

**Chapter 2: The System Unit: Processing and Memory**

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**TRUE/FALSE**

1. The process of representing data in digital form so it can be used by a digital computer is called decimal byte representation.

ANS: F                      PTS: 1                      REF: 52

2. The binary numbering system uses only two symbols—the digits 0 and 1—to represent all possible numbers.

ANS: T                      PTS: 1                      REF: 52-53

3. Unlike ASCII, Unicode is a universal coding standard designed to represent text-based data written in any language, including those with different alphabets.

ANS: T                      PTS: 1                      REF: 54

4. Each pixel in a monochrome graphic can be only one of two possible colors (such as black or white).

ANS: T                      PTS: 1                      REF: 55

5. To convert analog sound to digital sound, several thousand samples—digital representations of the sound at a particular moment—are taken every second.

ANS: T                      PTS: 1                      REF: 55

6. Early computers required programs to be written in machine language.

ANS: T                      PTS: 1                      REF: 56

7. The main circuit board inside the system unit is called the megaboard.

ANS: F                      PTS: 1                      REF: 57

8. The number of bits being transmitted at one time is dependent on the bus width.

ANS: T                      PTS: 1                      REF: 62

9. ROM (read-only memory), also called main memory, is used to store the essential parts of the operating system while the computer is running.

ANS: F                      PTS: 1                      REF: 62

10. Each location in memory has an address.

ANS: T                      PTS: 1                      REF: 64

11. Traditionally, PC Cards were used for notebook expansion.

ANS: T                      PTS: 1                      REF: 67

12. The backside bus (BSB) has been one of the most common types of expansion buses in past years.  
ANS: F                    PTS: 1                    REF: 69
13. Several of the original ports used with desktop computers—such as the parallel ports traditionally used to connect printers—are now considered standard ports.  
ANS: F                    PTS: 1                    REF: 70
14. USB ports are used to connect a computer to a phone outlet via telephone connectors.  
ANS: F                    PTS: 1                    REF: 71
15. MIDI ports are used to receive wireless transmissions from devices.  
ANS: F                    PTS: 1                    REF: 71
16. The decode unit coordinates and controls the operations and activities taking place within the CPU.  
ANS: F                    PTS: 1                    REF: 74
17. The control unit takes the instructions fetched by the prefetch unit and translates them into a form that can be understood by the control unit, ALU, and FPU.  
ANS: F                    PTS: 1                    REF: 74-75
18. As a hard drive begins to get full, it takes less time to locate and manipulate the data stored on the drive.  
ANS: F                    PTS: 1                    REF: 77
19. Pipelining increases the number of machine cycles completed per second.  
ANS: T                    PTS: 1                    REF: 80
20. Typically, 3D chips are created by layering individual silicon wafers on top of one another.  
ANS: T                    PTS: 1                    REF: 85

#### **MODIFIED TRUE/FALSE**

1. Most recent software programs, including the latest versions of Microsoft Windows, Mac OS, and Microsoft Office, use ASCII. \_\_\_\_\_  
ANS: F, Unicode  
PTS: 1                    REF: 54
2. ASCII is the coding system traditionally used with personal computers. \_\_\_\_\_  
ANS: T                    PTS: 1                    REF: 54

3. Because of its large size, when audio data is transmitted over the Internet it is often encrypted to shorten the download time. \_\_\_\_\_

ANS: F, compressed

PTS: 1                      REF: 55

4. The system unit is the main case of a computer. \_\_\_\_\_

ANS: T    PTS: 1                      REF: 56

5. The central processing unit (CPU) consists of a variety of circuitry and components that are packaged together and connected directly to the motherboard. \_\_\_\_\_

ANS: T    PTS: 1                      REF: 58

6. The CPU—also called the microprocessor or just the board—does the vast majority of the processing for a computer. \_\_\_\_\_

ANS: F, processor

PTS: 1                      REF: 58

7. Benchmark tests typically run the same series of programs on several computer systems that are identical except for one component (such as the CPU) and measure how long each task takes in order to determine the overall relative performance of the component being tested.  
\_\_\_\_\_

ANS: T    PTS: 1                      REF: 60-61

8. Cache memory today is usually external cache. \_\_\_\_\_

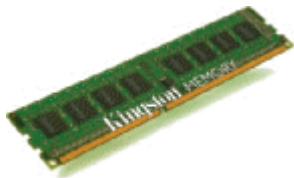
ANS: F, internal

PTS: 1                      REF: 61

9. Memory refers to the amount of long-term storage available to a PC. \_\_\_\_\_

ANS: F, Storage

PTS: 1                      REF: 62



10. The accompanying figure shows a DIMM RAM microprocessor. \_\_\_\_\_

ANS: F, memory module

PTS: 1                      REF: 63

11. The buses used to connect peripheral (typically input and output) devices to the motherboard are usually referred to as expansion buses. \_\_\_\_\_

ANS: T

PTS: 1

REF: 68

12. Keyboards and mice are typically connected to a computers using parallel ports.  
\_\_\_\_\_

ANS: F, USB

PTS: 1

REF: 69

13. Today's CPUs contain hundreds of millions of transistors, and the number doubles approximately every 18 months, a phenomenon known as Moliere's Law. \_\_\_\_\_

ANS: F, Moore's Law

PTS: 1

REF: 73

14. Each machine language instruction in a CPU's instruction set is broken down into several smaller, machine-level instructions called supercode. \_\_\_\_\_

ANS: F, microcode

PTS: 1

REF: 75

15. With pipelining, a new instruction begins executing as soon as the previous one reaches the next stage of the pipeline. \_\_\_\_\_

ANS: T

PTS: 1

REF: 80

## MULTIPLE CHOICE

1. Eight bits grouped together are collectively referred to as a \_\_\_\_.

a. kilobit

c. pixel

b. byte

d. binary

ANS: B

PTS: 1

REF: 52

2. The numbering system we commonly use is called the decimal numbering system because it uses \_\_\_\_ symbols to represent all possible numbers.

a. 2

c. 10

b. 5

d. 16

ANS: C

PTS: 1

REF: 52

3. A \_\_\_\_ is the smallest unit of data that a binary computer can recognize.

a. byte

c. pixel

b. datum

d. bit

ANS: D

PTS: 1

REF: 52

4. A \_\_\_\_ is equal to 1,024 bytes.

- a. kilobyte (KB)
- b. megabyte (MB)
- c. gigabyte (GB)
- d. terabyte (TB)

ANS: A                      PTS: 1                      REF: 52

5. Each place value in a binary number represents \_\_\_\_ raised to the appropriate power.
- a. 0
  - b. 1
  - c. 2
  - d. 10

ANS: C                      PTS: 1                      REF: 53

6. With bitmapped images, the color of each \_\_\_\_ is represented by bits; the more bits used, the better the image quality.
- a. pixel
  - b. vector
  - c. map
  - d. byte

ANS: A                      PTS: 1                      REF: 54-55

7. In a 16.8-million-color (called photographic quality or \_\_\_\_ ) image, three bytes (24 bits) are used to store the color data for each pixel in the image.
- a. mega color
  - b. true color
  - c. real color
  - d. full color

ANS: B                      PTS: 1                      REF: 55

8. Like graphics data, \_\_\_\_—such as a song or the sound of someone speaking—must be in digital form in order to be stored on a storage medium or processed by a PC.
- a. pixel data
  - b. giga data
  - c. audio data
  - d. audio programs

ANS: C                      PTS: 1                      REF: 55

9. Video data—such as home movies, feature films, and television shows—is displayed using a collection of \_\_\_\_.
- a. slides
  - b. pixels
  - c. vectors
  - d. frames

ANS: D                      PTS: 1                      REF: 56

10. A(n) \_\_\_\_ instruction might look like a meaningless string of 0s and 1s, but it actually represents specific operations and storage locations.
- a. COBOL language
  - b. ASCII
  - c. programming language
  - d. machine language

ANS: D                      PTS: 1                      REF: 56

11. \_\_\_\_ are very small pieces of silicon or other semiconducting material onto which integrated circuits are embedded.
- a. Pixels
  - b. Pentiums
  - c. Chips
  - d. Motherboards

ANS: C                      PTS: 1                      REF: 56

12. One measurement of the speed of a CPU is the \_\_\_\_, which is rated in megahertz (MHz) or gigahertz (GHz).
- a. system speed
  - c. system rpm





30. Instructions and data flow in and out of the CPU via the \_\_\_\_.
- a. control unit
  - b. prefetch unit
  - c. decode unit
  - d. bus interface unit
- ANS: D                      PTS: 1                      REF: 75
31. In order to synchronize all of a computer's operations, a \_\_\_\_—a small quartz crystal located on the motherboard—is used.
- a. cycle chip
  - b. fetch unit
  - c. system clock
  - d. microprocessor
- ANS: C                      PTS: 1                      REF: 75
32. Some \_\_\_\_ must be added in pairs for optimal performance.
- a. interfaces
  - b. memory modules
  - c. USB ports
  - d. hard drives
- ANS: B                      PTS: 1                      REF: 77
33. Today's CPUs are formed using a process called \_\_\_\_ that imprints patterns on semiconductor materials.
- a. vectoring
  - b. lithography
  - c. serigraphy
  - d. imprintment
- ANS: B                      PTS: 1                      REF: 79
34. One nanometer (nm) is \_\_\_\_ of a meter.
- a. one-billionth
  - b. one-millionth
  - c. one-thousandth
  - d. one-tenth
- ANS: A                      PTS: 1                      REF: 79
35. Terascale computing is the ability of computers to process one \_\_\_\_ floating-point operations per second (teraflops).
- a. million
  - b. billion
  - c. trillion
  - d. quadrillion
- ANS: C                      PTS: 1                      REF: 85

### Case-Based Critical Thinking Questions

#### Case 2-1

Jess is a musician who has just bought a new computer. Now she has to determine how to connect this computer to the devices that were connected to her old computer.

36. To connect her external hard drive where her music files are stored to the computer, Jess needs to use the \_\_\_\_ port.
- a. serial
  - b. USB
  - c. network
  - d. modem
- ANS: B                      PTS: 1                      REF: 71                      TOP: Critical Thinking
37. Jess has pictures from her old computer saved on a flash drive. To transfer these to her new computer, she would use a(n) \_\_\_\_ port.
- a. SCSI
  - c. modem





ANS: circuit board

PTS: 1 REF: 56

5. \_\_\_\_\_ are collections of electronic circuits containing microscopic pathways along which electrical current can travel.

ANS:

ICs

Integrated circuits

Integrated circuits (ICs)

ICs (Integrated circuits)

PTS: 1 REF: 56-57

6. The power supply inside a desktop computer connects to the \_\_\_\_\_ to deliver electricity to the computer.

ANS: motherboard

PTS: 1 REF: 57

7. Most CPUs today are \_\_\_\_\_ CPUs; that is, CPUs that contain the processing components or cores of multiple independent processors on a single CPU.

ANS: multi-core

PTS: 1 REF: 58

8. \_\_\_\_\_ is a special group of very fast memory circuitry located on or close to the CPU.

ANS: Cache memory

PTS: 1 REF: 61

9. Like the CPU, RAM consists of circuits etched onto chips. These chips are arranged onto circuit boards called \_\_\_\_\_.

ANS: memory modules

PTS: 1 REF: 63

10. \_\_\_\_\_ are locations on the motherboard into which expansion cards can be inserted to connect those cards to the motherboard.

ANS: Expansion slots

PTS: 1 REF: 66

11. Expansion buses connect directly to \_\_\_\_\_ on the system unit case or to expansion slots on the motherboard.

ANS: ports

PTS: 1 REF: 68-69

12. \_\_\_\_\_ are the connectors located on the exterior of the system unit that are used to connect external hardware devices.

ANS: Ports

PTS: 1 REF: 70



13. The accompanying figure shows the mouse connected to the computer via a(n) \_\_\_\_\_.

ANS: USB hub

PTS: 1 REF: 71

14. \_\_\_\_\_ computing utilizes atoms or nuclei working together as quantum bits that are capable of representing more than just two states as in electronic computing of today.

ANS: Quantum

PTS: 1 REF: 83

15. A(n) \_\_\_\_\_ slot can be used with both the postage-stamp-sized Secure Digital (SD) flash memory cards, as well as with peripheral devices adhering to the Secure Digital Input/Output (SDIO) standard.

ANS: SD

PTS: 1 REF: 72

16. The \_\_\_\_\_ coordinates and controls the operations and activities taking place within the CPU, such as retrieving data and instructions and passing them on to the ALU or FPU for execution.

ANS: control unit

PTS: 1 REF: 74-75

17. Most computers today can process more than one piece of microcode at one time—a characteristic known as \_\_\_\_\_, or being able to process multiple instructions per cycle (IPC).

ANS: superscalar

PTS: 1                      REF: 76

18. As large documents are stored, retrieved, and then stored again, they often become \_\_\_\_\_—that is, not stored in contiguous (adjacent) storage areas.

ANS: fragmented

PTS: 1                      REF: 77

19. \_\_\_\_\_ are tiny, hollow tubes made up of carbon atoms.

ANS:

CNT

Carbon nanotubes

Carbon nanotubes (CNT)

CNT (Carbon nanotubes)

PTS: 1                      REF: 82

20. The \_\_\_\_\_ chip is estimated to be 100 times faster than silicon.

ANS: graphene

PTS: 1                      REF: 80

## ESSAY

1. Explain what a register is and how it is used.

ANS:

A register is high-speed memory built into the CPU. Registers are used by the CPU to temporarily store data and intermediary results during processing. Registers are the fastest type of memory used by the CPU, even faster than Level 1 cache. Generally, the more data a register can contain at one time, the faster the CPU performs.

PTS: 1                      REF: 65                      TOP: Critical Thinking

2. Of what does ROM (read-only memory) consist? What is one important difference between ROM and RAM (random access memory)?

ANS:

ROM (read-only memory) consists of nonvolatile chips that permanently store data or programs. Like RAM, these chips are attached to the motherboard inside the system unit, and the data or programs are retrieved by the computer when they are needed. An important difference, however, is that you can neither write over the data or programs in ROM chips (which is the reason ROM chips are called *read-only*), nor destroy their contents when you shut off the computer's power.

PTS: 1                      REF: 65                      TOP: Critical Thinking

3. What are the general operations of a machine cycle?

ANS:

Each machine cycle consists of the following four general operations:

1. Fetch—the program instruction is fetched.
2. Decode—the instructions are decoded so the control unit, ALU, and FPU can understand them.
3. Execute—the instructions are carried out.
4. Store—the original data or the result from the ALU or FPU execution is stored either in the CPU's registers or in memory, depending on the instruction.

PTS: 1

REF: 76

TOP: Critical Thinking

4. Explain the difference between multiprocessing and parallel processing.

ANS:

With multiprocessing, each CPU typically works on a different job. Because multiple jobs are being processed simultaneously, they are completed faster than with a single processor. With parallel processing, multiple processors work together to make one single job finish sooner; a control processor assigns a portion of the processing for that job to each CPU.

PTS: 1

REF: 80-81

TOP: Critical Thinking

5. Describe how Hyper-Threading Technology works.

ANS:

Hyper-Threading Technology is a technology developed by Intel to enable software to treat a single processor as two processors. Since it utilizes processing power in the chip that would otherwise go unused, this technology lets the chip operate more efficiently, resulting in faster processing, provided the software being used supports Hyper-Threading.

PTS: 1

REF: 81

TOP: Critical Thinking