

BINDURA UNIVERSITY OF SCIENCE EDUCATION
DEPARTMENT OF ENVIRONMENTAL SCIENCE
BACHELOR OF SCIENCE HONOURS DEGREE IN SAFETY, HEALTH AND ENVIRONMENTAL
MANAGEMENT

ESM 412

BSC PART IV EXAMINATION
Water supply, Sanitation and Hygiene promotion

2 HOURS

MAR 2023

INSTRUCTIONS

Answer all multiple choice questions from SECTION A. You must answer any two from SECTION B

SECTION A (COMPULSORY)

1. Which one of the following is not part of the sustainable development goal 6 targets for water?

A. More efficient water use	B. Integrated water management
C. Safe drinking water for all	D. None of the above

2. Which of the following is important improvement of the millennium development goal to the sustainable development goal?

A. Universality	B. Equality	C. Sanitation service chain	D. All of the above
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3. Achieving the millennium development goal to improve water supply and sanitation to those who were underserved in developing countries was impacted by:

A. high population growth	B. natural disasters and civil strife
C. economic stagnation and sustainability issues	D. all of the above

4. Which one of the following is important to choose a sanitation technology?

A. Groundwater table	B. Soil type	C. Flooding	D. All of the above
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5. The level of community participation when the service providing organisation asks selected members of the target group for advice is:

A. instruction	B. consultation	C. instrumentalisation	D. inclusion
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6. What led to an emphasis on community participation in WASH interventions?

A. Unjust and unequal wealth	B. Top-down bureaucratic approaches
C. Capital-centred development, not people centred	D. All of the above

7. Which of the following is a dimension of community participation?

A. Involve all those affected	B. Sharing programme benefits
C. Mass contribution to developments efforts	D. All of the above

8. Which combination of factors influences the degree of positive community participation in developments projects?

A. Education and socio-cultural factors	B. Political stability and good leadership
C. Accountability and locally available resources	D. All of the above

9. Which research instrument gets information on why people think the way they do?
 A. Semi-structured questionnaire B. Closed-ended questionnaire
 C. Focus group discussion D. All of the above
10. Which of the following strategies ensures the sustainability of a WASH technology?
 A. Capacity development B. Provision of employment
 C. Providing capital investment D. All of the above
11. Evaluation of WASH interventions normally focuses on:
 A. efficiency, effectiveness and impact B. sustainability
 C. relevance D. all of the above
12. An evaluation of a WASH intervention can be undertaken:
 A. at the planning stage B. at baseline C. at any stage of the project D. at endline
13. Which of the following is may be the best evaluation criteria for WASH projects?
 A. Intervention objectives B. National targets
 C. Baseline data D. Comparable communities
14. Which of the following gives the correct categorisation of water quality parameters?
- | <i>Physical</i> | <i>Chemical</i> | <i>Microbiological</i> |
|-----------------------------|--------------------|----------------------------|
| A. Turbidity | Alkalinity | <i>E. coli</i> |
| B. Dissolved O ₂ | Temperature | Coliforms |
| C. Mineral oil | Dry solids content | pH |
| D. Electrical conductivity | COD | <i>Faecal streptococci</i> |
15. Which of the following water treatment processes is correctly categorised?
- | <i>Physical principles</i> | <i>(bio) chemical principles</i> |
|----------------------------|----------------------------------|
| A. Oxidation/disinfection | Coagulation |
| B. Water conditioning | Adsorption |
| C. Aeration | Softening |
| D. Sedimentation | Flotation |
16. The advantage of using chlorine in household water treatment is that it:
 A. has residual effect B. effectively kills all pathogens
 C. exists in other use-friendly forms D. all of the above
17. Which of the following is not a disinfection method?
 A. Heat treatment B. UV treatment C. Chlorination D. None of the above
18. The solubility of chlorine (Cl₂) gas in water is shown in the table below:

Temperature (°C)	Solubility (Kg Cl ₂ /m ³ water)
0	14.4
20	7.25
40	4.6

- Which of the following statements is correct about the solubility of chlorine?
- A. Solubility decreases at rising temperature
 B. Solubility of Cl₂ is higher than 7.25 Kg Cl₂/m³ of water at room temperature
 C. Doubling water temperature exactly halves the solubility of chlorine
 D. All of the above

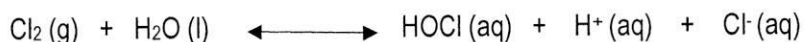
19. On the drinking water monitoring ladder an improved source that misses a 'safely managed' criteria (over 30 minutes roundtrip to collect water) is referred to as:

- A. improved
- B. basic
- C. limited
- D. none of the above

20. Which characteristic(s) best describe(s) a safely managed drinking water source?

- A. Located on the source
- B. Water is available when needed
- C. Water is free from contamination
- D. All of the above

21. When chlorine is added to water during disinfection, the following reaction occurs:



Which of the following is not true about the reaction?

- A. It is a hydrolysis reaction
- B. Total available $\text{Cl}_2 = \text{Cl}_2 + \text{HOCl} + \text{OCl}^-$
- C. OCl^- is the less effective form of active of Cl_2
- D. None of the above

22. The process by which Al and Fe salts added to water to transform impurities into large flocs is:

- A. coagulation
- B. flocculation
- C. chloroamination
- D. disinfection

23. The large flocs formed in question 22 (above) are easily removed by:

- A. electrophoresis
- B. sedimentation and filtration
- C. aeration
- D. all of the above

24. The process of agglomeration of destabilised particles in water is:

- A. sedimentation
- B. flocculation
- C. Brownian movement
- D. none of the above

25. What is the mass percent content of Cl_2 in the commonly used calcium hypochlorite, $(\text{Ca}(\text{OCl})_2 \cdot 4\text{H}_2\text{O})$ also called Highest Test Hypochlorite (HTH) or Perchloron?

[Use rel. atomic masses: $\text{Ca} = 40$, $\text{O} = 16$, $\text{Cl} = 35.5$, $\text{H} = 1$]

- A. 60 - 70
- B. 33
- C. 66
- D. 99.8

26. Privatising urban water supply ensures:

- A. inefficient metering and billing
- B. adequate continuous supply
- C. reduced costs
- D. water availability to the poor

27. When communities are assured that they will get government support for the sustainability of their water technology, that is:

- A. socio-cultural sustainability
- B. economic & financial sustainability
- C. institutional sustainability
- D. environmental sustainability

28. Household water treatment and safe storage (HWTS) is important to:

- A. prevent diarrhoeal diseases
- B. reduce chances of re-contamination of treated water
- C. improve water quality
- D. all of the above

29. Re- contamination of stored treated water at the household may be through:

- A. abstraction with a contaminated container
- B. home pets and domestic animals
- C. unsanitary home conditions
- D. all of the above

30. Which household water treatment process is negatively influenced by the turbidity of water for its effectiveness?

- A. Filtration
- B. Solar disinfection
- C. Boiling
- D. All of the above

SECTION B

- B1. Describe municipal water supply for a small town such as Bindura. **[20 Marks]**
- B2. Discuss the relationship (*if any*) between the sustainable development goals (SDG) and SDG 6 on water, sanitation and hygiene **[20 Marks]**
- B3. Water-borne diseases can be prevented by water, sanitation and hygiene interventions. Discuss. **[20 Marks]**
- B4. Discuss the management of water supply and community health in rural communities of developing countries such as Zimbabwe. **[20 Marks]**

END OF PAPER