higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

WATER AND WASTE-WATER TREATMENT PRACTICE N1

5 December 2023

This marking guideline consists of 6 pages.

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QUESTION 1

1.1 It is the coldness or hotness of a liquid or substance.

1.2 It is when a liquid changes its state to become a solid at a temperature of 0 °C.

1.3 It is the process by which water changes from a liquid to a gas or vapour.

1.4 Occurs when water vapour in the atmosphere condenses into clouds and falls to the earth.

1.5 It is liquid waste containing chemicals from industry or sewage.

1.6 It is water used in households for cooking, cleaning and washing.

1.7 Is water used in companies for cooling towers, cleaning the plant and mixing of chemicals.

1.8 It is water beneath the earth's surface, often between saturated soil and rock that supplies wells and springs.

1.9 It is a sanitation system which doesn't use water to function.

1.10 It is a semi-solid slurry that can be produced from a range of industrial processes from water treatment.

(10 × 2) **[20]**

QUESTION 2

2.1
- Water is the most abundant compound on the earth's surface, covering about 70% of the planet.
- In nature, water exists in liquid, solid and gaseous stages.
- A dynamic equilibrium exists between the liquid and gaseous states at standard temperature and pressure.
- At room temperature, it is a tasteless and odourless liquid, nearly colourless with a hint of blue.
- Many substances dissolve in water and it is commonly referred to as a universal solvent.
- Because of this, water in nature and in use is rarely pure and some of its properties may vary slightly from those of pure substances.
- However, there are also many compounds that are essentially, if not completely, insoluble in water.
- Water is the only common substance found naturally in all three common states of matter and it is essential for all life on Earth.
- Water usually makes up 55 to 78% of the human body. (Any 5 × 1) (5)

2.2
- Do not waste water, e.g. leaving a tap open while brushing your teeth.
- Conserve water, e.g. use water wise plants.
- Do not pollute our water sources. (3)

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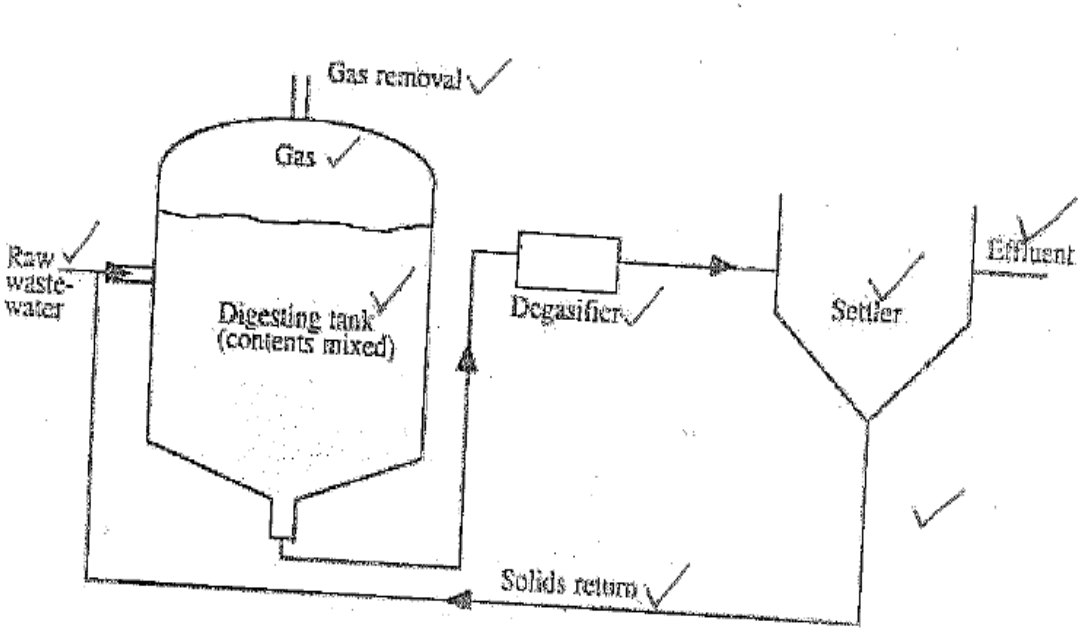
2.3



(9)

2.4 Because water is present in the air as a vapour, air pollution affects the quality of our water.✓ Air pollution is caused by fuel for cars and burning coal.✓ Smoke is unburnt carbon particles floating in the air.✓ When these particles get into water,✓ they do dissolve.✓ One can see when water is polluted because it is cloudy and unclear.✓ Exhaust gases from petrol and diesel vehicles account for 60% of all air pollution.✓ (7)

[24]

QUESTION 3

3.1
- Replace worn parts
- Check and regularly service all equipment in the penstock
- Check penstock seals, replace if faulty
- Replace filter penstock
- Check all moving parts and lubricate
- Test pressure points (Any 5 × 1) (5)

3.2 3.2.1 To remove hardness the carbonic gases must be removed.✓ Aeration has limited success.✓ Boiling the water also releases the carbon dioxide and the salts are precipitated.✓ This causes furring of hot water systems.✓ This causes blockages of hot water systems and also leads to wastage of energy.✓ (5)

3.2.2 This type of hardness cannot be removed by boiling the water.✓ Permanent hardness can only be removed by chemical means.✓ This leads to added expenses to reduce hardness levels to acceptable standards.✓ (3)

3.2.3
- Screens are used to remove solids.
- Chemicals are added to limit the growth of algae.
- A pre-sedimentation stage settles out sand, grit and gravel from the water. (3)

3.3
- Protozoan parasite
- Giardia
- Cryptosporidium (3)

3.4
- Waste during the manufacturing process
- Cleaning equipment
- Water used for cooling (3)

[22]

QUESTION 4

4.1 To measure oxygen absorption, organic and inorganic matter is oxidised by an acidified permanganate solution over a period of 4 hours at a temperature of 27 °C. (3)

4.2 Advantages
- Inexpensive
- Quickly constructed
- No water needed for operation
- Easily understood (Any 3 × 1)

Disadvantages
- Unsuitable where water-table is high, soil is too unstable to dig or ground is very rocky.
- There is no ventilation pipe so there are often odour problems.
- Insect infestation is common. (6)

4.3
- Only suitable for short-term temporary use such as special functions.
- It requires regular emptying.
- It is an expensive option. (3)

4.4 It is the procedure that takes place in order to make sewage less harmful✓ to people and the environment.✓ (2)

4.5
- Falling into treatment tanks
- Falling from treatment tanks
- Gases containing chorine or sulphur dioxide
- Splashes of chemicals in the eyes
- Crushing of fingers in machines
- Back injuries (Any 5 × 1) (5)

[19]

QUESTION 5

5.1 5.1.1 When working with harsh chemicals like acid to prevent hands from burning. (2)

5.1.2 To protect one's head against falling objects. (2)

5.1.3
- Flammable gases/vapour
- Toxic substances, most notably hydrogen sulphide
- Microbial aerosols (3)

5.2
- Flood water levels
- Peak hourly wastewater flow rates
- Water capacity of the works
- Effluent pumping systems (4)

5.3 The objective of record keeping is to aid in maintaining a safe,✓ cost effective and ecologically sound water and wastewater service to the public.✓ It provides accurate and up-to-date information about the operations taking place within the system and quality of the water.✓ This ensures that accurate information is reported to regulatory authorities.✓ (4)

[15]

TOTAL: 100

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