higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

WATER TREATMENT PRACTICE N3

9 April 2021

This marking guideline consists of 5 pages.

Copyright reserved

QUESTION 1

1.1 1.1.1
- Pre-sedimentation is a pre-treatment process used to remove gravel, sand and other gritty material
- from raw water before it enters the main treatment.

1.1.2
- Floc is a collection of small particles that have come together into larger more settleable particles
- as a result of the coagulation/flocculation process.

1.1.3
- Aerobic organisms require free oxygen in air or dissolved in water in decomposing organic matter
- to gain energy for growth and multiplication.

1.1.4
- Jar tests are a laboratory procedure for evaluating coagulation, flocculation and sedimentation processes
- used to estimate a proper coagulant.

1.1.5
- A sedimentation tank is a tank in which water is retained to allow settleable matter
- such as floc to settle with gravity.

(5 × 2) (10)

1.2
1.2.1 NH_4
1.2.2 $Ca(OH)_2$
1.2.3 $CaCO_3$
1.2.4 NaOH
1.2.5 $NaHCO_3$
1.2.6 H_2SO_4
1.2.7 Na_2CO_3
1.2.8 Na_2SO_4
1.2.9 $FeCl_3$
1.2.10 CaO

(10 × 1) (10)
[20]

QUESTION 2

2.1
2.1.1 Chemical
2.1.2 Physical
2.1.3 Chemical
2.1.4 Toxic
2.1.5 Toxic

(5 × 1) (5)

2.2
- Check for any unusual noises or excessive vibration.
- Check all pump connections for evidence of leaking.
- Check the pump for overheating.
- Check the suction strainer and clean if necessary.
- Be especially alert for unusual sounds when pumping liquids containing solids. (5)

2.3
- Pump not properly primed
- Suction head too large
- Air leakages at inlet pipes and packed stuffing boxes
- Strainer blocked, and liquid cannot flow to pump casing ✓
- Pump speed too low for pressure build-up
- Pump may be badly worn or there may be another mechanical fault
- Strainer not properly submerged under water thus permitting air to be drawn in with water (7)

2.4
- Mostly requires no treatment
- Cheaper than impounding reservoirs
- The available amounts are more certain (i.e. they are not affected by draught in the short run) (3)

[20]

QUESTION 3

3.1
- Bacteria
- Algae/protozoa
- Silt and clay
- Plants (4)

3.2
- Dysentery
- Polio
- Trachoma
- Arsenicosis
- Thyroid fever
- Cholera
- Diarrhoea (Any 4 × 1) (4)

3.3
- Personal health and safety
- Representative sample collection
- Keep record of all samples collected (3)

3.4 3.4.1 $Fe(HCO_3)_2$ ✓ + $2Ca(OH)_2$✓ ⟶ $Fe(OH)_2$ ✓+ $2CaCO_3$ ✓+$2H_2O$ ✓
(✓ for correct balancing) (6)

3.4.2 $Cl_2 + H_2O$ ✓ ⟶ HOCl ✓ + HCl ✓ (3)

[20]

QUESTION 4

4.1
- Addition of the flocculants
- Initial formation of floccules
- Conditioning (flocculation) (3)

4.2
- Gas
- Granular form (powder form) (2)

4.3
- Temperature
- Turbidity
- Colour
- pH
- Alkalinity
- Time and effectiveness of mixing
- Agitation during floc formation
- Characteristics of coagulants being used
- Hydraulic conditions during flocculation (Any 5 × 1) (5)

4.4 $r = \frac{D}{2} = \frac{40}{2} = 20m$ ✓

$V = \pi r^2 h$

$= 3{,}142 \times (20)^2(6)$ ✓

$= 7540{,}8\ m^3$✓ (3)

4.5 12 l/s = 12 × 60 = 720 l/min✓

$\frac{720}{1000}$ = 0,72 m^3/min

$\frac{7540{,}8m^3}{0{,}72m^3\ \min} = \frac{10473{,}333\min}{60}$ ✓

= 174,555

= 175 hrs✓ (3)

[16]

QUESTION 5

5.1
- Desalination of brackish water supplies and seawater can be very costly.
- Some of the processes of removing salts from water are distillation, demineralisation, electro dialysis, reverse osmosis, etc.
- Reverse osmosis and electrodialysis are used to desalt brackish groundwater
- or to reduce the concentration of contaminants such as nitrate and fluoride. (4)

5.2
- Differential pressure and filter runs
- Volume of wash water used and time backwashed
- To avoid deterioration of filtered water it is important to see whether the air and water are evenly distributed over the sand bed
- Check for mud balling
- Measure the filter bed at least twice per year and record the depth
- Brush the filter walls daily to keep it free from growths
- Regularly measure and record turbidity of filtered water
- Regularly fill recording instruments with ink and change flow charts

(Any 5 × 1) (5)

5.3
- Open the water supply to the injector.
- Start the pump and check to see that the needed pressure is obtained.
- Open the valve on the chlorine cylinder.
- Note the mass of the mass.
- Check whether the pressure gauge and vacuum gauge are registering correctly. (5)

5.4
- Saturation index = pH – pHs
- If the index is zero the water is in chemical equilibrium
- If the index is positive the water has scale forming properties.
- If the index is negative the water has corrosive properties. (4)

5.5
- Paint the object.
- Apply oil, grease, Vaseline or lard.
- Metal coating
- Hot dipping – dip mild steel into molten zinc to produce galvanisation.
- Electroplating
- Spraying coatings such as tin, copper, aluminium, etc. onto base metals.
- Nonmetallic coating: anodising, chromating, etc. (Any 6 × 1) (6)

[24]

TOTAL: 100

Copyright reserved