higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

WATER AND WASTE-WATER TREATMENT PRACTICE N2

5 AUGUST 2019

This marking guideline consists of 5 pages.

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QUESTION 1

1.1 True
1.2 True
1.3 False
1.4 True
1.5 True

(5 × 1) **[5]**

QUESTION 2

2.1 Total viable organisms give an indication of the bacterial pollution of the water and the amount of organic material available as nutrients to the bacteria.✓ There should not be more than 100 organisms per 1 ml of water.✓

Total coliform organisms 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.✓ Their presence is an indication that other more harmful bacteria could possibly be present.✓

Faecal coliforms originate in the intestines of man and animals.✓ They serve as an indicator organism of faecal pollution and that there may therefore be other bacteria in the water originating from man or animals which might be the carriers of disease, i.e. the presence of pathogenic bacteria.✓ E. Coli is quite resistant, therefore it is reasonable to accept that if all the E.coli has been destroyed by the chlorination process✓ then the pathogenic bacteria has also been destroyed.✓ In both the recommended and maximum allowable standards a 100 ml sample of water should be completely free of E. Coli.✓ (10)

2.2
- To treat the amount of water needed
- To be able to add the correct amount of chemicals
- To calculate retention times
- To determine unit costs
- To determine water losses through the plant
- To determine distribution systems by metering water delivered against the flow

(6 × 1) (6)

2.3
- pH
- Total dissolved solids
- Alkalinity
- Temperature
- Calcium concentration

(Any 4 × 1) (4)
[20]

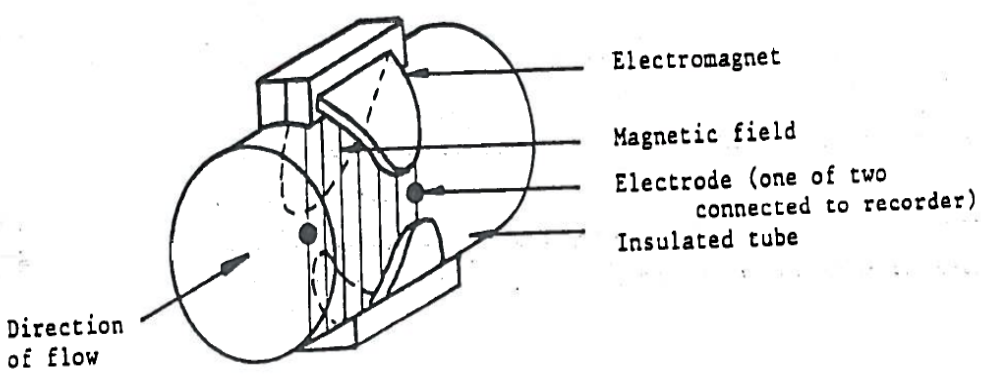
QUESTION 3

3.1 pHs = (9,3 + A + B) – (C + D)✓
= (9,3 + 0,18 + 1,86) – (1,56 + 1,56)✓
= 11,34 – 3,12✓
= 8,22✓✓ (5)

3.2
- An electrically driven paddle or propeller
- Orifice in pipeline
- Vortex created in a conical chamber
- Adding chemicals just after a waterfall (4)

3.3 It must be handled carefully with the correct equipment✓ and it must be stored in equipment which is able to withstand its corrosive properties.✓ Steel of any kind, even stainless steel, is entirely unsuitable for storing, transporting or controlling $FeCl_3$.✓ Concrete or cement-like products are equally unsuitable.✓ Only plastic and rubber-lined materials should be allowed to come into contact with $FeCl_3$ including diluted solutions.✓ (5)

3.4



(5 x 1 for labels + 1 x 1 for diagram) (6)
[20]

QUESTION 4

4.1
- Flash mixing
- Floc formation
- Floc conditioning (3 × 1) (3)

4.2
- Aluminium sulphate (also called alum)
- Ferric chloride
- Lime
- Floccotan
- Poly-electrolytes (Any 4 × 1) (4)

4.3
- Zigzag channel
- Collecting channel for clear water
- Scraper
- Desludging pipe (4)

4.4
- The size, weight and shape of the floc
- The temperature and the viscosity of the water
- The design of the inlet and outlet of the works
- The effective depth of the tank
- The area of the tank
- The rate of flow (6)

4.5 Move ammonia cotton wool around the installation.✓
If any white clouds appear, there is a leak.✓✓ (3)
[20]

QUESTION 5

5.1 The biological filtration process is an aerobic process.✓ The bacteria responsible for the process obtain food from sewage flowing over the media.✓ Air is circulated in the voids between the media.✓ As sewage trickles over the media, organic substances are absorbed on the biological film.✓ If either food or oxygen is absent, metabolism of the substrate will stop.✓ End products of metabolism are mainly carbon dioxide and water.✓ The process is most efficient when the slime layer is thin and aerobic.✓ Dissolved impurities and fine suspended matter which is taken up in the biological film✓ take several hours or even days before they are broken down and leave the filter as end products.✓✓ (10)

5.2 Phosphate can be removed from sewage by the addition of chemicals✓ such as alum, ferric chloride, ferrous sulphate, sodium aluminate or waste pickle liquor✓ to the activated sludge process or by biological means in which phosphates✓ are incorporated into the biological sludge and removed with the sludge.✓✓ (5)

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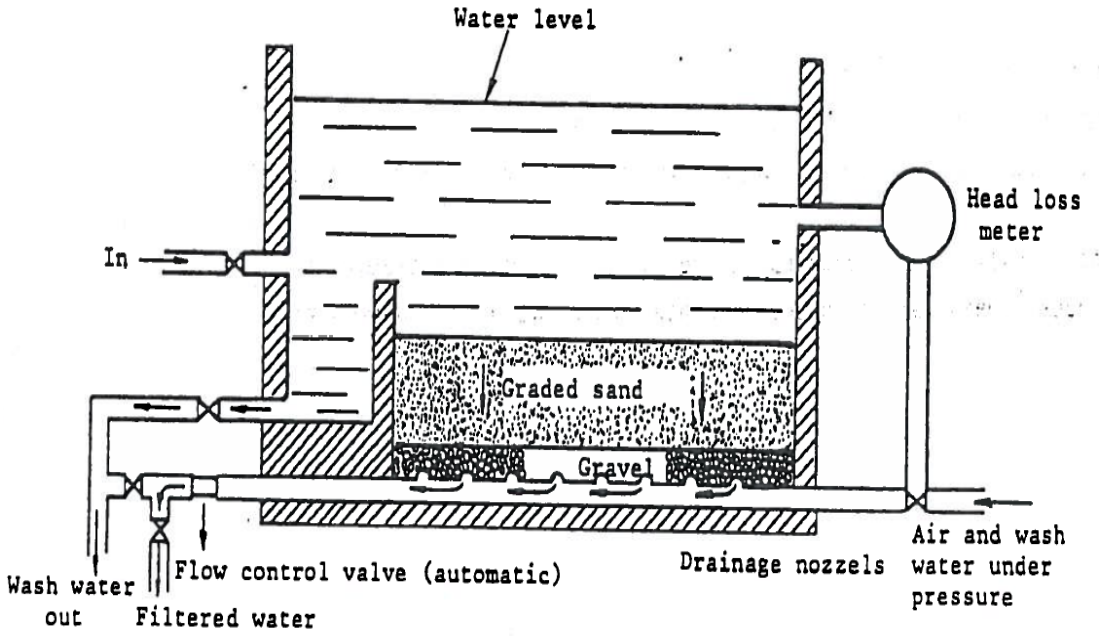
5.3



(10 × 1 for labels) (10)
[25]

QUESTION 6

6.1
- Grab or spot sampling
- Composite sampling over short periods of time
- Composite sampling over 24 hours
- Composite sampling over 24 hours in relation to flow (4)

6.2
- Mercury chloride
- Sulphuric acid (2)

6.3 The grab sample is normally not representative and can only give a rough idea of the effluent quality at the time of the sampling. (2)

6.4 6.4.1 Relative stability

6.4.2 Methylene blue

(2 × 1) (2)
[10]

TOTAL: 100

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