	0	0				
0	0	1				
0	1	0				
0	1	1				
1	0	0				
1	0	1				
1	1	0				
1	1	1				

(An additional truth table, if required, can be found on *page 22*)

[Turn over

5. A logic probe is used to test the inputs and outputs of a 7400 series logic chip.

The logic probe is set to TTL and pulse.



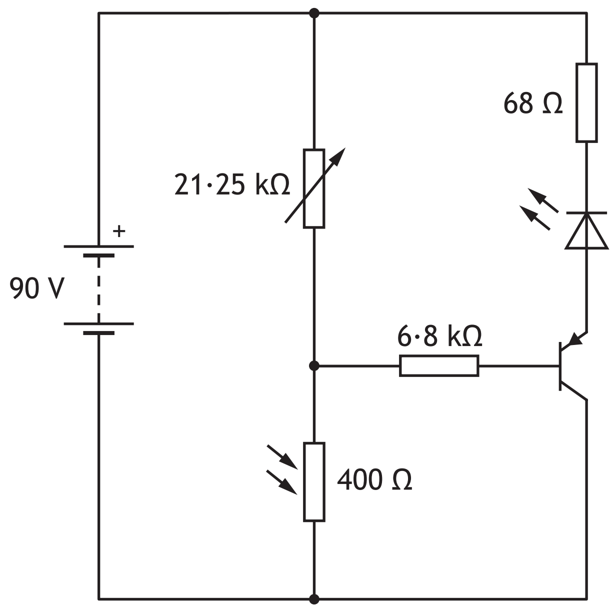
(a) State where the red and black wires should be connected. **1**

(b) Describe how a logic **0** would be detected. **2**

6. A student produces a simulation of a circuit that will turn on a LED when it gets dark.

However, the simulation does not work as specified.

Identify four errors in the simulation below. **4**



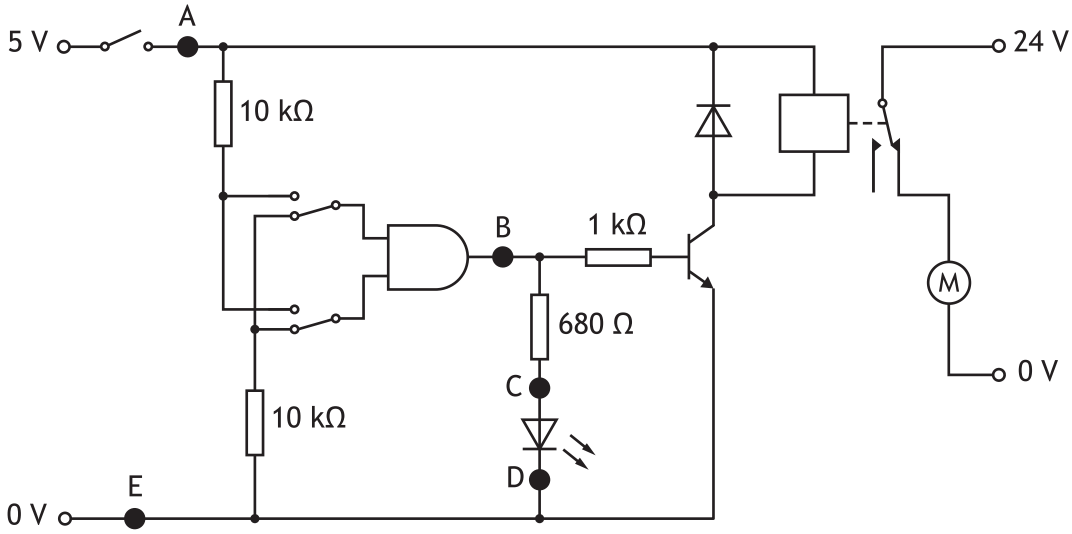
Error 1:

Error 2:

Error 3:

Error 4:

7. The circuit diagram below has test points A, B, C, D and E as shown.



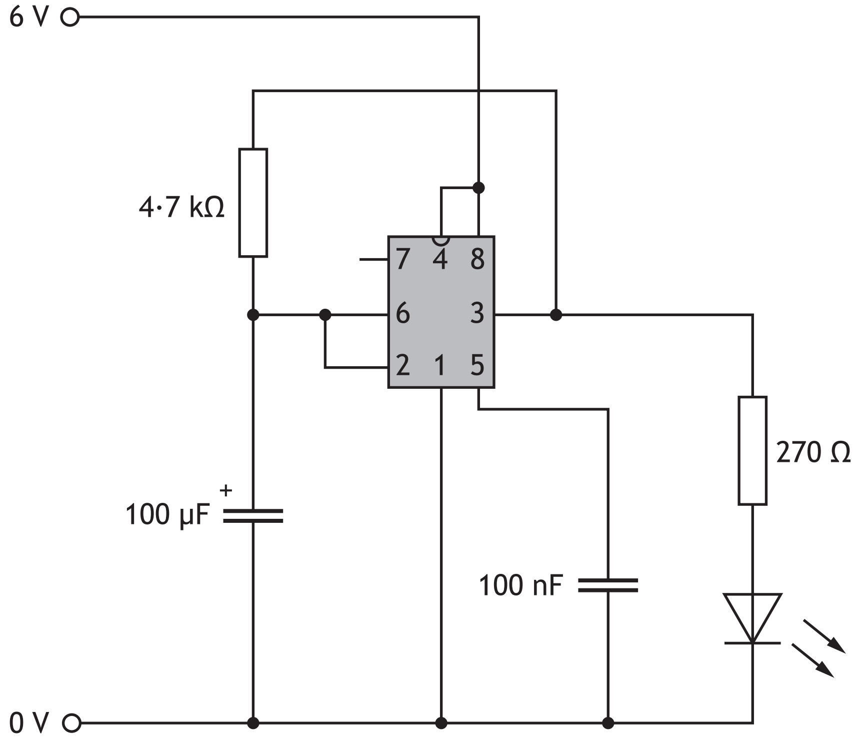
Complete the table below stating what the test points measure and the instrument used to carry out each test. **2**

Test points	Measuring	Instrument
A and E	supply voltage	multimeter voltage setting
B		
C and D		

[Turn over for next question

DO NOT WRITE ON THIS PAGE

8. A student builds the circuit shown below.



Using the information from the two suppliers catalogues shown on the opposite page, complete the costings sheet below to produce the **lowest** cost for the circuit. **5**

Supplier	Component	Product code	Cost (p)
JIMSON	NE555	TC124	20
SWIFT	8 way DIL socket	SK-0080	10
	LED 5 mm std		
	100 μF electrolytic capacitor		
	100 nF capacitor		
	270R		
	4K7		

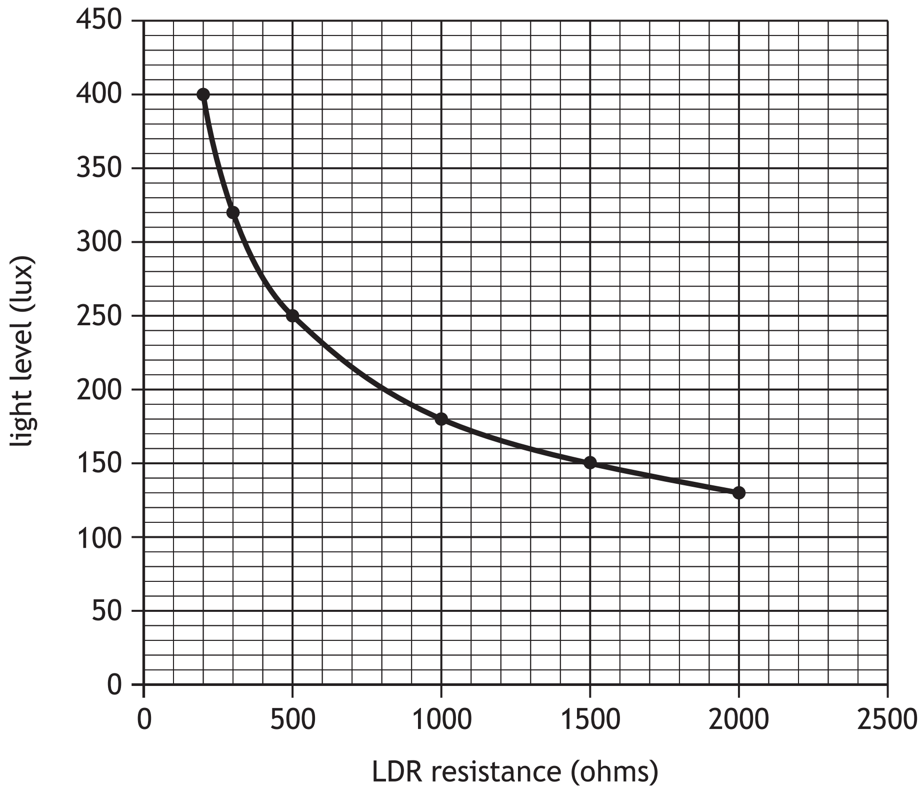
(An additional costings sheet, if required, can be found on *page 23*)

8. (continued)

Supplier	SWIFT			
	Component	**Description**	**Product code**	**Cost**
Integrated circuits	LM555CM	timers	IC-0283	45p
	NE555	timers	IC-0254	32p
	NE556	timers	IC-0216	25p
	8 way dil	ic socket	SK-0080	10p
Semi-conductors	LED	5 mm std red	SC-0155	4p
	LED	10 mm std red	SC-0177	10p
Capacitors	10 nF	16 V	CP-2020	30p
	100 nF	16 V	CP-2030	35p
	100 nF	5 V	CP-2040	40p
Electrolytic capacitors	10 μF	16 V	CP-0555	10p
	100 μF	16 V	CP-0566	18p
	100 μF	5 V	CP-0599	8p
Resistors	270R	0·25 W carbon film 5%	EC-0161	0·5p
	4K7	0·25 W carbon film 5%	EC-0175	0·5p
	47K	0·25 W carbon film 5%	EC-0182	1·5p
Supplier	**JIMSON**			
	Component	**Description**	**Product code**	**Cost**
Integrated circuits	LM555CM	timers	TC 123	90p
	NE555	timers	TC 124	20p
	NE556	timers	TC 125	80p
	8 way dil	ic socket	SK 099	50p
Semi-conductors	LED	5 mm std red	LD345	12p
	LED	10 mm std red	LD346	20p
Capacitors	10 nF	16 V	CP 120	12p
	100 nF	16 V	CP 135	45p
	100 nF	5 V	CP 140	25p
Electrolytic capacitors	10 μF	16 V	EC 799	14p
	100 μF	16 V	EC 800	10p
	100 μF	5 V	EC 801	8p
Resistors	270R	0·25 W carbon film 5%	FR 922	0·25p
	4K7	0·25 W carbon film 5%	FR 923	0·25p
	47K	0·25 W carbon film 5%	FR 924	2p

9. A technician needs to work in a well lit room. For safety reasons when the light level decreases to 250 lux an alarm sounds.

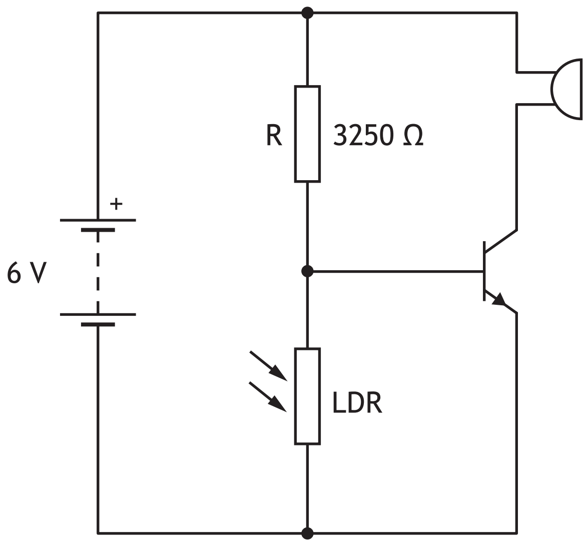
The alarm circuit uses a light dependent resistor as a sensor. The graph below shows how the resistance of the LDR varies with changing light levels.



(a) State the resistance of the LDR when the alarm sounds. **1**

9. (continued)

(b) The alarm circuit is shown below.



Calculate the voltage across the LDR when the alarm (buzzer) sounds. **3**

Space for working and answer

(c) Describe how this circuit works. **3**

10. A zoo uses an incubator to keep eggs warm.

A safety system for the incubator requires an electric heater to turn on when the temperature in the incubator becomes too cold.

When the heater is turned on during daylight hours an alarm should sound.

Selecting from the elements given below, draw a **block diagram** of an electronic solution for this system.

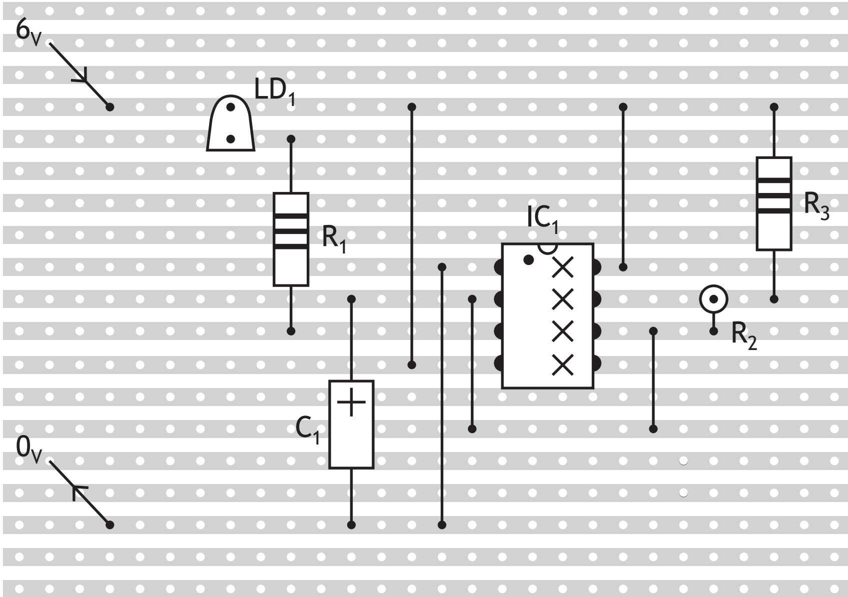
On your diagram, clearly indicate the input, process and output sections of your solution. **6**

light sensor (logic 1 for light)	motion sensor (logic 1 for motion)	temperature sensor (logic 1 for hot)	buzzer	XOR gate	AND gate
			heating element	NOT gate	lamp

[Turn over for next question

DO NOT WRITE ON THIS PAGE

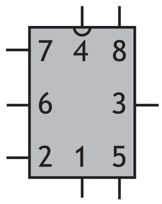
11. The stripboard plan shows a **component (top) view** of a circuit with the following layout.



Note R_2 vertically mounted.

Component data

Circuit symbol for IC_1



IC_1 — NE555

LD_1 — 5 mm standard led (red)

R_1 — carbon film 330 R 0·25 w

R_2 and R_3 — carbon film 10 K 0·25 w

C_1 — 100 µF 16 V **electrolytic** capacitor

Draw a circuit diagram for this circuit.

Each component must be labelled. **6**

DO NOT WRITE IN THIS MARGIN

11. (continued)

[END OF QUESTION PAPER]

* X 8 6 0 7 5 0 1 2 1 *

ADDITIONAL SPACE FOR ANSWERS

Additional truth table for question 4 (a)

A	B	Output
0	0	
0	1	
1	0	
1	1	

Additional truth table for question 4 (c)

A	B	C	D	E	Y	Z
0	0	0				
0	0	1				
0	1	0				
0	1	1				
1	0	0				
1	0	1				
1	1	0				
1	1	1				

ADDITIONAL SPACE FOR ANSWERS

Additional costings sheet for question 8

Supplier	Component	Product code	Cost (p)
JIMSON	NE555	TC124	20
SWIFT	8 way DIL socket	SK-0080	10
	LED 5 mm std		
	100 µF electrolytic capacitor		
	100 nF capacitor		
	270R		
	4K7		

ADDITIONAL SPACE FOR ANSWERS

MARKS DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS

X860750125

[BLANK PAGE]

DO NOT WRITE ON THIS PAGE

[BLANK PAGE]

DO NOT WRITE ON THIS PAGE

[BLANK PAGE]

DO NOT WRITE ON THIS PAGE

Acknowledgement of copyright
Question 2 Panyawatt/shutterstock.com
Question 2 alphaspirit/shutterstock.com