

Digital electronics (extended candidates)

Question Paper 2

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Electricity and Magnetism
Sub-Topic	Digital electronics (extended candidates)
Paper Type	(Extended) Theory Paper
Booklet	Question Paper 2

Time Allowed: 42 minutes

Score: /35

Percentage: /100

- 1 A student is designing a digital electronics circuit and needs to use the logic gate X shown in Fig. 10.1.

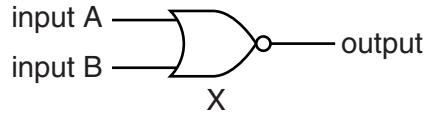


Fig. 10.1

(a) Name the logic gate X. [1]

(b) Write down the values of the output when the inputs are

(i) input A low (logic 0), input B low (logic 0), output

(ii) input A low (logic 0), input B high (logic 1), output

(iii) input A high (logic 1), input B low (logic 0), output

(iv) input A high (logic 1), input B high (logic 1). output

[2]

(c) When the student starts to build the circuit, he finds that the store room has run out of this type of logic gate. There is a supply of AND, OR and NOT gates. The student's teacher explains that a combination of two of these gates may be used instead of logic gate X.

(i) State the two gates he should use to replace logic gate X.

..... and

(ii) Draw clearly in the space below these two logic gates, correctly connected, using standard symbols.

(d) Fig. 10.2 shows a block diagram, not using standard symbols, of a combination of gates.

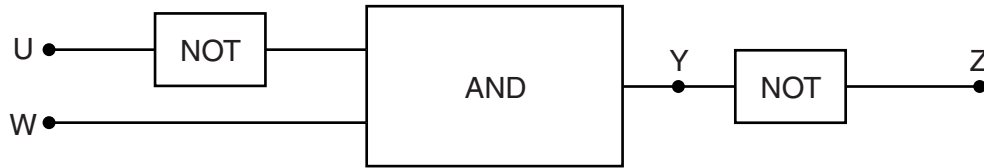


Fig. 10.2

State the logic levels of points Y and Z when the logic levels of points U and W are both 1.

logic level at point Y

logic level at point Z

[2]

[Total: 8]

- 2 A student carries out an experiment with the circuit shown in Fig. 11.1. The component in the dashed box labelled X is a diode.

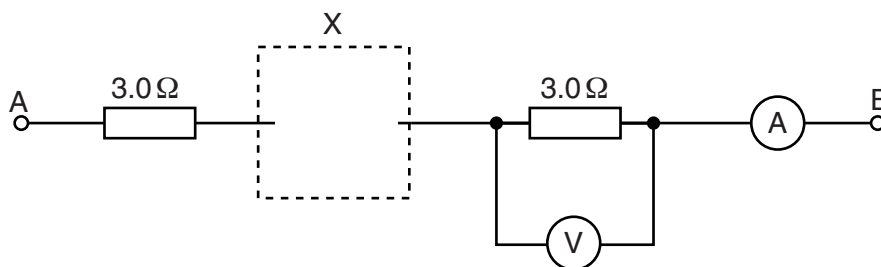


Fig. 11.1

- (a) On Fig. 11.1, draw the correct symbol for a diode, connected either way round, in the dashed box labelled X. [1]

- (b) (i) +6.0V is applied to point A, 0V to point B.

State what the student observes on the ammeter.

.....

- (ii) –6.0V is applied to point A, 0V to point B.

State what the student observes on the ammeter.

.....

[2]

- (c) The voltage shown in Fig. 11.2 is applied to the point A of the circuit in Fig. 11.1. Point B is kept at 0V.

On Fig. 11.2, draw a graph of the readings indicated by the voltmeter.

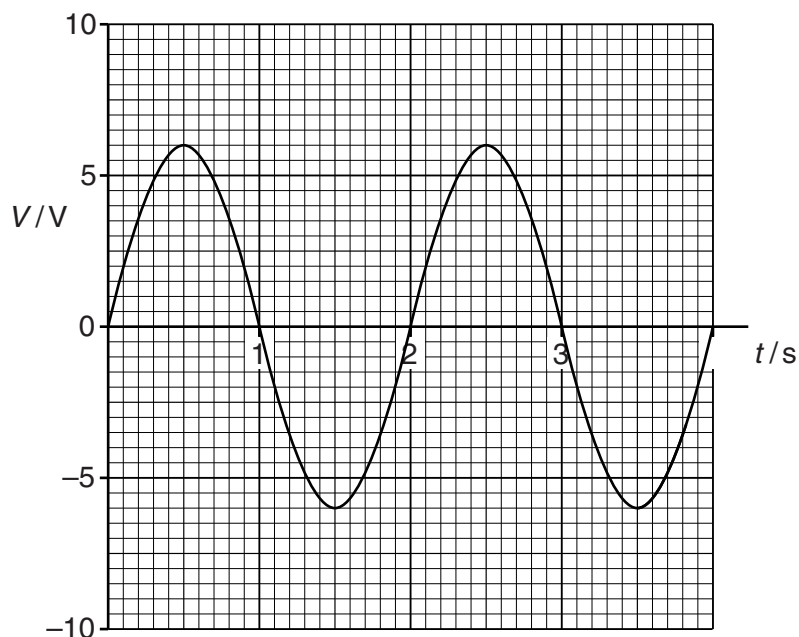


Fig. 11.2

[2]

- (d) The circuit shown in Fig. 11.3 contains two switches S_1 and S_2 and two indicator lamps L_1 and L_2 .

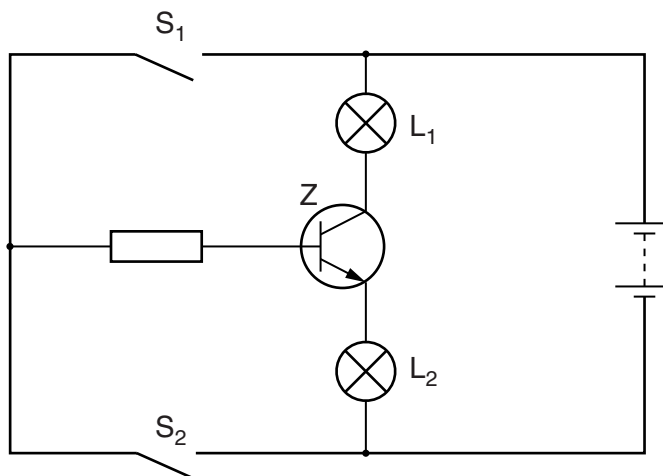


Fig. 11.3

- (i) Name component Z. [1]
- (ii) Complete the table to state whether the lamps are on or off with the switches in the positions stated.

switch S_1	switch S_2	lamp L_1	lamp L_2
open	closed		
closed	open		

[2]

[Total: 8]

3 (a) In the space below, draw the symbol for an OR gate.

[1]

(b) Describe the action of an OR gate in terms of its inputs and outputs.

.....
.....
.....
.....
.....[2]

(c) A car manufacturer wishes to install an alarm system in a 2-door car to inform the driver if either door is not properly closed. An OR gate is to be used in the construction of this system. Describe suitable input and output arrangements for the gate.

.....
.....
.....
.....
.....[3]

[Total: 6]

- 4 (a) In Fig. 10.1, A is a 1000Ω resistor, C is a transistor, and D is a lamp. S is a 9V supply.

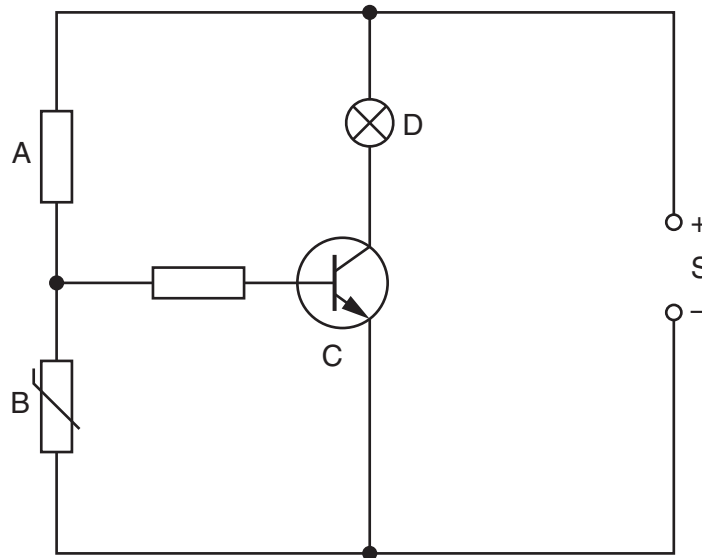


Fig. 10.1

- (i) Name the component labelled B.

.....[1]

- (ii) At 20°C the resistance of B is 800Ω .
At 100°C the resistance of B is 25Ω .

In terms of the p.d. across B, explain what happens in the circuit as the temperature varies from 20°C to 100°C .

.....

[4]

- (b) Suggest a practical use for this circuit.

.....
[1]

- 5 The circuit shown in Fig. 10.1 was designed by an electronics student to provide a warning, by sounding the buzzer, that there is light in a photographic darkroom at times when it is in use.

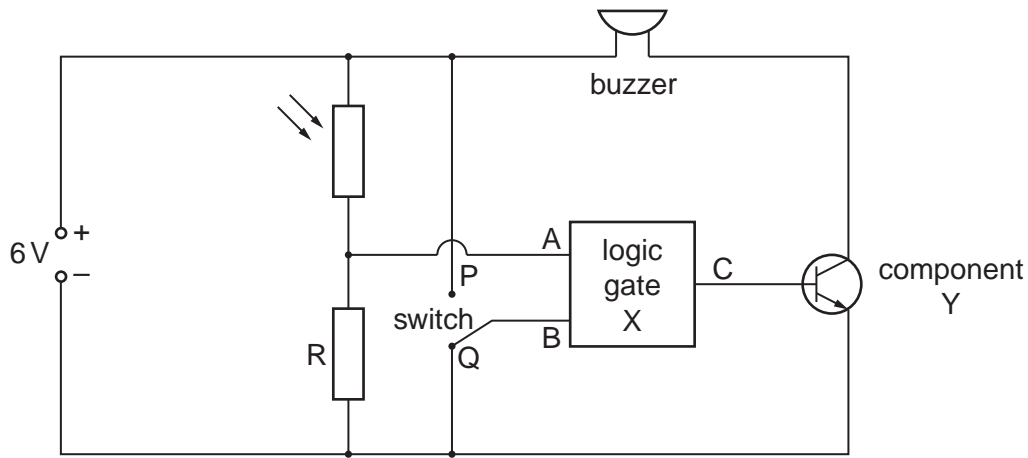


Fig. 10.1

When the darkroom is in use the switch is moved to position P. When it is not in use, the switch is in position Q.

Depending upon the light level, the resistance of the light dependent resistor varies between much higher and much lower than the resistance of resistor R.

- (a) State what happens to the resistance of the light dependent resistor when the light level changes from dark to light.

.....
 [1]

- (b) Write down whether the voltage level is high (logic 1) or low (logic 0) at the various points in the circuit in the following situations:

(i) at A light in the darkroom,
 dark in the darkroom,

(ii) at B switch in position P,
 switch in position Q. [2]

- (c) The output C of logic gate X is only high (logic 1) when both inputs A and B are high (logic 1). State which type of gate is logic gate X.

..... [1]

- (d) State the name of component Y.

..... [1]

- (e) Explain whether or not the student’s circuit achieves the aim of providing a warning that there is light in the darkroom when it is in use.

.....
.....
.....
..... [2]

[Total: 7]