higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

REFRIGERATION TRADE THEORY N2

20 April 2021

This marking guideline consists of 6 pages.

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QUESTION 1

1.1
- Rotating vane compressor
- Rotating eccentric compressor
- Screw compressor (3)

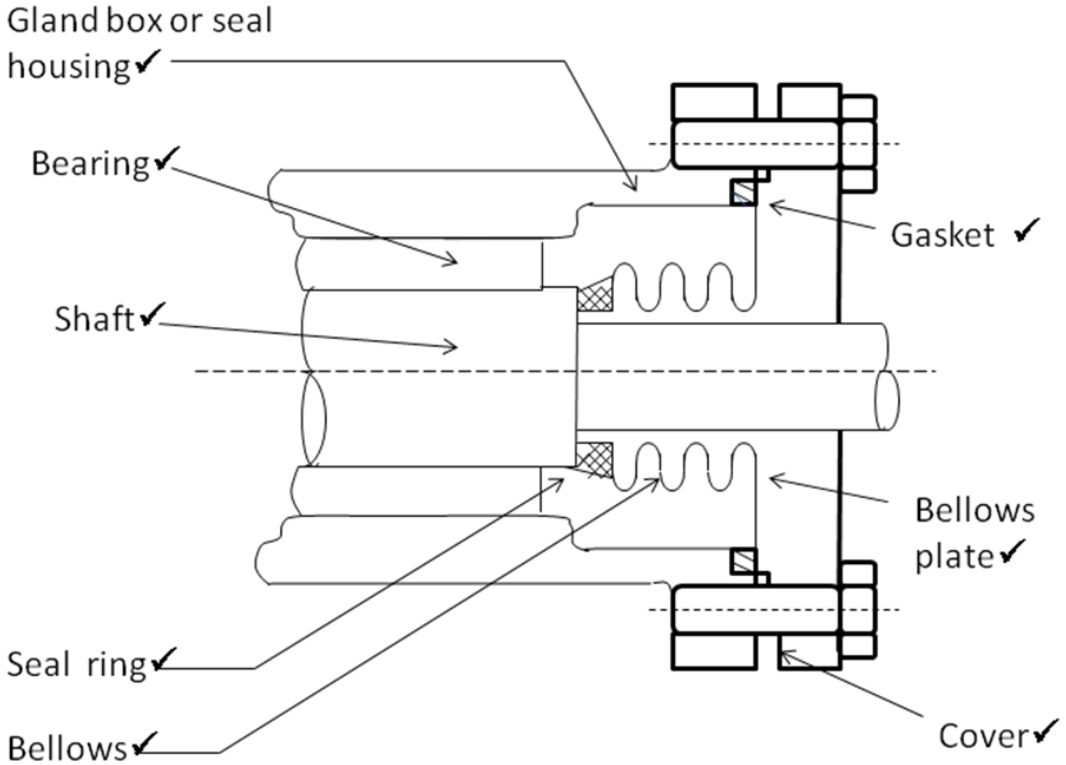
1.2
- The friction loss must be as low as possible.
- The valve must be open with the least possible pressure difference.
- The valve must close quickly to avoid back leakage.
- The valve must not increase clearance volume. (4)

1.3

1.3.1	C	
1.3.2	E	
1.3.3	B	
1.3.4	F	
1.3.5	A	
1.3.6	D	

(6 × 1) (6)

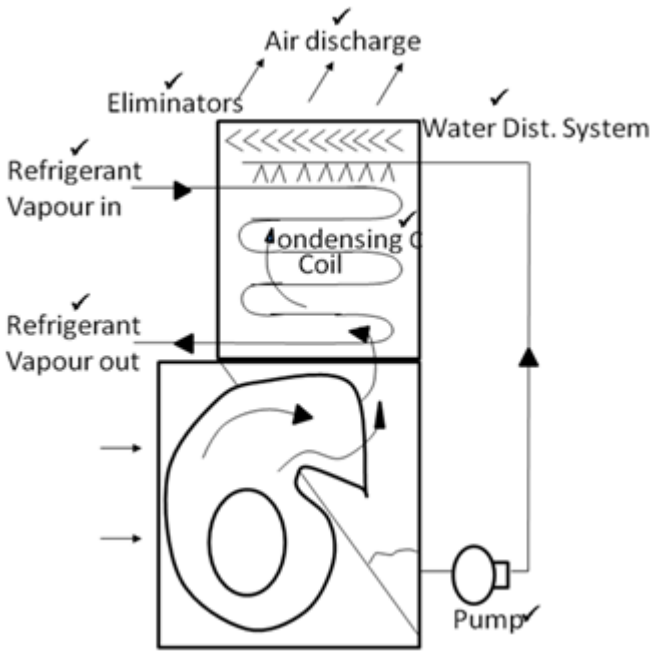
1.4



(7)
[20]

QUESTION 2

2.1



(6)

2.2 2.2.1

- The condenser removes or rejects heat from the refrigeration system.
- The evaporator absorbs heat by evaporating liquid refrigerant.
- The thermostatic expansion valve controls the amount of refrigerant entering the evaporator.
- The filter drier traps unwanted moisture and particles in the system.
- The accumulator presents liquid refrigerant from entering the suction line into the compressor. (5 × 2) (10)

2.2.2 Dirt can be prevented by installing a filter drier in front of the expansion valve. (2)

2.3

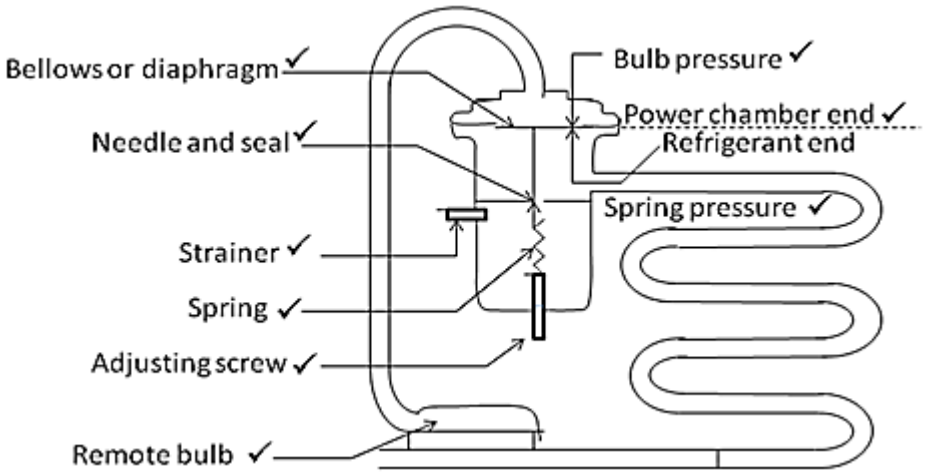
- Refrigerant type
- Saturated evaporating temperature or pressure
- Saturated condensing temperature or pressure
- Amount of subcooling (if present) (Any 2 × 1) (2)

[20]

QUESTION 3

3.1
- Automatic expansion valves
- Thermostatic expansion valves
- High-pressure side-float valves
- Low-pressure side-float valves
- Capillary tubes
- Fibbed orifice-expansion devices
- Hand-expansion valves
- Level-control valves (Any 4 × 1) (4)

3.2



(6)

3.3
- It stops liquid carry-over to the compressor.
- It ensures that the entire evaporator is used at full- and part-loading conditions.
- It responds quickly to wide and frequent load variation. (Any 2 × 2) (4)

3.4 3.4.1 Remote bulb thermostats have temperature-actuated controls to cycle a system (on and off).✓ It has a fluid-filled remote bulb to open✓ and close electrical contacts by action of the fluid inside the bulb.✓

3.4.2 An LP/HP switch has pressure-actuating cycling (to control low and high pressures) and a set of electrical contacts that are opened/closed by pressure.

(2 × 3) (6)
[20]

QUESTION 4

4.1
- Longer running time
- Insufficient defrost time
- Design temperature not reached
- Suction temperature higher than design
- Condensing temperature higher than design
- Excessive current drawn by the compressor (Any 5 × 1) (5)

4.2 When the temperature rises, the pressure rises and when the temperature drops, the pressure also drops. (2)

4.3
- Correctly cut the end of the copper tube so that it is square and all burring is removed.
- If the opposite end of the tube is fixed to another fitting, slide the nut of the new fitting over the tube.
- Place the tubing in the correct-sized flaring block with the aid of vernier callipers or a ruler.
- Tighten the clamp.
- Make the yoke to the tubing and attach it to the flare block.
- Use a 45° cone and place a few drops of oil on it.
- Slowly screw the cone into the tube until it is firmly in the end.
- Unscrew the cone and remove the flared tube.
- Inspect the flare for any signs of defects such as being too thin, split, cracked or uneven.
- If acceptable, thoroughly clean oil residue with solvent before use. (Any 8 × 1) (8)

4.4
- Always follow the manufacturer's instructions on the best way to care for and maintain the flaring tool.
- Never exert too much pressure at once, rather gradually increase the force.
- Use oil to obtain a better finish.
- Keep the flaring tools clean and well-oiled when not in use.
- Do not hammer on it.
- Take care not to damage the threads on the yoke. (Any 5 × 1) (5)

[20]

QUESTION 5

5.1 Purging is the process of removing trapped air in the service lines and the camber of the manifold gauges. (2)

5.2 Purging is done when recovering, transferring and charging refrigerant on a system. (2)

5.3 5.3.1 The oil-pressure safety switch stops the compressor if there is a loss of oil due to leaks.✓ If the oil pressure falls below the preset limit, the controller will stop the compressor.✓ A manual reset button is recommended.✓

5.3.2 A time-delay relay is fitted in the compressor control circuit to prevent short cycling.✓ It prevents the compressor starting for a period of five minutes after the compressor has stopped.✓ This reduces the chance of overheating the motor and prevents motor burnout that can be caused from frequent starting.✓

(2 × 3) (6)

5.4
- Attach the probe of a temperature analyser to the expansion valve outlet and to the bulb position of the expansion valve.
- The temperature probe must make good contact with the pipe and must be well insulated from the surrounding air as to get the true temperature at the point of measurement.
- Start the plant and when stable running conditions have been obtained take the two thermometer readings.
- The suction superheat is the difference between the temperature at the bulb and the expansion valve outlet.
- For most plants, the bulb temperature should be 5–8 above the expansion valve outlet temperature. (Any 4 × 2) (8)

5.5 All moisture and air must be eliminated from the components by drawing a vacuum on the system. (2)

[20]

TOTAL: 100

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