C6

Introduction to Digital Circuits

CHAPTER ASSIGNMENT

Name _____ Class _____ No. _____ Date _____

> Answer every question in the space given. Show your working. You may use the chapter page to help you.

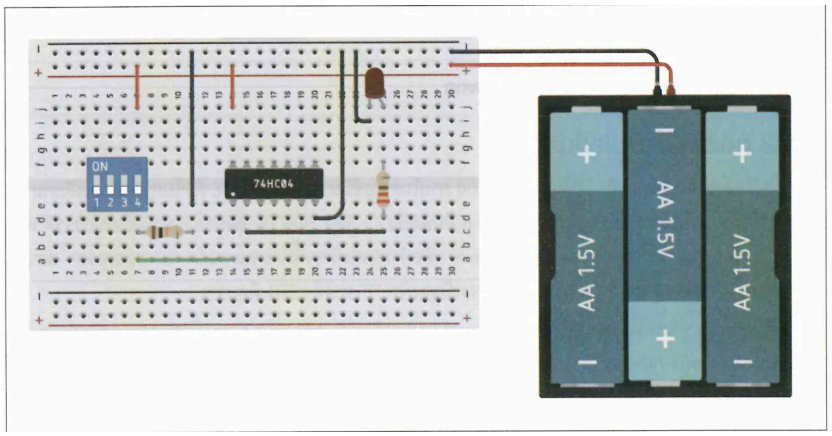
Questions from the Guru Jazzy chapter page, for classroom use.

Labs

6.1 Test the 74HC04 NOT gate

1. Build Fig 6-7 in Tinkercad. Slide switch 4 ON and OFF and watch the LED. *Switch 4 OFF → LED on. Switch 4 ON → LED off.*

2. Build it with real parts (Fig 6-8) and repeat step 1.



6.2 Test the 74HC00 NAND gate

1. Build Fig 6-11 in Tinkercad. Press S1 and S2 and watch the LED.

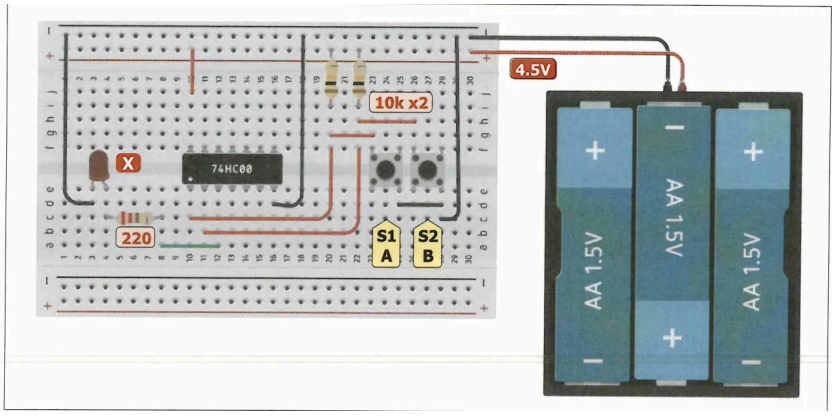
– *No button pressed: A = 1, B = 1 → LED off.*

– *Hold S1 only: A = 0, B = 1 → LED on.*

– *Hold S2 only: A = 1, B = 0 → LED on.*

– *Hold both: A = 0, B = 0 → LED on.*

2. Build it with real parts (Fig 6-12) and repeat step 1.



6.3 Test the 74HC02 NOR gate

1. Build Fig 6-15 in Tinkercad. Switch DIP positions 1 and 4 step by step.

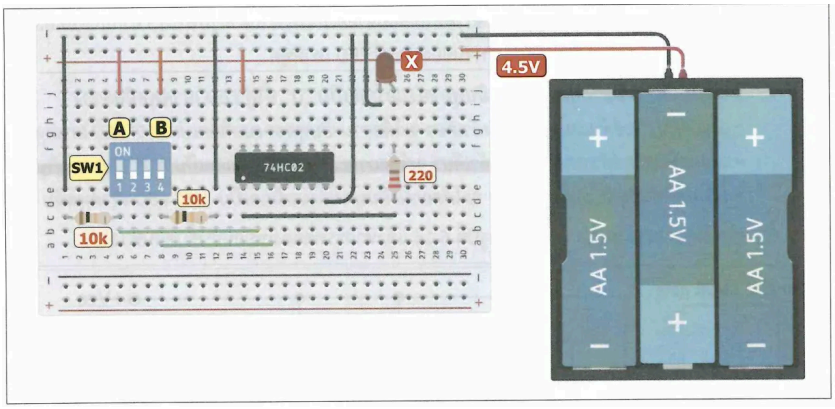
– *Neither on: inputs "00" → LED on.*

– *Position 1 only: "10" → LED off.*

– *Position 4 only: "01" → LED off.*

– *Both on: "11" → LED off.*

2. Build it with real parts (Fig 6-16) and repeat step 1.



6.4 Test the 74HC08 AND gate

1. Build Fig 6-19 in Tinkercad and switch DIP positions 1 and 4 step by step.

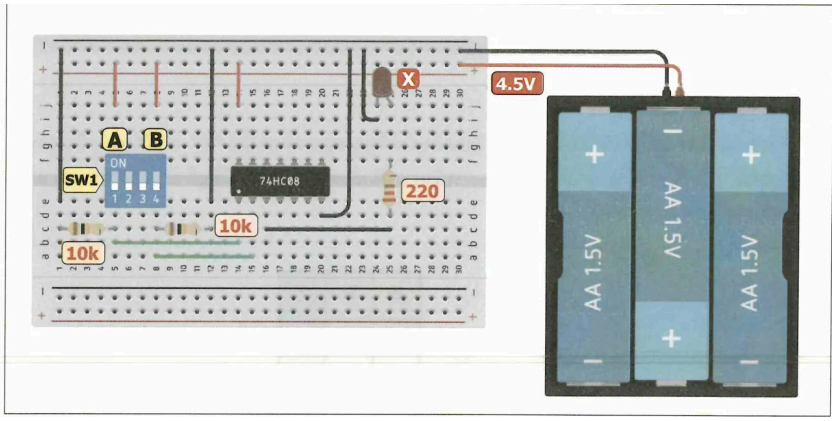
– *Neither on: “00” → LED off.*

– *Position 1 only: “10” → LED off.*

– *Position 4 only: “01” → LED off.*

– *Both on: “11” → LED on.*

2. Build it with real parts (Fig 6-20) and repeat step 1.



6.5 Test the 74HC32 OR gate

1. Build Fig 6-23 in Tinkercad and switch DIP positions 1 and 4 step by step.

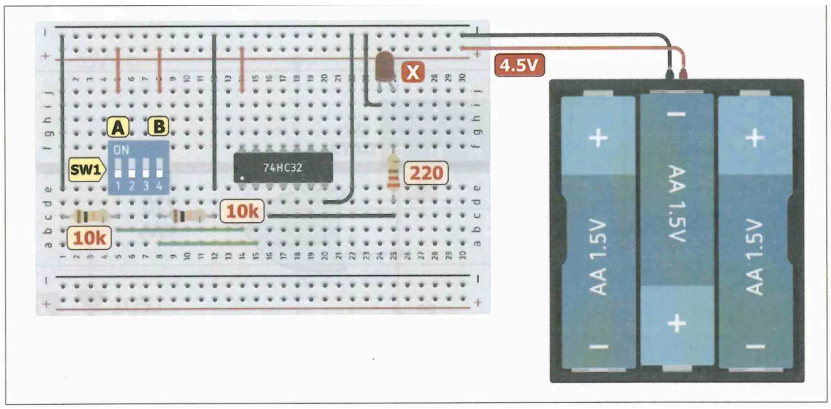
– *Neither on: “00” → LED off.*

– *Position 1 only: “10” → LED on.*

– *Position 4 only: “01” → LED on.*

– *Both on: “11” → LED on.*

2. Build it with real parts (Fig 6-24) and repeat step 1.



Activity: Practise conversions and gates

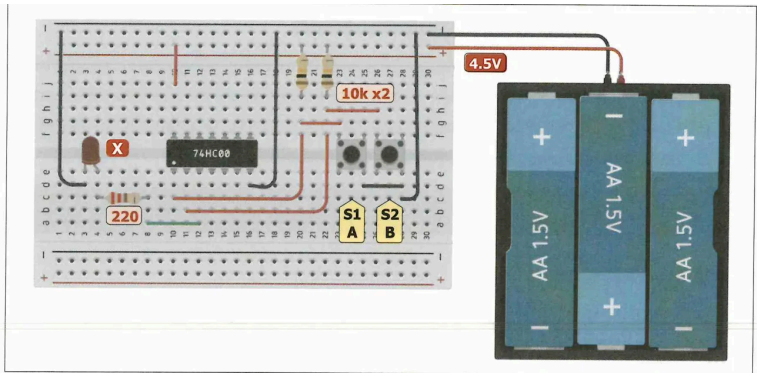
1. Convert to decimal: 0110, 1001, 1111, 10000000.

2. Convert to binary: 5, 10, 25, 100.

3. How many states can 6 bits show? What is the place value of the MSB of a 6-bit number?

4. Before testing each gate in Tinkercad, fill in its truth table on paper, then check every row with the DIP switch.

5. Change the NAND test (Fig 6-11) to use pull-down resistors and switches to the supply, like the AND test. Does the truth table change?



Chapter quiz

1. In a TTL circuit, which voltage counts as logic “1”?

   A. Anything above 0 V B. 2 V and above C. Only exactly 5 V D. 0.8 V and below

2. How many different states can 4 binary digits show?

   A. 4 B. 8 C. 16 D. 32

3. What is binary 1011 in decimal?

   A. 9 B. 11 C. 13 D. 1011

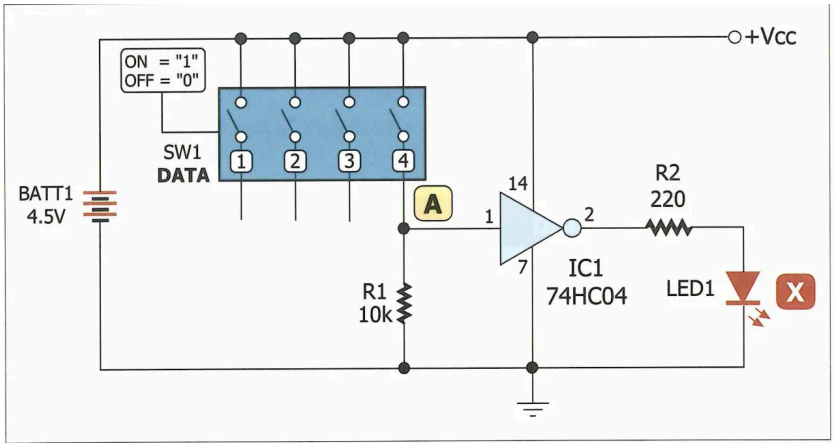
4. What is decimal 13 in binary?

   A. 1011 B. 1101 C. 1110 D. 0111

5. In an 8-bit number, what is the place value of the MSB (b7)?

   A. $2^0 = 1$ B. $2^3 = 8$ C. $2^7 = 128$ D. $2^8 = 256$

6. In the NOT gate test (Fig 6-6), DIP switch 4 is OFF. What does the LED do, and why?



A	B	C	D
Off — the input floats	On — R1 pulls the input down to “0”, so the output is “1”	Off — the output is “0”	It blinks

7. Which gate gives a “0” output only when both inputs are “1”?

A. AND B. OR C. NAND D. NOR

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8. Which gate gives a “1” output only when both inputs are “0”?

A. AND B. OR C. NAND D. NOR

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9. Which IC number holds four 2-input OR gates?

A. 74HC00 B. 74HC02 C. 74HC08 D. 74HC32

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10. In a real design, what should you do with the inputs of the gates you do not use?

A	B	C	D
Leave them floating	Tie them to ground or to the supply	Connect them to an LED	Cut them off

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End of assignment · Check your answers against the chapter at gurujazzy.com/subjects/tinkercad/chapter-6-digital-circuits/