



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**Faculty of Health, Natural  
Resources and Applied  
Sciences**

School of Natural and Applied  
Sciences

Department of Biology,  
Chemistry and Physics

13 Jackson Kaujeua Street T: +264 61 207 2012  
Private Bag 13388 F: +264 61 207 9012  
Windhoek E: dbcp@nust.na  
NAMIBIA W: www.nust.na

QUALIFICATION : VARIOUS	
QUALIFICATION CODE: VARIOUS	LEVEL: 4
COURSE: BASIC SCIENCE	COURSE CODE: BSC410S
DATE: NOVEMBER 2023	SESSION: 1
DURATION: 3 HOURS	MARKS: 100

**FIRST OPPORTUNITY: EXAMINATION QUESTION PAPER**

**FULLTIME MODE**

**EXAMINERS:** *MRS LEONORITHA NAOMAS, MR TUWILIKA TOBIAS, DR VAINO  
INDONGO*

**MODERATOR:** *PROF EDOSA OMOREGIE*

**INSTRUCTION:**

1. Answer all questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.

**PERMISSIBLE MATERIAL:**

Non-Programmable Calculator

**ATTACHEMENT**

Periodic Table

**This paper consists of 16 pages including this front page and a Periodic Table.**

**SECTION A: BIOLOGY****(35)****QUESTION 1****(20)**

**Question Type:** Multiple Choice Questions. Choose and write the letter corresponding to the correct answer.

- 1.1 Components of the ecosystem that are essentially indispensable to its smooth functioning are; (1)
- A. Biotic and Abiotic factors
  - B. Producers and the Sun
  - C. Producers and Decomposers
  - D. Primary and Secondary consumers
- 1.2 Asexual reproduction produces an offspring that is \_\_\_\_\_ to the parent. (1)
- A. not identical
  - B. identical
  - C. characterised
  - D. None of the above.
- 1.3 Scientific names higher than genus are; (1)
- A. capitalized but not printed distinctively, italicized, or underlined
  - B. italicized or underlined
  - C. capitalized and italicized or underlined
  - D. italicized or underlined with the first word capitalized
- 1.4 True multicellularity occurs only in \_\_\_\_\_. (1)
- A. animals
  - B. eukaryotes
  - C. plants and animals
  - D. plants, animals and protists
- 1.5 When a fruit bat eats the fruit from a fig tree, it eats the seeds as well. These seeds are dispersed through the bat's droppings. This is an example of a \_\_\_\_\_ relationship. (1)
- A. mutualism
  - B. predation
  - C. commensalism
  - D. competition

- 1.6 An organism that depends on other organisms for food is best described as; (1)
- A. an autotrophic organism
  - B. heterotrophic organism
  - C. Both A and B
  - D. None of the above.
- 1.7 The two types of competitions found in ecology are; (1)
- A. Endoparasites and Ectoparasitic competition.
  - B. Interspecific and Endospecific competition.
  - C. Intraspecific and interspecific competition.
  - D. Ectospecific and Endospecific competition.
- 1.8 Detritivores/Scavengers refers to \_\_\_\_\_. (1)
- A. organisms that feed both on plants and animals
  - B. organisms that end the food chain or food web
  - C. organisms that feed on tissues of dead organisms
  - D. organisms that are not required in the ecosystem
- 1.9 Which of the following is an example of a micronutrient? (1)
- A. Carbohydrate
  - B. Fats
  - C. Protein
  - D. Vitamin
- 1.10 A \_\_\_\_\_ reaction is when two monosaccharide units combine, and a bond is formed. (1)
- A. hydrolysis
  - B. condensation
  - C. hydrogenation
  - D. liquification
- 1.11 What is the name of the enzyme that is found in the saliva? (1)
- A. Sucrase
  - B. Amylase
  - C. Lipase
  - D. Trypsin

- 1.12 Which of the following is a fat-soluble vitamin? (1)
- A. Vitamin A
  - B. Vitamin B
  - C. Vitamin C
  - D. None of the above
- 1.13 Which sentence is untrue with respect to the human body? (1)
- A. Unconsumed water broken → fats
  - B. Carbohydrates broken → Sugars
  - C. Proteins broken down → Amino acids
  - D. Fats broken down → Fatty acids and glycerol
- 1.14 Which provides energy very slowly? (1)
- A. Carbohydrates
  - B. Fats
  - C. Proteins
  - D. Fibers
- 1.15 The process that changes glucose into carbon dioxide and lactic acid/alcohol is known as; (1)
- A. Fermentation
  - B. Photosynthesis
  - C. Condensation
  - D. Hydrogenation
- 1.16 Boiling the wort with the hops is to/for; (1)
- A. inactivate enzymes
  - B. sterilization
  - C. caramalyze sugar slightly
  - D. All of the above
- 1.17 The bubbles in champagne and soda is due to the presence of; (1)
- A. Hydrogen
  - B. Carbon dioxide
  - C. Nitrogen
  - D. Oxygen

- 1.18 Which of the following are Milk Processing Operations? (1)
- A. Clarification
  - B. Pasteurization
  - C. Homogenization
  - D. All of the mentioned
- 1.19 Statement 1: Dry wines are the wines which contain little unfermented sugar.  
Statement 2: With the increase in the alcohol content, the growth of yeasts \_\_\_\_\_. (1)
- A. True, increases
  - B. True, decreases
  - C. False, increases
  - D. False, decreases
- 1.20 Sulphite is added to wine to \_\_\_\_\_. (1)
- A. act as a preservative to prevent spoilage and oxidation at several stages of the winemaking
  - B. continue fermentation
  - C. assist oxidation
  - D. increase the pH of the wine

**QUESTION 2 (15)**

- 2.1 Explain the relationship between vitamin D and osteoporosis. (2)
- 2.2 Which class of vitamins has the potential to be toxic? Why? (2)
- 2.3 Why is fructose twice as sweet as sucrose? (2)
- 2.4 Name the six kingdoms of organisms. (3)
- 2.5 Discuss why protozoans are regarded as animal-like and algae as plant-like organisms? (2)
- 2.6 Explain the role of fermentation in bread making. (2)
- 2.7 Why is a mushroom regarded as fungus rather than a plant? (2)

## QUESTION 3

(20)

**Question Type:** Multiple Choice Questions. Choose and write the letter corresponding to the correct answer.

3.1 Which of the following is a quantitative measurement? (1)

- A. Amount of matter in an object
- B. Fluorescence of different objects
- C. Colour change in different objects
- D. Coarseness of a powder

3.2 What is the SI unit for temperature? (1)

- A. Celsius
- B. Fahrenheit
- C. Kelvin
- D. Thermometer

3.3 Convert 62.2 Fahrenheit to Kelvin. (1)

- A. 335.4 K
- B. 16.8 K
- C. 289.9 K
- D. 94.2 K

3.4 How many significant figures are in 400.400 m? (1)

- A. 3
- B. 4
- C. 5
- D. 6

3.5 The factor  $10^{-6}$  corresponds to which prefix? (1)

- A. Mega
- B. Micro
- C. Milli
- D. Nano

- 3.6 Given that 85.0 K is the accepted value for a particular measurement, which of the following experimental trials is precise? (1)
- A. 85.0 K , 87.7 K & 89.9 K
  - B. 85.0 K, 84.8 K & 84.9 K
  - C. 83.0 K , 85.0 K & 88.0 K
  - D. 85.0 K , 89.0 K & 90.0 K
- 3.7 Use the suitable significant figures calculation's rule to solve this mathematical operation; (1)
- $4.32 \times 2.224$
- A. 9.6
  - B. 9.60
  - C. 9.61
  - D. 9.607
- 3.8 Which equation represents the law of conservation of mass? (1)
- A.  $\text{Mass}_{\text{reactants}} = \text{Mass}_{\text{products}}$
  - B.  $\text{Mass}_{\text{reactants}} \neq \text{Mass}_{\text{products}}$
  - C.  $\text{Density}_{\text{reactants}} = \text{Density}_{\text{products}}$
  - D.  $\text{Density}_{\text{reactants}} \neq \text{Density}_{\text{products}}$
- 3.9 Which of the three states of matter possess these features; definite shape, definite volume, small thermal expansion and incompressible? (1)
- A. Liquid
  - B. Solid
  - C. Gas
  - D. A and B
- 3.10 Which of the following is charge free? (1)
- A. Proton
  - B. Electron
  - C. Neutron
  - D. None of the above
- 3.11 What is the mass number of Boron? (1)
- A. 26.9815
  - B. 10.81
  - C. 12.011
  - D. 14.0067

- 3.12 What is common to elements in the same group? (1)
- A. Similar boiling point
  - B. Similar freezing point
  - C. Similar number of shells
  - D. Similar number of valence electron
- 3.13 Which metal is liquid at room temperature? (1)
- A. Mercury
  - B. Magnesium
  - C. Copper
  - D. Lead
- 3.14 Which of the following elements is unreactive? (1)
- A. Neon
  - B. Carbon
  - C. Zinc
  - D. Potassium
- 3.15 Which of the following elements has both metallic and non-metallic properties? (1)
- A. Na
  - B. Mg
  - C. Si
  - D. Ar
- 3.16 Which ion do bases contain? (1)
- A.  $H^+$
  - B.  $OH^-$
  - C.  $H_3O$
  - D.  $NH_3$
- 3.17 One of the physical properties that all acids have is; (1)
- A. sour taste
  - B. bitter taste
  - C. colourful
  - D. colourless



- 3.18 Which of these acids is used as a treatment agent of bone marrow and scurvy diseases? (1)
- A. Acetic acid
  - B. Hydrochloric acid
  - C. Ascorbic acid
  - D. Nitric acid
- 3.19  $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$  is chemically known as? (1)
- A. Neutralization
  - B. Ionization
  - C. Dissociation
  - D. Acidification
- 3.20 Sodium Carbonate decahydrate is commonly known as \_\_\_\_\_? (1)
- A. Caustic soda
  - B. Bleaching soda
  - C. Washing soda
  - D. Baking soda

**QUESTION 4** (15)

Question type: Structured questions.

- 4.1 An experiment to determine the boiling point of water, the experimental value measured is 150.2 K and the Accepted /true value is 300.15 K. Determine the error value. (2)
- 4.2 Convert 500 Gigameters to meters. (2)
- 4.3 Use the appropriate significant figures rule to carry out the calculation below;
- (i)  $64.54 - 15.201$  (2)
  - (ii)  $\frac{25.02}{4.015}$  (2)
- 4.4 Define the following terms; element, mixture and compound. (3)
- 4.5 Differentiate between Compounds and Mixtures? (2)
- 4.6. State 2 physical properties of bases. (2)

## QUESTION 5

(20)

**Question Type:** Multiple Choice Questions. Choose and write the letter corresponding to the correct answer.

- 5.1 The following is the best graph to represent tabulated data of the velocity of a crawling baby over time; (1)
- A. Pie chart
  - B. Circle
  - C. Histogram
  - D. Line graph
- 5.2 Two objects, A and B, move with velocities of 2 m/s and 3 m/s over 1 s from rest, respectively. Which object has high acceleration? (1)
- A. Both A and B
  - B. A only
  - C. B only
  - D. None has acceleration.
- 5.3 Which one is a non-renewable source of energy? (1)
- A. nuclear energy
  - B. tidal energy
  - C. hydropower
  - D. biofuel
- 5.4 The correct order for generation of electrical energy from coal is\_\_\_\_\_. (1)
- A. Supply electricity → heat water to make steam → steam turns turbines → electrical power sent around the country
  - B. Fusion of fuel → heat water to make steam → steam turns turbines → electrical power sent around the country
  - C. Fission of coal → heat water to make steam → steam turns turbines → electrical power sent around the country
  - D. Crushing of fuel → burn fuel → heat water to make steam → steam turns turbines → electrical generators produce energy

5.5 Another name for **crude oil** is \_\_\_\_\_ . (1)

- A. Natural gas
- B. Biofuels
- C. Petroleum
- D. Coal

5.6 Which of the following is true for geothermal energy? (1)

- A. It is a form of heat generated from the earth's core.
- B. It can be generated from the heat of biomass.
- C. It is generated as the sun overheats the surface of the earth unevenly.
- D. None of the above.

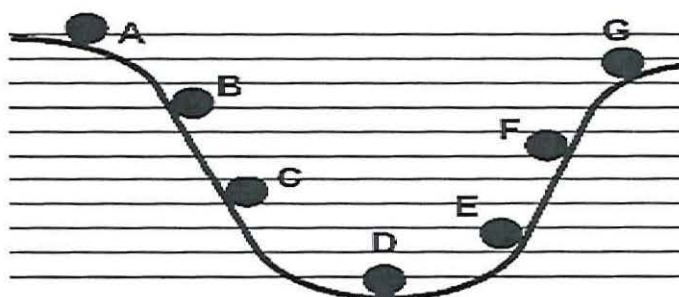
5.7 Peter uses energy of 300 J to carry a suitcase upstairs for a distance of 6 m. Assuming the acceleration due to gravity is  $9.81 \text{ m/s}^2$ . Find the mass of the suitcase. (1)

- A. 20.0 g
- B. 20.0 kg
- C. 5.1 kg
- D. 6.0 kg

5.8 A 2.5 g stone was thrown into the frictionless air with an initial velocity of 7.2 m/s. Which statement is NOT true about the ball when it reaches the top of its ascent? (1)

- A. Kinetic energy is minimum at that point.
- B. The whole energy is equal to gravitational energy.
- C. The stone loses all its energy at this point.
- D. Potential energy is at maximum.

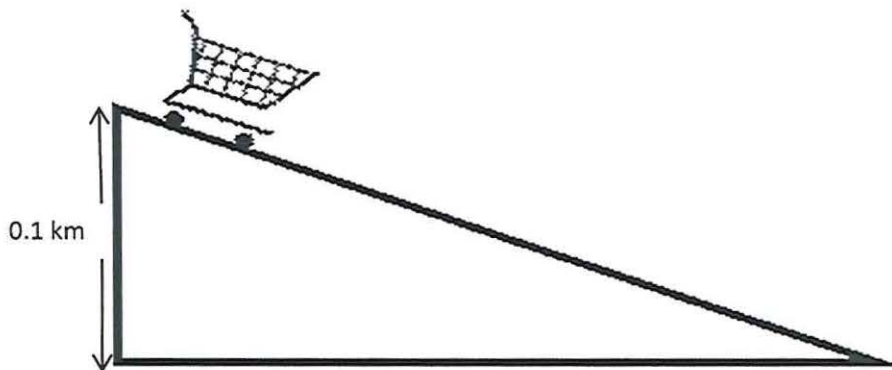
5.9 This graph shows a ball rolling from A to G. The ball starts at point A and rolls through to point G.



Which letter shows the greatest kinetic energy of the ball? (1)

- A. D only
- B. A and G
- C. C and F
- D. D and A

5.10 A cart at the top of a 0.1 km hill has a mass of 2 kg? Assume that acceleration due to gravity is  $10 \text{ m/s}^2$ .



What is the cart's gravitational potential energy? (1)

- A. 20 J
- B. 2000 J
- C. 1000 J
- D.  $500 \text{ Nm}^2$

5.11 Law of Conservation of Energy states that; (1)

- A. Energy can be created or destroyed; it may be transformed from one form into another, but the total amount of energy never changes.
- B. Energy cannot be created or destroyed; it may be transformed from one form into another, but the total amount of energy never changes.
- C. A. Energy cannot be created or destroyed; it may be transformed from one form into another, but the total amount of energy changes.
- D. Energy can be created or destroyed; it may be transformed from one form into another, but the total amount of energy changes.

- 5.12 A gas produced by burning fossil fuels and causes 'acid rain' is known as \_\_\_\_\_. (1)
- A. sulphur dioxide
  - B. natural gas
  - C. oxygen
  - D. carbon dioxide
- 5.13 An alpha particle is equivalent to a (an) \_\_\_\_\_. (1)
- A. gamma ray
  - B. helium atom
  - C. helium nucleus
  - D. electron
- 5.14 Suppose that a radionuclide undergoes beta decay. The net effect on the parent nuclide is that there is \_\_\_\_\_. (1)
- A. a loss of 1 in mass number and loss of 1 in the atomic
  - B. a loss 1 in both mass number and atomic number
  - C. no effect mass number and the atomic number increases by 1
  - D. no effect on both mass and atomic numbers
- 5.15 The rate of flow of electrical charges in the circuit is called \_\_\_\_\_. (1)
- A. resistance
  - B. capacitance
  - C. current
  - D. power
- 5.16 A measure of how much energy electrical charges receive to flow in a circuit is known to be; (1)
- A. voltage
  - B. conventional current
  - C. electrical work
  - D. non-conventional power
- 5.17 When five electrical components are connected one after the other, then voltage \_\_\_\_\_. (1)
- A. divides amongst the components
  - B. is the same through the circuit
  - C. increases in the components
  - D. None of the above

5.18 What happens to the resistance when three bulbs are connected in parallel circuit? (1)

- A. it remains the same
- B. it increases
- C. it decreases
- D. it vanishes rapidly

5.19 When a net force is applied, the following are effects on the object **except**; (1)

- A. No net change in the position of the object.
- B. Change (increase or decrease) the velocity of the object.
- C. Change the direction of the moving object.
- D. Change the shape of the moving object.

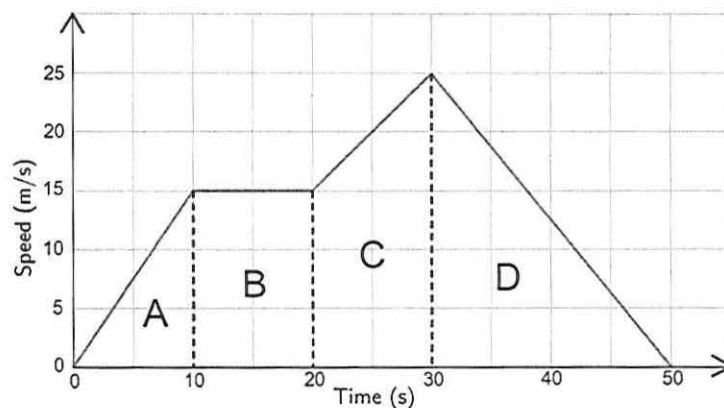
5.20 Which of the following is not a type of '*Inertia*'? (1)

- A. Inertia of rest
- B. Inertia of waves
- C. Inertia of direction
- D. Inertia of motion

**QUESTION 6** (10)

**Question Type:** Structured questions.

6.1 Study the speed-time graph below representing a journey of a car and answer the questions relating to the graph.

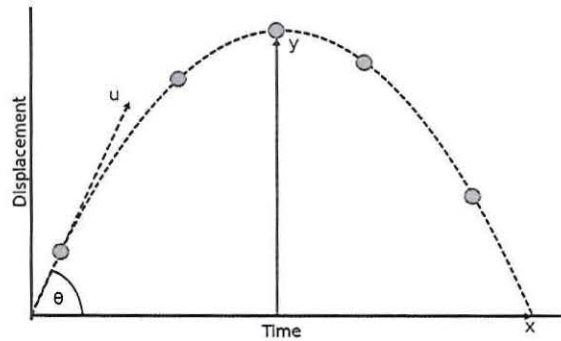


a) Calculate the acceleration over Part C of the graph. (2)

b) Calculate the total distance travelled over parts D. (2)

6.2 Define 'Inertia'. (1)

6.3 A stone of mass 20 g was thrown into the frictionless air with an initial velocity  $u = 11$  m/s. The trajectory of the stone is shown in the diagram. What is the stone's kinetic energy? (2)



6.4 What are values for **a**, **b** and **c** in the following nuclear equation during alpha-decay process:



**END**

## PERIODIC TABLE OF THE ELEMENTS

1																	18
1 <b>H</b> 1.00794																	2 <b>He</b> 4.00260
3 <b>Li</b> 6.941	4 <b>Be</b> 9.01218											5 <b>B</b> 10.81	6 <b>C</b> 12.011	7 <b>N</b> 14.0067	8 <b>O</b> 15.9994	9 <b>F</b> 18.9984	10 <b>Ne</b> 20.179
11 <b>Na</b> 22.9898	12 <b>Mg</b> 24.305											13 <b>Al</b> 26.9815	14 <b>Si</b> 28.0855	15 <b>P</b> 30.9738	16 <b>S</b> 32.06	17 <b>Cl</b> 35.453	18 <b>Ar</b> 39.948
19 <b>K</b> 39.0983	20 <b>Ca</b> 40.08	21 <b>Sc</b> 44.9559	22 <b>Ti</b> 47.88	23 <b>V</b> 50.9415	24 <b>Cr</b> 51.996	25 <b>Mn</b> 54.9380	26 <b>Fe</b> 55.847	27 <b>Co</b> 58.9332	28 <b>Ni</b> 58.69	29 <b>Cu</b> 63.546	30 <b>Zn</b> 65.38	31 <b>Ga</b> 69.72	32 <b>Ge</b> 72.59	33 <b>As</b> 74.9216	34 <b>Se</b> 78.96	35 <b>Br</b> 79.904	36 <b>Kr</b> 83.8
37 <b>Rb</b> 85.4678	38 <b>Sr</b> 87.62	39 <b>Y</b> 88.9059	40 <b>Zr</b> 91.22	41 <b>Nb</b> 92.9064	42 <b>Mo</b> 95.94	43 <b>Tc</b> (98)	44 <b>Ru</b> 101.07	45 <b>Rh</b> 102.906	46 <b>Pd</b> 106.42	47 <b>Ag</b> 107.868	48 <b>Cd</b> 112.41	49 <b>In</b> 114.82	50 <b>Sn</b> 118.69	51 <b>Sb</b> 121.75	52 <b>Te</b> 127.6	53 <b>I</b> 126.9	54 <b>Xe</b> 131.29
55 <b>Cs</b> 132.905	56 <b>Ba</b> 137.33	71 <b>Lu</b> 174.967	72 <b>Hf</b> 178.49	73 <b>Ta</b> 180.948	74 <b>W</b> 183.85	75 <b>Re</b> 186.207	76 <b>Os</b> 190.2	77 <b>Ir</b> 192.22	78 <b>Pt</b> 195.08	79 <b>Au</b> 196.967	80 <b>Hg</b> 200.59	81 <b>Tl</b> 204.383	82 <b>Pb</b> 207.2	83 <b>Bi</b> 208.908	84 <b>Po</b> (209)	85 <b>At</b> (210)	86 <b>Rn</b> (222)
87 <b>Fr</b> (223)	88 <b>Ra</b> 226.025	103 <b>Lr</b> (260)	104 <b>Rf</b> (261)	105 <b>Db</b> (262)	106 <b>Sg</b> (263)	107 <b>Bh</b> (264)	108 <b>Hs</b> (265)	109 <b>Mt</b> (268)	110 <b>Uun</b> (269)	111 <b>Uuu</b> (272)	112 <b>Uub</b> (269)		114 <b>Uuq</b>		116 <b>Uuh</b>		118 <b>Uuo</b>

**Lanthanides:**

57 <b>La</b> 138.906	58 <b>Ce</b> 140.12	59 <b>Pr</b> 140.908	60 <b>Nd</b> 144.24	61 <b>Pm</b> (145)	62 <b>Sm</b> 150.36	63 <b>Eu</b> 151.96	64 <b>Gd</b> 157.25	65 <b>Tb</b> 158.925	66 <b>Dy</b> 162.50	67 <b>Ho</b> 161.930	68 <b>Er</b> 167.26	69 <b>Tm</b> 166.934	70 <b>Yb</b> 173.04
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**Actinides:**

89 <b>Ac</b> 227.028	90 <b>Th</b> 232.038	91 <b>Pa</b> 231.036	92 <b>U</b> 238.029	93 <b>Np</b> 237.048	94 <b>Pu</b> (244)	95 <b>Am</b> (243)	96 <b>Cm</b> (247)	97 <b>Bk</b> (247)	98 <b>Cf</b> (251)	99 <b>Es</b> (252)	100 <b>Fm</b> (257)	101 <b>Md</b> (258)	102 <b>No</b> (259)
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