This problem is taken from  'Computer Networking: A Top-Down Approach', 6/E by Kurose and Ross.

Consider the figure given below. Now we replace the router between subnets 1 and 2 with a switch S1, and label the router between subnets 2 and 3 as R1.



**1. Consider sending an IP datagram from Host E to Host F. Will Host E ask router R1 to help forward the datagram? Why? In the Ethernet frame containing the IP datagram, what are the source and destination IP and MAC addresses?**

No, since both computers are in the same subnet, and it checks the prefix – the ip datagram knows to head directly to computer F.

Source IP: E.ip , Destination IP: F.ip, Source Mac: E.mac, Destination Mac: F.mac

**2. Suppose E would like to send an IP datagram to B, and assume that E’s ARP cache does not contain B’s MAC address. Will E perform an ARP query to find B’s MAC address? Why? In the Ethernet frame (containing the IP datagram destined to B) that is delivered to router R1, what are the source and destination IP and MAC addresses?**

No, because the subnet prefix is different and therefore knows the host is not on the same LAN.

Source IP: E.ip, Destination IP: B.ip, Source Mac: E.mac, Destination Mac: R1.mac

**3. Suppose Host Awould like to send an IP datagram to Host B, and neither A’s ARP cache contains B’s MAC address nor does B’s ARP cache contain A’s MAC address. Further suppose that the switch S1’s forwarding table contains entries for Host B and router R1 only. Thus, Awill broadcast an ARP request message. What actions will switch S1 perform once it receives the ARP request message? Will router R1 also receive this ARP request message? If so, will R1 forward the message to Subnet 3? Once Host B receives this ARP request message, it will send back to Host Aan ARP response message. But will it send an ARP query message to ask for A’s MAC address? Why? What will switch S1 do once it receives an ARP response message from Host B?**

Switch S1 will receive host A’s ARP broadcast and add A’s entry into S1 mac address table.

Yes, R1 will receive the ARP message but won’t forward it to any other subnet.

No, Host B will not send a request message because it has already learned A’s mac from the broadcast

S1 will update its mac forwarding table to include Host A as the same subnet as Host B.