1. What is the heat source in a Down Drain System?
2. Oil
3. Propane
4. Electricity
5. Solar
6. Is the Down Drain System and open or closed loop system?
7. What heat transfer media does a Down Drain System use?
8. Freon
9. Glycol
10. Water
11. Esophageal Phlegm
12. What is the biggest problem with a Down Drain System?
13. Over heating
14. Heat exchanger failure
15. Freezing of component parts
16. Antifreeze depletion
17. True or False: A Down Drain System drains by gravity.
18. True or False: A Down Drain System uses both a storage tank and a heat exchanger.
19. True or False: A Down Drain System uses both gate valves and ball valves.
20. True or False: A Down Drain System requires a pump.
21. The Balance Point is defined as…
22. The point at which the building in use would be able to support thermal comfort without the need for heating or cooling
23. The point at which interior noise and exterior noise are in equilibrium.
24. The point at which heating loads and cooling loads are such that they negate one another.
25. The point at which flame and smoke are present in equal amounts.
26. HVAC system components can be grouped into which 3 of the following categories…
27. Source
28. Diffusion
29. Delivery
30. Distribution
31. Collection
32. Return
33. True or False: Cooling can be described as reverse heat flow.
34. The term “coolth” is…
35. Used in reference to a heat sink.
36. A cooling mass used to chill interior space.
37. A naturally occurring “cool” spot within the earth that cab be tapped for distribution.
38. True or False: Absorption is a chemical process.
39. True or False: Vapor compression is a mechanical process.
40. What are the 3 major refrigeration approaches employed in buildings:
41. Cross ventilation
42. Evaporative cooling
43. Absorption
44. Vapor compression
45. Vapor Expansion
46. Naturally occurring heat sinks include which of the following:
47. Outside air
48. Outside soil
49. On-site bodies of water
50. The night sky
51. Munster cheese
52. True or False: Fire places are passive heating systems.
53. RE: Fireplaces- The method of heat distribution is… (Choose 2)
54. Conduction
55. Radiation
56. Enthalpy
57. Convection
58. Projectile vomiting
59. A Furnace is designed to hear…
60. Air
61. Water
62. Gas
63. Oil
64. Which heat sources are used with a furnace?
65. Solar
66. Heat pumps
67. Human farts
68. Electrical resistance
69. On-site combustion (oil, natural gas, coal, propane)
70. The basic components of a furnace are:
71. Burner / coil
72. Filter
73. Flue fan
74. Plenum
75. All of the above
76. A boiler heats what media for distribution…
77. Water
78. Oil
79. Propane
80. Air
81. Steam
82. A boiler uses what 2 basic heat sources to function?
83. On-site combustion
84. Electric resistance
85. Wood
86. Snot
87. Solar
88. True or False: An on-site solar energy collection system can serve in lieu of a boiler.
89. True or False: Heat pumps may serve as a substitute for a boiler.
90. Electric baseboard heat works on the principal of…
91. Conduction
92. Convection
93. Radiation
94. Evaporation
95. A&B
96. B&C
97. All of the above.
98. A heat pump : (choose 2)
99. Is a reversible cycle vapor compression unit.
100. Is a reversible cycle absorption unit.
101. Requires some kind of on-site combustion to take place for it to work.
102. Uses electricity as its power source.
103. The diagram below illustrates a…
104. An air to air chiller cycle
105. The vapor compression refrigeration cycle
106. The absorption refrigeration cycle

Refer to the diagram below for the following 9 questions



1. Component A is…
2. The evaporator
3. The pump
4. The compressor
5. Component B is…
6. The compressor
7. The condenser
8. The expansion valve
9. Component C is…
10. The pump
11. The expansion valve
12. The check valve
13. Component D is a…
14. Vapor lock
15. Condenser
16. Evaporator
17. At stage 1, the media in question is…
18. Gaseous
19. Cold refrigerant
20. Hot refrigerant
21. None of the above
22. At stage 2, the media in question is…
23. Absorbing heat
24. Giving off heat
25. Creating a vacuum
26. At stage 3, the media in question is…
27. Still gaseous
28. Still liquid
29. still crazy after all these years
30. At stage 4, the media in question …
31. Undergoes a dramatic pressure drop
32. Is subject to an intense pressure increase
33. Exposed to high heat
34. At stage 5, the media in question …
35. Radiates heat
36. Absorbs heat
37. Is in the form of hot liquid
38. To switch from refrigeration to vapor compression heat pump, what has to happen?
39. The compressor shifts to a vacuum.
40. Water must be purged from the system and replaced with refrigerant.
41. The system cannot be switched.
42. The expansion valve changes flow directions so the inside coil becomes the condenser and the outside coil the evaporator.
43. A condenser …
44. Rejects heat
45. Absorbs heat
46. In the absorption-refrigeration cycle, what is the “driving force” of the process?
47. A heat pump
48. Liquid nitrogen
49. A desiccant salt
50. Freon
51. The absorption-refrigeration cycle is…
52. A chemical process
53. A mechanical process
54. A physical process
55. An electrical process
56. Evaporative cooling is the process in which what 2 things happen simultaneously?
57. Air is sensibly cooled
58. Refrigerant is chilled further by exposing it to air
59. Air is humidified
60. Water is cooled to the point of evaporation.
61. A window air conditioner is an example of…
62. A chiller
63. A heat pump
64. An absorption-refrigeration unit
65. A DX unit
66. A chiller …
67. Is a refrigeration unit designed to produce cold water for space cooling
68. Can be operated on the vapor compression principal
69. Can be operated on the absorption principal
70. Is an act of sexual depravity outlawed in most states
71. None of the above
72. A & C
73. B & C
74. A,B & C
75. A & C
76. Once the media leaves the chiller, it is circulated to… (choose 3)
77. Cooling coils located in AHU(s)
78. Fan Coils
79. Cast Iron radiators
80. Induction units
81. Duct work leading to spaces requiring cooling
82. The purpose of a cooling tower is…
83. To extract heat from the water that is used to cool the condenser coils of the chilled water plant.
84. The mechanism by which heat removed from the building by the air conditioning system is dissipated to the atmosphere.
85. Humidify the air.
86. A & C
87. A & B
88. All of the above
89. Chilled water based cooling systems are typically used in…
90. Single story residential buildings
91. Larger buildings
92. Tee Pee(s)
93. An air-cooled condenser is…
94. A sensible heat exchange device where the magnitude of heat flow is a function of the temperature differential between the heat carrying media and the outside air temp.
95. A latent heat exchange device where the magnitude of heat flow is a function of the temperature differential between the heat carrying media and the outside air temp.
96. A hybrid DX unit that uses glycol as the heat carrying medium, and is directly cooled by outside air.
97. The Coefficient of Performance is defined as…
98. The amount of light given off in relation in relation to the amount of energy put in.
99. The amount of noise reduced divided by the amount received.
100. The cooling output divided by the energy input.
101. Which 2 of the following heat rejection devices?
102. Chiller
103. Air-cooled condenser
104. Compressor
105. Cooling tower
106. A cooling tower is…
107. A sensible heat exchanger
108. A latent heat exchanger
109. A method of changing gaseous media to liquid
110. Used only in the North East
111. The same as a chiller
112. An act of such profound perversion that is has been banned in the continental US, and most of Europe.
113. A cooling tower is…
114. Affected by the relative humidity of the outside air
115. Not affected by the relative humidity of the outside air
116. Used in conjunction with all-air systems
117. Used in conjunction with all water systems
118. A & C
119. B & C
120. C & D
121. A,C & D
122. B,C, & D
123. B & D
124. Supply duct is typically designed to operate at \_\_\_\_\_\_-velocity and \_\_\_\_\_\_\_-pressure.
125. High, low
126. Low, high
127. Low, low
128. High, high
129. Increasing air flow velocities allows the use of \_\_\_\_\_\_\_ duct cross sections.
130. Larger
131. Smaller
132. When would you specify a high velocity system?
133. When space is unlimited, but financial resources scarce.
134. When distribution space is constricted.
135. Only in single story buildings of less than 3000 s.f.
136. When is higher pressure in an air distribution system necessary? (Choose 3)
137. In a system that is old and has degenerated over time.
138. In a system that has multiple 90 degree bends.
139. In a system with a long distribution path.
140. In a system providing both heating and cooling.
141. In a system requiring extensive media filtration devices throughout the distribution path.
142. Return duct is typically designed to operate at \_\_\_\_\_\_-velocity and \_\_\_\_\_\_\_-pressure.
143. High, low
144. Low, high
145. Low, low
146. High, high
147. True or False: High velocity systems are advantageous in that they are quieter than their low velocity counterparts.
148. Regarding specific heat, which substance is the measure to which all other substances are compared (i.e.- which substance has the highest capacity for specific heat)?
149. Air
150. Water
151. CO2
152. steam
153. HVAC systems can be noisy. What are 3 ways that this can be mitigated?
154. For air systems, using interior duct liners/insulation
155. For air systems, using exterior duct liners/insulation
156. Locate equipment in areas away from occupied areas
157. Place equipment on vibration isolators
158. Use flexible duct connections originating from the plant
159. All of the above
160. B & C
161. A,B, & D
162. A,C,D & E

The following diagrams were shamelessly lifted from my MEEB, 6th Edition book. Use them to answer the following questions:



1. The first diagram is what type of system?
2. A single pipe, series (perimeter) loop
3. The second diagram is what type of system?
4. A single pipe system
5. The third diagram is what type of system?
6. A two-pipe, reverse return system
7. The fourth diagram is what type of system?
8. A two-pipe, direct return system
9. Which system is the least efficient and limited in the amount of heaters it can feed?
10. A single pipe, series (perimeter) loop
11. Of all the systems above, which system is the most efficient?
12. The two-pipe, reverse return- the spent water does not feed the following heating elements. Each element gets the same temp. water. Also, by reversing the return, equal friction resulting in equal flow is achieved through all baseboards.
13. Of all the diagramed systems, which one ***cannot*** have valves attached to each unit?
14. Single-pipe series perimeter loop. Shutting down one heating element would shut down the whole system…duh….

The following diagrams were lifted from the Architect’s Studio Companion

1. The diagram below is an example of…
2. A single duct, VAV system
3. A single duct, CAV system
4. A multi-zone, CAV system
5. A multi-zone, VAV system



1. Name components A,B,C,D,E, & F
2. Supply (fresh) Air Intake
3. Exhaust air
4. Diffusers
5. Humidifier
6. Fan room
7. Cooling tower
8. This type of system is appropriate for…
9. Theaters
10. Lobbies
11. Department stores
12. All of the above
13. None of the above
14. True or False: This system permits total temperature control by individual occupants.



1. The diagram above is an example of…
2. A single duct, VAV system
3. A single duct, CAV system
4. A multi-zone, CAV system
5. A multi-zone, VAV system
6. True or False: This system permits total temperature control by individual occupants.
7. True or False: This system is well suited for larger buildings with many zones.
8. True or False: In this system, the air is mixed within each individual zone.
9. True or False: This system the heating of one area while simultaneously cooling another no matter how extreme the temperature differential.



1. The diagram above is an example of…
2. A single duct, air-water VAV system
3. A single duct, air-water CAV system
4. A multi-zone, air-water CAV system
5. A multi-zone, air-water VAV system
6. An air-water induction system
7. True or False: The air is the heat carrying medium in this system.
8. The air supplied to the “space conditioning unit” is referred to as…
9. Primary air
10. Secondary air
11. Tertiary air
12. The air drawn into the “space conditioning unit” is…
13. Of smaller quantity in relation to the supplied air
14. Of greater quantity in relation to the supplied air
15. Of equal quantity in relation to the supplied air
16. The air drawn into the “space conditioning unit” is…
17. The coil within the “space heating unit” is heated or cooled by…
18. The water supplied, which is referred to as “secondary water.”
19. The air drawn in, which is referred to as “secondary air.”
20. The air supplied, which is referred to as “primary air.”
21. The ratio of room air to supplied air mix within this system is…
22. Room air, apx. 50%, Supply air 50%
23. Room air, apx. 75%, Supply air 25%
24. Room air, apx. 10%, Supply air 90%
25. Room air, apx. 30%, Supply air 70%



1. The diagram above is an example of…
2. A fan-coil terminal
3. An air-water induction system
4. A closed loop heat pump
5. A hydronic convector
6. Name components A,B,C,D,E, & F
7. Control valves
8. Bypass valves
9. Pump
10. Heat pump
11. Cooling tower
12. True or False: The water can bypass both the cooling tower and boiler when no heating or cooling is necessary.



1. The diagram above is an example of…
2. A fan-coil terminal
3. An air-water induction system
4. A closed loop heat pump
5. A hydronic convector
6. True or False: This system can be used for either heating or cooling.
7. This system works on the principal of…
8. Radiation
9. Conduction
10. Convection
11. Induction
12. Which types of all air system(s) is/are capable of heating one area of a building while simultaneously cooling another?
13. Single Duct VAV
14. Dual Duct CAV
15. Multi-Zone
16. Single Duct CAV
17. DX System
18. Single Duct CAV w/ Reheat
19. Determine the temperature @ each inside wall layer at the cavity (sans stud) of a wall section with the following characteristics: Design day= 15 degF, Interior Temp = 65 deg F

Formula is Delta T layer= (Rlayer/Rtotal) x Delta Ttotal

* Outside air film R=0.15
* Aluminum siding (who specified that?!) R=0.50
* ½” Plywood sheathing R=.60
* 3 ½” Batt insulation R=11.5
* ½” GWB R=.40
* Inside air film R=.70