



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION: BACHELOR OF SCIENCE	
QUALIFICATION CODE: 07BOSC	LEVEL: 7
COURSE CODE: ENC702S	COURSE NAME: ENVIRONMENTAL CHEMISTRY
SESSION: JANUARY 2019	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SUPPLEMENTARY/SECOND OPPORTUNITY EXAMINATION PAPER	
EXAMINER(S)	Dr JULIEN LUSILAO
MODERATOR:	Dr JAMES ABAH

INSTRUCTIONS
<ol style="list-style-type: none">1. Answer ALL the questions in the answer book provided.2. Write and number your answers clearly.3. All written work MUST be done in blue or black ink.

PERMISSIBLE MATERIALS

Non-programmable Calculators

THIS QUESTION PAPER CONSISTS OF 5 PAGES (Including this front page)

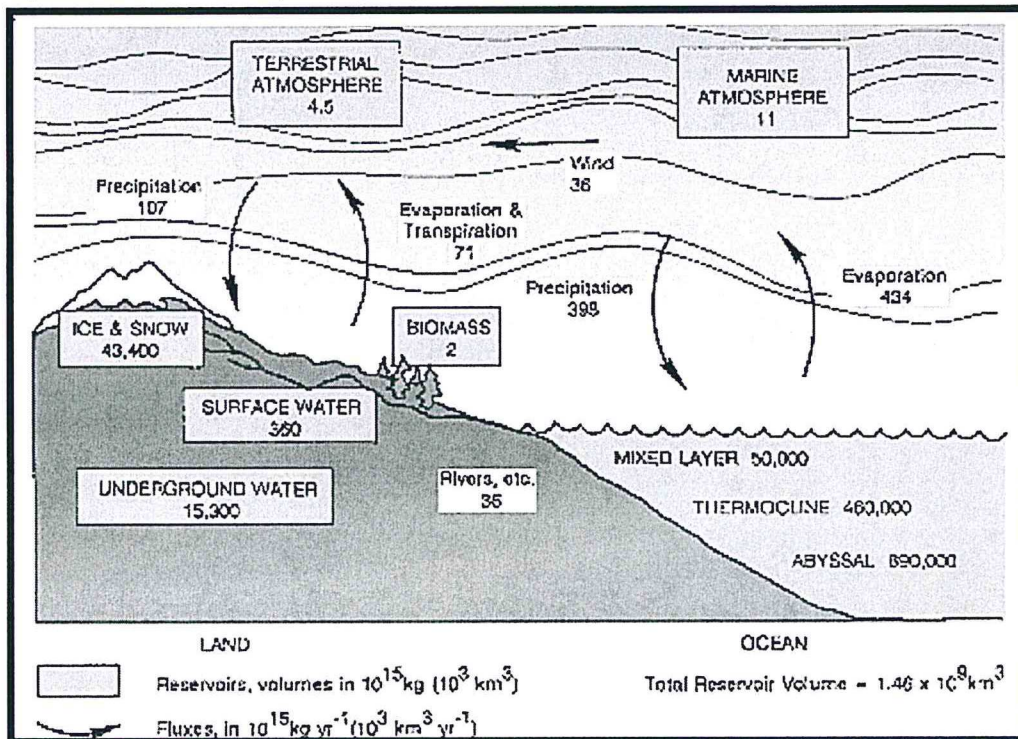
Question 1

[10]

1.1 Differentiate between the followings:

- (a) Metamorphic rock and sedimentary rock. (2)
- (b) Geosphere and Hydrosphere. (2)

1.2 Explain in details the hydrologic cycle below. (6)



Question 2

[10]

2.1 The atmosphere can be defined as “the thin gaseous envelope surrounding the Solid body of the Earth”. Why is it called “thin” envelop when its actual thickness is estimated to be of about 1200km? (2)

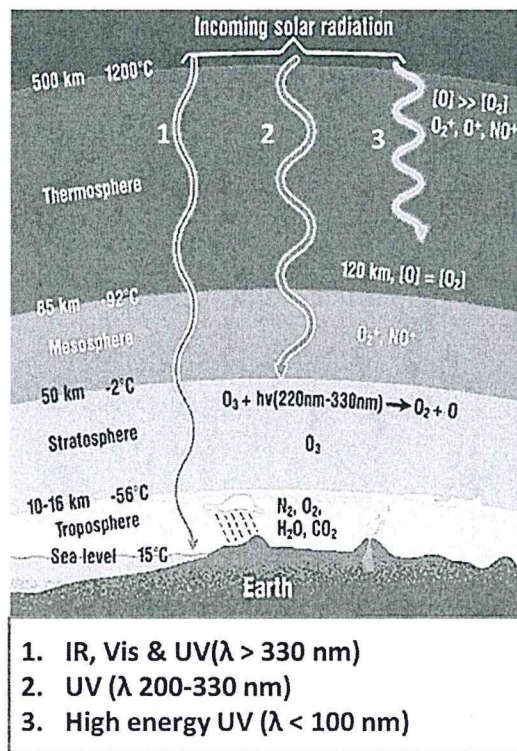
2.2 How important is the atmosphere to the Earth planet? (5)

2.3 Give three major agents of the physical weathering of exposed rocks. (3)

Question 3

[13]

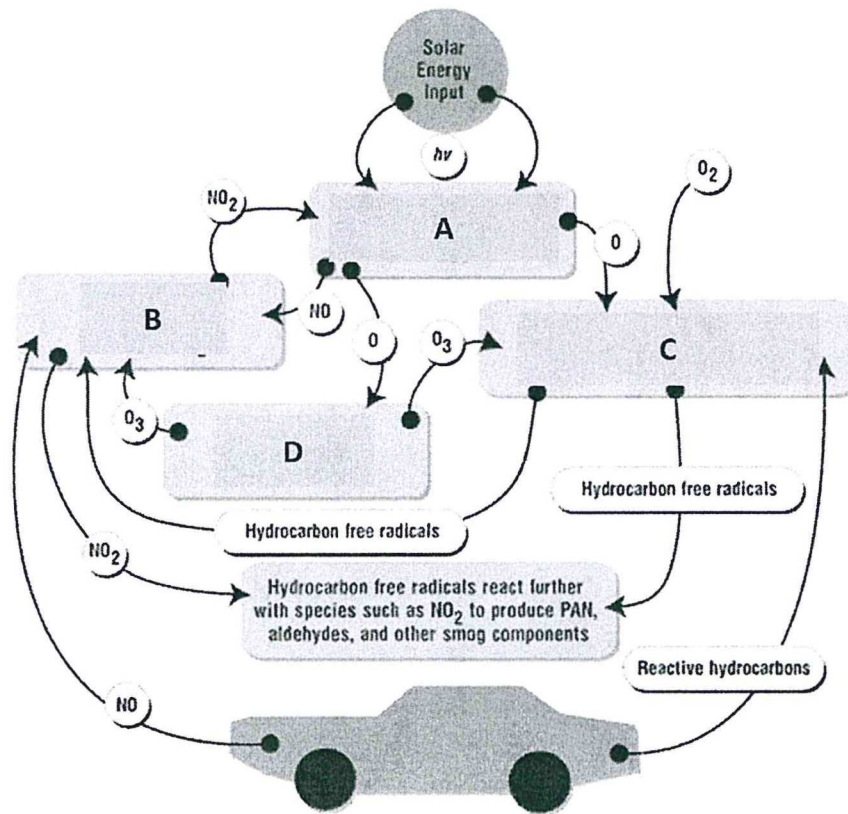
Explain in detail, the fate and consequences of the radiations 1, 2 and 3 shown in the diagram below.



Question 4

[15]

- 4.1 What are the two constituents that are considered as the most important in atmospheric chemistry and why are they so important? (4)
- 4.2. Give two mechanisms (with reactions) by which molecular oxygen and excited oxygen atoms are produced in the atmosphere. (4)
- 4.3 The diagram below shows the daily chemical transformations occurring in the formation of photochemical smog. Explain these transformations by describing the mechanisms in A to D.



(7)

Question 5

[15]

- 5.1 Draw a labelled diagram classifying the top and bottom layer of a lake in summer as either oxidizing or reducing in character, and showing the stable forms of carbon, sulphur, nitrogen, and iron in the two layers. (8)
- 5.2 Write the approximate net reaction between carbonate ion and water in a system that is exposed to atmospheric carbon dioxide. Is the resulting water mildly acidic or mildly alkaline? (3)
- 5.3 Write the balanced chemical reaction by which organic carbon, represented by CH_2O , is disproportionated by bacteria under anaerobic conditions. (2)
- 5.4 Write the balanced half-reaction involving oxygen that occurs in acidic waters when it oxidises organic matter. (2)

Question 6

[17]

- 6.1 The alkalinity of a river was determined to be 5×10^{-3} mol H⁺/L and its pH is 8.0. Calculate the concentrations of CO₃²⁻ and HCO₃⁻ in the river when the acid dissociation constant for the bicarbonate ion is equal to 4.69×10^{-11} . (7)
- 6.2 Explain with examples how the following natural conditions may impact on water quality.
- (a) Geology (2)
 - (b) Water morphology (2)
- 6.3 Discuss with examples the effect of temperature in aquatic systems. (6)

Question 7

[20]

- 7.1 Briefly discuss the soil composition (or soil breakdown). (4)
- 7.2 What are the factors that control dissolution and deposition processes in soil? (3)
- 7.3 Discuss in detail the soil erosion (i.e. what is it; its causes, mechanisms and types) (8)
- 7.4 List five factors that may contribute to enhancing the concentration of heavy metals in soils. (5)

END