Problem Set 1.1:

1) Which of the following can air source heat pumps be used for?

- a. Cooling a household in the summer.
- b. Heating a household in the winter.
- c. Heating a household in an extreme cold climate
- d. All of the above.

Answer: 1 – d

Problem Set 1.2:

1) Match the terms with the correct definition.

<table>
<thead>
<tr>
<th>Definition</th>
<th>Key Term</th>
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<tbody>
<tr>
<td>1) Nominal output of heat pump at 47°F (Btu/hr) as tested.</td>
<td>a. Design Heating Capacity</td>
</tr>
<tr>
<td>2) Heat pump’s output at the winter design temperature (Btu/hr).</td>
<td>b. Design Heating Load</td>
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<td>3) Lowest possible output at a given temperature.</td>
<td>c. Displacement Heating</td>
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<tr>
<td>4) Maximum heating capacity when the outdoor temperature is 5°F.</td>
<td>d. Heating Capacity @ 5°F</td>
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<tr>
<td>5) Heating need at the target minimum winter temperature (Btu/hr).</td>
<td>e. Minimum Heating Capacity</td>
</tr>
<tr>
<td>6) A design strategy where the heat pump is only intended to cover part of the home’s annual load, displacing heat that would otherwise come from another heating system.</td>
<td>f. Multi, Mini, Package, Split</td>
</tr>
<tr>
<td>7) A chemical compound that readily absorbs and releases heat using a phase change. Common heat pump refrigerants include R410a, R32, R134a, R744 (CO2), R22 (phased out).</td>
<td>g. Rated Heating Capacity</td>
</tr>
<tr>
<td>8) System type descriptions.</td>
<td>h. Refrigerant</td>
</tr>
</tbody>
</table>

Answers:

1. G
2. A
3. E
4. D
5. B
6. C
7. H
8. F
Problem Set 1.3:

1) Which of the following would not be a good reason to install a heat pump in an existing home.

a. The homeowner needs a new HVAC system and wants to have air-conditioning
b. The home is being renovated and there is not space for ductwork
c. Heat pumps have more heating capacity than furnaces or boilers
d. Heat pumps come in small capacities appropriate for small additions

2) Why is there current interest in fuel switching from fossil-fuel heating sources to electric heat pumps?

a. Health and safety concerns with fossil fuel combustion in the home
b. Environmental concerns with how fossil fuels are extracted
c. Homeowners want to stabilize their utility costs
d. All of the above

Answers: 1 – c, 2 – d

Problem Set 2.1:

1) Which of the following components are in both heat pumps and air conditioners?

a. Compressor
b. Indoor coil
c. Expansion valve
d. All of the above

2) Why do most heat pumps have auxiliary heat?

a. Auxiliary heat is more efficient
b. Heat pumps cannot provide enough heat if the outdoor temperature is too low
c. Heat pumps are prone to failure
d. Auxiliary heat still works if there is a power outage

Answers: 1 – d, 2 – b

Problem Set 2.2:

1) Which of the following choices is not a typical option when installing a heat pump in a home currently heated by a furnace or boiler?
a. Replace an existing ducted furnace system with a ducted heat pump
b. Install a heat pump as the primary heating system but keep the existing furnace or boiler as backup
c. Install a ductless heat pump system to address a single isolated zone
d. Install a heat pump to provide cooling when the furnace overheats the house

Answer: 1 – d

Problem Set 3.1:

1) Which of the following should be assessed before installing a heat pump?
   a. Is the electrical panel sized to accommodate the heat pump?
   b. Is there space to locate the outdoor unit so it gets proper airflow?
   c. Is there a location for the outdoor unit where noise will not be bothersome?
   d. All of the above

Answer: 1 – d

Problem Set 3.2:

1) Which of the following statements is not true when replacing a ducted furnace with a ducted heat pump?
   a. The ductwork should be assessed to ensure it is properly sized for the new equipment
   b. Air conditioning will not increase the risk of condensation on the ducts
   c. The existing ductwork should be assessed to ensure it is properly insulated and sealed
   d. Properly insulating ductwork will reduce the risk of condensation on the ducts

Answer: 1 - b