**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
   b. byte
   c. pixel
   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
   b. 5
   c. 10
   d. 16

   ANS: C PTS: 1 REF: 52

3. A ____ is the smallest unit of data that a binary computer can recognize.
   a. byte
   b. datum
   c. pixel
   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

b. CPU clock speed
d. CPU rpm

ANS: B PTS: 1 REF: 60

13. A computer ____ is the amount of data (measured in bits or bytes) that a CPU can manipulate at one time.
a. word
b. character
c. statement
d. unit

ANS: A PTS: 1 REF: 61

14. A ____ is an electronic path over which data can travel.
a. bus
b. lane
c. word
d. cache memory

ANS: A PTS: 1 REF: 62

15. The bus width and bus speed together determine the bus's ____ or bandwidth; that is, the amount of data that can be transferred via the bus in a given period of time.
a. clock speed
b. throughput
c. machine cycle
d. memory

ANS: B PTS: 1 REF: 62

16. The term ____ refers to chip-based storage used by the computer.
a. storage media
b. memory
c. hard drive
d. Zip drive

ANS: B PTS: 1 REF: 62

17. One of the most promising types of nonvolatile RAM is magnetic (or more precisely, ____) (MRAM).
a. magnetoselective
b. magnetobalanced
c. magnetoresistive
d. magnetocharged

ANS: C PTS: 1 REF: 64

18. ____ are small components typically made out of aluminum with fins that help to dissipate heat.
a. ACs
b. Fans
c. Heat buses
d. Heat sinks

ANS: D PTS: 1 REF: 65

19. ____ consists of nonvolatile memory chips that can be used for storage by the computer or the user.
a. RAM
b. Register
c. SDRAM
d. Flash memory

ANS: D PTS: 1 REF: 65

20. ____ have begun to replace ROM for storing system information, such as a PC's BIOS.
a. Motherboards
b. Microprocessors
c. Adapter cards
d. Flash memory chips

ANS: D PTS: 1 REF: 65

21. The ____ enables up to 127 devices to be connected to a computer through a single port on the computer's system unit.
a. HyperTransport bus
c. AGP (Accelerated Graphics Port) bus

b. USB standard
d. PCI Express Bus

ANS: B PTS: 1 REF: 69

22. Most network cards contain a port that accepts a(n) ____, which looks similar to a telephone connector but is larger.
a. RJ-11 connector
c. RJ-14 connector
b. RJ-12 connector
d. RJ-45 connector

ANS: D PTS: 1 REF: 71

23. A USB ____ is a device that plugs into your PC's USB port to convert one port into several USB ports.
a. hub
c. bus
b. module
d. connector

ANS: A PTS: 1 REF: 71

24. Most computers today support the ____ standard, in which the computer automatically configures new devices as soon as they are installed and the PC is powered up.
a. Plug and Play
c. Serial port
b. Match
d. Parallel port

ANS: A PTS: 1 REF: 71

25. The key element of the microprocessor is the ____—a device made of semiconductor material that acts like a switch controlling the flow of electrons inside a chip.
a. processor
c. chipbus
b. transistor
d. S-card

ANS: B PTS: 1 REF: 73

26. The ____ takes instructions from the prefetch unit and translates them into a form that the control unit can understand.
a. register
c. ALU
b. decode unit
d. internal cache

ANS: B PTS: 1 REF: 73

27. The ____ is the section of the CPU that performs arithmetic involving integers and logical operations.
a. FPU
c. decode unit
b. control unit
d. ALU

ANS: D PTS: 1 REF: 74

28. The ____ orders data and instructions from cache or RAM based on the task at hand.
a. ALU
c. control unit
b. prefetch unit
d. decode unit

ANS: B PTS: 1 REF: 75

29. The ____ tries to predict what data and instructions will be needed and retrieves them ahead of time, in order to help avoid delays in processing.
a. control unit
c. arithmetic/logic unit
b. floating point unit
d. prefetch unit

ANS: D PTS: 1 REF: 75

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

b. FireWire
d. USB

ANS: D PTS: 1 REF: 71 TOP: Critical Thinking

**Case-Based Critical Thinking Questions**

**Case 2-2**
Jack has a computer at home that he uses to access the Internet, store and edit personal photos, and create and edit documents. Recently, he has come to realize that in order to keep the computer performing at its best, he needs to carry out regular system maintenance on the computer.

38. Jack can speed up his computer by scanning it for viruses and ____.
a. RAM
b. Flash drives
c. spyware
d. bytes

ANS: C PTS: 1 REF: 78 TOP: Critical Thinking

39. Jack can use the ____ program to locate and delete temporary files, such as installation files, Web browsing history, and files in the Recycle Bin.
a. Windows Registry
b. Disk Defragmenter
c. Temporary Files
d. Windows Disk Cleanup

ANS: D PTS: 1 REF: 78 TOP: Critical Thinking

40. Since Jack has a Windows system, he can right-click a hard drive icon in Windows Explorer, select Properties, and then select the ____ option on the Tools tab to check that hard drive for errors.
a. Check now
b. Disk Defragmenter
c. Defragment now
d. Windows Disk Cleanup

ANS: A PTS: 1 REF: 78 TOP: Critical Thinking

**COMPLETION**

1. _____ data consists of still images, such as photographs or drawings.

ANS: Graphics

PTS: 1 REF: 54

2. One of the most common methods for storing graphics data is in the form of a bitmap—a grid of hundreds of thousands of dots, called _____.

ANS: pixels

PTS: 1 REF: 54

3. Text-based data is represented by fixed-length binary coding systems specifically developed for text-based data—namely, ASCII, EBCDIC, and _____.

ANS: Unicode

PTS: 1 REF: 53

4. A(n) _____ is a thin board containing chips and other electronic components.

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