

**UNIVERSITY OF SWAZILAND  
DEPARTMENT OF GEOGRAPHY, ENVIRONMENTAL SCIENCE AND PLANNING  
FINAL EXAMINATION, DECEMBER 2007  
B.A., B.Ed., B.Sc., B.A.S.S**

**TITLE OF PAPER: INTRODUCTION TO THE NATURAL ENVIRONMENT**

**COURSE CODE: GEP 111**

**TIME ALLOWED: THREE HOURS**

**INSTRUCTIONS: THIS PAPER IS DIVIDED INTO THREE SECTIONS**

**SECTION A: ANSWER ANY THREE QUESTIONS FROM THIS SECTION**

**SECTION B: TECHNIQUES AND SKILLS:  
ANSWER ALL QUESTIONS**

**DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR**

**SECTION A:**  
**ANSWER ANY THREE QUESTIONS**

**Question 1**

- a. Using a terrestrial food chain of your choice, describe the structure of an ecosystem and explain how energy is transferred from one trophic level to the other. (14 marks)
- b. Discuss the role of predation and parasitism in the maintenance of ecosystem stability. (6 marks)

**(20 marks)**

**Question 2**

- a. Describe any small-scale motion of the earth and its effect on the earth's environment. (10 marks)
- b. With the aid of a diagram describe the various layers which make up the earth's internal structure. (10 marks)

**(20 marks)**

**Question 3**

- a. Differentiate between divergent and convergent boundaries. (5 marks)
- b. With the aid of diagrams, describe how the following features of are formed.
  - i. Grabben and horst. (5marks)
  - ii. Isoclinal folds. (5 marks)
  - iii. Composite volcanoes. (5 marks)

**(20 marks)**

**Question 4**

- a. Describe the factors that have resulted in the distribution of soils around Swaziland. (10 marks)
- b. Using an annotated diagram only, describe a mature soil profile. (10 marks)

**(20 marks)**

**Question 5**

- a. What is precipitation? (3 marks)
- b. Describe the atmospheric mechanisms which bring about precipitation. (12 marks)
- c. Describe how pressure gradient affect the direction and speed of wind movement. (5 marks)

**(20 marks)**

**SECTION B: TECHNIQUES AND SKILLS**  
**ANSWER ALL QUESTIONS FROM THIS SECTION**

**QUESTION 1**

Define the following:

- i) Nominal Location (2 marks)
- ii) Local Time (2 marks)
- iii) Albedo (2 marks)
- iv) Satellite image (2 marks)
- v) Drainage net (2 marks)

**QUESTION 2**

With reference to topographical map of Swaziland (PWD 12) calculate the following:

- i) The straight line distance between Logobisa dipping tank and Lutfotja School. (2 marks)
- ii) ) The distance of Mhlambanyoni dipping tank from the equator in kilometres (km). (3 marks)
- iii) The distance of Sigombeni dipping tank from the meridian of origin in kilometres (km). (3marks)

**QUESTION 3**

Atmospheric pressure decreases with an increase in altitude at an approximate rate of 12.7 millibars (mb) per 100 metres. Estimate the atmospheric pressure in millibars at the following locations:

- a) Mount Everest (35 000 m) (2 marks)
- b) Tugela Gorge (135 m) (2 marks)
- c) Bulembu Mountain (1590 m) (2 marks)
- d) Gobolondlo Mountain (1800 m) (2 marks)
- e) Mahamba Mountain (1650) m) (2 marks)

**QUESTION 4**

With reference to tables 1, 2, and 3 calculate the amount of in-coming and out-going and net solar radiation in Manzini (26.30°S) under the hypothetical conditions shown in the table below.

Month	es	T(°C)	n(hours)	R <sub>i</sub>	R <sub>o</sub>	H
January	16.4	23	8.0			
June	11.8	9	9.5			
November	21.8	27	13.2			

(12 marks)  
**(40 Marks)**

**TABLE 1: SOLAR RADIATION ( $R_s$ ) EXPRESSED IN EQUIVALENT  
EVAPORATION (MM/DAY)**

Latitude	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
60°N	1.4	3.6	7.0	11.1	14.6	16.4	15.6	12.6	8.5	4.7	2.0	0.9
50°N	3.7	6.0	9.2	12.7	15.5	16.6	16.1	13.7	10.4	7.1	4.4	3.1
40°N	6.2	8.0	11.1	13.8	15.9	16.7	16.3	14.7	12.1	9.3	6.8	5.6
30°N	8.1	10.5	12.8	14.7	16.1	16.5	16.2	15.2	13.5	11.2	9.1	7.9
20°N	10.8	12.4	14.0	15.2	15.7	15.8	15.8	15.4	14.4	12.9	11.3	10.4
10°N	12.8	13.9	14.8	15.2	15.0	14.8	14.9	15.0	14.8	14.2	13.1	12.5
Equator	14.6	15.0	15.2	14.7	13.9	13.4	13.6	14.3	14.9	15.0	14.6	14.3
10°S	14.6	15.0	15.2	14.7	13.9	13.4	13.6	14.3	14.9	15.0	14.6	14.3
20°S	16.8	15.7	15.1	13.9	12.5	11.7	12.0	13.1	14.4	15.4	15.7	15.8
30°S	17.2	15.8	13.5	10.9	8.6	7.5	7.9	9.7	12.3	14.8	16.7	17.5
40°S	17.3	15.1	12.2	8.9	6.4	5.2	5.6	7.6	10.7	13.8	16.5	17.8
50°S	16.9	14.1	10.4	6.7	4.1	2.9	3.4	5.4	8.7	12.5	16.0	17.6
60°S	16.5	12.6	8.3	4.3	1.8	0.9	1.3	3.1	6.5	10.8	15.1	17.5

Source: Shaw, 1983. *Hydrology in Practice*.

**TABLE 2: MEAN DAILY DURATION OF MAXIMUM POSSIBLE SUNSHINE HOURS (N)**

North Lat.	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
South Lat.	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
60°N/S	6.7	9.0	11.7	14.5	17.1	18.6	17.9	15.5	12.9	10.1	7.5	5.9
58°N/S	7.2	9.3	11.7	14.3	16.6	17.9	17.3	15.3	12.8	10.3	7.9	6.5
56°N/S	7.6	9.5	11.7	14.1	16.2	17.4	16.9	15.0	12.7	10.4	8.3	7.0
54°N/S	7.9	9.75	11.7	13.9	15.9	16.9	16.5	14.8	12.7	10.5	8.5	7.4
52°N/S	8.38	9.94	11.8	13.8	15.6	16.5	16.1	14.6	12.7	10.6	8.8	7.8
50°N/S	8.58	10.0	11.8	13.7	15.3	16.3	15.9	14.4	12.6	10.7	9.0	8.1
48°N/S	8.8	10.2	11.8	13.6	15.2	16.0	15.6	14.3	12.6	10.9	9.36	8.3
46°N/S	9.1	10.4	11.9	13.5	14.9	15.7	15.4	14.2	12.6	10.9	9.5	8.7
44°N/S	9.3	10.5	11.9	13.4	14.7	15.4	15.2	14.0	12.6	11.0	9.7	8.9
42°N/S	9.4	10.6	11.9	13.4	14.6	15.2	14.9	13.9	12.6	11.1	9.8	9.1
40°N/S	9.63	10.7	11.9	13.3	14.4	15.0	14.7	13.7	12.5	11.2	10.0	9.3
35°N/S	10.1	11.0	11.9	13.1	14.0	14.5	14.3	13.5	12.4	11.3	10.3	9.86
30°N/S	10.4	11.1	12.0	12.9	13.6	14.0	13.9	13.2	12.4	11.5	10.6	10.2
25°N/S	10.7	11.3	12.0	12.7	13.3	13.7	13.5	13.0	12.3	11.6	10.9	10.6
20°N/S	11.0	11.5	12.0	12.6	13.1	13.3	13.2	12.8	12.3	11.7	11.2	10.9
15°N/S	11.3	11.6	12.0	12.5	12.8	13.0	12.9	12.6	12.2	11.8	11.4	11.2
10°N/S	11.6	11.8	12.0	12.3	12.6	12.7	12.6	12.4	12.1	11.8	11.6	11.5
5°N/S	11.8	11.9	12.0	12.2	12.3	12.4	12.3	12.3	12.1	12.0	11.9	11.8
Equator	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0

Source: Shaw, 1983. *Hydrology in Practice*.

**TABLE 3:      VALUES OF  $\sigma_T$**

°F	0	1	2	3	4	5	6	7	8	9
30	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.6	11.7	11.87
40	11.9	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8
50	12.9	130.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.9
60	14.0	14.1	14.2	14.3	14.4	1.5	14.6	14.5	14.8	14.9
°C										
-0	11.2	11.0								
0	11.2	11.4	11.5	11.7	11.9	12.0	12.2	12.3	12.5	12.7
10	12.9	13.1	13.3	13.5	13.7	13.9	14.0	14.2	14.4	14.6
20	14.8	15.0	15.2	15.4	15.6	15.8	16.0	16.2	16.4	16.6

Source: Shaw, 1983. *Hydrology in Practice*.