higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

REFRIGERATION TRADE THEORY N2

11 August 2021

This marking guideline consists of 5 pages.

Copyright reserved

QUESTION 1

1.1
1.1.1 True
1.1.2 False
1.1.3 True
1.1.4 True
1.1.5 True

(5 × 1) (5)

1.2
- It is completely free of maintenance
- Can easily be replaced
- Does not damage the shaft (3)

1.3
- Leakage or broken valve reeds
- Worn or broken piston rings, if fitted
- Wear on the cylinder walls and pistons, causing gas pressure to leak into the sump
- Too thick a cylinder head gasket, giving excessive clearance between the piston and valve plate (4)

1.4 1.4.1 Construction: the blades are arranged in a propeller shape around a rotating shaft and the airflow is axial. **(**2)

Uses: cooling towers and outdoor condensers (2)

1.4.2 Advantages

- Compressors are available in a wide range of capacity
- Very high delivery pressure is easily attained
- High volume flow rate is posible by multistaging
- High overall efficiency compared to other compressors (2x1)

Disadvantages

- High vibrations
- Pulsating flow-rate
- Suitable for small volumes at high pressure
- Maintenance cost high due to a large number of parts (2x1)

[20]

Copyright reserved

QUESTION 2

2.1 To reject heat at constant high pressure from the refrigeration system (2)

2.2
- The type of refrigerant
- Heat transfer rate or evaporation rate
- Evaporator pipe size
- Mass flow rate of the refrigerant
- Length of the evaporator
- The saturated evaporating temperature or pressure
- Inlet state at the evaporator (6 × 1) (6)

2.3
2.3.1 Refrigerant vapour in
2.3.2 Refrigerant liquid out
2.3.3 Eliminators
2.3.4 Condensing coil
2.3.5 Air discharge
2.3.6 Pump
(6 × 1) (6)

2.4 Water is pumped from the sump of the evaporative condenser✓ and is distributed over the exterior of the condensing coil.✓ A fan forces air through the falling water✓ and over the coil surface.✓ (4)

2.5
- Condenser inlet: vapour
- Condenser outlet: liquid (2)

[20]

QUESTION 3

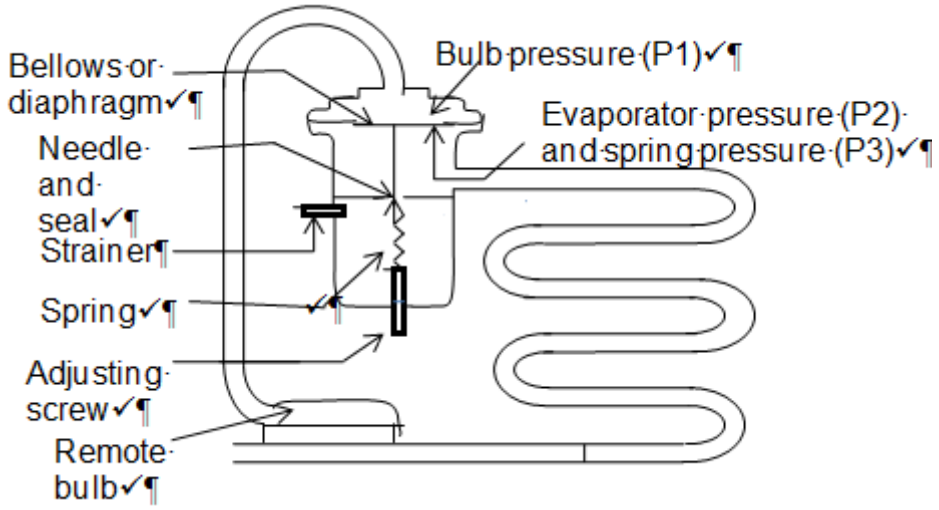
3.1 Prevent too much oil from leaving the compressor by separating it and returning it back into the compressor and limit the oil in the refrigeration system which might negatively affect the system. (2)

3.2
3.2.1 Pipe cutter✓ – used to cut soft copper tubes✓

3.2.2 Pipe bender✓ – used to bend soft copper tubes✓

3.2.3 Gauge manifold✓– purges, charges and adds oil in a refrigeration system✓
(3 × 2) (6)

3.3



(8)

3.4

- Maintains a constant degree of suction superheat at the evaporator outlet.
- Regulates the rates of flow of liquid refrigerant in proportion to the rate of evaporation in the evaporator. (4)

[20]

QUESTION 4

4.1 4.1.1 R22✓ – air conditioning applications✓

4.1.2 R134a✓ – in chiller applications✓

4.1.3 R404A✓ – low and medium temperature refrigeration applications✓

4.1.4 R410A✓ – commercial air conditioning applications✓

(4 × 2) (8)

4.2 4.2.1 Superheated vapour is vapour at a particular pressure whose temperature is above the vapour saturation temperature corresponding to the pressure. (3)

4.2.2 Saturated vapour is vapour at a particular pressure in which all the liquid droplets has evaporate at the vapour saturation temperature. The vapour is just dry. (3)

4.3 4.3.1 C
4.3.2 F
4.3.3 A
4.3.4 E
4.3.5 D
4.3.6 B

(6 × 1) (6)

[20]

Copyright reserved

QUESTION 5

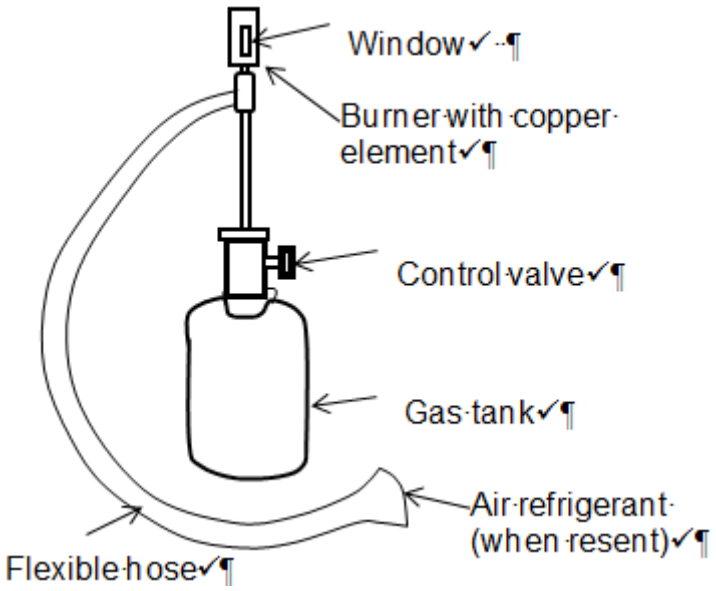
5.1
- The refrigerant must be recovered immediately using a recovery unit or the system is pumped down.
- The system must be evacuated, and dry nitrogen passed while the pipes are being brazing. (2 × 2) (4)

5.2 5.2.1
- Oil failure control
- Overload protection tripped
- Low pressure control open
- High pressure control open (Any 3 × 1)

5.2.2
- Power failure
- Isolator switched off
- Fuse blown or circuit breaker tripped
- Remote switch 'off' (Any 3 × 1)

(3 × 2) (6)

5.3



(6)

5.4
- Moisture causes freezing up.
- Moisture will be picked up and becomes entrained in the refrigerant line in a fine mist from which ice crystals form at the point of expansion valve.
- Acids forming in the system causing damage to the compressor (4)
- Development of compressor oil sludge
- High compression pressure
- Low refrigerating effect
- Compressor motor burnout
- Liquid slugging.

(4 ×1)

[20]

TOTAL: 100

Copyright reserved