1. Differentiated services (DiffServ) is an IPv4 header field that is used to define the priority of each packet. The first 6 bits identify the value that is used by the QoS mechanism, and the last 2 bits identify the value that can be used to avoid packet dropping during network congestion. Flags is an IPv4 header field that identifies how the packet is fragmented.

2. The large number of public IPv6 addresses eliminates the need for NAT. Sites from the largest enterprises to single households can get public IPv6 network addresses. This avoids some of the NAT-induced application problems that are experienced by applications that require end-to-end connectivity.

3. The Flow Label field is designed to inform devices that an IPv6 packet is part of a flow of packets that should all follow the same path through a network.

4. Hosts must maintain their own local routing table to ensure that network layer packets are directed to the correct destination network. This local table typically contains a route to the loopback interface, a route to the network that the host is connected to, and a local default route, which represents the route that packets must take to reach all remote network addresses.

5. On a Windows host, the **route print** or **netstat -r** commands can be used to display the host routing table. Both commands generate the same output. On a router, the **show ip route** command is used to display the routing table. The **netstat –s** command is used to display per-protocol statistics. The **tracert** command is used to display the path that a packet travels to its destination.

6. A router receives a packet on an interface and looks at the destination IP address. It consults its routing table and matches the destination IP address to a routing table entry. The router then discovers that it has to send the packet to the next-hop address or out to a directly connected interface. When the destination address is on a directly connected interface, the packet is switched over to that interface.

7. Routers contain three types of permanent storage. ROM contains the bootstrap file, flash memory contains the Cisco IOS image file, and NVRAM contains the startup configuration file. These three types of information are not lost when power is lost. Elements that are held in RAM, such as the routing table and ARP cache, are lost when power is turned off.

8. VTY lines use Telnet or SSH to establish a configuration session to the router. All other interfaces can be used, but not via Telnet or SSH services.

9. The two primary files needed for bootup are the IOS image file and startup configuration, which are copied into RAM to maximize performance. If a router configuration register is set to 0x2102, the router will attempt to load the IOS image from flash memory and the startup configuration file from NVRAM.

10. If a full version of the Cisco IOS cannot be located in Flash or on a TFTP server, the router will boot to a maintenance version of the Cisco IOS that is stored in ROM.

11. The **reload** command provides an option to save the running configuration but would reboot immediately. The **copy startup-config running-config** command would take the configuration already saved in

NVRAM and update the configuration in RAM. This could lead to errors in the configuration. Copying the running configuration to flash would save a copy of the modified configuration but if the router rebooted, it would reboot using the old configuration in NVRAM.

12. The three commands needed to password protect the console port are as follows:
    line console 0
    password cisco
    login
    The **interface fastethernet 0/0** command is commonly used to access the configuration mode used to apply specific parameters such as the IP address to the Fa0/0 port. The **line vty 0 4** command is used to access the configuration mode for Telnet. The **0** and **4** parameters specify ports 0 through 4, or a maximum of five simultaneous Telnet connections. The **enable secret** command is used to apply a password used on the router to access the privileged mode.

13. Interface configuration mode is where the requirements for an active interface are applied. Router LAN and WAN interfaces must be configured in order to be active. In addition to being configured with the **no shutdown** command, a configured interface must also be connected to another device in order for the physical layer to be active.

14. The **show interfaces** command provides detailed interface statistics, whereas the **show ip interface brief** provides a summary of the interfaces, addressing, and current operational status. Only exit interfaces for routing table routes are displayed by **show ip route**. **Show ip** is an incomplete command.

15. A computer that connects to any network outside its own broadcast domain needs a default gateway in order to deliver packets. The default gateway address is usually configured by a DHCP server, but if there is not a DHCP server, then it is necessary that the default gateway address be manually configured.

16. If the destination host is in the same LAN as the source host, there is no need for a default gateway. A default gateway is needed if a packet needs to be sent outside the LAN.

17. A hop is an intermediary Layer 3 device that a packet has to traverse to reach its destination.

18. ROM is the nonvolatile memory where the diagnostic software, the bootup instructions, and a limited IOS are stored.

19. The **enable** command is entered at the R1> prompt. The **login** command is entered at the R1(config-line)# prompt. The **copy running-config startup-config** command is entered at the R1# prompt. The **interface fastethernet 0/0** command is entered at the R1(config)# prompt.

20. IPv6 has more QoS and control features than IPv4 has. Fields like Flow Label and Traffic Class in the IPv6 header support those features. Length/Type is not found in Layer 3 headers. It is a Layer 2 field.
21. The **show version** command is used to determine the amount of RAM and flash memory in the router. For RAM look for the line that begins with the words "Cisco CISCO1941/K9 (revision 1.0) with X bytes of memory." For flash memory, review the line that starts "X bytes of ATA System CompactFlash 0 (Read/Write)".