higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

PROCESS TECHNOLOGY
NQF LEVEL 2

21 November 2023

This marking guideline consists of 6 pages.

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QUESTION 1

1.1 C
1.2 D
1.3 A
1.4 B
1.5 D

(5 × 1) **[5]**

QUESTION 2

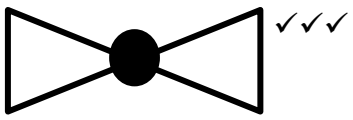
2.1 False
2.2 False
2.3 True
2.4 False
2.5 True

(5 × 1) **[5]**

QUESTION 3

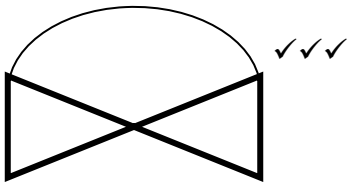
3.1
- The line number, which describes the area where the pipe is found.
- The fluid transported within the pipe.
- The pipe size.
- The type and thickness of insulation, where applicable.
- The pipe class. (4)

3.2 3.2.1 Globe valve



(3)

3.2.2 Diaphragm valve



(3)

3.3
- Bolts not filled correctly✓
- Mating flanges not fitted correctly✓
- Flanges not lined up correctly✓
- Bolts loose or bolt holes not aligned perfectly✓
- Incorrect joining materials (Any 3 × 1) (3)

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3.4
- Flanged connections
- Screwed connections
- Welded connections
- Flared connections (Any 3 × 1) (3)

[16]

QUESTION 4

4.1 'Reciprocating' means that something is moving backwards and forward.✓✓
OR It is something that moves to and fro.✓✓ (2)

4.2
- Gear pumps
- Vane pumps
- Lobe pumps
- Screw pumps
- Cam-and-piston pumps (Any 4 × 1) (4)

4.3
A – Filter
B – Compressor
C – Knockout drum
D – Non-return valve
E – Gate valve
F – Separator drum
G – Dryer
H – Relief valve (8)

4.4
- Requires high maintenance
- Fixed speed
- Creates noisy atmosphere
- Damping requirement
- More moving parts
- Efficiency drops off between overhauls
- High running costs (Any 5 × 1) (5)

[19]

QUESTION 5

5.1
- They provide a flexible method of delivering small quantities of products to clients.
- They are re-usable, which makes them cost-effective compared to drums.
- Since they are re-usable, they are also environmentally friendlier than drums since they have no liners and do not need to be disposed of.
- They are corrosion-resistant, which makes them long-lasting and prevents corrosive products from affecting its contents.
- Some standardisation and adaptability allow for integration into a process.
- Forklift and overhead crane lugs provide for easy manoeuvrability.
- They can be stacked on top of one another, making them compact and convenient to store and transport. (Any 5 × 1) (5)

5.2
- Ensure that all equipment is properly earthed to prevent static electricity discharge.
- Do not introduce an ignition source to an area that contains or has contained flammable material.
- Do not cut, weld, or heat empty containers.
- Store and dispense chemical material in well-ventilated areas only, away from heat and sources of ignition.
- Label containers properly, and keep them closed when not in use.
- Check that labels remain legible and firmly fastened if the product is to be stored for a long period.
- Do not allow waste to accumulate.
- Clean up spills of flammable products as soon as they occur.
- A clean and tidy site reduces the risk of fires involving litter, rubbish, and flammable waste products.
- In the event of fire, follow the emergency procedures outlined in your company's emergency plan. (Any 5 × 1) (5)

5.3
- Plastics
- Dry chemicals
- Waste products
- Minerals
- Pharmaceuticals (5)

[15]

QUESTION 6

6.1 Water to be treated normally comes from a river, dam, or an underground source and is treated to make it fit for human consumption.✓ Some of this water may be fit for consumption even without treatment, but the treatment done by private or municipal treatment plants ensures that all contaminants are within a specified range.✓ These plants have to clean the water to very specific standards in order to make it safe for consumption.✓ These standards are known as contamination limits and specify the number of particular contaminants allowed in the water.✓ The contamination limits of treated water for human consumption✓ (5)

6.2
- Pre-treatment
- Primary sedimentation
- Activated sludge treatment
- Disinfection
- Solids treatment (5)

[10]

QUESTION 7

7.1 7.1.1 Saturation happens when a solvent has so much solute dissolved in it that it cannot dissolve any more.

7.1.2 Mother liquor is the portion of a solution remaining after crystallisation.

7.1.3 Crystals are solid chemicals with a long-range, three-dimensional internal atomic structure.

(3 × 2) (6)

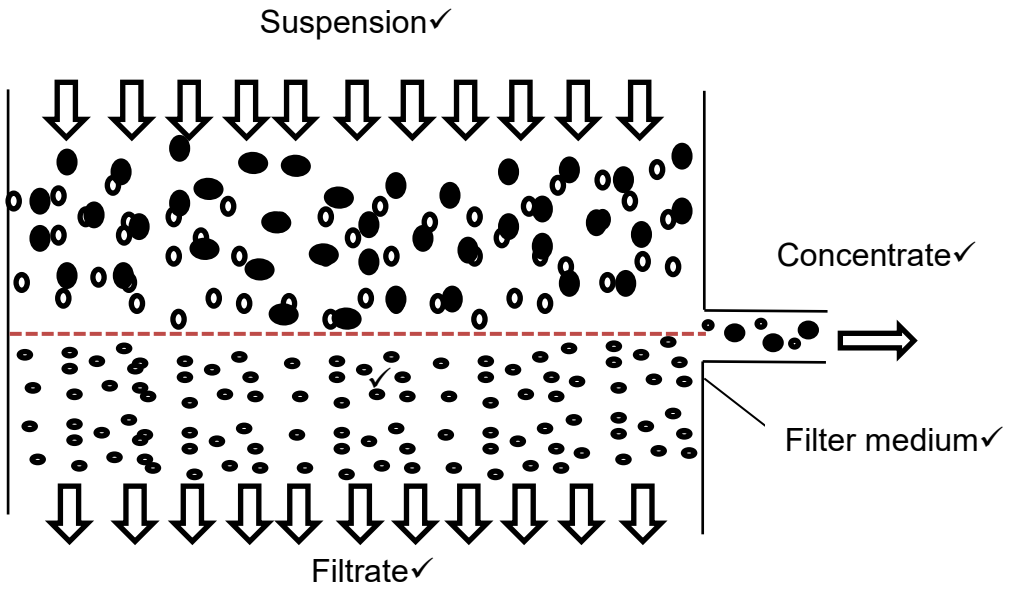
7.2 $V = \frac{35\ 000\ \ell}{1\ 000}$ = 35 m^3✓

$F = \frac{7{,}5\ \ell/min \times 60\ min/h}{1\ 000\ \ell/m^3}$✓ = 4,5 m^3/h✓

$T = \frac{V}{F} = \frac{35}{4{,}5}$✓

= 7,7 h✓ (5)

7.3



(5)

7.4 One of the main reasons why supersaturation occurs is because of a lack of nucleation.✓ For crystals to form, they need starting points in the form of either small particles or any other rough surface.✓ Since producers do not want crystals to form against the sides of the crystallisation equipment, they keep these surfaces very smooth and clean and rather provide other nucleation starting points called nuclei.✓ Small crystals are generally mixed with water to form 'magma', which is added to the process to act as nucleation zones for crystal growth.✓ The crystal size, quantity of crystals, and the time at which they are added to the solution determine the growth rate and form of the crystals materialising in the process.✓ (5)

7.5
- Annulus
- Tubular section
- Conical section
- Junk trap (4)

7.6
- Once installed, they are inflexible because their performance is determined by their designed feed flow rates.
- They are sensitive to changes in feed flow rate and quality.
- They are susceptible to abrasion erosion.
- They have low efficiencies.
- Pump-operating costs can become high when multiple banks of cyclones are required to separate very small particles or similar materials. (5)

[30]

TOTAL: 100

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