



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF SPATIAL PLANNING AND NATURAL RESOURCES MANAGEMENT
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF ARTS IN SPATIAL
PLANNING AND DESIGN
2ND YEAR 1ST SEMESTER 2024/2025 ACADEMIC YEAR
MAIN CAMPUS

COURSE CODE: PNB 1314

COURSE TITLE: GROUNDWATER ASSESSESMENT, DEVELOPMENT AND MANAGEMENT

DATE:

TIME:

DURATION: 2 HOURS

Instructions:

1. Answer ALL questions in Section A and B and ANY other TWO questions in Section C
2. Tick the most correct alternative in Section A
3. Answers to Questions in Section B and C must be written in the spaces provided on the question paper.
4. Candidates must ensure they submit their work by clicking "finish and submit attempt" button at the end.

1. Which of the following doesn't control aquifer behaviour?
- A. Wind conditions
 - B. Nature of the rock
 - C. Structural disposition
 - D. Climate conditions like precipitation

ANSWER: A

2. An aquifer can hold water _____ and the state of water is _____
- A. Permanently - State of flow
 - B. Temporarily - State of flow
 - C. Permanent - State of stagnancy
 - D. Temporary - State of stagnancy

ANSWER: B

3. What is the specific yield of an aquifer?
- (A) The total volume of water in the aquifer
 - (B) The volume of water that can be extracted by pumping
 - (C) The rate at which water enters the aquifer
 - (D) The measure of the aquifer's porosity

Answer: B

4. What is the main source of groundwater contamination from agricultural activities?
- (A) Saltwater intrusion
 - (B) Pesticides and fertilizers
 - (C) Industrial discharge
 - (D) Leaking septic systems

ANSWER: B

5. What is the main purpose of a groundwater monitoring well in hydrogeology?
- (A) To extract groundwater for use
 - (B) To recharge an aquifer with surface water
 - (C) To measure and monitor groundwater levels and quality
 - (D) To detect seismic activity

ANSWER: C

6. The quantity of water that can be withdrawn annually and also the rate at which this withdrawal could be made without adversely affecting the inventory of the aquifer is called _____
- A. Annual yield
 - B. Percent yield
 - C. Operational yield
 - D. Monthly yield

ANSWER: C

7. When an aquifer is used to artificially recharge by making it pass through an intervening layer, the aquifer acts as _____
- A. A cooling agent
 - B. An aerating agent
 - C. An odour agent
 - D. A filter plant

ANSWER: D

8. When would the dam become irrelevant?
- A. When the rocks are strong
 - B. When the rocks are impermeable
 - C. When the rocks are porous

D. When the rocks are weathered to a certain extent

ANSWER: C

9. Which quality of rock should be known properly for the foundations of dams, reservoirs, etc.?

- A. Colour knowledge
- B. Geological
- C. Hydrogeological
- D. History of the formation of rocks

ANSWER: C

10. Groundwater is a source of trouble at which place?

- A. Plains
- B. Slopes
- C. Rivers
- D. Lakes

ANSWER: B

11. An associated protection of rising water-table is the development of

- A. Loss of nutrients
- B. Loss of good quality of water
- C. Salinity of water
- D. Increase in turbidity

ANSWER: C

12. The root system of crops in water-logged areas get _____

- A. Decomposed
- B. Enriched with nutrients
- C. Photosynthesised
- D. Growth inhibited

ANSWER: A

13. The lubricating action of water is a positive action for slope rocks.

- a) True
- b) False

ANSWER: B

14. An associated protection of rising water-table is the development of

- A. Loss of nutrients
- B. Loss of good quality of water
- C. Salinity of water
- D. Increase in turbidity

ANSWER: C

15. Groundwater cannot fill the porous spaces in soil, sediment, and rocks.

- A. TRUE
- B. FALSE

ANSWER: FALSE

16. Choose YES or NO: Can groundwater be recharged naturally?

- A. YES
- B. NO

ANSWER: A

17. Which of the following doesn't control aquifer behaviour?

- A. Wind conditions
- B. Nature of the rock
- C. Structural disposition
- D. Climate conditions like precipitation

ANSWER: A

18. An aquifer can hold water _____ and the state of water is _____

- A. Permanently - State of flow
- B. Temporarily - State of flow
- C. Permanent - State of stagnancy
- D. Temporary - State of stagnancy

ANSWER: B

19. Groundwater is a subordinate to surface water.

- A. True
- B. False

ANSWER: B

20. The upper level of an underground surface is known as _____.

- A. Water trunk
- B. Water desk
- C. Water table
- D. Water tilt

ANSWER: C

21. A confined aquifer under pressure also known as _____

- A. Phreatic aquifer
- B. Unconfined aquifer
- C. Artesian aquifer
- D. Perched aquifer

ANSWER: C

22. Which of the following processes can lead to groundwater depletion?

- A. Increased infiltration
- B. Enhanced recharge areas
- C. Over-pumping for agricultural and industrial use
- D. Decreased surface runoff

ANSWER: C

23. What is the term for the boundary between the zone of saturation and the zone of aeration?

- A. Aquitard
- B. Water table
- C. Capillary fringe
- D. Permeable layer

ANSWER: B

24. Which type of aquifer is recharged directly from the surface and is not confined by impermeable layers?

- A. Confined aquifer
- B. Perched aquifer
- C. Unconfined aquifer
- D. Artesian aquifer

ANSWER: C

25. What is a major consequence of excessive groundwater pumping in coastal areas?

- (A) Increased surface runoff
- (B) Ground subsidence
- (C) Saltwater intrusion
- (D) Formation of sinkholes

ANSWER: C

26. What is the term for a body of rock that impedes the flow of groundwater?

- (A) Aquifer
- (B) Aquitard
- (C) Permeable layer
- (D) Recharge zone

Answer: (B) Aquitard

27. How is the hydraulic gradient calculated in geohydrology?

- (A) By dividing the difference in hydraulic head by the distance between two points
- (B) By measuring the volume of water flowing through an aquifer
- (C) By determining the water table depth
- (D) By calculating the rate of evaporation

ANSWER: A

28. What is the role of a recharge well in geohydrology?

- A. To extract groundwater for consumption
- B. To introduce water into an aquifer for replenishment
- C. To measure groundwater levels
- D. To detect subsurface contaminants

ANSWER: B

29. Which of the following best describes the term "hydraulic conductivity"?

- A. The measure of the total volume of water in an aquifer
- B. The ability of a material to transmit water
- C. The speed at which groundwater flows
- D. The amount of water that can be extracted from an aquifer

ANSWER: B

30. What is the term for the downward movement of water from the land surface into the soil or rock?

- A. Runoff
- B. Percolation
- C. Infiltration
- D. Evapotranspiration

ANSWER: C

SECTION B: 20 Marks

Attempt ALL questions

a. Differentiate between the following terms:

- i. Zone of aeration and saturation zone. (2 marks)
- ii. Confined and unconfined aquifer. (2 marks)
- iii. Flowing artesian well and non-flowing artesian well (2 marks)
- iv. Cohesion and adhesion forces. (4 marks)

b. Discuss challenges of artificial recharge of ground water. (10 marks)

SECTION C: 20 Marks

Attempt ANY TWO questions

a. Discuss components of hydrologic cycle. (10 marks)

b. Define Darcy's Law and explain its assumptions and limitations. (10 marks)

c. Explain the purpose of pumping test and describe a procedure for carrying it. (10 marks)