higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

WATER AND WASTE-WATER TREATMENT PRACTICE N2

28 November 2024

This marking guideline consists of 4 pages.

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QUESTION 1

1.1 1.1.1 Chlorine is used up as organisms are being destroyed✓and if enough chlorine is added, there will be some left in the water after all the organisms have been destroyed.✓ This is called free chlorine.✓

1.1.2 If the water is tested and there is still some free chlorine left, it proves that the most dangerous organisms in the water have been removed✓and it is safe to drink.✓This measuring is called the chlorine residual. ✓

1.1.3 Toxic substances have a poisoning effect on humans, animals or plants.✓Metals and have a more serious effect on some species than others have.✓For example, copper is essential in minute amounts in the human diet, but small amounts of copper are detrimental to marine life.✓

(3 × 3) (9)

1.2 This method uses a diethyl-p-phenylenediamine (DPD) powder.✓ DPD reacts with the residual chlorine, turning it a shade of pink.✓ The pinker the water, the more chlorine present.✓ (3)

1.3
- Hydrolysis.✓
- Acidogenesis.✓
- Acetogenesis.✓
- Methanogenesis.✓ (4)

1.4 Colour in water is normally caused by organic substances,✓– usually these substances result from the vegetation in the area through which the water flows.✓ For example, the vegetation in the Western Cape gives rise to the brown or tea-like colour in the water of that region. ✓ (3)

1.5
- Screens may be used to remove rocks, sticks, leaves and other debris. ✓✓
- Clorine may be added to control the growth of algae. ✓✓
- A pre-sedimentation stage can settle out sand, grit and gravel from raw water. ✓✓ (3 × 2) (6)

[25]

QUESTION 2

2.1 Turbidity is the cloudiness or haziness of water✓ caused by large numbers of individual particles✓ that are generally invisible to the naked eye✓. The measurement of turbidity is a key test of water clarity✓ and water quality✓. (5)

2.2 It is the process of removing undesirable chemicals,✓biological contaminants, suspended solids✓and gases from contaminated water.✓The goal is to produce water fit for a specific purpose✓ (e.g. human consumption).✓ (5)

2.3
- Flash mixing✓
- Floc formation✓
- Floc conditioning✓ (3)

2.4 $\mathrm{R} = 700\ \mathrm{mm}/1\ 000 = 0{,}7\ \mathrm{m}$✓

$A = \pi r^2$✓
$= 3{,}14 \times (0{,}7)^2$✓
$= 1{,}539\ \mathrm{m}^2$✓

$\mathrm{Q} = \mathrm{VA}$✓
$= 5 \times 1{,}539$✓
$= 7{,}695\ \mathrm{m}^3/\mathrm{s}$✓ (7)

[20]

QUESTION 3

3.1 The Green Drop certification programme was designed to serve as a stimulus for change,✓a catalyst to establish motivation and leadership in the water sector regarding the management of waste-water services.✓ The aim of the Green Drop programme is to create a paradigm shift by which waste-water operations,✓ management and regulation is approached. It promotes incentive-based regulation;✓establishing excellence as the benchmark for wastewater services.✓ (5)

3.2
- Operations (system control) ✓
- Maintenance (servicing, repair, inspection) ✓
- Monitoring quality✓
- Troubleshooting and optimisation✓
- Documentation✓ (5)

3.3 The sludge that settles to the bottom of the sedimentation tanks✓must be withdrawn.✓ Sludge is collected in the hoppers within the tank where it concentrates to give a higher percentage of solid matter.✓ The more concentration of the sludge that is drawn off, the less water is lost✓and the more efficient the process. ✓ (5)

3.4
- Pressure differential meter✓
- Velocity meter✓
- Magnetic flowmeter✓
- Ultrasonic flowmeter✓ (4)

3.5
- Oxidising carbonaceous biological matter✓
- Oxidising nitrogenous matter✓
- Removing phosphates✓
- Driving entrained gases like carbon dioxide, ammonia, nitrogen✓
- Generating biological floc that is easy to settle✓
- Generating liquor low in dissolved or suspended material✓ (6)

[25]

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QUESTION 4

4.1 Anaerobic fermentation could be defined as the introduction of microorganisms✓that flourish without free oxygen✓ to gradually decompose organic compounds✓induced by the action of the living organisms or the introduction of chemical agents. ✓ (4)

4.2
- Slow sand filters✓
- Rapid-gravity sand filters✓
- Pressure sand filters✓
- Hamlin-type sand filters✓
- Dual-media filters✓
- Microstraining✓ (6)

4.3
- Spreading on land: ✓The final destination of treated sewage sludge usually is land. Dewatered sludge can be buried underground in a sanitary landfill.✓ It also may be spread on agricultural land as a soil conditioner and fertiliser.✓
- Lagooning: ✓ Lagoons used for disposal are usually fairly deep. Sludge is added in successive layers until the lagoon is completely filled.✓ Final disposal of digested sludge by lagoons is economical as it eliminates all dewatering treatments. ✓
- Hazardous landfill: ✓ hazardous landfill of digested sludge, clean grit and incinerator residue✓ can be safely disposed of in abandoned mine quarry by means of dumping✓
- Landfilling:✓ Once the sludge has been effectively dewatered, it can be buried underground in a sanitary landfill or can be used as a fertiliser, depending on its chemical composition.✓ In cases where the sludge is too toxic to be reused or buried, you can simply incinerate the sludge and convert it into ash. ✓ (4 × 3) (12)

4.4
- At the convenient point after screening✓
- Lowest end of the effluent channel✓
- Effluent from trickling filters✓
- Effluent from aeration channels✓
- Effluent from the humus tank or final clarifier✓
- Sand filter effluent✓
- Effluent from maturation ponds✓
- At the receiving stream✓ (8)

[30]

TOTAL: 100

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