higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

PLANT OPERATION THEORY N1

5 APRIL 2018

This marking guideline consists of 5 pages.

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QUESTION 1: CHEMISTRY

1.1

CHEMICAL NAME		CHEMICHAL FORMULA	
1.1.1	Sodium chloride	1.1.2	NaCl
1.1.3	Hydrogen oxide	1.1.4	H_2O
1.1.5	Calcium oxide	1.1.6	CaO
1.1.7	Aluminium oxide	1.1.8	Al_2O_3
1.1.9	Silicon oxide	1.1.10	SiO_2

(10 × 1) (10)

1.2 $_{13}Al$: $1s^2,2s^22p^6,3s^23p^1$✓✓

$_{10}Ne$: $1S^2,2S^22p^6$✓✓

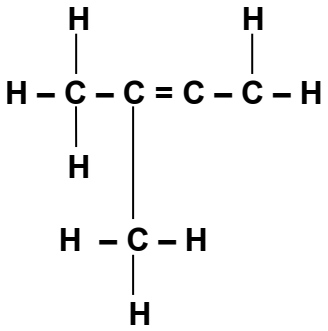
Neon complies the structure of noble gas, $2S^2$ and $2P^6$✓

Filled the orbitals. (5)

1.3 $Zn + HCl$✓ $\rightarrow ZnCl_{2(aq)}$✓ + $H_{2(g)}$✓

Metal + Acid → Salt + hydrogen gas (3)

1.4



(4)
[22]

QUESTION 2: VALVES AND PIPES

2.1
- Size of pipe
- Length of pipe
- Bends
- Roughness inside pipe
- Flow velocity
- Restrictions caused by fitting
- Density of fluid (Any 5 × 1) (5)

2.2
- Light and medium weight
- Cheap and easy to install
- Not easily affected by soil corrosion and weathering
- Low friction factor
- Resistant to chemicals (Any relevant 5 × 1) (5)

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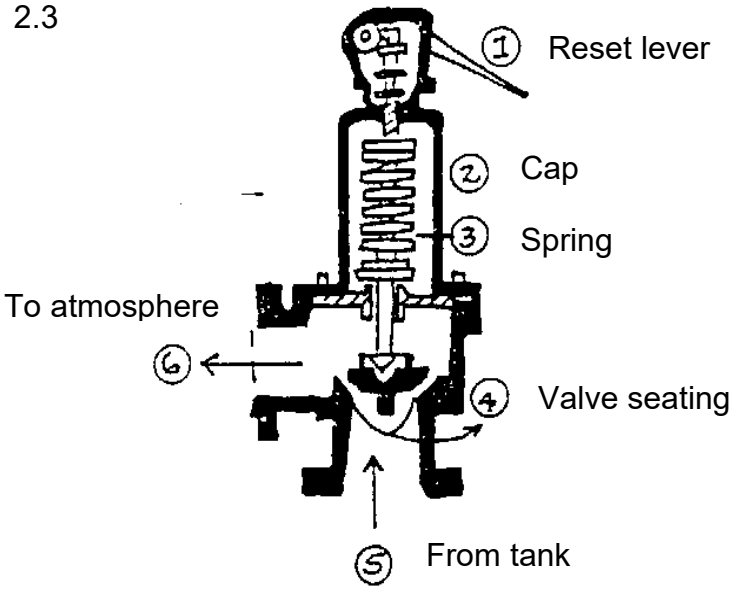
2.3



(6)

2.4
- Check for leakages.
- Use sufficient force to close the valve completely.
- If the valve was not closed tightly, open and close it a couple of times to remove seat bedding caused by flow pressure.
- Ensure that you close the valve properly after use.
- Rinse the pipe and the valve before operation.
- Lubricate the valve regularly if possible. (Any 5 × 1) (5)

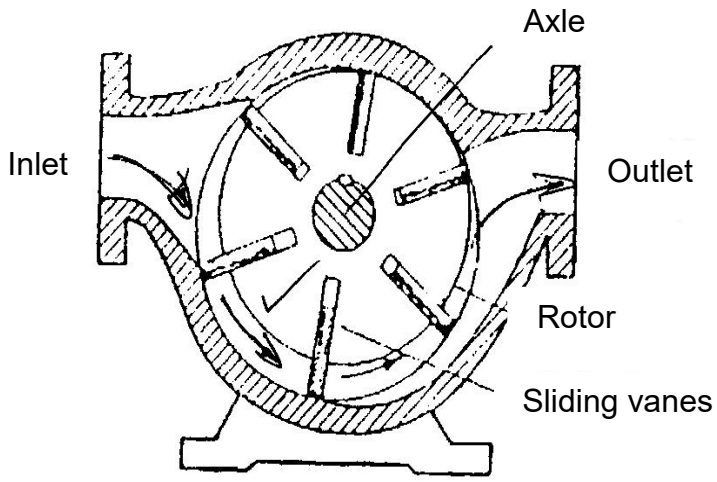
[21]

QUESTION 3: PUMPS AND INSTRUMENTATION

3.1
- Pump casing – surrounds the shaft gland packing impeller
- Suction port – where the fluid enters the pump
- Discharge port A bearing – supported part that holds and turns the impeller when the shaft is coupled to a motor
- Bearings – support the shaft and impeller in a casing
- Impeller – rotating part that increases the speed of the fluid
- Types of impeller used for different purposes (Any 5 × 2) (10)

3.2
- Two stuffing boxes
- Complex housing many parts
- Not suitable for high pressure
- Not suitable for high viscosity
- Not good with abrasives (5)

3.3



1 mark for drawing (6)
[21]

QUESTION 4: DISTILLATION AND WATER TREATMENT

4.1
- Sulphate
- Chloride
- Calcium
- Magnesium (4)

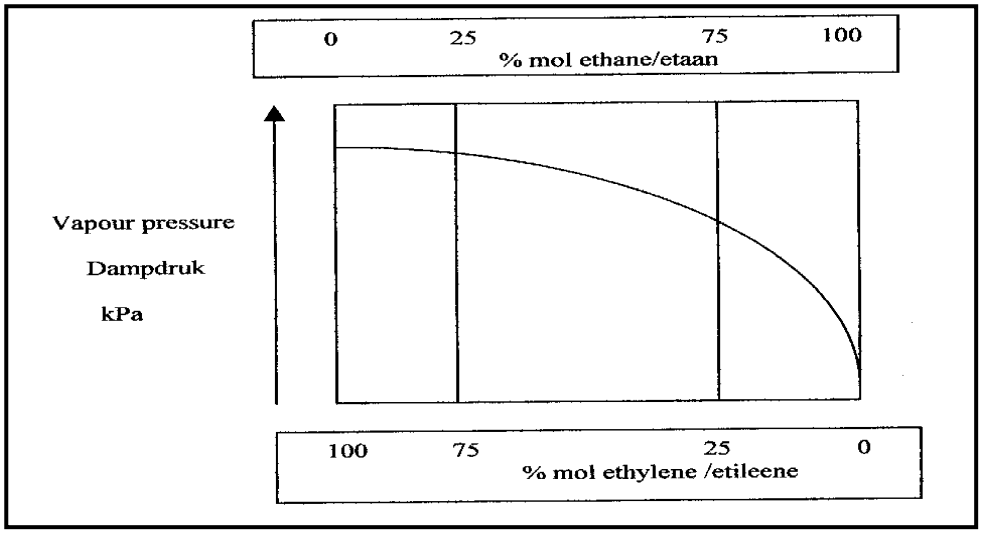
4.2
- Prevents corrosion to equipment and machinery
- Prevents scaling in pipe, tubes, heat exchangers and boilers
- Blocks the pipes
- Improves working process
- Economical (5)

4.3 4.3.1 Separation of component of a liquid mixture through evaporation✓ and cooling until a pure light product is obtained towards the top✓ and a pure heavy product at the bottom.✓ (3)

4.3.2 Takes place as a result of heating which provides the molecules✓ of the liquids with greater molecular movement✓ (2)

4.3.3 Movement of the molecules of the vapour✓ decreases as a result of cooling✓ (2)

4.4



√ √ √ √

(2 marks for correct sketch)

VAPOUR PRESSURE AGAINST COMPOSITION OF LIQUID (4)
[20]

QUESTION 5: SAFETY AND STORAGE

5.1
- Eye protection
- Safety glasses
- Goggles
- Approved face mask (4)

5.2
- Foam
- Water pumps
- Water spray
- Gas cartridges (4)

5.3
- Cone roof
- Dome roof
- Umbrella roof
- Hanging roof
- Fixed roof (dome or cone) with internal floating roof (5)

5.4
- Lower basic price
- More convenient to prefabricate and mount
- Stronger than aluminium with clearly pronounced yield strength

(Any 3 × 1) (3)
[16]

TOTAL: 100

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