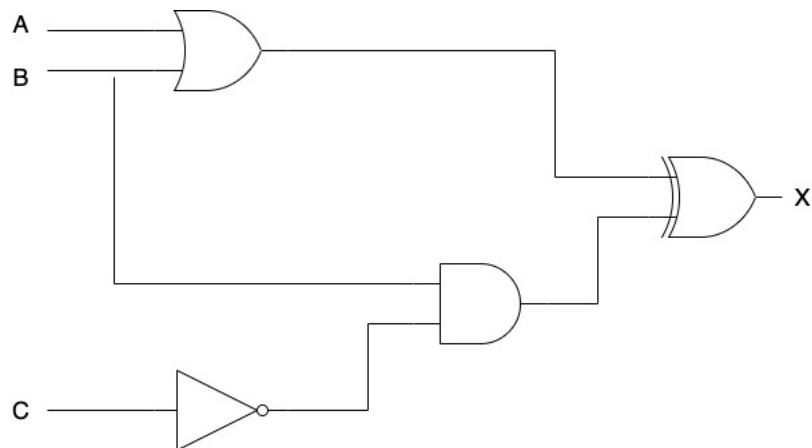


- 1 Complete the truth table for the following logic circuit

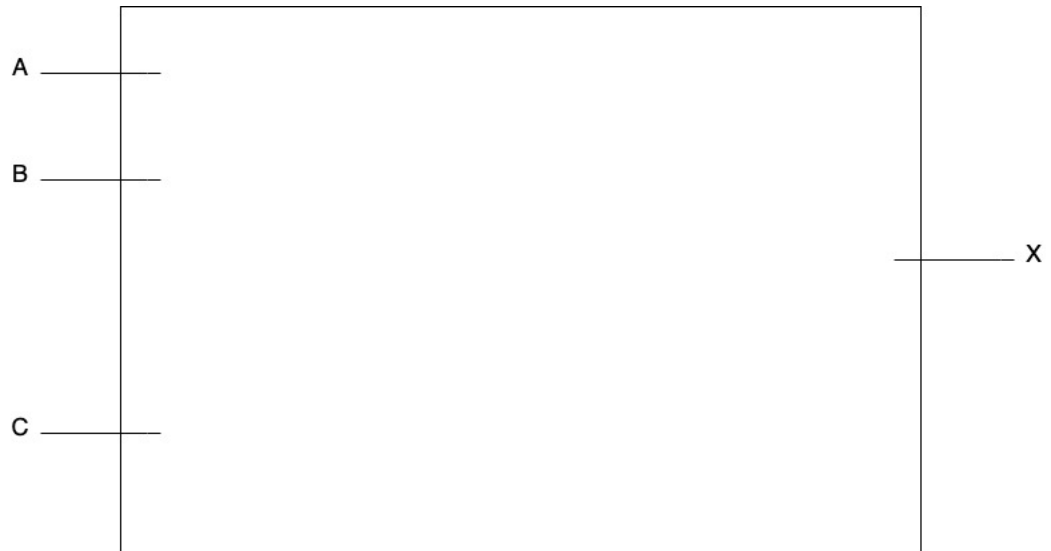


A	B	C	Working area	x
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

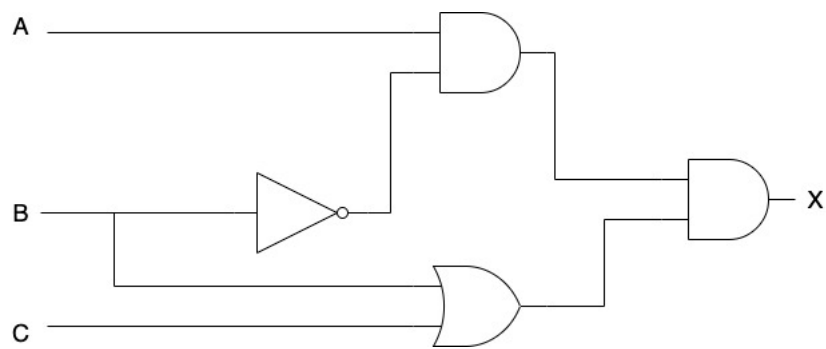
- 2 a Write the following statement as a logic statement

X is 1 if A and B are on or if B is off and C is on

- b Draw the logic circuit to represent your statement in part a.

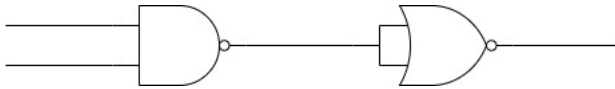


3 a Write down the logic statement to represent the following logic circuit



A	B	C	Working area	x
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

b what single logic gate could replace the following logic circuit



4 A chemical process is monitored using a logic circuit. There are three inputs to the logic circuit representing the parameters being monitored in the chemical process. An alarm, X, will give an output value of 1 depending on certain conditions.

The following table describes the process conditions being monitored:

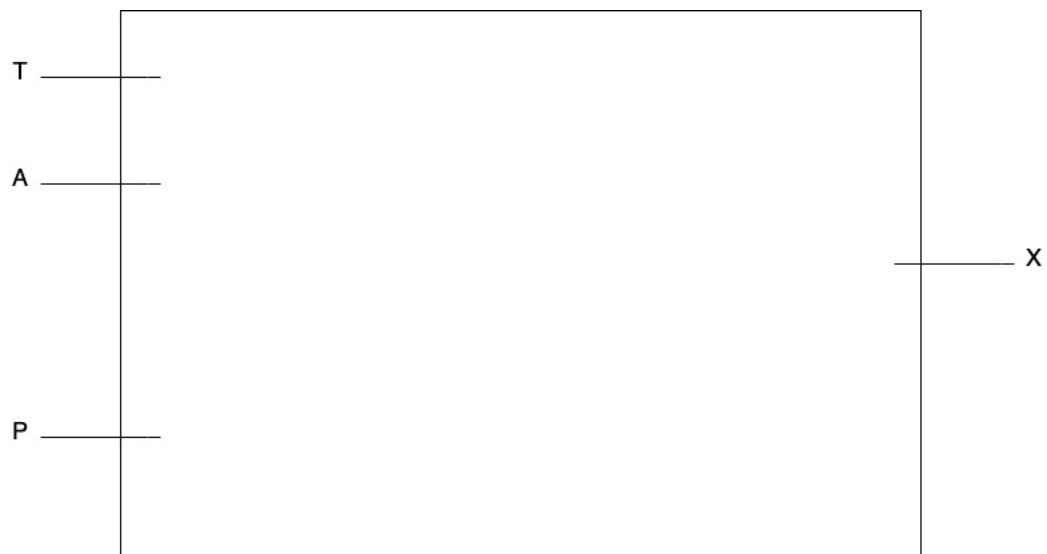
Parameter description	Parameter	Binary value	Description of condition
Reaction temperature	T	0	Temperature > 120°C
		1	Temperature ≤ 120°C
Pressure of CO gas evolved	P	0	Pressure > 2 bars
		1	Pressure ≤ 2 bars
Acid concentration	A	0	Acid concentration > 4 moles
		1	Acid concentration ≤ 4 moles

An alarm, X, will generate the value 1 if:

- either temperature > 120°C and acid concentration ≤ 4 moles
- or temperature ≤ 120°C and gas pressure ≤ 2 bars
- or acid concentration > 4 moles and gas pressure ≤ 2 bars

a Write the logic statement to represent this system

b Draw the logic circuit to represent this system.



c Complete the truth table to represent this system

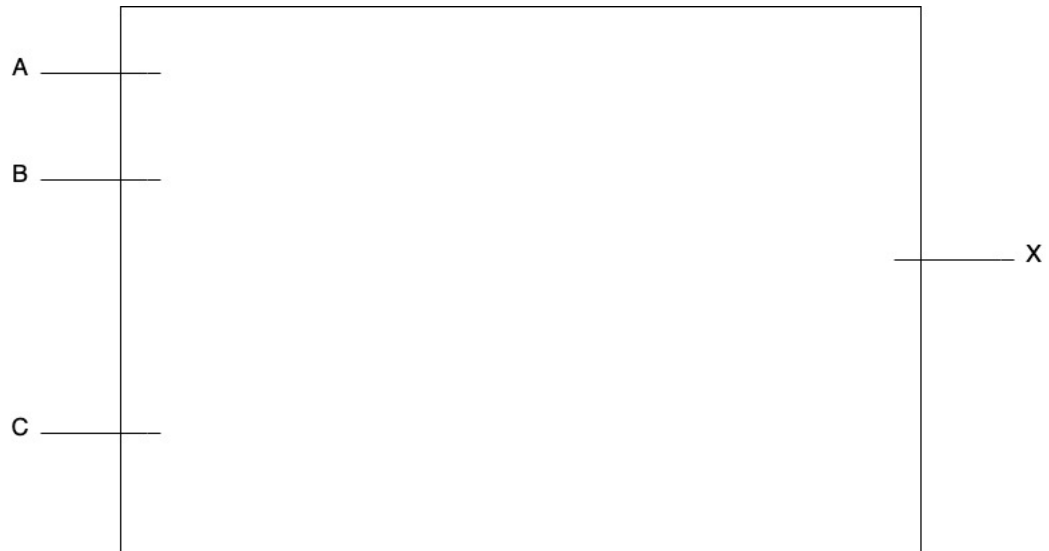
T	A	P	Working area	x
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

5 Consider the logic statement:

$$X = (((A \text{ NAND } B) \text{ NOR } (B \text{ AND } C)) \text{ OR } C)$$

a Draw a logic circuit to match the given logic statement

All logic gates must have a maximum of two inputs. Do not attempt to simplify the logic statement



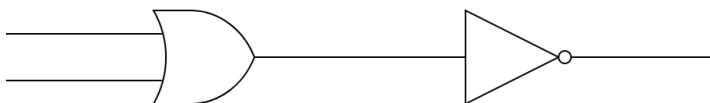
b Complete the truth table for the given logic statement

A	B	C	Working area	x
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

6 a identify the name and draw the single logic gate that can replace the given logic circuits.



Name of gate : _____ Drawing of gate:



b complete the truth table for the given logic statement:

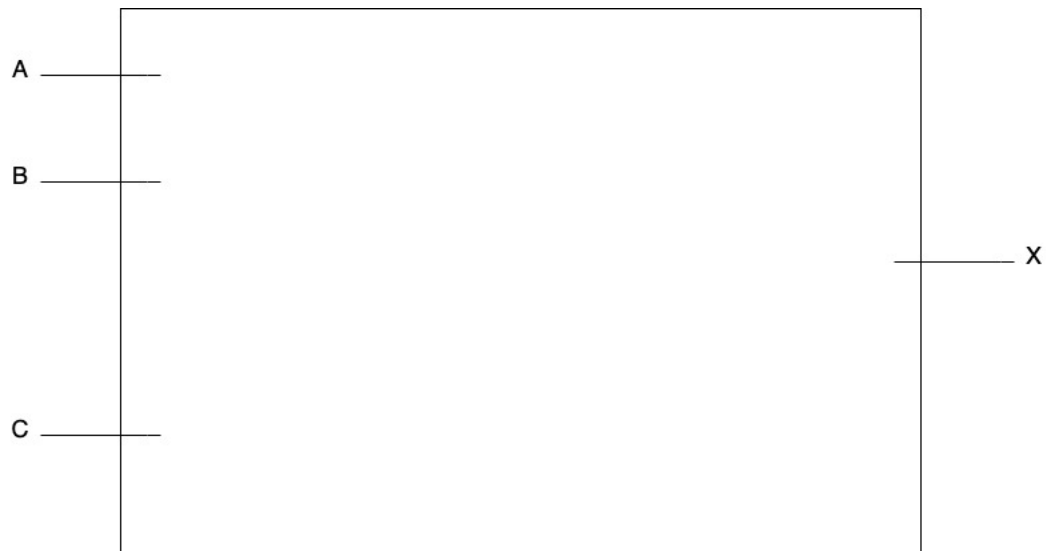
$$X = (((A \text{ OR } C) \text{ AND } (\text{NOT } A \text{ AND } \text{NOT } C)) \text{ XOR } B)$$

A	B	C	Working area	x
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

7 Consider the logic statement:

$X = 1$ if $((A \text{ is } 1 \text{ NOR } C \text{ is } 1) \text{ AND } (B \text{ is NOT } 1 \text{ NOR } C \text{ is } 1)) \text{ OR } (A \text{ is } 1 \text{ AND } B \text{ is } 1)$

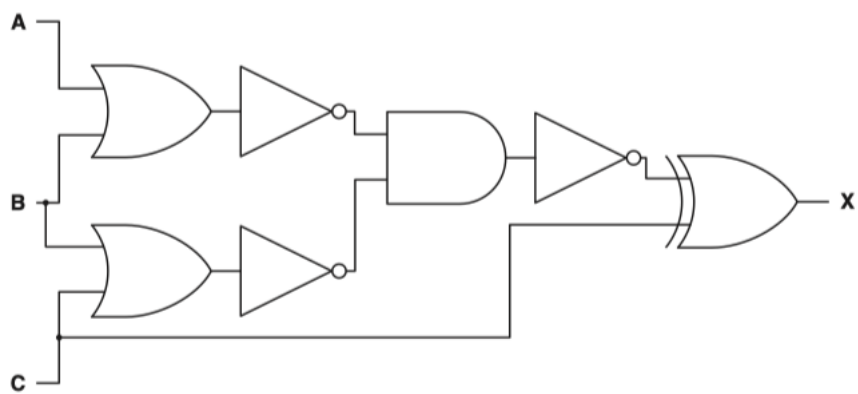
a Draw a logic circuit to match the given logic statement. Each logic gate used must have a maximum of two inputs. Do not attempt to simplify the logic statement.



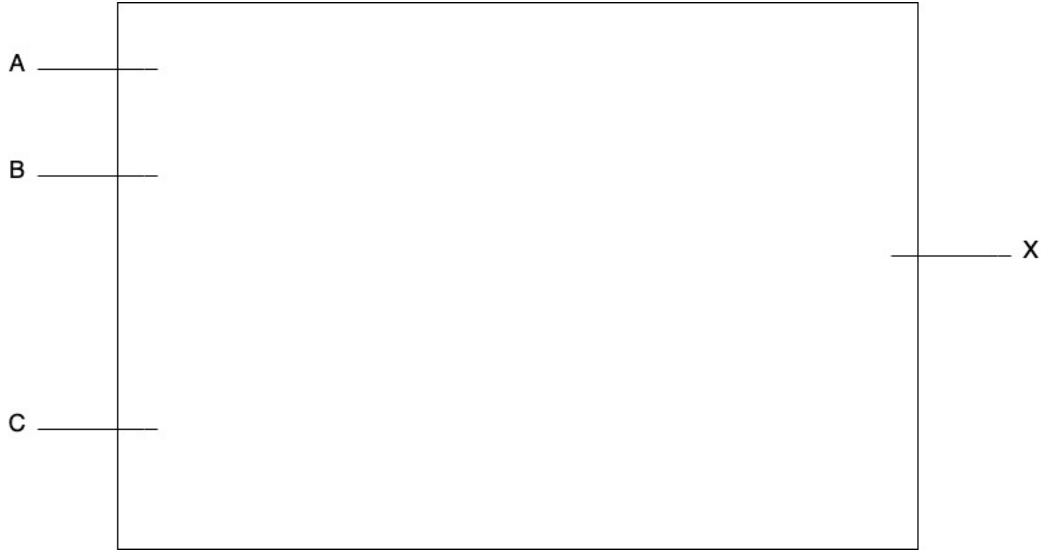
b Complete the truth table for the given logic statement

A	B	C	Working area	x
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

8 Consider the given logic circuit:



a Redraw the logic circuit using only 4 logic gates. Each logic gate used must have a maximum of two inputs.



b complete the truth table for the given logic circuit

A	B	C	Working area	x
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

c Describe the purpose of a logic gate in a logic circuit

(190513)