UNIVERSITY OF FORT HARE

WATER RELATIONS
AGC 311

DEGREE EXAMINATIONS

JUNE

2018

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Time:	**3 hours**
Subject:	**AGG 311**
Marks:	**100**

This paper consists of 4 pages including the cover page

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External Examiners

INSTRUCTIONS

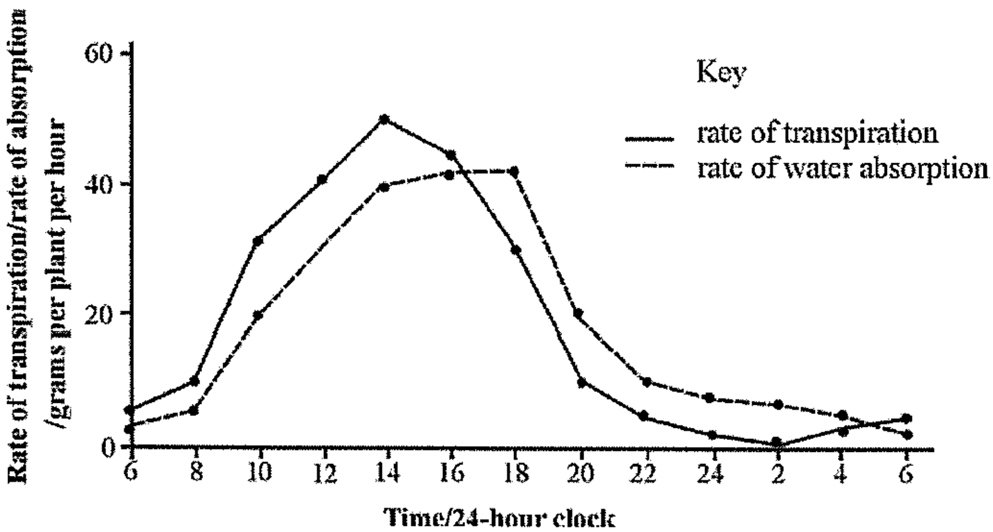
ANSWER **ALL** QUESTIONS

SECTION A (50 MARKS)

ANSWER ALL QUESTIONS IN BRIEF

1. Explain in brief the difference between osmosis and diffusion? (4)
2. Briefly explain why water molecules have adhesive and cohesive properties? (6)
3. List the three types of osmosis. Explain in brief which type of osmosis will prevail during a wilting process of a plant due to soil moisture stress. (6)
4. A cell with a pressure potential of 0.8 MPa and an osmotic potential of -1.6 MPa is placed in a beaker of pure water.
    i. What is the water potential in the beaker and in the cell initially? (3)
    ii. In which direction will water flow? (2)
    iii. After equilibrium, what will be the component potentials and water potentials in the beaker and cell? (6)
5. The transpiration of a desert succulent plant is minimal at midday even though that is when evaporation from open water in the same area is maximal. Explain how and why this can be true. (3)

6. Study the graph below which shows the rate of transpiration and water absorption in a plant.

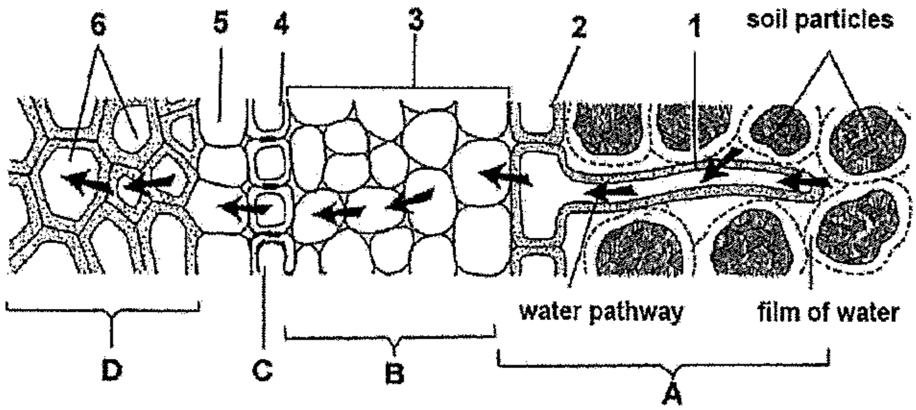


a) Name THREE environmental factors which could directly influence the rate of transpiration from the leaves of the plant. (3)

b) Choose ONE of the factors that you have mentioned and explain why it could cause the rapid decrease in the rate of transpiration after 16h00 (see the graph above). (2)

c) Give a reason why the rate of water absorption started to decrease in the late afternoon. (4)

Study the diagram below and answer the questions that follow.



a) Identify structure 1, 3 and 5. (3)

b) What type of pathway of water movement is indicated by the arrows? (2)

c) Describe the three forces which develop in cells D to assist water travel up the stem (long transport). (6)

SECTION B (50 MARKS)
ANSWER ALL QUESTIONS

7. a. Explain why water is considered a finite resource (2)
   b. Briefly describe the 4 'magic' properties of water (8)

8. a. Explain water demand management (2)
   b. The City of Cape of Town has in past year faced crippling water shortages due to drought. Briefly explain some of the water management strategies that have been implemented to avoid what has been dubbed 'Day Zero' (8)

9. a. Briefly distinguish between infiltration and percolation (2)
   b. Graphically show the following:
   i. The infiltration rate and cumulative infiltration rate (4)
   ii. The infiltration rate of initially wet and dry soil (4)

10. a. Define crop water requirements according to FA0(1977) (2)
    b. A farmer wishes to determine the crop water requirements for his summer maize crop and has only minimum and maximum data from a nearby weather station.
    i. Which method will you recommend to farmer to use to determine the ETo (2)
    ii. Explain the advantages and disadvantages of the method in (i) (6)

11. a. Explain soil water availability (2)
    b. The following table shows the water content of three soil samples.

Soil Sample	% Water at Field Capacity	% Water at Wilting Point
A	6	2
B	24	12
C	30	22

i. What is the percentage of available water in sample A? (2)
ii. Which sample will be the most suitable for a crop suffering a drought during the growing season? (2)

iii. Which sample would be the most suitable for a crop growing during a wet spring? (2)