

071306T4RAC

REFRIGERATION AND AIR CONDITIONING LEVEL 6

ENG/OS/RAC/CR/03/6/B

Design Refrigeration System

Nov/Dec 2024



**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION
COUNCIL (TVET CDACC)**

PRACTICAL ASSESSMENT

INSTRUCTIONS TO ASSESSOR

1. Assess the candidate as the practical progresses observing the critical areas
2. You are required to mark the practical as the candidate perform the tasks
3. You are required to take video clips at critical points
4. Ensure the candidate has a name tag and registration code at the back and front

OBSERVATION CHECKLIST

Candidate's Name & Registration Code			
Assessors Name & Registration Code			
Venue of Assessment			
Date of Assessment			
Items to be Evaluated: <i>Please award marks as appropriate. Give a brief comment on your observation.</i>	Marks Available	Marks Obtained	Comments
TASK 1: Design a water cooler with bare coil evaporator to be immersed in a water tank to cool 10 liters of water from 25°C to 5 °C in 2 hours.			
1. Wore appropriate PPE as per the job requirements • Overall/dust coats • Goggles/Face shield • Safety boots • Gloves <i>(Award marks as indicated or zero)</i>	4		
2. Handled tools and equipment as per workshop procedure • Correct use of tools and equipment • Observed safety when using tools and equipment <i>(Award marks as indicated or zero)</i>	1 1 2		

3. Determine R134a compressor capacity for the cooler • $Q = m \cdot C_w \cdot \Delta T$ • Mass of water: $m = 10 \text{ liters} = 10 \text{ kg}$ • $\Delta T = 25^\circ\text{C} - 5^\circ\text{C} = 20^\circ\text{C}$ • $Q = 10 \times 4.186 \times 20 = 837.2 \text{ kJ}$ • Power required (P) = $\frac{Q}{t} = \frac{837.2}{2 \times 3600}$ = $0.116 \text{ kW} = 116 \text{ W}$ • Compressor capacity of a 125 W compressor would be suitable, (Award marks as indicated or zero)	1 1 1 1 1 1		
	7		
4. Design and construct the evaporator • $Q = U \times A \times \Delta T$ • $U \approx 300 \text{ W/m}^2\text{C}$ • $A = \frac{Q}{U \cdot \Delta T} = \frac{116}{300 \times 10} = 0.0387 \text{ m}^2$ • $A = \pi \times d \times L$ • $L = \frac{A}{\pi \times d} = \frac{0.0387}{\pi \times 0.00635} = 1.94 \text{ m}$ • Cut approximately 2 meters of $\frac{1}{4}$ tube pipe • Reamed the cut pipe • Formed the copper pipe into a coil shape • No kink on the evaporator (Award marks as indicated or zero)	1 1 1 1 1 1		
	8		

TASK 2: ASSEMBLE THE PARTS OF THE WATER-COOLING SYSTEM			
5. Mounted system components on the platform - Mounted compressor on the plat form - Mounted the condenser platform - Mounted tank on the platform	1 1 1		
<i>(Award marks as indicated or zero)</i>	3		
6. Completed the refrigerant circuit - Brazed the discharge line on the discharge of compressor - Used flux to braze discharge line on to the condenser - Used flux to Braze condenser to a filter drier - Brazed the capillary tube to the evaporator - Brazed the evaporator to the evaporator - Brazed suction line to the evaporator - Brazed the suction line on to the compressor	2 2 2 2 2 2		
<i>(Award marks as indicated or zero)</i>	14		
7. Carried out pressure testing on the system as per standard operating procedure - Set-up nitrogen tank for pressure testing - pressure for pressure strength test - Checked for leakage	1 1 1		

- Performed pressure tightness test - Repaired leaking section, if necessary (Award marks as indicated or zero)	1		
	1		
	5		
TASK 3: PERFORMED INSULATION			
8. Performed insulation - Insulated the tank with insulation form - Insulated the suction line with Armaflex (Award marks as indicated or zero)	1		
	1		
	2		
TASK 4: INSTALLED THE WIRING SYSTEM OF THE COOLER			
9. Performed wiring of the cooler - Correctly stripped the wire - Connected the thermostat on the li - Place the probe of the thermostat inside the tank - Connected the overload live - Connected the relay on the negative - Correctly connected the relay and overload on the compressor - Correctly installed the top plug - Used a multimeter to confirm correct wiring (Award marks as indicated or zero)	1		
	1		
	1		
	1		
	1		
	3		
	10		
TASK 5: CHARGE 100 g OF REFRIGERANT INTO THE SYSTEM			

8. Performed system evacuation as per standard operating procedure • Set-up evacuation equipment • Started evacuation • Monitored operation • Stopped evacuation <i>(Award marks as indicated or zero)</i>	1 1 1 1 4		
9. Performed charging operation on the air conditioning unit as per service requirement guide • Set-up refrigerant charging equipment • Purged hoses • Monitored charging operation (Pressures; Performance) • Charged 100g of refrigerant • Stopped charging operation <i>(Award marks as indicated or zero)</i>	1 1 7		
TASK 6:TEST RUN AND COMMISSION THE REPAIRED UNIT			

10. Monitored performance of the system as per workplace procedures.			
• Checked for compressor vibration	1		
• Examined evaporator temperatures	1		
• Checked the condenser temperatures	1		
• Poured water into the tank	1		
• Check the operation of the thermostat	1		
(Award marks as indicated or zero)	4		
11. Performed housekeeping as per workplace policy			
• Cleared the work station,	1		
• Cleaned and stored tools and equipment			
• Cleaned the air conditioning sys	1		
• Disposal of any waste			
(Award marks as indicated or zero)	4		
12. Commissioned the unit as per standard operating procedures	2		
13. Prepared a service report in line with workplace procedures	4		
GRAND TOTAL	80		
ASSESSMENT OUTCOME			

The candidate was found to be:	
Competent ☐	Not yet Competent ☐
<i>(Please tick as appropriate)</i>	
<i>(The candidate is competent if the candidate obtains at least 50%)</i>	
Feedback from the Candidate:	
Feedback to the Candidate:	
Candidate Signature	Date:
_____	_____
Assessor's Signature	Date
_____	_____