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FACULTY OF HEALTH SCIENCES
DEPARTMENT OF ENVIRONMENTAL HEALTH
SCIENCE**

RESIT EXAMINATION PAPER: JULY 2018

TITLE OF PAPER	ON-SITE SANITATION
COURSE CODE	EHS 205
DURATION	2 HOURS
TOTAL NUMBER OF MARKS	100
INSTRUCTIONS	<ol style="list-style-type: none">1. DO NOT OPEN THIS PAPER UNTIL YOU ARE INSTRUCTED TO DO SO BY THE INVIGILATOR.2. QUESTION ONE IS COMPULSORY. CHOOSE THREE OTHER QUESTIONS IN ADDITION TO QUESTION ONE.3. BEGIN YOUR ANSWERS TO EACH QUESTION ON A FRESH PAGE OF THE ANSWER BOOKLET. ALL PAGES MUST BE NUMBERED CORRECTLY.4. UNCLEAR HANDWRITING AND CARELESSNESS IN ENGLISH LANGUAGE GRAMMAR SHALL RESULT IN LOSS OF MARKS.5. MISCONDUCT DURING THE COURSE OF THE EXAMINATION IS PUNISHABLE IN LINE WITH REGULATIONS 012.45-012.48.

QUESTION ONE [25 MARKS]

1. The decomposition of excreta in a septic tank or at the bottom of a pit latrine is largely;
 - (a) Anaerobic
 - (b) Aerobic
 - (c) Facultative
 - (d) Facultative or anaerobic
2. For finding food, sight and smell are not important in;
 - (a) Flies
 - (b) Anopheles mosquitos
 - (c) Viruses
 - (d) Pathogens
3. When building latrines, the shape of the pit may be circular, square or rectangular in plan. However, the most stable type of a pit is the one that is;
 - (a) Square
 - (b) Rectangular
 - (c) Circular
 - (d) Square (especially in granular soils)
4. Many insects are attracted to excreta because it provides rich organic material and water, both of which are essential for the insects' development. The most important groups of insects, from a health point of view, include;
 - (a) Tsetse flies
 - (b) Dragon flies
 - (c) Anophelene mosquitos
 - (d) *Musca domestica*
5. Soil porosity also affects the rate of infiltration liquids from pits and drainage trenches. Soils known to drain with difficulty include;
 - (a) Gravel
 - (b) Silt
 - (c) Soils containing organic matter
 - (d) Clay
6. The greatest number of episodes of illness (morbidity) and deaths (mortality) worldwide is caused by;
 - (a) Water-related insect vectors
 - (b) Water-borne and water-related insect vectors
 - (c) Water-washed and water-borne diseases
 - (d) Water-based aquatic intermediate host and water-washed diseases
7. Apart from pathogens found in excreta, other components of wastewater that might lead to health problems include;
 - (a) CO₂ content
 - (b) NO₃⁻ content
 - (c) CO content
 - (d) SO₂ content

8. Methaemoglobinaemia in infants is associated with elevated levels of;
 - (a) NO_3^- content
 - (b) CO_2 content
 - (c) CO content
 - (d) SO_2 content
9. The main reservoirs of most diseases that affect humans are;
 - (a) Houseflies
 - (b) Humans
 - (c) Snails
 - (d) Mosquitos
10. Optimum control of foul odours and infestation of flies and mosquitos are better controlled in;
 - (a) Borehole, aqua-privy, and VIP latrines
 - (b) Septic tank, pour-flush and aqua-privy systems
 - (c) Aqua-privy, off-set pour-flush and double pit VIP latrines
 - (d) Hardly any of the above
11. This statement "the superstructure design is irrelevant to the operation of the latrine but crucial to the acceptability of the latrine to the user" is applicable to;
 - (a) VIP latrines
 - (b) Ecological latrines
 - (c) Simple latrines
 - (d) Composting latrines
12. When they are operated as recommended, they can be considered as permanent installations. These are;
 - (a) Very dip simple latrines
 - (b) VIP latrines
 - (c) Double-pit VIP latrines
 - (d) Very dip simple latrines lined with hard rock
13. Unfortunately the superstructure frequently becomes infested with flies and mosquitos and full of pungent odours because users do not replace the squat hole cover after use. Self-closing hole covers have been tried but are often disliked because the cover rests against the user's back. This describes a/an;
 - (a) Pour-flush latrine
 - (b) Offset simple latrines
 - (c) Unlined VIP latrines
 - (d) Simple latrine
14. In a flat-roofed latrine, to achieve satisfactory air movement, the top of the vent should be at least;
 - (a) 450 mm above the highest part of the roof
 - (b) 550 mm above the highest part of the roof
 - (c) 600 mm above the highest part of the roof
 - (d) 500 mm above the highest part of the roof

15. Consider this statement: *they are often self-supporting; however they may lose their self supporting properties.* This statement refers to;
 - (a) Silts and clays
 - (b) Clays and gravel
 - (c) Gravel and silts
 - (d) Sands and clays
16. The least expensive on-site sanitation systems are;
 - (a) Sanitation facilities that require the use of water
 - (b) VIP latrines
 - (c) Sanitation facilities that do not require the use of water
 - (d) Ecological latrines
17. In a septic tank, the maximum rate of digestion can be achieved at about;
 - (a) 25 °C
 - (b) 35 °C
 - (c) 40 °C
 - (d) 45 °C
18. In an emergency situation, the type of latrine that might bring relief within a short space of time is;
 - (a) A raised pit latrine
 - (b) Borehole latrine
 - (c) Simple pit latrine
 - (d) Pour-flush latrine
19. The diameter of the hole in a borehole latrine is about;
 - (a) 100-300 mm
 - (b) 200-500 mm
 - (c) 300-500 mm
 - (d) 300-600 mm
20. Double-pit pour-flush latrines and double-pit VIP latrines are most useful in areas;
 - (a) Where there is a problem of mosquito infestations
 - (b) Where pit lining is not required
 - (c) Where it is not possible to dig a deep pit
 - (d) Where a concrete superstructure is not required
21. When casting concrete slabs, curing is an important aspect that determines the strength of the slab. If the concrete is not cured, it will have only;
 - (a) 40% of its ultimate design strength
 - (b) 50% of its ultimate design strength
 - (c) 70% of its ultimate design strength
 - (d) 60% of its ultimate design strength
22. If the concrete is cured for three days, it will attain;
 - (a) 60% of its ultimate design strength
 - (b) 90% of its ultimate design strength
 - (c) 70% of its ultimate design strength
 - (d) 80% of its ultimate design strength

23. In building latrine slabs, if concrete is cured for no less than seven days, it will reach almost;
- 100% of its ultimate design strength
 - 80% of its ultimate design strength
 - 90% of its ultimate design strength
 - 70% of its ultimate design strength
24. Keeping excreta in a dark place does not prevent the breeding of;
- Houseflies
 - Dragon flies
 - Anopheles mosquitos
 - Blowflies
25. In many parts of the world, people prefer to sit when using the toilet. Advisably, the seat level should be at a position that is comfortable for the majority of the users, which is normally about;
- 150 mm above the top of the slab
 - 350 mm above the top of the slab
 - 250 mm above the top of the slab
 - 450 mm above the top of the slab

QUESTION TWO [25 MARKS]

1. The results of a recently concluded study of simple pit latrines and VIP latrines are shown in **Table 1**. Describe the key reasons for the large differences in numbers of flies observed in the two types of latrines [8].

Table 1: Comparison of the numbers of flies leaving the squat holes of a simple pit latrine and a VIP latrine

Period of trapping	Number of flies trapped in simple pit latrines	Number of flies trapped in VIP latrines
8 October – 5 November	1723	5
5 November – 3 December	5742	20
3 December – 3 January	6488	121

- What is sanitation? [2]
- State the different designs of a pour flush latrine [3].
- What is concrete? [2]
- When building concrete slabs for pit latrines, reinforcement is normally required. Why do we need to reinforce concrete? [2]
- State any two major nuisances that discourage the use of simple pit latrines [2]
- Well-constructed and maintained VIP latrines combat most of the problems associated with simple pit latrines, except for just one problem. State the problem that even VIP latrines fail to control [2].
- State any four factors affecting the amount of excreta and urine excreted by an individual on a daily basis [4]

QUESTION THREE [25 MARKS]

1. Investments in water supply and sanitation services can generate a number of economic, environmental and social benefits. How does this statement relate to *school attendance*, *workplace productivity*, and *tourism*? [6].
2. What is the objective of the United Nations Sustainable Development Goals (SDGs) and their targets? [3]
3. For each of the following on-site sanitation facilities, state any two advantages [6].
 - (a) Simple pit latrines
 - (b) Borehole latrines
 - (c) Ventilated pit latrine
4. State any four types of insects that are of importance in the study of health and sanitation-related diseases [4].
5. In building latrines, in addition to positioning the vent pipe on the outside, describe other considerations that might enhance the functioning of the vent pipe [4].
6. What is the purpose of seeding a new tank with sludge from the tank that has been operating for some time? [2]

QUESTION FOUR [25 MARKS]

1. The key steps that can be followed when implementing community-led total sanitation are (in no particular order); *scaling up*, *triggering*, *pre-triggering*, and *post-triggering*. In each of the scenarios given below, state the most relevant step [20].
 - (a) Encourage visits to very successful communities. Use them as training and learning laboratories for outsiders. Neighbouring villages may also notice visitors coming and then come to see for themselves.
 - (b) Meet local leaders, village chief, visit all hamlets/sub-hamlets, and get an idea of the size of the village and population.
 - (c) Locate the most dirty and filthy areas, and know about the history of subsidies if any.
 - (d) This is based on stimulating a collective sense of disgust and shame among community members as they confront the crude facts about mass open defecation and its negative impacts on the entire community.
 - (e) This includes immediate follow-up and encouragement, community action follow-up, monitoring of process and progress, etc.
 - (f) Facilitate the identification of those who are weaker, poorer, landless or otherwise unable to construct their own toilets. These may be old people, widows, single mothers, the disabled, those who are chronically sick or others.
 - (g) The goal of the facilitator is purely to help community members see for themselves that open defecation has disgusting consequences and creates an unpleasant environment.
 - (h) It is then up to community members to decide how to deal with the problem and to take action.
 - (i) Families who do own toilets discover that they are just as prone to faecal-oral contamination due to the actions of those who don't.

- (j) Transect walks are the single most important motivating tool. The embarrassment experienced during this 'walk of disgust' can result in an immediate desire to stop open defecation and get rid of these areas.
2. State any five factors that contribute to the wear and tear of fly screens in vent pipes [5].

QUESTION FIVE [25 MARKS]

1. There are a number of diseases related to excrete and wastewater which commonly affect people, especially developing countries. State any five diseases that are associated with poor excreta disposal [5].
2. State any four types of durable material that may be used for pit latrine lining [4].
3. State any two factors that determine the amount of urine excreted by an individual on a daily basis [2].
4. What is a vent pipe? [2]
5. What is the difference between a pour-flush latrine and an off-set pour-flush latrine? [2]
6. Describe any two situations or conditions that might favour the use of pour-flush latrines in a particular place [2].
7. Describe any two reasons why offset pour-flush latrines are favoured by many people [4].
8. State any four factors that affect the rate of infiltration of liquids from pits and drainage trenches [4].