higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

RENEWABLE ENERGY TECHNOLOGIES
NQF LEVEL 3

(12041043)

21 November 2018 (X-Paper)
09:00–12:00

This question paper consists of 7 pages and 1 formula sheet.

NCV

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TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. A formula sheet is attached.
5. Write neatly and legibly.

NCV

QUESTION 1

1.1 Explain why South Africa has such a high greenhouse gas emission rate. (2)

1.2 How do solar water-heating systems reduce CO_2 emissions? (3)

1.3 Name FIVE factors that can affect financial returns when installing a solar water-heating system. (5)

1.4 Name the THREE Acts (legislation) relevant to the work of a solar water-heating installer. (3)

1.5 Give FOUR examples of issues that are addressed by SANS 10252-1. (4)

1.6 SANS 10400 XA sets out the standards for energy usage in buildings.

Name THREE standards that have specific reference to solar water-heating systems. (3)

[20]

QUESTION 2

2.1 Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–E) next to the question number (2.1.1–2.1.5) in the ANSWER BOOK.

	COLUMN A		COLUMN B
2.1.1	Light reflected or scattered from ground or nearby surfaces	A	radiation
2.1.2	This type of mounting is used on flat or low-pitched roofs (< 10°)	B	Standoff mounting
2.1.3	Mounting on roofs that slightly elevates the collector from the roof surface allowing air and rainwater to pass underneath the collector	C	absorption
2.1.4	Energy emitted in the form of light like electromagnetic waves	D	rack mounting
2.1.5	The condition in which radiation is converted into sensible heat within material	E	reflected light

(5 × 1) (5)

2.2 Make a sketch of the construction of a flat plate solar collector. Clearly show and label the different parts. (8)

2.3 Name the THREE most common modes of heat transfer. (3)

2.4 State ways in which the effects of shading on a solar water-heating system can be minimised. (3)

2.5 Define the following terms regarding energy conversion:

2.5.1 Transmittance

2.5.2 Emission

2.5.3 Reflection

(3 × 2) (6)

2.6 Name FIVE factors to be considered before installing a solar water-heating system on a roof. (5)

[30]

QUESTION 3

3.1 Explain the following terms:

3.1.1 Safety hazards

3.1.2 Chemical hazards

3.1.3 Burning and scalding hazards

(3 × 2) (6)

3.2 The table below shows a health and safety checklist. Complete the table by writing only the missing information next to the question number (3.2.1–3.2.2) in the ANSWER BOOK.

HEALTH AND SAFETY CHECKLIST		
FACTOR	BEST PRACTICE	OPTIONS IF BEST PRACTICE IS NOT PRACTICABLE
Fall over roof's edge	3.2.1	Use barriers to restrict access to 1 m or at least 2 m from the hazard.
Protect workers from falling from incomplete roofs	Use safety nets/mesh before the roof is laid	3.2.2

(2 × 1) (2)

3.3 Complete the sentences below by choosing a word from the following list. Write only the answer next to the question number (3.3.1–3.3.4) in the ANSWER BOOK.

scaffolds; platforms; hazards; ladders; trustworthy; competent; concrete; firm

3.3.1 Use a … foundation to set up the scaffold.

3.3.2 A … person must be available to set up the scaffold.

3.3.3 There are different kinds of … and the one used must be suitable for the specific job and must be able to carry the necessary load (tools, equipment, workers, etc.).

3.3.4 All workers using a scaffold should be trained to use the scaffold and how to recognise … associated with the type of scaffold they are working on.

(4 × 1) (4)

3.4 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (3.4.1–3.4.3) in the ANSWER BOOK.

3.4.1 Anchor points should ideally be positioned above head height of the worker to limit the free fall distance.

3.4.2 Body harness systems require that the lanyard or the safety line is connected to a suitable anchorage point.

3.4.3 All temporary anchors must be set up by competent persons and must be installed or fitted in accordance with the manufacturer's instructions and specifications.

(3 × 1) (3)

[15]

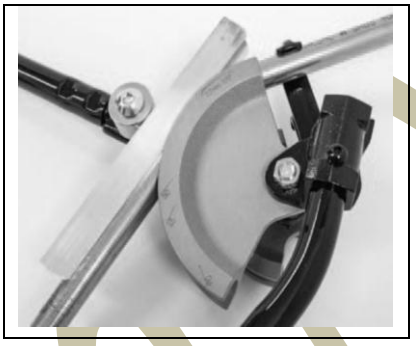
QUESTION 4

4.1 Describe the use of each of the following tools:

4.1.1



4.1.2



4.1.3



4.1.4



(4 × 1) (4)

4.2 Describe the procedure for joining a copper pipe (tube) by making use of a capillary pipe fitting. (6)

4.3 Make a neat, labelled sketch of the working principle of an evacuated heat pipe system. (6)

4.4 Name the following valves that are used in a solar water-heating system:

4.4.1 

4.4.2 

(2 × 1) (2)

4.5 Explain the working principle of a heat exchanger. (2)

4.6 Name THREE application criteria that will determine the type of pump that is suitable for an installation, when designing a solar system. (3)

4.7 Compare the main difference in operation between active and passive heating systems. (4)

4.8 Name TWO main components in a low-pressure close-coupled thermos-siphon system. (2)

4.9 Name TWO types of collector glass. (2)

4.10 State FOUR points of information that should appear on the site assessment checklist of a solar water-heating system. (4)

[35]

TOTAL: 100

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FORMULA SHEET

$\Delta = V \times C \times \Delta T$

$Q = C \times m \times \Delta T$

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