1.

   A's mac address: 81:17:84:2e:8e:95

   a. 10.0.0.2/24 matches with 10.0.0.0/24. Therefore, the host will send this packet out to the interface a-s1.
   b. There is no entry in the forwarding table that matches 10.0.1.2/24. Therefore, this packet will be dropped.

2.

   a. The protocol was ARP. The purpose was to ask who has 10.0.0.2 IP and it was broadcasted.
   b. b and r1
   c. b and r1 are connected to switch s1. ARP is broadcast in the local network, which means that s1 will forward this packet to all nodes connected to it, hence r1 and b. r1 will not forward this packet further because it is broadcast in the local network only.
   d. Only a observed the response.
   e. It sends to host 'a' because a was the host that sent the request. Sending ARP response directly to the requesting host reduces unnecessary traffic in the network. In addition, this reduces security issues where not all hosts on the network knows the senders mac-ip mapping.
   f. Yes, 'a' received ping response from 'b'.

3. 10.0.0.2 dev s1 lladdr a6:2c:45:96:45:87 STALE
4.

   a. The ping was not successful.
   b. None of them

5. The command is: sudo ip route add 0.0.0.0/0 via 10.0.0.3 dev a-s1
6.

   a. It is ARP asking who has the IP address 10.0.1.2.
   b. c and d.
   c. The router wants to find 10.0.1.2 which is part of the subnet 10.0.1.0/24, and the switch that controls that subnet is s2. Therefore, r1 will broadcast an ARP to all the hosts and routers connected to S2. These are d and d.
   d. No, because the subnet that 10.0.1.2 belong to is s2 not s1.
   e. No!

7. The entries are:
   10.0.0.1 dev r1-s1 lladdr 8a:17:84:2e:8e:95 STALE
   10.0.1.2 dev r1-s2 lladdr 82:8b:87:a4:4b:82 STALE
8. The command is: sudo ip route add 0.0.0.0/0 via 10.0.1.1 dev c-s2.
9. Yes, it was successful.
10.

   - There is an error and 0 packet received.
   - There is an error and 0 packets received.

11.

   a. For r1: sudo ip route add 10.0.3.0/24 via 10.0.2.2 dev r1-r2
   b. For r2: sudo ip route add 10.0.0.0/24 via 10.0.2.1 dev r2-r1

a. sudo ip route add 0.0.0.0/0 via 10.0.3.1 dev e-s3

12. Yes
13. TTL: 59.
    This means that the packet passed by 64 – 59 = 5 hops
14.
    a. Host: r3
       Reason: The packets were dropped because they reached ttl limit.
    b. Host: r5
       Reason: The host couldn't find the next hop for the packets in its forwarding table.
    c. Host: r5
       Reason: The host couldn't find the next hop for the packets in its forwarding table.
    d. Host: r5
       Reason: The host could not find a path to the destination (path in the routing table).
    e. Host: h2
       Reason: The host is not listening to on the port.
15.
    a. There are 2 fragments.
    b. Fragment 1: 1480 bytes
       Fragment 2: 28 bytes
    c. Fragment 1 offset: 0
       Fragment 2 offset: 1480