higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

PLANT OPERATION THEORY N1

31 JULY 2018

This marking guideline consists of 6 pages.

Copyright reserved

QUESTION 1: CHEMISTRY

1.1
- vinegar
- sugar
- baking soda
- caustic soda
- caustic potash
- washing soda saltpetre (Any 5 × 1) (5)

1.2 1.2.1 When two or more atoms are grouped together and held together by electrostatic force.

OR

It is the process of change valence electrons that two or more atoms achieve by loss or gain of electrons.

1.2.2 It is the sharing of electrons in pairs that occur with the gain or loss of electrons.

OR

It occurs when atoms of non-metals combine with each other.

OR

It is when atoms join by sharing electrons.

1.2.3 It is the fixed orderly arrangements of the small regularly shaped molecules of a solid substance.

1.2.4 This is the strong force of attraction between the atoms of the element

1.2.5 These are atoms of the same element with the same number of protons but which differ with regard to the numbers of neutrons.

OR

Atoms of the same element, with the same atomic number which differ in mass number.

(5 × 2) (10)

1.3 1.3.1 True
1.3.2 True
1.3.3 True
1.3.4 False
1.3.5 False

(5 × 1) (5)

[20]

QUESTION 2: VALVES AND PIPES

2.1 These pipes are used mainly for large qualities of water,✓ e.g. storm water and drainage.
To increase the mechanical strength of concrete,✓ it is reinforced with metal but may still not used in instances where pressures and shocks are high.✓ They are not resistant to acids and some alkalis✓ and should, when necessary, be protected against them. (4)

2.2 Today lead pipes are limited to plumbing.✓ Formerly it was used in dwellings but has been abandoned to a large extent as the result of the danger of lead poisoning.✓

Lead pipes are not resistant to high pressure,✓ but are resistant to corrosion.✓

Pressing melted lead✓ through forms of the required measurements with the aid of a hydraulic plunger to obtain long seamless pipes forms lead pipes. (5)

2.3 Carbon steel pipes can be lined (galvanized) with zinc✓ it can also be lined with plastic✓ or any other rust-resistant material like copper.
(Any 2 × 1) (2)

2.4 2.4.1 Gate valves
- It shuts off flow or let it flow full out
- There is little pressure loss over the valve

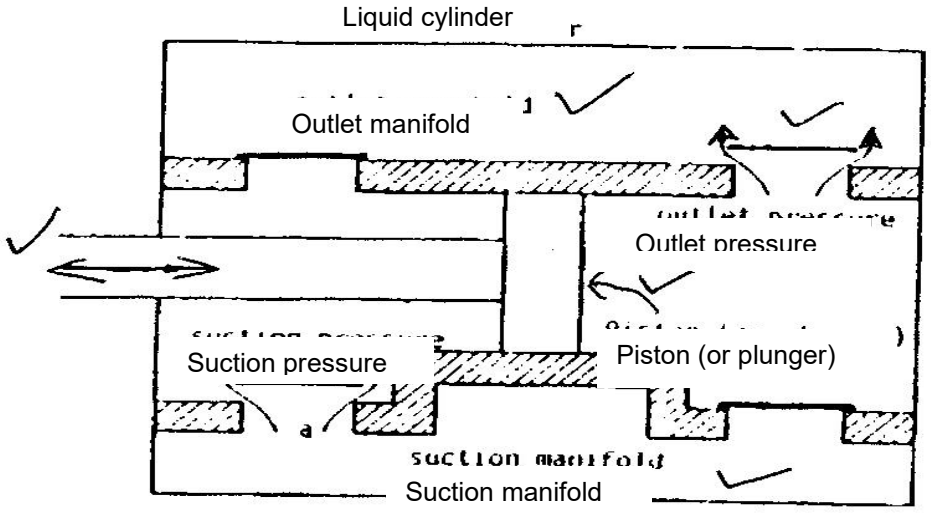
2.4.2 Ball valves
- It regulates flow
- There is a great pressure loss over the valve

2.4.3 Non-return valves
- Flows in one direction
- There is little pressure loss over the valve

(3 × 3) (9)
[20]

QUESTION 3: PUMPS AND INSTRUMENTATION

3.1



DOUBLE-ACTION PISTON PUMP SKETCH

(ONE mark for correct sketch) (7)

3.2
- A very small floor area is required
- Low maintenance costs
- A low initial cost
- High-working speed makes connection to primary source of power possible
- Small and light foundation are required
- Very little, if any, vibration
- Discharge of liquid is continuous and without shocks
- Air containers or relievers not required (Any 5 × 1) (5)

3.1 3.3.1 Work (F) = Power (P) × Distance (H)
= (2000 × 487× 9,81 × 60) ÷ 10^6✓
= <u>573,2964 MJ</u>✓

3.3.2 Power (P) = F ÷ Time (t)
= (573,2964 × $10^{6)}$÷(2×60×60)✓
= <u>4,7774kW</u>✓

3.3.3 Efficiency = output/input ×1000
= 4,7774kw/40×100
= 12%

(3 × 3) (9)

3.4 It is the force which tends to cause✓ a rotating object to move away from the centre.✓ (2)

3.5
- Pump with volute casing turbine-type
- Turbine-type with centrifugal pumps (2)

[25]

QUESTION 4: DISTILLATION AND WATER TREATMENT

4.1 Is due to bicarbonate of calcium✓ and magnesium✓ also limestone✓ and calcium carbonate.✓✓ (4)

4.2 4.2.1 These are solids such as clay, slit, mud and organic solids (leaves), which are insoluble in water.

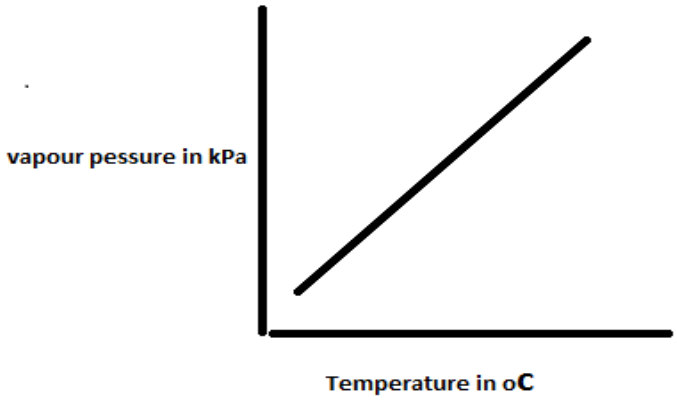
4.2.2 It is the process of removing all the dissolved salts and ions from water.

4.2.3 The contamination of water which is not visible originate from salts, soil fertilisers, human and household effluent.

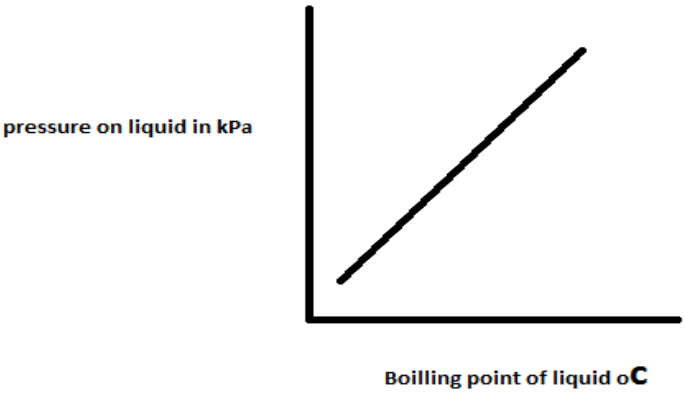
(3 × 2) (6)

4.3 Liquid will boil when the vapour pressure exceeds the pressure on the fluid. The higher the pressure , the higher the boiling point.✓

✓✓✓



Should the pressure or the temperature change,✓ the rate of evaporation will also change.



✓✓✓ (7)

[17]

QUESTION 5: SAFETY AND STORAGE

5.1
- gloves
- laboratory coats
- aprons
- safety shoes (Any 4 × 1) (4)

5.2
- oil
- fat
- grease
- organic solvents
- paint (Any 4 × 1) (4)

5.3
- lightweight
- Not easy to cored
- Have better resistance to chemical attack
- They can be used to a large oil meter up to 120 m
- Not necessary for painting (Any 4 × 1) (4)

5.4 Shortage of oxygen: $2C + O_2 \longrightarrow 2CO$✓✓ carbon monoxide is formed

Complete combustion: $C + O_2 \longrightarrow CO_2$✓✓ carbon dioxide is formed (6)
[18]

TOTAL: 100

Copyright reserved