



higher education
& training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

RENEWABLE ENERGY TECHNOLOGIES

NQF LEVEL 3

TEST 2

Time: 1H30min

Marks: 50

INSTRUCTIONS & INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number all the answers according to the numbering system used in the question paper.
4. Write neatly and legibly.

QUESTION 1

- | | | |
|-----|---|------------|
| 1.1 | What is the relationship between heat and temperature? | (2) |
| 1.2 | Name the three modes of heat transfer | (3) |
| 1.3 | How is thermal losses prevented in solar collectors | (2) |
| 1.4 | Give the definitions for the following: <ul style="list-style-type: none">• Direct irradiation• Diffused irradiation | (1)
(1) |
| 1.5 | Name three aspects that must be considered when installing solar collectors on a roof or on the ground. | (3) |
| 1.6 | What is the minimal distance between the height of the tank and the collector in a split thermo-siphon system? | (2) |
| 1.7 | Why are mounting kits used when installing SWH systems on top of rooves? | (1) |
| 1.8 | Name the TWO ways to mount flat plate collectors | (2) |

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QUESTION 2

- 2.1 Define Density (1)
- 2.2 What is the purpose of an expansion vessel, and give a brief explain how it works? (3)
- 2.3 Determine the volume increase of a 100 litres of water based on a temperature increase from 15°C to 55°C.
 Volumetric (cubic) expansion coefficient = 0.0007
 Use $\Delta V = V \times C \times \Delta T$ (2)
- 2.4 Is the expansion vessel installed in the cold or hot water line? (1)
- 2.5 Determine the minimum size (volume) of an appropriate expansion vessel for a given SWH system (150lt storage and 2,5m² collector area).
 Use the correct units
 Known quantities:
 V_t = 10 litre
 C_e = 0.0007
 Expansion volume factor = V_t x C_e
 V_{vap} = 2 litre
 V_r = 5 litre
 P_M = 5,4 bar
 P_m = 1,4 bar
 P_{PRV} = 6 bar

$$V_u = [(V_t \times C_e) + V_{vap} + V_r] \times \frac{P_M + 1}{P_M - P_m}$$
 (3)
- 2.6 What does the abbreviation “Vu” in question 2.3 stand for? (1)
- 2.7 Calculate the quantity of heat required to raise the temperature of 450 grams of water from 15°C to 85°C. (1)
 Given:
 m = 450g
 C = 4.2J/g/°C
 T_{initial} = 15°C
 T_{final} = 85°C
 Formula: Q = C x m x ΔT (2)

2.8 Define Specific heat capacity, and in what unit is it measured? (2)

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QUESTION 3

3.1 Define the following:

3.1.1 Ergonomic Hazards (2)

3.1.2 Chemical hazards (2)

3.2 Name the four steps of the risk assessment process? (4)

3.3 List FIVE precautions that should be taken into consideration when using a ladder to gain temporary access to a roof. (5)

3.4 Give TWO guidelines that should be considered when using scaffolding. (2)

3.5 By using the definitions, give the difference between a RESTRAINT SYSTEM and a FALL ARREST SYSTEM (2)

[17]

TOTAL 50
