Q1

Question 1

As a network engineer, you are required to configure a company's network topology with different types of static routes and also explain the static routing concepts to their staffs. Answer the following questions to ensure successful communications between all routers and hosts in Figure 1-1. Assume Internet Protocol version 4 (IPv4) addressing is configured in all devices.
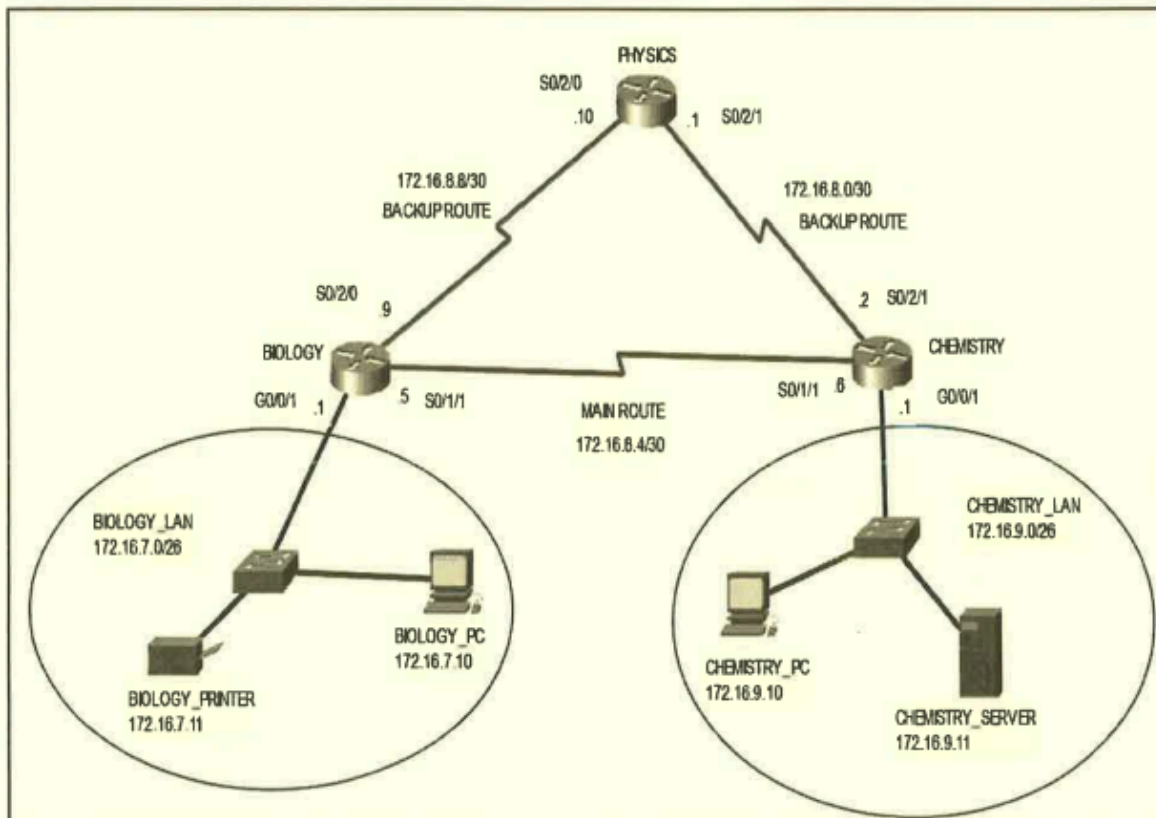

Figure 1-1: A network topology

a) (i) Configure a **Standard static route** and a **Floating Standard static route** in **BIOLOGY** using next hop IP address to forward traffic to the **CHEMISTRY_LAN**. State your assumptions for the Floating Standard static route. (4 marks)

ip route 172.16.9.0 255.255.255.192 172.16.8.5
ip route 172.16.9.0 255.255.255.192 172.16.8.10 10

Assume the Administrative Distance (AD) of the main route which next hop address is 172.16.8.5 is 1 and is lower than the floating route which next hop address is 172.16.8.10 and AD is 10.

Assume main route which next hop address with 172.16.8.5 AD is 1. Therefore set the floating route AD as 10 and not a preferred primary route.

(ii) Configure a **Standard static route** and a **Floating Standard static route** using **exit interface** in **CHEMISTRY** to forward packets to **BIOLOGY_LAN**. State your assumptions for the Floating Standard static route. (4 marks)

ip route 172.16.7.0 255.255.255.192 s0/1/1
ip route 172.16.7.0 255.255.255.192 s0/2/1 10

Assume that the AD of the main route which exit interface is s0/1/1 is 1 and is lower than the AD of the floating route which exit interface is s0/2/1

(iii) Explain the implementation of a **Floating Standard static route** in **BIOLOGY**. (4 marks)

b) (i) Configure a **Standard static route** using **next hop IP address** in **PHYSICS** to forward packets to **BIOLOGY_LAN** and **another Standard static route** using **exit interface** in **PHYSICS** to forward packets to **CHEMISTRY_LAN** respectively. (3 marks)

ip route 172.16.7.0 255.255.255.192 172.168.8.9
ip route 172.16.9.0 255.255.255.192 s0/2/1

(ii) Explain the impact on **PHYSICS** routing table search or lookup process with the implementation of two **Standard static routes** in Question 1 b) (i). (4 marks)

When the PHYSICS want to send forward packets to the BIOLOGY_LAN, it will have two or more lookup process.

This is because the statics route is configure using next hop IP address, and PHYSICS need to look at its routing table first time to get known the next hop IP address. Then need to lookup again the routing table to get which exit interface is go out to the next hop IP address.

c) Assume all the static routes configured had been removed. You are required to implement **Open Shortest Path First (OSPF)** configurations using the network command with wildcard mask based on subnet mask in **BIOLOGY** and **PHYSICS** only. Use OSPF **process-id 321** and **area-id 0**. Use Table 1-1 to document your answer.

Table 1-1: Documentation Table

Router name	Configurations

(6 marks)

[Total: 25 marks]

Router	Configuration

BIOLOGY	router ospf 321 network 172.16.8.8 0.0.0.3 area 0 network 172.16.8.4 0.0.0.3 area 0 network 172.16.7.0 0.0.0.63 area 0 passive-interface g0/0/1
PHYSICS	router ospf 321 network 172.16.8.0 0.0.0.3 area 0 network 172.16.8.4 0.0.0.3 area 0 network 172.16.9.0 0.0.0.63 area 0 passive-interface g0/0/1

Q2

Question 2

a)   (i)   Describe a Dynamic Host Configuration Protocol (DHCP) spoofing attack.   (1 mark)

    (ii)   Suggest **TWO (2)** attacks that attackers may perform using misleading information obtained during the DHCP spoofing attack.   (6 marks)

b)   Analyse the network topology in Figure 2-1 and implement Access Control List (ACL) to filter the network traffic and answer the following questions. All PCs and routers can communicate with each other.
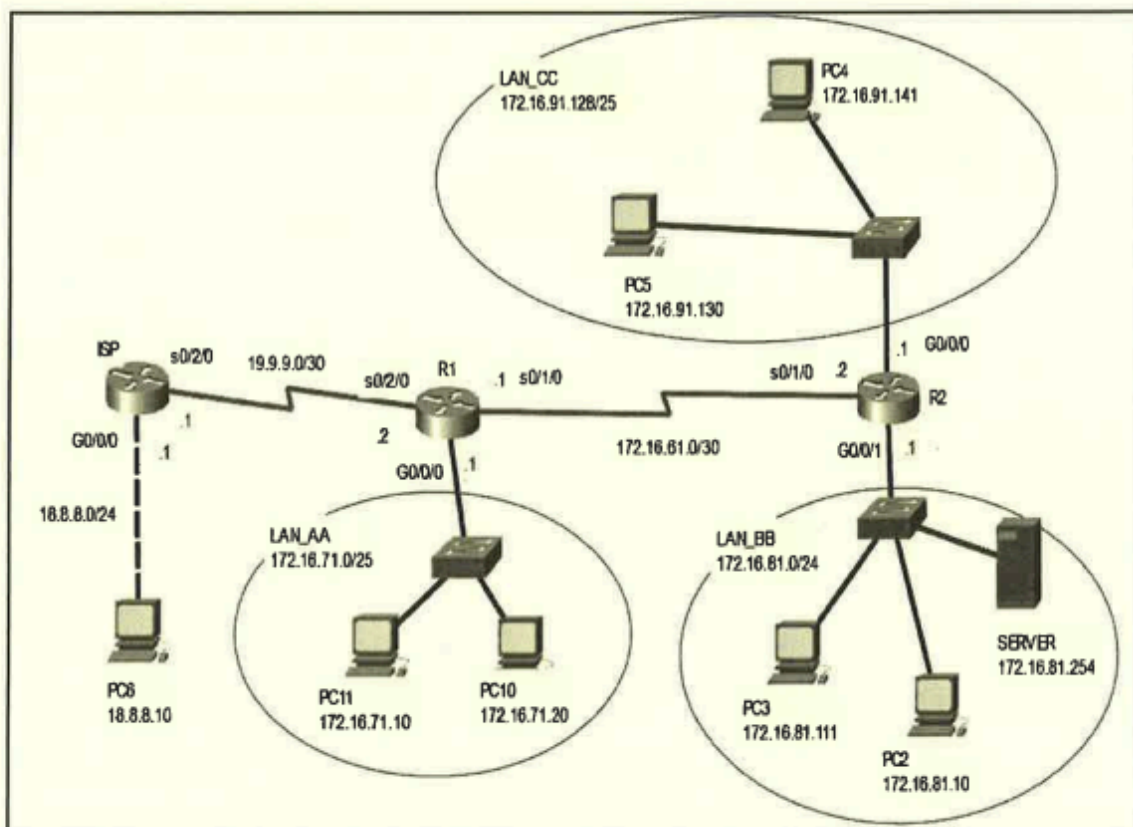

Figure 2-1: A network topology

    (i)   Apply a standard access list numbered 68 to block **PC11** to communicate with **SERVER**. Allow all other traffics. Use suitable keyword(s) in the ACL. Indicate the router, interface, and direction to apply the ACL.   (6 marks)

Router R2:

access-list 68 deny host 172.16.71.0
access-list 68 permit any

interface g0/0/1
access-group 68 out

(ii) Apply an extended access list named **ALLOW_ACCESS**. The **LAN_CC** network is able to perform **HTTPS** on the **SERVER**. In addition, **LAN_CC** network can ping hosts with odd numbered IP addresses in **LAN_BB** network. Deny all other traffic, which must be explicitly written in your ACL. Use **port number** for **service** and suitable keyword(s) in your ACL. Indicate the router, interface, and direction to apply the ACL. (12 marks)

[Total: 25 marks]

Router R2:
ip access-list extended ALLOW_ACCESS
permit tcp 172.16.91.128 0.0.0.127 host 172.16.81.254 eq 443
permit icmp 172.16.91.128 0.0.0.127 172.16.81.1 0.0.0.254
deny ip any any

interface g0/0/0
access-group ALLOW_ACCESS in

Q3

Question 3

Analyse Figure 3-1 and Figure 3-2 on DHCP (Dynamic Host Configuration Protocol), Static NAT and PAT (Port Address Translation) configurations. OSPF and static routing protocols are configured in the respective routers.
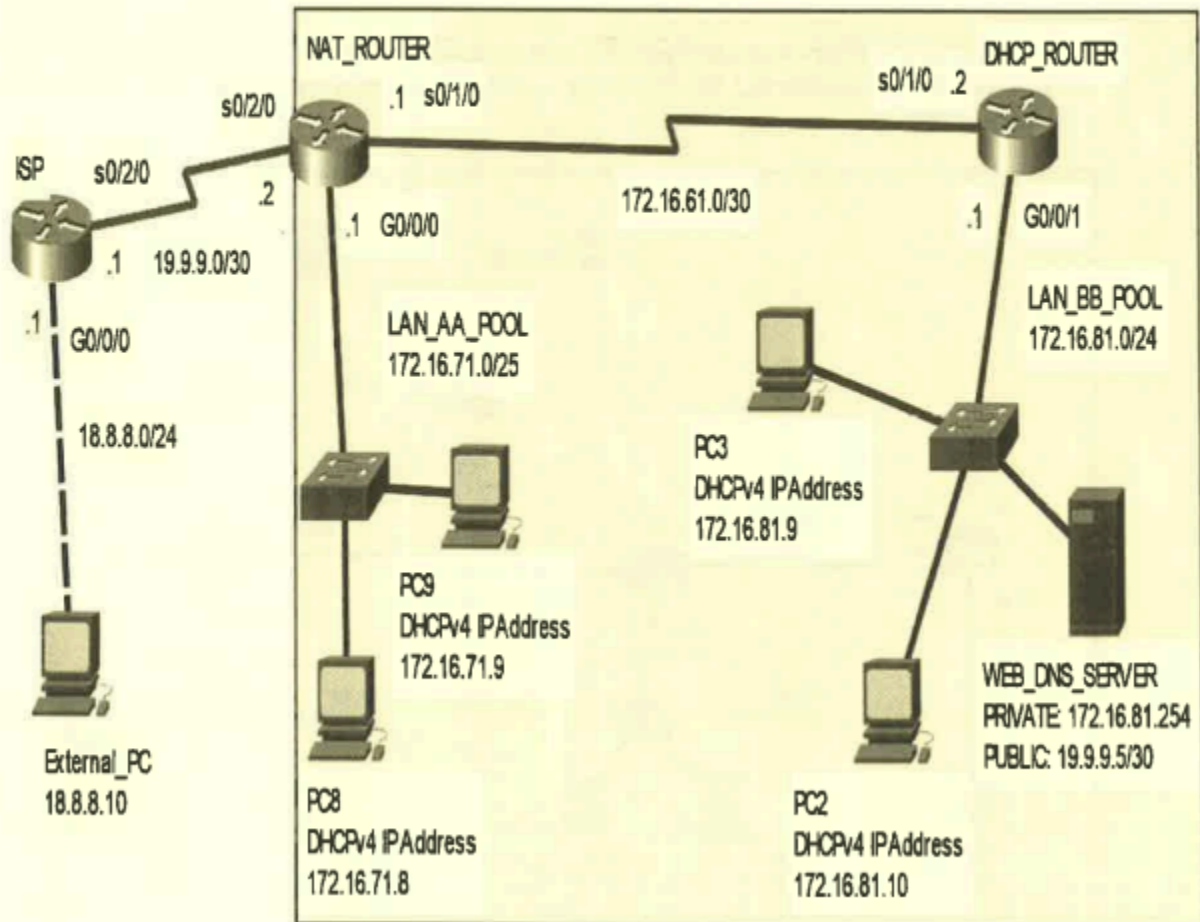

Figure 3-1: A network topology

NAT_ROUTER	DHCP_ROUTER
interface GigabitEthernet0/0/0 ip address 172.16.71.1 255.255.255.128 interface Serial0/1/0 ip address 172.16.61.1 255.255.255.252 interface Serial0/2/0 ip address 19.9.9.2 255.255.255.252 ip nat inside source list 1 pool NAT_POOL overload	ip dhcp excluded-address 172.16.81.1 172.16.81.8 ip dhcp excluded-address 172.16.81.254 ip dhcp excluded-address 172.16.71.1 172.16.71.7 ip dhcp pool LAN_BB_POOL network 172.16.81.0 255.255.255.252 dns-server 172.16.81.254 interface GigabitEthernet0/0/1 ip address 172.16.81.1 255.255.255.0 interface Serial0/1/0 ip address 172.16.61.2 255.255.255.252

Figure 3-2: Partial output of "show run" commands

a) **DHCP_ROUTER** is configured as a DHCP server. PCs are having a problem obtaining the IP addresses and other DHCP configurations successfully. Analyse the partial output of "show run" commands in Figure 3-2 and network topology in Figure 3-1. Use Table 3-1 to document all errors, provide the solutions/correct configurations for the respective errors and lastly justify your answers. State your assumptions in your answers. (12 marks)

Table 3-1: Documentation Table

Errors	Solutions	Justifications

Errors	Solutions	Justifications
ip helper address on NAT_ROUTER missing		
Subnet mask of the network for dhcp pool LAN_BB are wrong	Should be 255.255.255.0	
Missing default router for the dhcp pool LAN_BB	default-router 172.16.81.1	
Missing configure the dhcp pool for LAN_AA	ip dhcp pool LAN_AA network 172.16.71.0 255.255.255.128 default-router 172.16.71.1 dns-server 172.16.81.254	

b) (i) Implement **Static NAT** configurations in the respective router and apply to the router's interfaces for the **WEB_DNS_SERVER** to be reachable from the Internet. A public address 19.9.9.5 is assigned to the **WEB_DNS_SERVER** from the external network address of **19.9.9.4/30**. (5 marks)

ip nat inside source static 172.16.81.254 19.9.9.5

(ii) Identify errors and provide solutions for **PAT** configurations to use the **remaining** public IP address from the external network address **19.9.9.4/30** as the pool of address. All the internal PCs should be able to ping the **External_PC**. Use Table 3-2 to document your answers. (8 marks)

Table 3-2: Documentation Table

Errors	Solutions

[Total: 25 marks]

Errors	Solutions
Missing configure access list that use as pat binding	access-list 1 permit

Q4

a)   (i)   Give **TWO (2)** comparisons between a private Wide Area Network (WAN) and a public WAN.   **(6 marks)**

    (ii)   Each broadband solution has advantages and disadvantages. Explain **TWO (2)** factors to be considered when selecting broadband solutions.   **(4 marks)**

b)   Examine **TWO (2)** types of Virtual Private Networks (VPNs) used by mobile workers.   **(6 marks)**

c)   Differentiate the characteristics of voice, video, and data traffic for QoS (Quality of Service) policy.   **(9 marks)**

[Total: 25 marks]