higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

REFRIGERATION PRACTICE
NQF LEVEL 3

21 November 2024

This marking guideline consists of 5 pages.

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QUESTION 1

1.1 D
1.2 D
1.3 C
1.4 B
1.5 D
1.6 D

(6 × 1) **[6]**

QUESTION 2

2.1 2.1.1 The specific volume of a substance is the volume that 1 kg of that substance will occupy.

2.1.2 Density of a substance is the mass per unit volume.

2.1.3 Airflow is a measurement of the amount of air that flows through a particular device per unit of time.

(3 × 2) (6)

2.2 Work = force × distance
= 2 450 N × 6 m✓
= 14,7 kJ✓ (2)

2.3 Power = work / time
= 14 700 J / 5 × 60 s✓
= 14 700 J / 300 s✓
= 49 watts✓ (3)

2.4 Q = m x c x Δt✓
$\Delta t = \frac{Q}{mc}$✓

$\Delta t = \frac{947J}{76{,}4g \times 06{,}607J/g^{O}C}$✓

= 20,4 °C✓ (4)

2.5 2.5.1 Work done = m × g × s
= 93 × 9,8 × 78✓
= 71 089,20 J✓

2.5.2 Power = WD / t
= 71 089/11✓
= 6 462,65 W✓

(2 × 2) (4)
[19]

QUESTION 3

3.1 To ensure that people, animals and property are protected from hazards that can arise from the operation of an electrical installation under both normal and fault conditions. (3)

3.2 To protect people and animals from being electrocuted due to leakage currents, static electricity and lightning discharges. (2)

3.3 A wire way is a tray or enclosure, such as a conduit, duct, or trunking. (2)

3.4 To allow all the components of an electrical system to be at the same electrical potential and to be connected to the earth, to reduce the danger of electric shock due to an electrical fault. (2)

3.5
- Communicate your intention to everyone that might be affected when you switch off the power.
- Isolate the circuit breaker by switching of the main switch.
- Post warning notices.
- Test to see that the faulty circuit breaker has been isolated.
- Remove the faulty circuit breaker by disconnecting the live connection on top and the load connection at the bottom of the circuit breaker.
- Insert the new circuit breaker and connect it to the supply and load.
- Turn the power back on and test to insure that the new circuit breaker is fully operational.
- Remove warning notices. (7)

3.6 A circuit breaker automatically disconnects a circuit from the supply✓ in the event of an overload in that circuit.✓
An earth leakage relay automatically disconnects circuits connected to the earth leakage relay✓ in the event of a predetermined fault current flowing to earth.✓ (4)

3.7
- Short-circuit and open-circuit test (continuity test).
- Insulation resistance test between windings.
- Insulation resistance test between electrical components to earth. (3)

3.8 Reverse the connections of the start windings or the run windings. (2)
[25]

QUESTION 4

4.1
- Mineral oils:✓ They are particularly suited for use with CFC, HCFC refrigerants and ammonia.✓
- Alkyl benzene oils (AB):✓ AB oils are specially recommended for refrigerants like R-22 and HCFC blends.✓
- Polyalphaolefins (PAO):✓ PAO oils can be used in refrigeration systems working in extreme conditions with R-22 or ammonia thanks to their low pour points and excellent thermal stability.✓
- Polyalkylene glycols (PAG):✓ PAG oils are mainly used in copper-less car air conditioning systems using R-134a, because of their tendency to absorb water and their incompatibility with copper.✓
- Polyol ester oils (POE):✓ POE oils are intended for all refrigeration and air conditioning applications.✓ (5 × 2) (10)

4.2
- Oil that is too heavy will not flow smoothly to all working parts.
- Oil that is too light will not adhere properly, causing inadequate lubrication.

(Any 1 × 2) (2)

4.3
4.3.1 Clamp meter
4.3.2 Socket tester
4.3.3 Multi meter
4.3.4 Circuit breaker and fuse finder
4.3.5 Insulation tester

(5 × 1) (5)

4.4
- Water contamination
- Solids contamination
- Depleted anti foam agents due to the use of excessively fine filtration and electrostatic separation technologies
- Mechanical issues causing excessive aeration of the fluid
- Overfilling of the sump with splash and bath-lubricated compartments
- Cross contamination of the fluid with the wrong lubricant
- Contamination of the fluid with grease
- Too much anti foam agent added by incorrect formulation or by incorrect reconstruction of additive package (Any relevant 8 × 1) (8)

[25]

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QUESTION 5

5.1
- To regulate the operation and construction of refrigeration and air-conditioning plants in South Africa.
- SANS 10147 requires that all service technicians are registered as competent in handling refrigerants. (Any 1 × 2) (2)

5.2 5.2.1 A type of safety valve used to control or limit the pressure in a system.

5.2.2 A non-reclosing pressure relief device that, in most cases, protects a pressure vessel, equipment or system from over pressurisation or potentially damaging vacuum conditions.

5.2.3 A threaded metal cylinder usually of bronze, brass or gunmetal, with a tapered hole drilled completely through its length.
(3 × 2) (6)

5.3
- Inspect the breathing apparatus before each use.
- Test and clean after each use.
- Inspect the equipment designated for "emergency use" at least monthly and after each use.
- Follow the manufacturer's instructions for care and maintenance.
- Permit only trainees, manufacturer-certified personnel to maintain respiratory and breathing apparatus.
- Do not mix parts from different manufacturers.
- Maintain a complete record for each respiratory and breathing apparatus.
(Any 6 × 2) (12)
[20]

QUESTION 6

- Neoprene or nitrile gloves
- Impervious apron
- Safety shoes
- Splash goggles
- Face shield (Any relevant 5 × 1) **[5]**

TOTAL: 100

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