namibia university
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES
DEPARTMENT OF NATURAL AND APPLIED SCIENCES

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QUALIFICATION CODE: VARIOUS	**LEVEL:** 4
COURSE NAME: BASIC SCIENCE	**COURSE CODE:** BSC410S
SESSION: JUNE 2022	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

FIRST OPPORTUNITY EXAMINATION	
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MODERATOR:	PROF HABAUKA KWAAMBWA

INSTRUCTIONS	
1.	Write all your answers in the answer booklet provided, using **black/blue** ink pen only.
2.	Read the whole question before answering.
3.	Begin each question on a new page.
4.	The Periodic Table is attached at the back of this question paper.

PERMISSIBLE MATERIALS
1. Examination script
2. Scientific Calculator

THIS QUESTION PAPER CONSISTS OF 16 PAGES
(INCLUDING THIS FRONT PAGE AND THE PERIODIC TABLE)

SECTION A: BIOLOGY [35]

QUESTION 1: MULTIPLE CHOICES. Each correct answer carries 2 marks. [20]

1.1 Which of the following are the correct taxa in the right order for the binomial
   nomenclature? (2)
   A. kingdom and then species
   B. genus and then family
   C. genus and then species
   D. species and then genus

1.2 Which two domains are prokaryotic? (2)
   A. Protista and Archaebacteria
   B. Eubacteria and Archaebacteria
   C. Fungi and Plantae
   D. Bacteria and Archaea

1.3 Bacteria that live in human intestines assist digestion and feed on nutrients the human
   consumed. This relationship might best be described as: (2)
   A. commensalism.
   B. mutualism.
   C. ectoparasitism.
   D. endoparasitism.

1.4 In symbiotic relationships parasitism refers to; (2)
   A. Two species interacting with each other and both are organisms.
   B. Two species interacting with each other and both species benefit.
   C. Two species interacting with each other, one specie benefits and the other is
      unaffected.
   D. Two species interacting with each other, one species benefits and host species is
      harmed.

1.5 Which two of the following are examples of globular proteins? (2)
   A. Haemoglobin and Insulin
   B. Antibodies and Fibrin
   C. Lactose and Sucrose
   D. Fibrin and Collagen

1.6 Which of the following is needed in our diet in small quantities? (2)
   A. Water
   B. Rice
   C. Vitamins
   D. Fats

1.7 All of the following are true about fermentation except; (2)
   A. It improves the sensory characteristics of food
   B. It is undesirable process in the food industry as it spoils the food
   C. It extends the shelf life of food
   D. It changes the nutritional value of food for example converting milk into cheese.

1.8 During the production of gasohol, where does ethanol (alcohol) come from that is blended with gasoline? (2)
   A. Ethanol comes from the fermentation of gasoline.
   B. Ethanol comes from the fermentation of agricultural crops such as sugar canes.
   C. There is no ethanol in gasohol.
   D. Ethanol is not a product of fermentation.

1.9 In which way does yoghurt provide us with the health benefit of boosting our immune system? (2)
   A. Yoghurt is rich in calcium.
   B. Yoghurt has anti-inflammatory properties.
   C. Yoghurt provides the body with proteins which are for making antibodies.
   D. Both A and B are correct.

1.10 During the production of cheese, yogurt, bread and so forth, enough time (it can be in days or hours) is important during fermentation. What is the rationale? (2)
   A. To allow microorganisms to have enough time to convert the all the sugar.
   B. Time is not an important factor during the process of fermentation.
   C. The longer the time the microorganisms are given to act on the sugar during fermentation   the better the results.
   D. Both A and C are correct
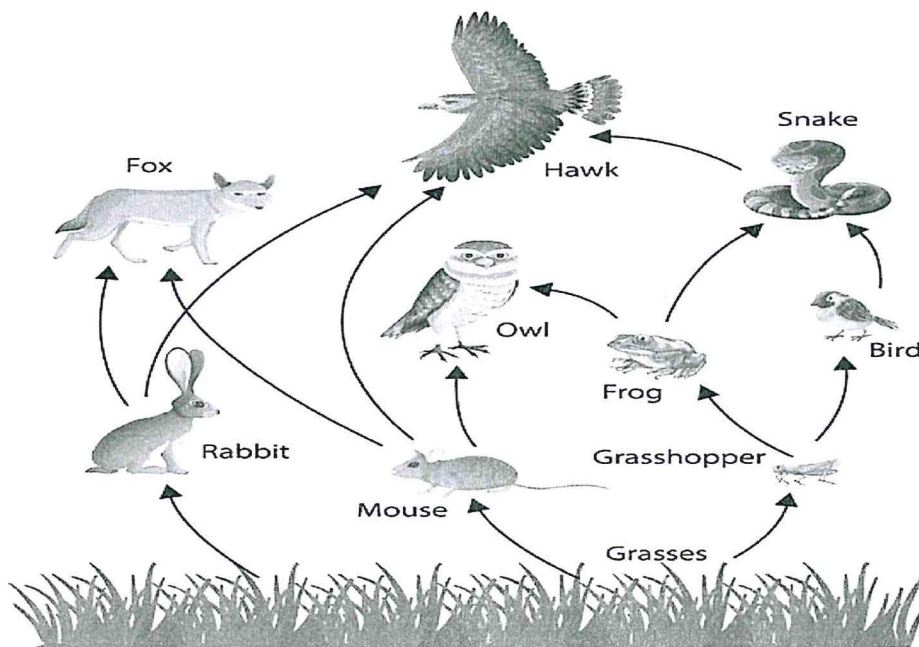
QUESTION 2: Structured questions [15]

2.1 Mention the three-domain system available in the classification of organisms. (3)

2.2 Differentiate between monocot and dicot plants based on the leaf venation and roots. (2)

2.3 Study diagram 1 below on the food web and answer the questions that follow.

Diagram 1: Food Web

2.3.1 Classify the following organisms as to either being; *producer, primary consumer, secondary consumer, tertiary consumer, quaternary consumer, herbivore, carnivore, omnivore and decomposer.*

1) The Hawk upon feeding on the snake as a carnivore, is thus classified as_____. (1)

2) The Rabbit because it feeds only on grasses in this food web is a_____, being a primary consumer. (1)

3) The grasses as the ones that brings in energy into the food web and ecosystem at large it would rightly classified as the _____. (1)

2.4 Explain the effects of a diet that is lacking proteins. (2)

2.5 Discuss the role of homogenisation and pasteurisation during the production of yoghurt. (4)

2.6 Discuss what determines the products of fermentation. (1)

SECTION B: CHEMISTRY [35]

QUESTION 3: MULTIPLE CHOICES. Each correct answer carries 1 mark. [20]

3.1 Which zeros are significant in the number 0.01030? (1)
   A. Only the zero at the end is significant
   B. All of the zeros are significant
   C. Only the zero between the 1 and 3 are significant
   D. The zero between the 1 and 3, and the zero after the 3 is significant

3.2 Round the number 3.46 to 2 significant figures. (1)
   A. 3.5
   B. 3.4
   C. 3.0
   D. 3.3

3.3 What would be the value of 298K on the Fahrenheit scale? (1)
   A. 50° F
   B. 77° F
   C. 98° F
   D. 22° F

3.4 Write 6.37×10^{-2} in standard form. (1)
   A. 0.00637
   B. 0.0637
   C. 637
   D. 63700

3.5 In metric system the prefix nano means: (1)

A. 10^{-9}
B. 10^{9}
C. 10^{12}
D. 10^{-12}

3.6. A change in which the form or shape of a substance changes but the chemical makeup of the substance remains the same (it does not create a new substance) is called a _____. (1)

A. Chemical change
B. Physical change
C. Chemical reaction
D. Physical Property

3.7 A combination of two or more different substances in which they keep their identities, is called _____. (1)

A. Reaction
B. Mixture
C. Solution
D. Solute

3.8 What is a solid? (1)
A. a substance that does not have a definite shape or volume
B. a substance with a definite volume, but no definite shape
C. a substance with a definite shape and volume
D. a substance whose particles glide past one another

3.9. What is an extensive property? (1)
A. A property that can be used to identify a substance
B. A property that depends on the amount of matter present
C. A property that does not depend on the amount of matter present
D. A property that can be observed or measured without changing the identity or composition of substance

3.10 Miscible liquids that have different boiling points can be separated by_____. (1)
A. Filtration
B. Separating funnel
C. Distillation
D. Chromatography

3.11 Which statement is correct for the element in Period 3, Group 6 of the periodic table? (1)

A. It is a metal
B. It will not react with oxygen
C. It has six valence electrons in the third shell
D. It is a gas at room temperature and pressure

3.12 Which substance has an overall 1+ charge? (1)
   A. Lithium
   B. Fluorine
   C. Magnesium
   D. Sulfur

3.13 Elements within the same group in the periodic table have similar properties because they have the same number of: (1)
   A. protons
   B. neutrons
   C. ions
   D. valence electrons

3.14 Which of the following elements is likely to form a negatively charged ion? (1)
   A. potassium, K
   B. barium, Ba
   C. selenium, Se
   D. sodium, Na

3.15 Which particle has a positive charge? (1)
   A. Proton
   B. Neutron
   C. Neuron
   D. Electron

3.16 A substance you test has a pH of 1. Which of the following statements is true about the substance? (1)
   A. it is a strong base
   B. It is a weak base
   C. It is a strong acid
   D. It is a weak acid

3.17 An alkali is a: (1)

A. Water soluble base

B. Water insoluble acid

C. Water soluble acid

D. Water insoluble base

3.18 _____ indicator is colorless in acid. (1)

A. Methyl red

B. Methyl Orange

C. Bromothymol blue

D. Phenolphthalein

3.19 Acid reacts with metal carbonate to form_____. (1)

A. Salt

B. Water

C. Carbon Dioxide

D. All of the above

3.20 Which definition of acids and bases emphasizes on the donation and acceptance of protons? (1)

A. Brønsted Lowry

B. Arrhenius

C. Brønsted Arrhenius

D. Lowry

QUESTION 4: Brief statement responses.   **[15]**

4.1 Apply the rules of rounding off numbers and round off the numbers below to the number of significant figures stated.

   i. Round off 8670 km to two significant figures   (1)

   ii. Round off 7.013 g to three significant figures   (1)

   iii. Round off 0.01025 m to three significant figures   (1)

4.2 You are provided with three test tubes with different liquids:

   A: Solutions of Tartaric Acid

   B: Soap Solution

   C: Pure Water

   What will you observe when you put:

   (a) a piece of blue litmus paper in each test tube?

   (b) a piece of red litmus paper in each test tube?

   (c) a few drops of phenolphthalein solution to each test tube?

   Complete the table below: (9)

Test tube	Effect in blue litmus	Effect on red litmus	Effect on Phenolphtahlein
A			
B			
C			

4.3 An atom of phosphorus has the symbol $^{31}_{15}$P

Give the number of protons, neutrons and electrons in this atom of phosphorus.   (3)

Number of protons:

Number of neutrons:

Number of electrons :

QUESTION 5: MULTIPLE CHOICES. Each correct answer carries 1 mark.   **[20]**

5.0 Two cars run a race against each other. Car A started from rest and attained a speed of 30 m/s in 8 seconds. A minute later, car B started from rest and accelerates uniformly to a speed of 24 m/s in the next 4 seconds and maintained the speed for another 3.6 seconds. It (car B) then accelerated uniformly to finish the race.
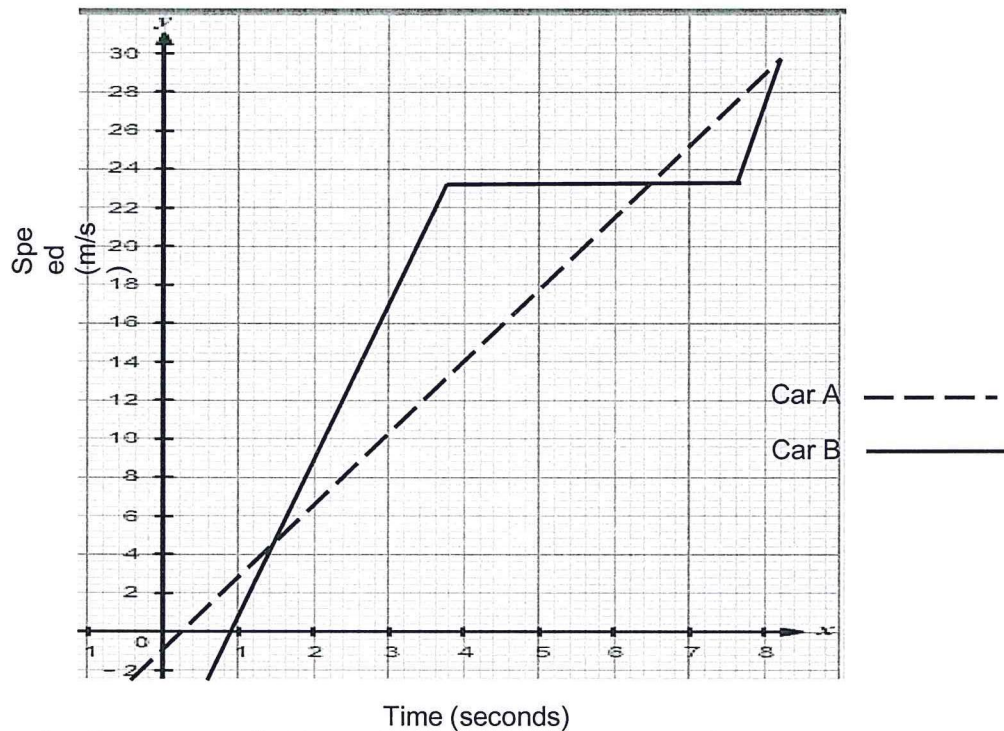
Time (seconds)

5.1 Considering the distance travelled by car B, over what distance was the race run between 4 and 7 seconds?   (1)

    A. 240 m
    B. 72 m
    C. 45 m
    D. 120 m

5.2 Which car was slower in the first 4 seconds? (1)
   A. car A
   B. car B
   C. both car A and B
   D. none of them.

5.3 At which time are the speeds of the two cars equal? (1)
   A. At t = 0 only
   B. At t = 1.9 s only
   C. At t = 1.9 s, t = 6.5 s and 8.1 s
   D. At t = 6.5 s and t = 8.1 s only

5.4 In the linear equation y = mx + C, the value of m represents _____ and
   C is the_____. (1)
   A. the independent and dependent variables
   B. the gradient and x –axis intercept
   C. the gradient and the y axis intercept
   D. the y intercept and the gradient

5.5 According to Newton's first law, if no force is applied to a stationary object _____. (1)
   A. acceleration is zero
   B. an object accelerates
   C. an object decelerates
   D. None of the above

5.6 Determine the magnitude and direction of the particles from the following process: (1)

   A. 70 N, right

   B. 30 N, right

   C. 70 N, left

   D. 30 N, left

5.7 _____ is the ability or capacity to do work. (1)
   A. Force
   B. Work
   C. Energy
   D. Power

5.8 The combination of _____ and _____ make up the universe. (1)
   A. power and matter
   B. work and force
   C. force and energy
   D. energy and matter

5.9 _____ is the rate of transfer of energy. (1)
   A. Force
   B. Work
   C. Energy
   D. Power

5.10 Energy possessed by a body in virtue of its velocity is called _____. (1)
   A. physical energy
   B. potential energy
   C. kinetic energy
   D. geothermal energy

5.11 The following below are examples of renewable energy except: (1)
   A. Wind energy
   B. Geothermal
   C. Nuclear energy
   D. Biofuels

5.12 Which of the following energy sources is another type of solar energy? (1)
   A. fossil fuel
   B. heat
   C. wind
   D. biomass

5.13 Which of the units given below is the SI unit of resistance? (1)
   A. Ampere
   B. Volt
   C. Ohm
   D. Watt

5.14 Which one of the following is a fundamental particle of matter? (1)

A. Proton
B. Atom
C. Electron
D. Neutron

5.15 Which of the following instruments is used to measure an electric current? (1)

A. Voltmeter
B. Galvanometer
C. Ammeter
D. Potentiometer

5.16 Which of the following current flows from negative to positive terminal of the power source in the circuit? (1)

A. Direct Current
B. Conventional current
C. Non-conventional current
D. Alternating Current

5.17 A type of electromagnetic radiation which is emitted as a photon from unstable radionuclides is called _____. (1)

A. Gamma radiation
B. Alpha radiation
C. Beta radiation
D. Neutrons

5.18 The equation for the alpha decay of Ra-226 is given by:

$$^{226}_{88}Ra \rightarrow {}^{m}_{d}X + {}^{4}_{2}He$$
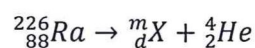
Determine the values of m and d. (1)

A. m = 226, d = 86
B. m = 222, d = 88
C. m = 222, d = 86
D. m = 226, d = 88

5.19 From (5.18) above, give the name of the new element X that is formed. (1)

A. He
B. At
C. Ra
D. Rn

5.20 Which of the following is produced by the application of radioisotope in food and agriculture? (1)

A. carbon dating

B. sterilisers

C. I-125 for cancer

D. fertilizers

QUESTION 6: Structured questions. [10]

6.1 A student with a mass of 48 kg stands at the top of a hill of height 200 m (Position A), as shown in the diagram below. *Note: Answer should be in SI units.*
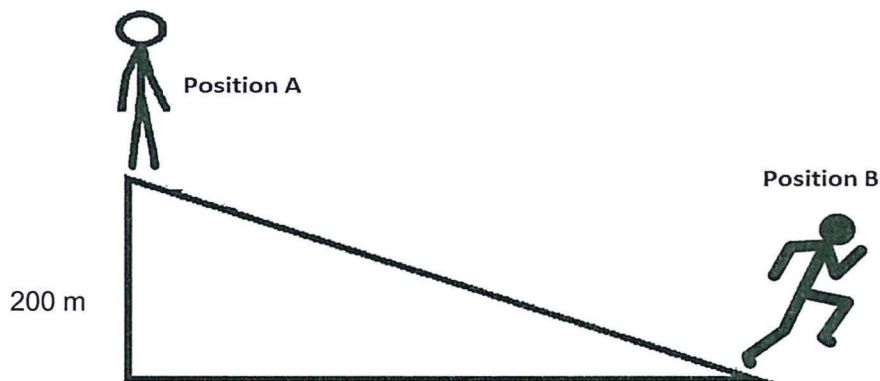
6.1.1 What is the student's gravitational potential energy at the top of the hill? (3)
Note: Gravitational acceleration (g) = 10 m.s^{-2}

6.1.2 Assume there was no energy loss when the student reached the bottom of the hill and calculate the maximum velocity of the student. (3)

6.2 An experiment carried out in the physics laboratory to determine the rate of change of velocity has the following results presented in graphical form below. Using the diagram answer the following questions:
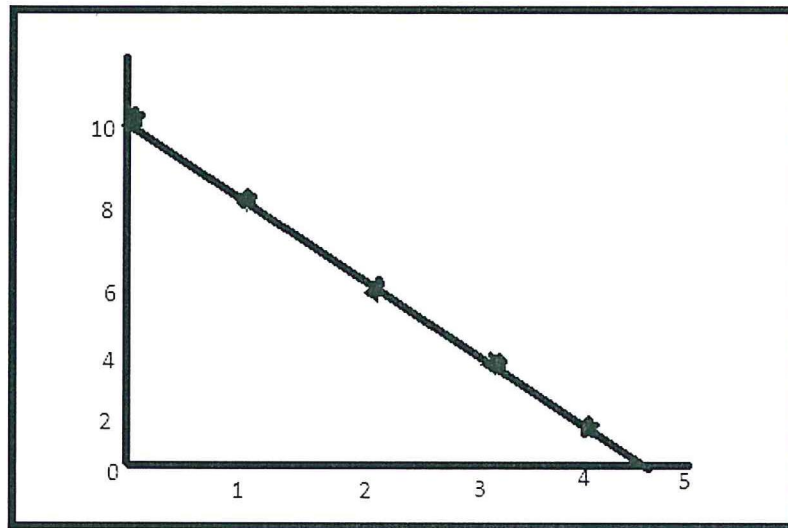
6.2.1 What are the two important pieces of information that are missing from the graph?   (2)

6.2.2 The equation of a straight line is given by

        y = mx + c

    i) From the expression above, which is the independent variable?   (1)

    ii) From the expression above, which letter represents the gradient?   (1)

END