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QUALIFICATION: **VARIOUS**	
QUALIFICATION CODE: **VARIOUS**	LEVEL: **4**
COURSE: **BASIC SCIENCE**	COURSE CODE: **BSC410S**
DATE: **NOVEMBER 2024**	SESSION: **1**
DURATION: **3 HOURS**	MARKS: **100**

FIRST OPPORTUNITY: EXAMINATION QUESTION PAPER (FM)

EXAMINER: *Mrs Leonoritha Naomas, Mr Simeon Ambuga and Mr Ferdinard Hakaala,*

Dr Vaino Indongo

MODERATOR: *Prof Edosa Omoregie*

INSTRUCTIONS:

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

None

This paper consists of 18 pages including this front page and a Periodic Table

SECTION A: BIOLOGY [35]

QUESTION 1 (20)

Question Type: Multiple Choices. Choose and write a letter corresponding to the correct answer. Each correct answer carries **1 mark.**

1.1 Organisms that lack nucleus and cell organelles belong to the following kingdoms:

i) Fungi
ii) Protista
iii) Archaebacteria
iv) Eubacteria

A. (i) and (ii)
B. (ii) and (iii)
C. (i) and (iii)
D. (iii) and (iv)

1.2 In taxonomy hierarchy family comes between;

A. Class and order.
B. Order and genus.
C. Genus and specie.
D. Division and Class

1.3 The term "Animalia" refers to the _____ to which numerous organisms belong.

A. Kingdom
B. Phylum
C. Domain
D. Genus

1.4 Which characteristic must all species have in order to avoid extinction?

A. Excretion
B. Reproduction
C. Growth
D. Respiration

1.5 Respiration is one of the seven characteristics of all living organisms. What is meant by respiration?

A. The way that all living things are made of cells.
B. The way living things get energy from food.
C. The reaction to a change in the environment.
D. Being able to produce a new individual.

1.6 The science that deals with the relationships between living organisms and their physical environment is known as:

A. Ecology
B. Biodiversity
C. Ecosystem
D. Environment

1.7 Which of the following is true about secondary consumers in an ecosystem?

A. They eat only plants.
B. They are eaten by primary consumers.
C. They are smaller and weaker than are primary consumers.
D. They are fewer in number than are primary consumers.

1.8 The organic and inorganic materials in all the organisms in the diagram will eventually return to the environment by the action of;

A. decomposers
B. producers
C. primary consumers
D. secondary consumers

1.9 A barnacle grows on a whale, doing it no harm. This is an example of;

A. vitalism
B. mutualism
C. parasitism
D. commensalism

1.10 Organisms of the same specie fighting over shared resources is called;

A. character displacement
B. intraspecific competition
C. predation
D. interspecific competition

1.11 Fat soluble vitamins;

A. are easily excreted.
B. seldom cause toxicity.
C. require bile for absorption.
D. are not stored in the body.

1.12 Citrus fruits are and excellent source of;

A. Calcium
B. Vitamin C
C. Vitamin D
D. Calories

1.13 Anemia is defined as the lack of ..... in the diet.

A. Calcium
B. Sodium
C. Iron
D. None of the above.

1.14 A substance needed by the body for growth, energy, repair and maintenance is known as;

A. Calories
B. Fatty acid
C. Carbohydrate
D. Nutrient

1.15 Obesity results if;

A. energy intake is lesser than energy expenditure.
B. the number of enzymes becomes more than the food.
C. energy expenditure is less than energy intake.
D. energy expenditure is more than energy intake.

1.16 Bacteria like Lactobacillus produce what compound required for the production of sauerkraut, yogurt, and sourdough is;

A. Lactic acid
B. Carbon dioxide
C. Yeast
D. Flour

1.17 Cheese is made by coagulating which of the following milk protein;

A. Rennet
B. Casein
C. Pepsin
D. Trypsin

1.18 Enzyme use to coagulate milk during cheese making procedure is;

A. Chymosin
B. Rennet
C. Trypsin
D. Amylase

1.19 Which of the following conditions affect the survival of microorganisms?

A. pH
B. temperature
C. oxygen concentration
D. all of the above

1.20 Fermentation occurs in the;

A. presence of oxygen
B. absence of oxygen
C. presence of nitrogen
D. presence of carbon

QUESTION 2 **(15)**

Structured questions

2.1 Define pasteurization and homogenation. (2)
2.2 Name two reasons why manual crushing of grapes were replaced with mechanical methods. (2)
2.3 Name four health benefits of yoghurt. (4)
2.4 List the deficiency disorders associated with prolonged deprivation of the following nutrients, namely; vitamin A, vitamin C, iodine and haemoglobin. (4)
2.5 Differentiate between endangered and extinct species, and state one contributing factor. (3)

SECTION B: CHEMISTRY **[35]**

QUESTION 3 **(20)**

Question Type: Multiple Choices. Choose and write a letter corresponding to the correct answer. Each correct answer carries **1 mark.**

3.1 An experiment was carried out on determination of boiling point of water, the accepted value is 373.15 K, whereas the measured value is 365.15 K. What is the error value from this experiment?

A. – 8
B. – 738.3
C. 8
D. – 735.1

3.2 Which of the following is the SI unit of temperature?

A. Fahrenheit
B. Celsius
C. Kelvin

D. Degree

3.3 On the Fahrenheit scale the freezing point of water is 32 °F and its boiling point is_____.

A. 100 °F
B. 0 °F
C. 273.15 °F
D. 212 °F

3.4 The distance from NUST main gate to Wernhil shopping mall is reported as 0.901 km, what is this distance in centimetres?

A. 901 cm
B. 901,000 cm
C. 9.01×10^4 cm
D. None of the above

3.5 Do the following calculations and report the final answer with the correct number of significant figures and in scientific notation.

$$(2.471 \times 206\ m) \div (2.30 \times 10^{-8}\ m)$$

Which of the following answers is correct?

A. 2.213×10^{-10} m
B. 2.213×10^{10} m
C. 2.21×10^{-10} m
D. 2.21×10^{10} m

3.6 Which of these is not a compound?

A. Carbon dioxide
B. Oxygen
C. Water
D. Sodium Chloride

3.7 In order for ice (solid) to melt into liquid, certain conditions must be met, what determines phase change?

A. Pressure
B. Temperature
C. Particle arrangement
D. Pressure and Temperature

3.8 Phase change can be described as either exothermic or endothermic, which of the following phase change is exothermic?

A. Melting
B. Freezing
C. Sublimation
D. Evaporation

3.9 Which of the following is not a chemical property?

A. Rust
B. Fermentation
C. Boiling point
D. Decomposition

3.10 Which of the physical properties of a sample depends on the amount of matter in the sample?

A. Melting point of the sample
B. Hardness of the sample
C. Length of the sample
D. Colour of the sample

3.11 Which separation method involves using heat to convert a liquid into vapor, then cooling it back to liquid?

A. Evaporation
B. Distillation
C. Filtration
D. Chromatography

3.12 Which of the following accurately describes the structure of an atom?

A. Protons and electrons inside the nucleus
B. Protons and neutrons in the nucleus, electrons around it
C. Neutrons and electrons in the nucleus, protons around it
D. Protons, neutrons, and electrons orbiting the nucleus

3.13 Elements in the same group of the periodic table have similar _____.

A. Atomic mass
B. Number of protons
C. Number of valence electrons
D. Physical properties

3.14 Which of the following elements is most likely to form a cation?

A. Oxygen
B. Chlorine
C. Sodium
D. Sulfur

3.15 Which of the following elements has naturally occurring isotopes?

A. Helium
B. Hydrogen
C. Neon
D. Argon

3.16 Which of the following is a strong acid?

A. Hydrochloric acid
B. Ammonia
C. Carbonic acid
D. Acetic acid

3.17 Which of the following bases is commonly used in soap making?

A. Sodium hydroxide
B. Ammonium hydroxide
C. Magnesium hydroxide
D. Sodium acetate

3.18 A farmer wants to reduce the acidity of the soil to improve crop growth. Which of the following would be a suitable substance to add to the soil?

A. Ammonium sulfate
B. Calcium hydroxide
C. Sodium hydroxide
D. Vinegar

3.19 You are tasked with identifying whether a solution is acidic or basic, but you only have red litmus paper. You dip it into the solution, and the paper remains red. Is the solution basic or acidic?

A. The solution is neutral or basic
B. The solution is acidic
C. The solution is neutral or acidic
D. The solution is basic

3.20 A copper smelting company in Namibia accidentally releases sulfur dioxide (SO_2) into the atmosphere. When this gas dissolves in rainwater, it forms sulfurous acid (H_2SO_3). What impact will this have on the pH of the rainwater?

A. It will make the rainwater neutral
B. It will increase the rainwater's pH
C. It will decrease the rainwater's pH, causing acid rain
D. It will have no effect on the rainwater

QUESTION 4 **[15]**

4.1 Perform the following calculations, and provide your answer to the correct number of significant figures. (2)

(i) (0.0045 x 100) – 22.512 =

(ii) 3.24 m x 7.0 =

4.2 Fill in the missing part of the table below (2)

Atom	Proton #	Electron #	Neutron #	Mass #
Na^+			12	
	17			35
P	15			

4.3 Provide the chemical names and common names/uses for the following chemical formulas; (3)

(i) $NaHCO_3$

(ii) NaCl

(iii) CH_3COOH

4.4 Differentiate between intensive and extensive properties of matter and give an example of each. (4)

Intensive properties	Extensive properties
•	•
•	•
•	•

4.5 Red and white phosphorus allotropes of phosphorus, define what is meant by 'allotropes' are and give another example of allotropes of an element that you have learned. (2)

4.6 Define the term alloy and give one example of an alloy. (2)

SECTION C: PHYSICS [30]

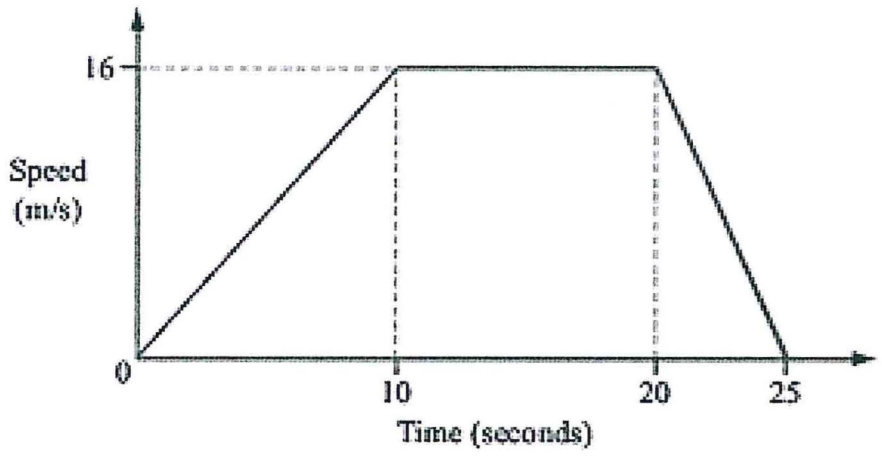
QUESTION 5 (20)

Question Type: Multiple Choices. Choose and write a letter corresponding to the correct answer. Each correct answer carries **1 mark.**

5.1 What does the acronym "**TAILS**" stands for?

A. Title, Axes, Intervals, Labels and Scale.
B. Total, Ages, Intervals, Labels and Scale.
C. Title, Axes, Intervals, Labels and Sketch.
D. Tails, Axes, Intervals, Labels and Small.

5.2 The graph below shows speed-time graph for an athlete as he was running from upper campus to lower campus.



(i) What is the acceleration of an athelete in the first 10 seconds?

A. 0.625 m/s
B. 1.6 m/s
C. 0 m/s^2
D. 1.6 m/s^2

(ii) How far is the upper campus from lower campus?

A. 280m
B. 160m
C. 40m
D. 200m

5.3 How should you formulate the title of your graph

A. x-axis vs y-axis
B. horizontal vs vertical
C. Time vs Distance graph
D. Dependent variable vs Independent variable

5.4 Given the equation F=ma, which variables are vectors

A. F and m
B. m and a
C. F and a
D. All of them

5.5 What is the unit of force?

A. Kg
B. m/s
C. $Kg.ms^{-2}$
D. N/Kg

5.6 Which of the following is a renewable source of energy?

A. Geothermal
B. Natural gas
C. Petrol
D. Coal

5.7 Energy source derived from the earth's heat is called?

A. Geothermal energy source
B. Fossil fuels
C. Biomass
D. All of the above

5.8 What is the main difference in the generation of electricity with water and nuclear energy?

A. Nuclear energy is a dangerous source of energy and hydroelectric power is safe
B. In nuclear energy fission of atoms heat water which turns the generator which generates electricity while in hydroelectric energy, potential energy of water turns the turbines which turns the electricity.
C. Hydroelectric power is a renewable source of energy while nuclear energy is non-renewable source of energy.
D. All of the above.

5.9 The transfer of energy by the application of a force that causes the body to move in the direction of force is called;

A. Power
B. Distance
C. Mechanical advantage
D. work

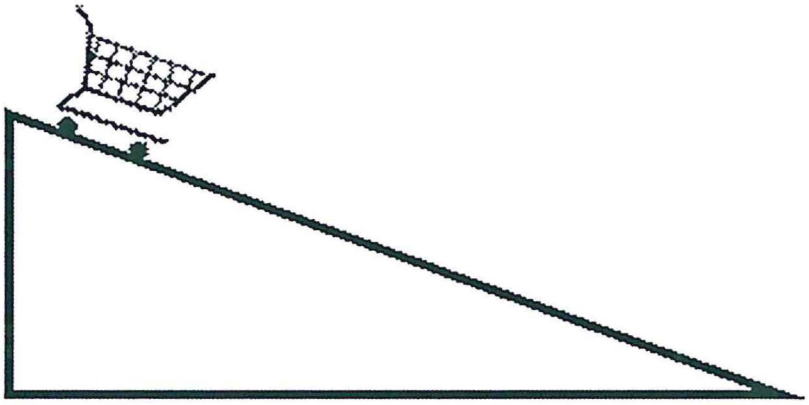
5.10 Fendy and Pius are lifting a box 12 cm upward. They exert forces of 30 N and 35 N on a box, respectively. How much work is being done?

A. 78 J
B. 360 J
C. 7.8 J
D. 420 J

5.11 Which of the following processes require the most work?

A. A 1000 kg weight rest on a bench
B. A person lifting a 10 kg weight 1 m off the floor
C. A person holding a 1 kg weight stationary with outstretching arms.
D. A person lifting a 1 kg weight 1 m off the floor

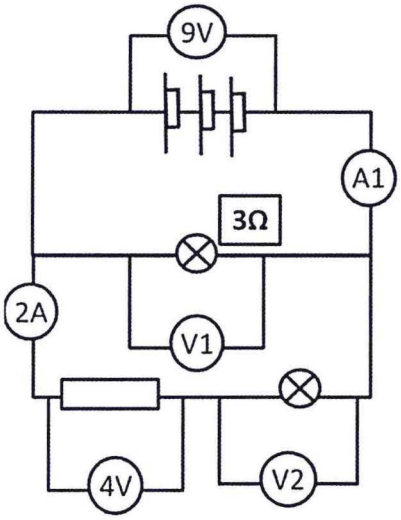
5.12 A 5 kg cart is at the top of 20 m hill. If the energy is conserved what would be the velocity of an object at ground.



If the energy is conserved, what will be the velocity of an object on the ground (g=10N/Kg)?

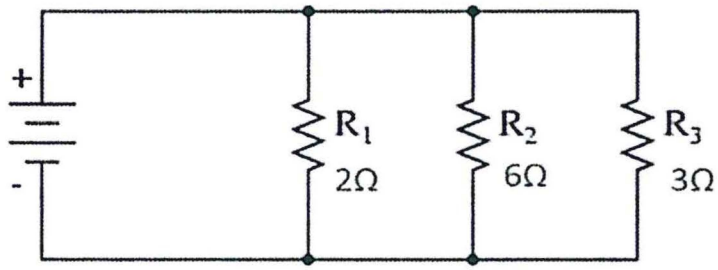
A. 20 m/s
B. 400 m/s
C. 40 m/s
D. 8000 m/s

5.13 What is the total voltage in the circuit below?



A. 9 V
B. 4 V
C. 2 A
D. 3 ohms

5.14 What is the resistance in the circuit below?



A. 1 ohms
B. 3 ohms
C. 11 ohms
D. 2 ohms

5.15 A light bulb has a resistance of 800 ohms and the voltage across it is 240 V. How much current will the buld draw?
A. 300 mA
B. 3000000 A
C. 0.003 A
D. 192000 A

5.16 Which of the following quanties remain the same in all parts of a series circuit?
A. Voltage
B. Current
C. Power
D. Resistance

5.17 _____is a process by which the nuclei of a nuclide emit α, β or γ rays.
A. Radioactive decay
B. Transmutation
C. Nuclear Forces
D. Isotopes

5.18 Atoms with identical atomic numbers but different mass numbers are known as?
A. Mass Number
B. Nuclides
C. Nucleons
D. Isotopes

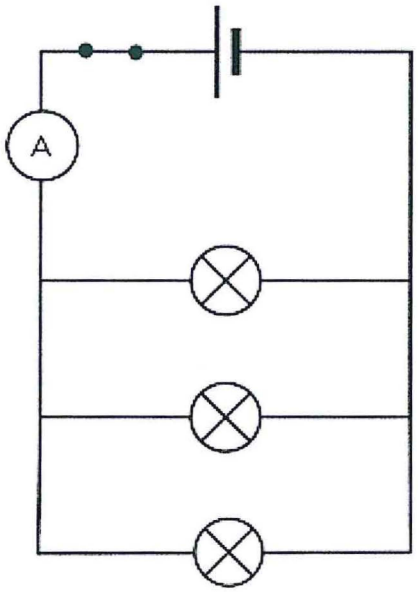
5.19 Which of the following particles resembles the nucleus of helium?

A. Beta particle
B. Alpha particle
C. Gamma particle
D. All of the above

QUESTION 6 **[10]**

Structured questions

6.1 Name and explain three fundamental forces of nature. (3)
6.2 State the law of conservation of energy. (1)
6.3 Define power. (1)
6.4 Construct a parallel circuit diagram with one cell, a closed switch and an ammeter and three bulbs connected in parallel. (5)



PERIODIC TABLE OF THE ELEMENTS

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

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

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