**CHAPTER SUMMARIES**

**Describe the operation of Carrier Sense Multiple Access with Collision Detection (CSMA/CD)**. CSMA/CD is a protocol that helps devices share the bandwidth evenly without having two devices transmit at the same time on the network medium. Although it does not eliminate collisions, it helps to greatly reduce them, which reduces retransmissions, resulting in a more efficient transmission of data for all devices.

**Differentiate half-duplex and full-duplex communication and define the requirements to utilize each method.** Full-duplex Ethernet uses two pairs of wires at the same time instead of one wire pair like half-duplex. Full-duplex allows for sending and receiving at the same time, using different wires to eliminate collisions, while half-duplex can send or receive but not at the same time and still can suffer collisions. To use full-duplex, the devices at both ends of the cable must be capable of and configured to perform full-duplex.

**Describe the sections of a MAC address and the information contained in each section**. The MAC, or hardware, address is a 48-bit (6-byte) address written in a hexadecimal format. The first 24 bits, or 3 bytes, are called the organizationally unique identifier (OUI), which is assigned by the IEEE to the manufacturer of the NIC. The balance of the number uniquely identifies the NIC.

**Identify the binary and hexadecimal equivalent of a decimal number**. Any number expressed in one format can also be expressed in the other two. The ability to perform this conversion is critical to understanding IP addressing and subnetting. Be sure to go through the written labs covering binary to decimal to hexadecimal conversion.

**Identify the fields in the Data Link portion of an Ethernet frame.** The fields in the Data Link portion of a frame include the preamble, Start Frame Delimiter, destination MAC address, source MAC address, Length or Type, Data, and Frame Check Sequence.

**Identify the IEEE physical standards for Ethernet cabling.** These standards describe the capabilities and physical characteristics of various cable types and include but are not limited to 10Base-2, 10Base-5, and 10Base-T.

**Differentiate types of Ethernet cabling and identify their proper application.** The three types of cables that can be created from an Ethernet cable are straight-through (to connect a PC’s or router’s Ethernet interface to a hub or switch), crossover (to connect hub to hub, hub to switch, switch to switch, or PC to PC), and rolled (for a console connection from a PC to a router or switch).

**Describe the data encapsulation process and the role it plays in packet creation.** Data encapsulation is a process whereby information is added to the frame from each layer of the OSI model. This is also called packet creation. Each layer communicates only with its peer layer on the receiving device.

**Understand how to connect a console cable from a PC to a router and switch.** Take a rolled cable and connect it from the COM port of the host to the console port of a router. Start your emulations program such as putty or SecureCRT and set the bits per second to 9600 and flow control to None.

**Identify the layers in the Cisco three-layer model and describe the ideal function of each layer.** The three layers in the Cisco hierarchical model are the core (responsible for transporting large amounts of traffic both reliably and quickly), distribution (provides routing, filtering, and WAN access), and access (workgroup connectivity into the distribution layer).

**Identify the possible causes of LAN traffic congestion.** Too many hosts in a broadcast domain, broadcast storms, multicasting, and low bandwidth are all possible causes of LAN traffic congestion.

**Describe the difference between a collision domain and a broadcast domain.** Collision domain is an Ethernet term used to describe a network collection of devices in which one particular device sends a packet on a network segment, forcing every other device on that same segment to pay attention to it. With a broadcast domain, a set of all devices on a network hears all broadcasts sent on all segments.

**Differentiate a MAC address and an IP address and describe how and when each address type is used in a network.** A MAC address is a hexadecimal number identifying the physical connection of a host. MAC addresses are said to operate on layer 2 of the OSI model. IP addresses, which can be expressed in binary or decimal format, are logical identifiers that are said to be on layer 3 of the OSI model. Hosts on the same physical segment locate one another with MAC addresses, while IP addresses are used when they reside on different LAN segments or subnets.

**Understand the difference between a hub, a bridge, a switch, and a router**. A hub creates one collision domain and one broadcast domain. A bridge breaks up collision domains but creates one large broadcast domain. They use hardware addresses to filter the network. Switches are really just multiple-port bridges with more intelligence; they break up collision domains but create one large broadcast domain by default. Bridges and switches use hardware addresses to filter the network. Routers break up broadcast domains (and collision domains) and use logical addressing to filter the network.

**Identify the functions and advantages of routers**. Routers perform packet switching, filtering, and path selection, and they facilitate internetwork communication. One advantage of routers is that they reduce broadcast traffic.

**Differentiate connection-oriented and connectionless network services and describe how each is handled during network communications**. Connection-oriented services use acknowledgments and flow control to create a reliable session. More overhead is used than in a connectionless network service. Connectionless services are used to send data with no acknowledgments or flow control. This is considered unreliable.

**Define the OSI layers, understand the function of each, and describe how devices and networking protocols can be mapped to each layer**. You must remember the seven layers of the OSI model and what function each layer provides. The Application, Presentation, and Session layers are upper layers and are responsible for communicating from a user interface to an application. The Transport layer provides segmentation, sequencing, and virtual circuits. The Network layer provides logical network addressing and routing through an internetwork. The Data Link layer provides framing and placing of data on the network medium. The Physical layer is responsible for taking 1s and 0s and encoding them into a digital signal for transmission on the network segment