CS 372 Introduction to Computer Networks
Self-Check Exercises: Lecture 28 **Solutions**

1) What is the purpose of DHCP?
DHCP is intended to streamline the connection of new devices to a network. Rather than having a sysadmin hard-code a relationship between hardware (MAC) addresses and IP-addresses, a new device can enter a network and automatically obtain an IP address valid in the network.

2) Give the steps undergone when a new device enters a DHCP-enabled network.
   1. It broadcasts a "DHCP discover" via UDP to port 67, sending the message to IP address 255.255.255.255 with a 'source IP address' of 0.0.0.0. It passes this datagram to the Link Layer which will broadcast to all nodes on the subnet.

   2. A DHCP-enabled server will pick up this message and send back a "DHCP offer" message on the broadcast IP address (255.255.255.255). This message will contain the proposed IP address, lease time, network mask, etc.
   NOTE: The link-layer frame is addressed to the MAC address of the new device.

   3. The new device sends a "DHCP request" message, echoing the configuration parameters, again to the IP broadcast address from source 0.0.0.0, and again to the MAC broadcast address, requesting an IP address.

   4. The DHCP-enabled server, in response, sends a "DHCP acknowledgement" message, confirming the parameters, to the Broadcast IP address (and the device's hardware address). It also records the relationship between this IP address, and the device's hardware address, in a table.

3) Why does an arriving DHCP client have to broadcast its hardware address?
An arriving DHCP client has no IP address. By broadcasting its hardware address to the entire network, it is received by the DHCP server. The DHCP server can then offer an IP address lease to the client, by sending to its (unique) hardware addressed?

4) Is IP address space exhaustion a problem?
This depends on your outlook. There are some mechanisms that are proving a stopgap, but really we've already run out. More on this in the discussion questions!