higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

REFRIGERATION PRACTICE
NQF LEVEL 3

XX February 2020

This marking guideline consists of 6 pages.

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QUESTION 1

1.1 E
1.2 H
1.3 A
1.4 K
1.5 J
1.6 M
1.7 O
1.8 B
1.9 C
1.10 F

(10 × 1) **[10]**

QUESTION 2

2.1 Mass flow is the movement of fluids down a pressure or temperature gradient. (2)

2.2 $Q = m \times c \times \Delta t$
$= 5,0\ g \times 4,184\ J/g.°C \times (75°C - 25°C)$✓
$= 5,0\ g \times 4,184\ J/g.°C \times 50°C$✓
$= 1\ 046\ J$✓ (3)

2.3 2.3.1 Change in internal energy = net quantity heat entered system – work done by system

$\Delta u = Q - W$
$= (3,00 \times 10^6\ J - 8,00 \times 10^6\ J)$✓ $- 4,50 \times 10^5\ J$✓
$= -5,45 \times 10^6\ J$✓ (3)

2.3.2 The negative sign means the system has lost internal energy. (2)

2.4 Given:
$\dot{m} = 120\ kg/min$
$\Delta t = 7°C$
$c = 4,2\ J/kg.°C$

Required energy (Q) in MJ/min:

$Q = \dot{m} \times c \times \Delta t$✓✓
$= 120 \times 4,2 \times 7$✓
$= 3\ 696\ kJ/min$✓
$= 3,696\ MJ/min$✓ (5)
[15]

QUESTION 3

3.1
- Switch off the power.
- Wear safety glasses and protective clothing.
- Use a voltage tester to test the wires.
- Use the right tools for the work.
- Check for loose connections. (5)

3.2
- Polarity test
- Insulation resistance between conductors and earth
- Insulation resistance between conductors
- Earthing and bonding
- Earth-leakage test
- Loop-impedance test (Any 5 × 1) (5)

3.3 Earthing allows all the components of an electrical system to be at the same electrical potential and connected to the earth to reduce the danger of electric shock due to an electrical fault. (2)

3.4
- Start with the highest number and move down systematically.
- Select a range where the deflection falls in the upper half of the meter scale.
- Check the circuit polarity especially when measuring direct current (DC) or voltages.
- Switch off the supply when testing the resistance of a circuit.
- Renew batteries frequently to obtain accurate resistance measurements.
- Recalibrate at regular intervals and keep the multimeter away from dust, moisture, fumes and heat. (6)

3.5 3.5.1
- Secure a cable gland to the cable.
- Remove the knock-out from the distribution board.
- Secure the gland fitted to the cable to the distribution board with a locknut. (3)

3.5.2
- Cable knife
- Junior hacksaw
- Shifting spanner
- Water-pump pliers (4)

[25]

QUESTION 4

4.1 Step 1: Turn off the appliance at the mains.
Step 2: Find the thermostat inside the refrigerator.
Step 3: Remove all frozen food and shelves from the refrigerator.
Step 4: Remove wires attached to the thermostat.
Step 5: Take the broken thermostat out of the refrigerator.
Step 6: Install the new thermostat.
Step 7: Switch on the refrigerator to test the new thermostat. (7)

4.2 4.2.1 A flaring tool is used to spread the copper end outward until a flare is formed.

4.2.2 Nut drivers are hand-held drivers used to drive or remove hex nuts or bolts.

4.2.3 A brazing torch is used to solder the joints of two copper tubes together.

4.2.4 A flat file is used to file newly cut copper tube ends to square it or to remove burrs from steel brackets.

4.2.5 A pipe wrench is used to fasten tubes and pipes.
(5 × 1) (5)

4.3 4.3.1 A clogged or frozen water supply line will, from time to time, cause water to puddle beneath the refrigerator.✓ It will also affect ice production from the ice maker and slow down or stop water flow from the dispenser.✓ (2)

4.3.2 Firstly unplug the refrigerator and locate the shut-off valve, typically underneath the sink, behind the refrigerator or below the refrigerator in the basement.✓✓ Make sure this valve is closed, and look for any leaks, kinks or clogs in the plastic supply line.✓✓ (4)

4.4 4.4.1
- Always wear eye protection and insulated gloves.
- Wear protective clothing if there is a possibility of direct contact or splashes.
- Wear safety boots when handling refrigerant cylinders.
- Never lift a cylinder by the top valve.
- When moving cylinders, keep caps on.
- Always assume that a cylinder contains gas.
- Wear self-contained breathing apparatus in high gas concentrations.
- Provide good ventilation. (Any 5 × 1) (5)

4.4.2 Do not release refrigerants into the atmosphere and always use recovery equipment. (2)
[25]

QUESTION 5

5.1 5.1.1 **Oblique drawing**

- Designed to show a three-dimensional view of an object
- Shows one face of the object in true shape, but the other faces on a distorted angle
- Not really a 3D system but a two-dimensional view of an object with forced depth

Isometric drawing

- One of the three forms of axonometric projection
- Pictorial representation of an object in which all three dimensions are drawn at full scale rather than foreshortening them to the true projection
- Looks like an isometric projection but all lines parallel to the three major axes are measurable

Orthographic drawing

- Represents a three-dimensional object in two dimensions
- Form of parallel projection, where the view direction is orthogonal to the projection plane, resulting in every plane of the scene appearing in affine transformation on the viewing surface
- Further divided into multiview orthographic projections and axonometric pictorials (3 × 3) (9)

5.1.2 The purpose of an engineering drawing is to clearly and accurately capture all geometric features of a product or component so that a manufacturer or engineer can produce the required item. (1)

5.2 5.2.1

- The operation of a refrigeration plant shall be carried out by competent personnel.
- All personnel involved in the operation and maintenance of refrigeration installations shall have been trained on the functioning of the installation to ensure that they are fully conversant with the equipment concerned.
- Personnel who, in the course of their duties, have to enter refrigerated spaces shall be trained in the use of all safety devices, procedures and health hazards.
- To avoid damage to equipment and danger to persons, it is essential that refrigeration plants be carefully maintained by the personnel to whom this duty is assigned.
- Automatic protective devices shall be checked regularly and leakages and other faults shall be attended to immediately.
- When a dangerous leakage of refrigerant has occurred, personnel shall not be permitted to enter the enclosed space until it has been cleared by purging or ventilating or, if this is impracticable, personnel who enter the enclosed space shall be provided with, and shall use, a safety belt and suitable gas mask or breathing apparatus.
- In all cases, at least one person shall remain in attendance outside, next to the entrance of the enclosed space. (Any 5 × 1) (5)

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5.2.2
- An escape door that can readily be opened outwards from the inside when every outside-operated lock or catch is fastened
- In the case of any door that opens pneumatically, a means for opening the door by hand, and a means to prevent a closing door from causing injury
- An alarm, operated by means of illuminated buttons or by chains hanging near the door and incorporating a fixed or flashing signal or a buzzer or bell that is visible/audible in a constantly manned place
- Where artificial lighting is provided within the chamber, a light switch inside the chamber, and an outside indicator lamp, arranged to show whether the chamber lighting is on
- A means to ensure that the way towards emergency exits and the way towards signals remains visible in the event of failure of the lighting system (5)

[20]

QUESTION 6

6.1 A biocide is a type of chemical or microorganism that can deter, render harmless or exert a controlling effect on harmful organisms by chemical or biological means. (2)

6.2
- Medicine
- Agriculture
- Forestry (3)

[5]

TOTAL: 100

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