higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

WATER AND WASTE-WATER TREATMENT PRACTICE N2

2 August 2021

This marking guideline consists of 6 pages.

NO ANSWER PROVIDED FOR QUESTION 4.4

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QUESTION 1

1.1 Turbidity✓
1.2 Floc formation✓
1.3 Ferric chloride✓
1.4 Post-chlorination✓
1.5 Retention time✓

(5 × 2) **[10]**

QUESTION 2

2.1 E✓
2.2 C✓
2.3 A✓
2.4 F✓
2.5 B✓

(5 × 1) **[5]**

QUESTION 3

3.1 3.1.1 Anaerobic fermentation: Is a series of processes in which micro-organisms break down biodegradable material in the absence of oxygen.✓ It is used for industrial or domestic purposes to manage waste and/or to release energy.✓

The fermentation process begins with bacterial hydrolysis of the input materials to break down insoluble organic polymers,✓ such as carbohydrates, and make them available for other bacteria.✓

Acidogenic bacteria then convert sugars and amino acids into carbon dioxide, hydrogen, ammonia and organic acids.✓ Acetogenic bacteria then convert these resulting organic acids into acetic acid, along with additional ammonia, hydrogen and carbon dioxide.✓ Finally, methanogens convert these products to methane and carbon dioxide.✓ (7)

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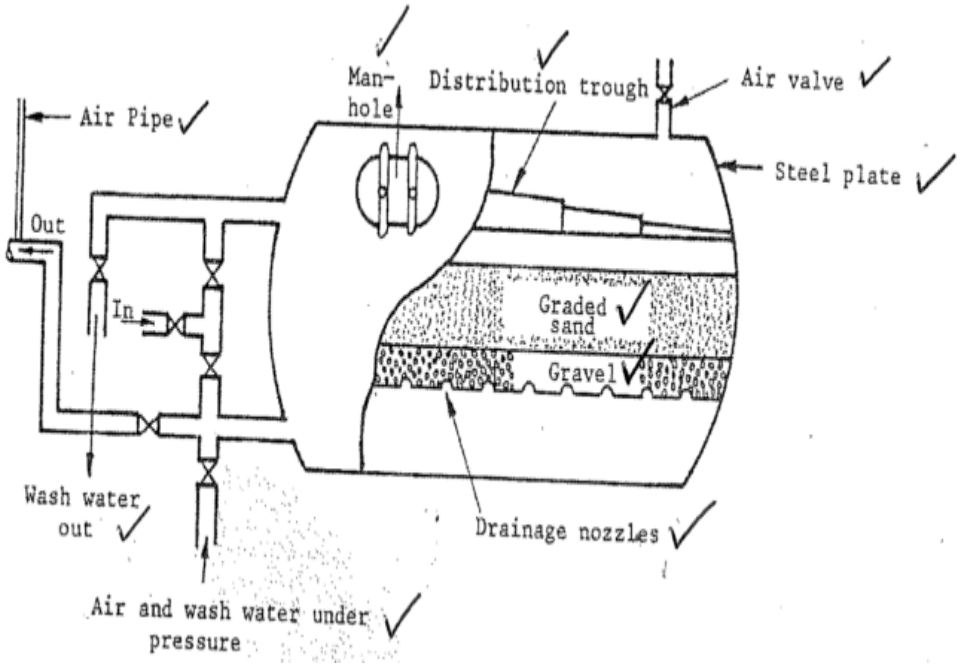
3.1.2 Sludge draw-off: The sludge which settles to the bottom of all sedimentation tanks must be withdrawn. If this not done, it will completely fill the tank.✓ Sludge is normally allowed to collect in hoppers within the tank where it concentrates to give a higher percentage of solid matter.✓ The more concentrated the sludge that is withdrawn, the less water is lost and the more efficient the process.✓

Sludge cannot be left in the hoppers for too long, as it may start fermenting, especially in the hot climates.✓
The amount of sludge to be withdrawn can be calculated from figures obtained in the laboratory will enable an operator to fine-tune this to suit the particular circumstances.✓

The valves controlling the sludge outlets can be operated manually, mechanically or electrically.✓ In some cases the rotating bridge of a radial flow tank trips a spring-loaded lever once every revolution which in turn opens the valve for a minute or two.✓

The sludge which is withdrawn from the sedimentation tanks is normally led to sludge lagoons where it concentrates further.✓ (8)

3.2



(10)
[25]

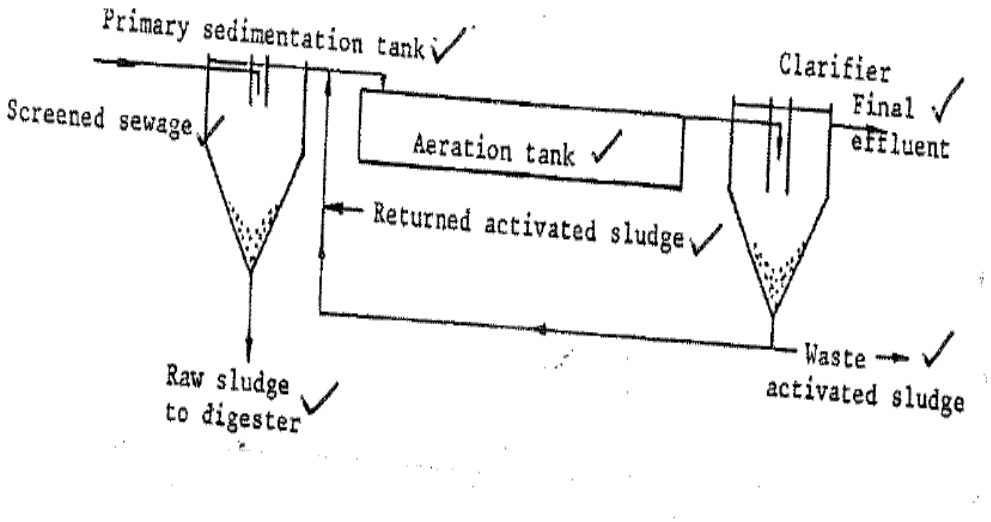
QUESTION 4

4.1
- Slow sand filters ✓
- Hamlin type sand filters✓
- Rapid gravity sand filters✓
- Pressure sand filters✓ (4)

4.2
- Water level✓
- Vent ✓
- Hydrostatic head✓
- Sludge valve✓
- Sludge✓ (5)

4.3
- Hydrolysis✓
- Acidogenesis✓
- Acetogenesis✓
- Methanogesis✓ (4)

4.4



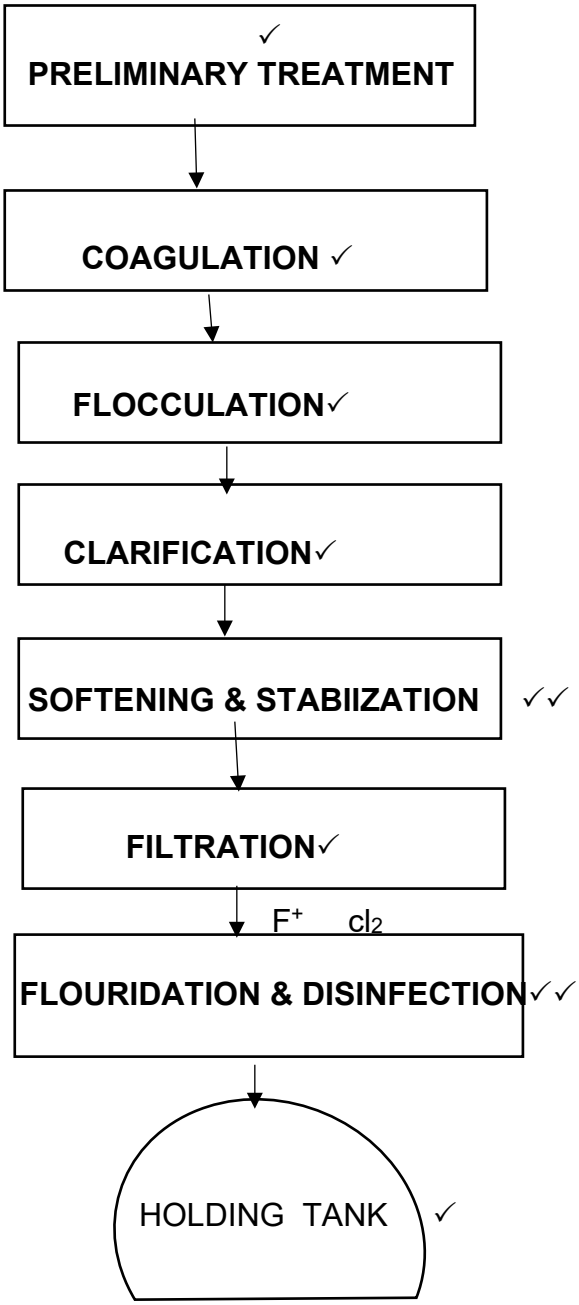
(7)
[20]

QUESTION 5

5.1 5.1.1 Colour in water is normally caused by organic substances in the water; ✓usually these substances result from the vegetation in the area through which water flows.✓
Colour could also indicate industrial pollution and suppliers should satisfy themselves about what the cause of the colour in the water is.✓
Colour from industrial plants could indicate toxic substances in the water,✓ which could be harmful to man, animals and plants.✓
Colour from vegetation is harmless and is only undesirable from an aesthetic point of view.✓ (6)

5.1.2 Coliforms are a group of bacteria of which the faecal coliforms are a subgroup.✓ The broad coliform group could originate from man, animals, plants as well as the soil.✓
Faecal coliforms originate in the intestines of man and animals.✓ They serve as an indicator of faecal pollution and other bacteria in the water originating from man or animals, which might be carriers of diseases, for example the presence of pathogenic bacteria.✓ (4)

5.2



WATER TREATMENT PROCESS (10)
[20]

QUESTION 6

6.1
- Aeration with compressed air✓
- Mechanical aeration✓
- Mixed liquor and suspended solids✓
- Control of oxygen input (demand) ✓
- Conventional aeration✓
- Extended aeration✓ (6)

6.2 Organic waste material contains carbon in its structure and originates from animal and plant matter.✓ This matter is biodegradable.✓

Inorganic waste matter contains no carbon structure and originates from lifeless products e.g. sand, mineral matter, etc.✓ This type of matter is non-biodegradable and is removed by preliminary treatment filters or settles with the introduction of chemical agents.✓ (2 × 2) (4)

6.3
- Spreading on land
- Lagooning
- Dumping
- Landfilling (4)

6.4
- Measure the temperature in an area of the reactor where the liquid has been mixed well.✓
- Dip the thermometer into the liquid,✓ move it up around, lift it out and bring up to eye level to read the temperature.✓
- Record the results.✓ (4)

6.5 Maturation is a process used to polish effluent before discharge✓✓ or to improve the bacteriological quality of the effluent which will act as a buffer in the event of a break-down at the sewage works. (2)

[20]

TOTAL: 100