higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

PROCESS TECHNOLOGY
NQF LEVEL 2

15 November 2024

This marking guideline consists of 6 pages.

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QUESTION 1

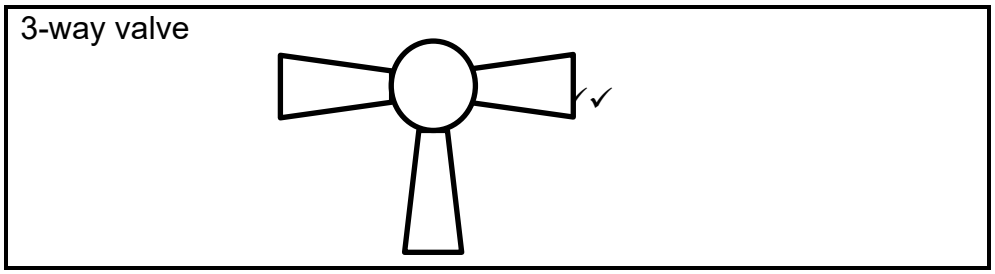
1.1 B
1.2 A
1.3 C
1.4 A
1.5 B

(5 × 1) **[5]**

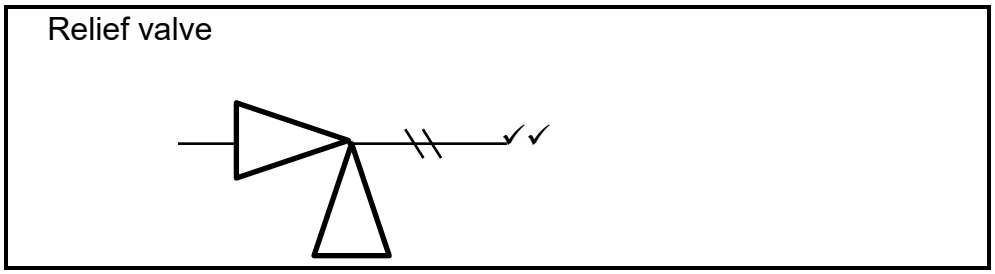
QUESTION 2

2.1
- To understand how the process works
- To trace a process through the plant
- Identify a process or stream
- Keep records of piping and equipment in a process plant (Any 2 × 1) (2)

2.2 2.2.1



2.2.2



(2 × 2) (4)

2.3
- The line number
- The fluid transported within the pipe
- The pipe size
- The type and thickness of insulation where applicable
- The pipe class (Any 3 × 1) (3)

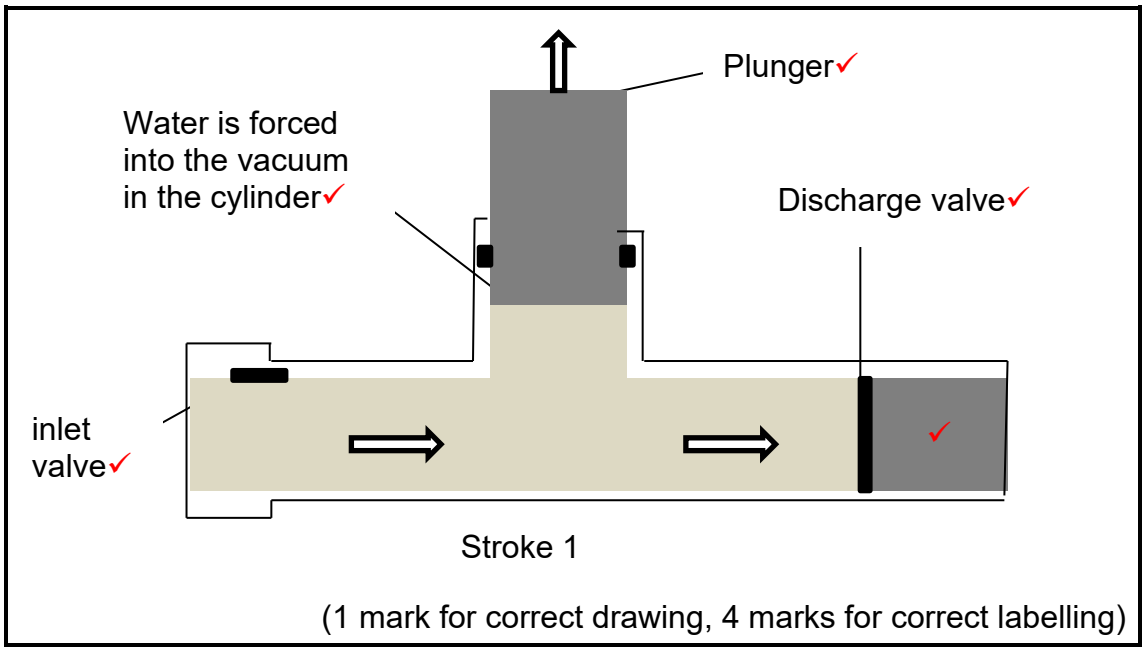
[9]

QUESTION 3

- The length of the pipe
- The nominal diameter
- The outside diameter (OD)
- The thickness of the pipe wall (wall thickness)
- The inside diameter (ID)
- The pipe schedule **[6]**

QUESTION 4

4.1



(1 mark for correct drawing, 4 marks for correct labelling) (5)

4.2
- The piston moves upward
- The liquid is drawn in through inlet valve 1
- At the same time, liquid is delivered through the discharge valve 4 (3)

4.3
- Gear pumps
- Vane pumps
- Lobe pumps
- Screw pumps
- Cam and piston pumps (5)

4.4
- Sight
- Hearing
- Smell
- Touch (4)

4.5
- Decrease liquid velocity by lowering the pump speed (if possible)
- Increase the suction line size
- Increase submergence by either limiting the minimum submergence by setting the automated pump shutoff level higher or by modifying the pump inlet to be very close to the tank floor. (3)

[20]

QUESTION 5

5.1 Standard Operating Procedures (1)

5.2 5.2.1
- Close all lids properly to prevent evaporation
- Cover bulk solids with plastic or another type of cover when not being processed.
- Close the valves of containers properly to prevent leakages
- Prevent leakage from containers and immediately clean leakages
- Do not allow unauthorised personnel into storage area
- Never leave a storage area open
- Prevent spillages by working carefully (Any 5 × 1) (5)

5.2.2
- Act immediately when you see a leaking container
- Always dispose of old or poor quality items properly
- Ensure that dangerous gases do not leak into the atmosphere
- Do not allow chemicals to react with one another (4)

5.3
- Am I safe?
- Who else is at risk?
- What risks have been caused by the spillage?
- How can the spillage be controlled or made safe?
- What precautions should be taken?
- Who should be informed?
- What can I learn from this? (7)

5.4
- Headroom constraints prevent the use of top-entry mixers
- Mixing is important in the bottom portion of a deep tank
- Large diameter storage tanks where several mixers are more efficient
- High-viscosity bleeding is required (Any 3 × 1) (3)

[20]

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QUESTION 6

6.1 Demineralised water is water that has been treated by ion exchange to remove unwanted components that may clog up equipment when the water is evaporated to produce steam.✓ Apart from the steam production, demineralised water is also used in industry for food and beverage production, an ingredient in chemical processing, and for some specialised cleaning functions.✓ There is a great deal of dispute about whether minerals should be removed from drinking water since these minerals are essential for human health.✓ (3)

6.2
- Household effluent
- Plants dying in the water
- Industry due to their processes (3 × 1) (3)

6.3
- Feed inlet
- Screen basket
- Rotor
- Motor
- Outlets for different size particles (Any 4 × 1) (4)

[10]

QUESTION 7

7.1 7.1.1 Filtrate is the liquid that has passed through the filter

7.1.2 A material with pores or holes through which fluids can pass

7.1.3 Slurry is a thick suspension of solids in a liquid, such as a mixture of water and cement

7.1.4 Coagulation is a chemical treatment process used to bind similar substances together in a bigger particle or colloid

7.1.5 Supersaturated mean something is more concentrated than normal (5 × 2) (10)

7.2
- Size
- Density
- Physical shape
- Stock viscosity
- Presence of air (5)

7.3
- Trough
- Water jacket
- Cooling water inlet
- Cooling water outlet
- Feed solution inlet
- Mother liquor outlet
- Helical agitator (7 × 1) (7)

7.4
- 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 rather provide other nucleation starting points called nuclei.
- Small crystals (nuclei) are generally mixed with water to form 'magma, which is added to the process to act as a 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 formed in the process (Any 3 × 1) (3)

7.5
- The slurry is fed to the bowl via the feed inlet pipe
- When the motor that drives the shaft is turned on, the shaft spins the bowl at a high speed, spinning the materials with it
- The centrifugal force moves the mixture outward from the centre of the bowl towards the bowl's wall where the materials separate into layers according to their densities.
- The clarified liquid is continuously removed through the overflow outlet
- As the solids deposit on the wall, the cake becomes thicker and when it is so thick that the centrifuge is no longer effective, it is cleaned (5)

[30]

TOTAL: 100

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