General Certificate of Secondary Education

Electronics

Unit 1

Written Paper

Specimen Mark Scheme

Question 1

1 (a) Any five dangers from:
working alone
working on mains powered circuit
circuit live/plugged in
no earth
capacitor charged across mains incorrectly polarised
water near mains supply
soldering iron danger ✓✓✓✓✓ (5 max)

(5 marks)

1 (b) shock related effect✓
burn related effect✓

(2 marks)

1 (c) remove victim from mains✓ put in recovery position✓ resuscitation✓
get help✓ (max 3)

(3 marks)

Total Mark: 10

Question 2

2 (a) (i) temperature sensor✓

(1 mark)

2 (a) (ii) heater✓

(1 mark)

2 (a) (iii) comparator✓

(1 mark)

2 (b) (i) comparator✓

(1 mark)

2 (b) (ii) temperature sensor✓

(1 mark)

2 (c) transistor switch✓ electromagnetic relay✓ (any order)

(2 marks)

2 (d) comparator output goes high (or changes) ✓
transistor switches relay ✓
relay switches on✓
heater switches on✓
(max 3)

(3 marks)

Total Mark: 10

Question 3

3 (a) OR✓
AND✓
NAND✓

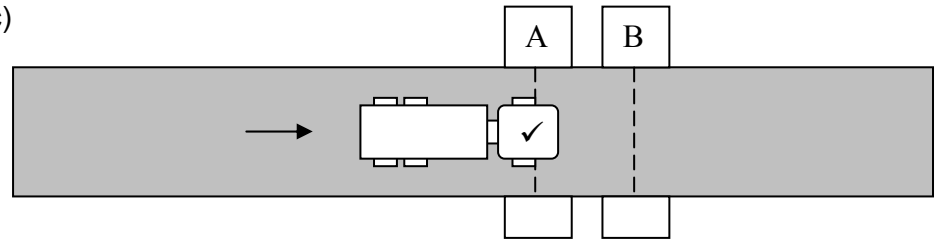
(3 marks)

3 (b)

A	B	C	D	Q
0	0	**0**	**1**	0
0	1	**1** ✓	**1** ✓	1 ✓
1	0	**1**	**1**	**1**
1	1	**1**	**0**	**0**
		✓	✓	✓

(6 marks)

3 (c)



(1 mark)

Total Mark: 10

Question 4

4 (a) capacitor✓
470 microfarads✓
16V✓
polarity✓

(4 marks)

4 (b) resistor✓
47✓000✓Ω✓
5%✓
to limit current✓

(*6 marks*)

Total Mark: 10

Question 5

5 (a) 7 V ✓

(1 mark)

5 (b) R = V/I = 7/0.2✓ = 350✓Ω✓ (2 max)

(2 marks)

5 (c) 360 Ω✓

(1 mark)

5 (d) orange ✓ blue✓ brown✓ gold✓

(4 marks)

Total Mark: 8

Question 6

6 (a) CD player in correct position ✓, Tuner in correct position✓,
Amplifier in correct position✓, speakers in correct position✓

(*4 marks*)

6 (b) (i) tuned circuit✓ selects✓ (one) frequency✓

(3 marks)

6 (b) (ii) demodulator✓ separates✓ the signal from the carrier wave✓

(*3 marks*)

6 (c) can distinguish signals✓ which have frequencies close to each other✓

(*2 marks*)

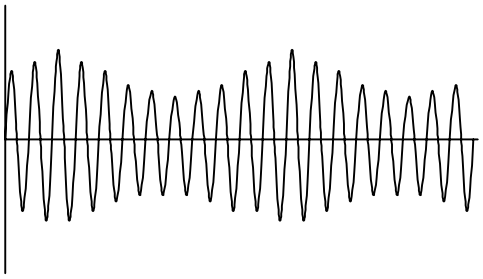
6 (d) (i) frequency modulation✓

(1 mark)

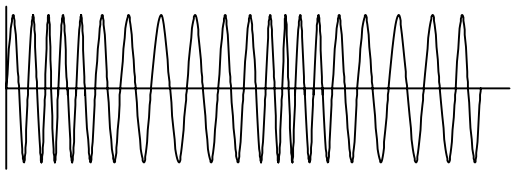
6 (d) (ii) amplitude modulation✓

(*1 mark*)

6 (e)



correct shape✓ approx. in phase with audio✓



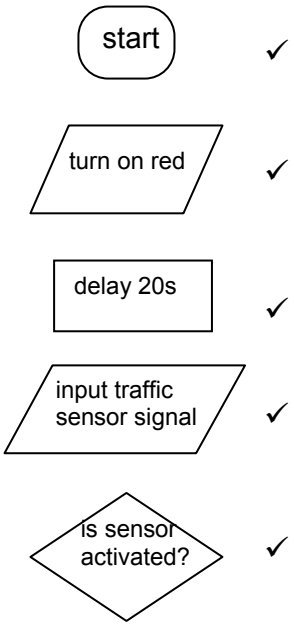
correct shape✓ approx. in phase with audio✓

(*4 marks*)

Total Mark: 18

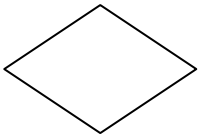
Question 7

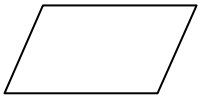
7 (a)



✓
✓
✓
✓
✓

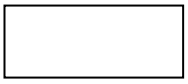
(5 marks)

7 (b) decision box  ✓

input box  ✓

a loop any line that returns to a point earlier in the flow chart✓

output box  ✓

process box  ✓

(5 marks)

7 (c) (i) 23s✓

(1 mark)

7 (c) (ii) green on for 10s longer✓

(1 mark)

7 (c) (iii) 2✓

(1 mark)

7 (c) (iv) 6s✓

(1 mark)

7 (c) (v) 56s✓

(1 mark)

7 (d)

The marking scheme for this part of the question includes an assessment of the Quality of Written Communication (QWC). There are no discrete marks for the assessment of written communication but QWC will be one of the criteria used to assign the answer to an appropriate level below.

Level	Marks	Descriptor an answer will be expected to meet most of the criteria in the level descriptor
3	4-5	- answer is full and detailed and is supported by an appropriate range of relevant points such as those given below - argument is well structured with minimal repetition or irrelevant points - accurate and clear expression of ideas with only minor errors in the use of technical terms, spelling, punctuation and grammar
2	2-3	- answer has some omissions but is generally supported by some of the relevant points below - the argument shows some attempt at structure - the ideas are expressed with reasonable clarity but with a few errors in the use of technical terms spelling, punctuation and grammar
1	0-1	- answer is largely incomplete, it may contain some valid points which are not clearly linked to an argument structure - unstructured answer - errors in the use of technical terms, spelling, punctuation and grammar or lack of fluency
		An example of the type of answer that may be produced would be: The traffic sensor signal is read and not activated leading to the short delay of 20s before the green light is switched off and the amber light is switched on. There is then a delay of 3s before the amber light is switched off and the red light is switched on. After a further 20s delay the amber light is switched on again for 3s before both amber and red lights are switched off when the green light is switched on again and cycle is repeated.

(5 marks)

Question 8

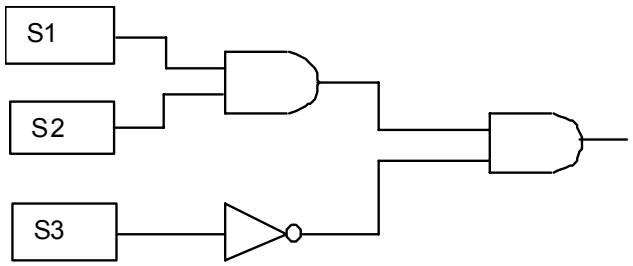
8 (a) (i) A can cannot break the beam to S1 without also breaking beam to S2 and S3✓

(1 mark)

8 (a) (ii)

	1	1	1	0
	1	1	0	1
	1	0	0	0
	0	0	0	1
	✓	✓	✓	✓

(4 marks)



8 (a) (iii) S1 to AND gate✓
S2 to same AND gate✓
S3 to NOT gate ✓
Both outputs to another AND gate✓

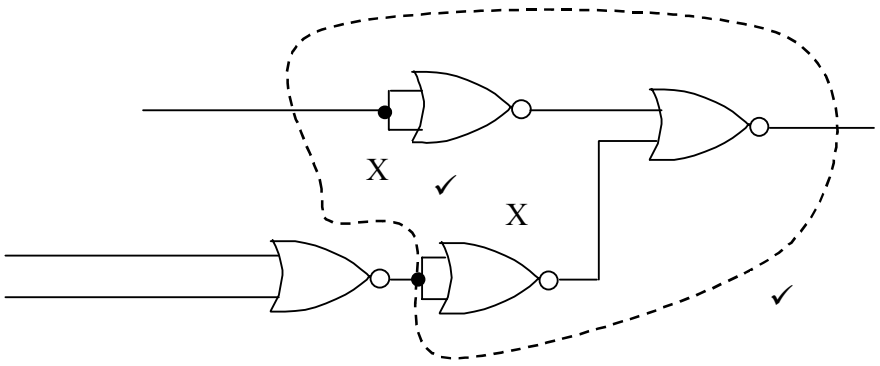
(4 marks)

8 (b) (i)

		1	1	0
		1	0	0
		0	1	0
		0	0	1
		✓	✓	✓

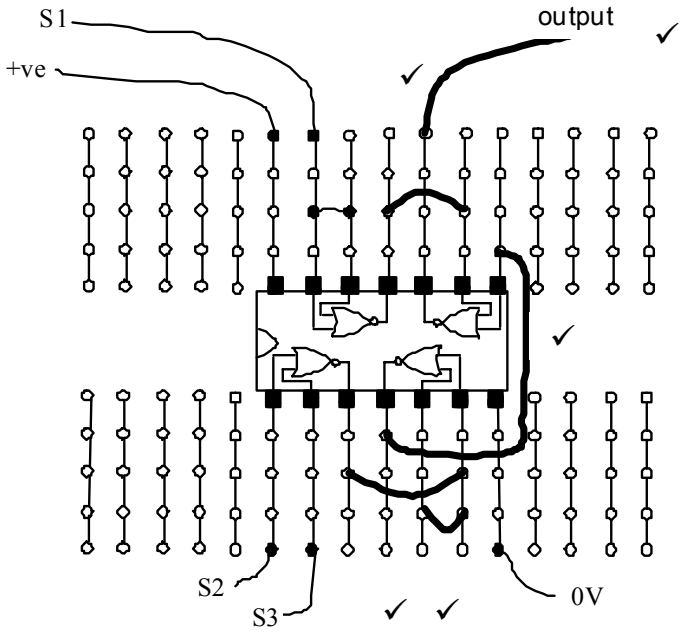
(3 marks)

8 (b) (ii)



(2 marks)

8 (b) (iii)



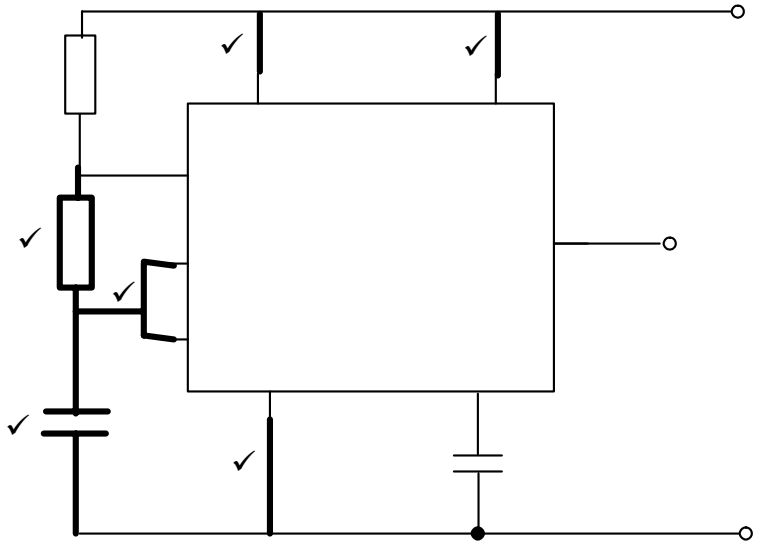
or equivalent

(5 marks)

Total Mark: 19

Question 9

9 (a)

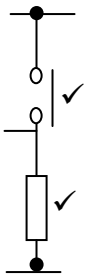


(6 marks)

9 (b) $T = (R_1 + 2R_2)C/1.44$✓ = 31✓ s✓

(3 marks)

9 (c) (i)

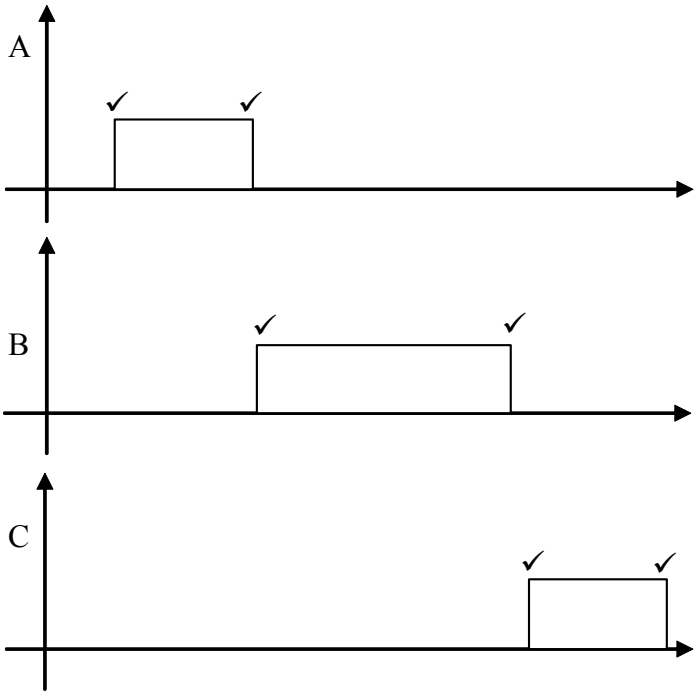


(2 marks)

9 (c) (ii) pull down resistor✓,to hold the voltage low✓ when the switch is not pressed✓ (2 max)

(2 marks)

9 (d) (i)



(6 marks)

9 (d) (ii) heater comes on (for half minute)✓
then stirrer comes on (for one minute)✓
pump comes on (for half minute)✓

(3 marks)

Total Mark: 22

Question 10

10 (a)

The marking scheme for this part of the question includes an assessment of the Quality of Written Communication (QWC). There are no discrete marks for the assessment of written communication but QWC will be one of the criteria used to assign the answer to an appropriate level below.

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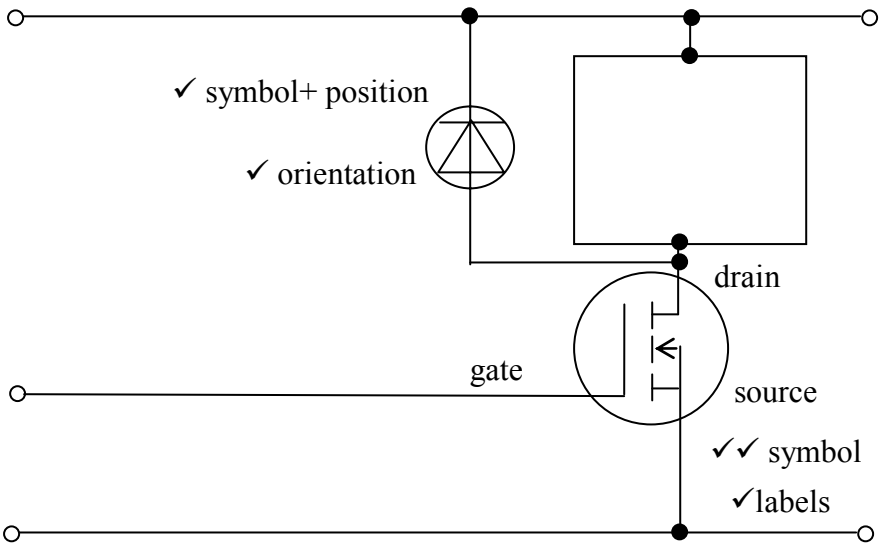
1	0-1	- answer is largely incomplete, it may contain some valid points which are not clearly linked to an argument structure - unstructured answer - errors in the use of technical terms, spelling, punctuation and grammar or lack of fluency
		An example of the type of answer that may be produced would be: The sensor S_2 gives a high output which causes output Q from the flip-flop to go high. The electrically operated valve opens and water flows into the tank until the sensor S_1 is covered. (The output of sensor S_2 becomes low but this does not affect the output of the flip-flop.) The sensor S_1 gives a high output which resets the flip-flop, meaning that its output Q is low, so the electrically operated valve stops the flow of water.

(5 marks)

10 (b) (i) & (ii)



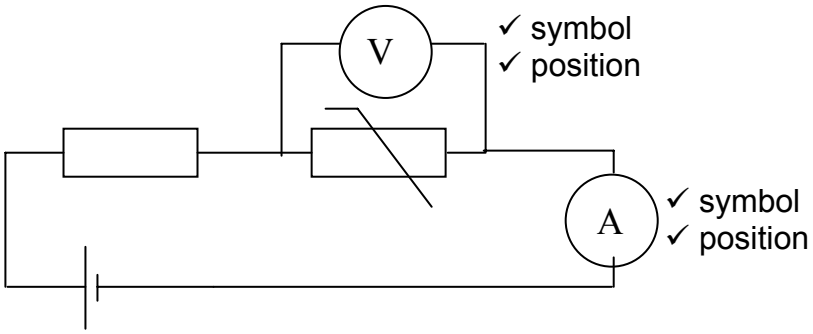
(5 marks)

10 (b) (iii) to protect the MOSFET ✓
from high voltages ✓
(induced) when the motor is switched off ✓ (Max 2)

✓ QWC
✓ - correct use of spelling, punctuation and grammar, prose is logical and coherent

(3 marks)

10 (c)



(4 marks)

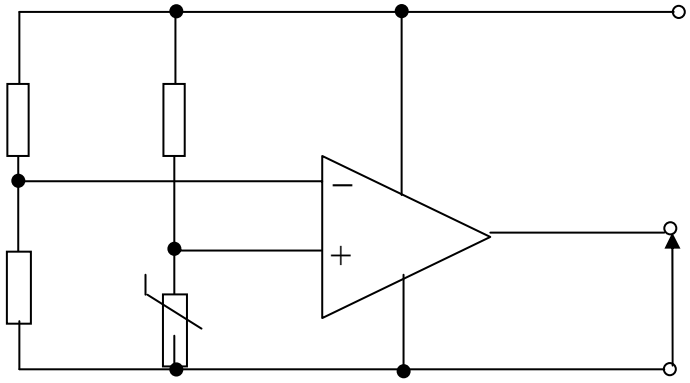
10 (d) 0.0005 A✓

(1 mark)

10 (e) R = V/I = 0.4/.0005 ✓ = 800✓ Ω✓ (2 max)

(2 marks)

10 (f)



potential divider to non-inverting input✓
thermistor in correct position ✓

(2 marks)

10 (g) 1600Ω✓✓

(2 marks)

Total Mark: 23

Paper Total: 150