



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

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

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

SUPPLEMENTARY/SECOND 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 14 PAGES
(INCLUDING THIS FRONT PAGE AND PERIODIC TABLE)

SECTION A: BIOLOGY

[35]

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

[20]

- 1.1 Which two of the following are the features used by microorganisms for movement? (2)
- A. Cilia and Legs
 - B. Flagella and Legs
 - C. Cilia and Fins
 - D. Flagella and Cilia
- 1.2 Which two domains are prokaryotic? (2)
- A. Protista and Archaeobacteria
 - B. Eubacteria and Archaeobacteria
 - C. Fungi and Plantae
 - D. Bacteria and Archaea
- 1.3 Dioecious are _____ . (2)
- A. Organisms that cannot reproduce sexually.
 - B. Plants that have male flowers on one plant and female flowers on another plants.
 - C. Plants that have male and female reproductive part on different locations on the same plant.
 - D. Plants that produce leaves throughout the year.
- 1.4 The two types of competitions found in ecology are: (2)
- A. Endoparasites and Ectoparasitic competition.
 - B. Interspecific and Endospecific competition.
 - C. Intraspecific and interspecific competition.
 - D. Ectospecific and Endospecific competition.
- 1.5 Detritivores/Scavengers refers to _____ . (2)
- 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
- 1.6 Components of the ecosystems that are essentially indispensable to its smooth functioning are _____ . (2)
- A. Biotic and Abiotic factors
 - B. Producers and the Sun
 - C. Producers and Decomposers
 - D. Primary and Secondary consumers

- 1.7 Micronutrients are dietary components often referred to as _____. (2)
- A. fats and vitamins
 - B. vitamins and minerals
 - C. amino acids and vitamin C
 - D. carbohydrates and lipids
- 1.8 Vitamins that are non-toxic to the body when taken in excessive amount are _____. (2)
- A. Vitamin B and D
 - B. Vitamin C and K
 - C. Vitamin A and K
 - D. Vitamin B and C
- 1.9 Biotechnology is defined as _____. (2)
- A. the study of industrialization
 - B. the use of living organisms and bio-processes to make products of interest
 - C. the study of innovation and technology
 - D. none of the above
- 1.10 What is the significance of temperature on fermentation during the production yogurt? (2)
- A. Fermentation work best at the optimal temperature of the microorganisms being used.
 - B. Temperature has no significance on any part of the processes of yogurt production.
 - C. Temperature makes the yogurt hard and thick.
 - D. Fermentation has nothing to do with temperature.

QUESTION 2 Structured questions

[15]

- 2.1 Discuss how a scientific name is written following the principles of the binomial nomenclature system. (2)
- 2.2 Explain why producers and decomposers are absolutely essential to the functioning of an ecosystem? (2)
- 2.3 Briefly explain three factors that cause organisms to become endangered or extinct. (3)
- 2.4 One of the health benefits of feeding on yoghurt is that it boosts the immune system. Brief explain how yogurt helps to boost the immune system? (3)
- 2.5 Discuss the effects of omitting pasteurization during yoghurt production. (2)
- 2.6 Define fermentation and explain its role in the production of gasohol? (3)

SECTION B: CHEMISTRY

[35]

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

[20]

3.1 How many significant figures does the measurement 0.0002500 m have? (1)

- A. Two
- B. Four
- C. Seven
- D. Five

3.2 The factor 10^6 corresponds to which prefix? (1)

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

3.3 The value of 100°C is equal to _____ (1)

- A. -373 K
- B. 273 K
- C. 73 K
- D. 373 K

3.4 What is 0.000058 written in scientific notation? (1)

- A. 5.8×10^{-6}
- B. 5.8×10^{-5}
- C. 5.8×10^5
- D. 5.8×10^6

3.5 1mm is equal to (1)

- A. $1 \times 10^{-2}\text{ m}$
- B. $1 \times 10^{-3}\text{ cm}$
- C. $1 \times 10^{-2}\text{ dm}$
- D. $1 \times 10^{-4}\text{ km}$

- 3.6 A change in one or more substances, caused by a chemical reaction, which forms new and different substances. (1)
- A. Chemical property
 - B. Chemical reaction
 - C. Chemical element
 - D. Chemical change
- 3.7 What is a pure substance that cannot be broken down into other substances by chemical or physical means? (1)
- A. Element
 - B. Substance
 - C. Mixture
 - D. Compound
- 3.8 Which of the following defines matter? (1)
- A. anything without mass
 - B. anything with mass and takes up space
 - C. anything with mass, but doesn't take up space
 - D. anything without mass and doesn't take up space
- 3.9 What is an Intensive property? (1)
- A. A property that cannot 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 Which one of the following pairs of separation techniques will BOTH separate salt from a mixture of salt and water? (1)
- A. Separating funnel and filtration
 - B. Chromatography and evaporation
 - C. Separating funnel and distillation
 - D. Distillation and evaporation
- 3.11 Which group does the element with atomic number 35 belong to? (1)
- A. Halogens
 - B. Alkaline earth metals
 - C. Noble gases
 - D. Alkali metals

- 3.12 Which substance has an overall charge of 1- ? (1)
- A. Lithium
 - B. Fluorine
 - C. Potassium
 - D. Sulfur
- 3.13 Which is not a family of the periodic table? (1)
- A. alkaline-earth metals
 - B. anions
 - C. halogens
 - D. noble gases
- 3.14 Which element is a semiconductor? (1)
- A. carbon
 - B. sodium
 - C. silicon
 - D. uranium
- 3.15 Which particle has a negative charge? (1)
- A. proton
 - B. neutron
 - C. neuron
 - D. electron
- 3.16 What do we call a substance that changes colors in acids or bases? (1)
- A. Indicator
 - B. Reactant
 - C. Developer
 - D. Product
- 3.17 In universal indicators, a pH of 7 is shown with (1)
- A. Yellow color
 - B. Green color
 - C. Blue color
 - D. Pink color

- 3.18 _____ indicator is pink in alkalis (1)
- A. Methyl red
 - B. Methyl Orange
 - C. Bromothymol blue
 - D. Phenolphthalein
- 3.19 Acid reacts with metal to form ____ (1)
- A. Salt + Hydrogen
 - B. Salt + Water
 - C. Salt + Water + Carbon Dioxide
 - D. Salt + Carbon Dioxide
- 3.20 According to the Brønsted-Lowry theory, an acid is any species that can (1)
- A. Donate a proton
 - B. Accept a proton
 - C. Donate an electron
 - D. Accept an electron

QUESTION 4: Brief statement responses. [15]

4.1 Carry out the following calculation and give the answer with the correct number of significant figure:

$(527.112 + 13)/63.498$ (2)

4.2 Use the dimensional analysis method to carry out the following conversion: (1)

a) 28.0 m to km

4.3 Determine whether each of the following statements is true or false. If false, correct or state why the statement is false. (5)

- a. Elements in the same group have the same number of valence electrons and have similar chemical properties.

b. The group number determines the number of electronic shells around a nucleus while the period number determines the number of valence electrons.

c. Hydrogen is a monoatomic, reactive gas which is classified with the group 1 (alkali metals) elements

4.4 List any 3 uses of washing soda. (3)

4.5 Use your knowledge of atomic calculations to complete the following table.

Note: $\text{Symbol} = \text{mass no.} \cdot \text{Element}^{\text{net charge}}$

Note each answer carries half a mark

(4)

Symbol	(a)	(b)	$^{80}\text{Br}^{-1}$
Protons	15	(c)	35
Neutrons	16	(d)	45
Electrons	(e)	10	(f)
Mass number	(g)	24	80
Net Charge	0	+2	(h)

SECTION C: PHYSICS**[30]****QUESTION 5: Brief statement responses.****[20]**

- 5.1 _____ must be drawn with reference to 360° ? (1)
- A. Histogram
 - B. Pie Chart
 - C. Line graph
 - D. Smooth curved line
- 5.2 Force (**F**) applied on an object of mass (**M**) is given by $F = Ma$, where **a** is the acceleration of the object. If a graph of **F** against **a** is linear, what would the value of F – intercept be if **a** = 0? (1)
- A. 0
 - B. Ma
 - C. F
 - D. Y
- 5.3 Usually it is best to fit a straight line that goes as near as possible to _____ as possible. (1)
- A. as many points
 - B. one point
 - C. two points
 - D. three points
- 5.4 Burning of fuel → heat water to make steam → ----- → turbines turn generators electrical power sent around the country. Which term is missing in the sequence? (1)
- A. turbine turns the team
 - B. generators turns the turbine
 - C. heat water to make smoke
 - D. steam turns turbine
- 5.5 In geothermal energy, _____ produced from underground rocks is used to drive turbines, which drive electric generators to produce electricity. (1)
- A. water
 - B. heat
 - C. dust
 - D. fire

5.6 Which of these below is an equation for kinetic energy (1)

- A. $KE = mgh$
- B. $KE = \frac{1}{2}mgh$
- C. $KE = \frac{1}{2}mv^2$
- D. None of these

5.7 What is the formula for calculating **power**? (1)

- A. Power = Force \times distance
- B. Power = $\frac{\text{force}}{\text{mass}}$
- C. Power = $\frac{\text{mass}}{\text{force}}$
- D. Power = Force \times Velocity

5.8 You drop a 20 kg bag of sugar from the edge of a building at a height of 4 m. How much work did you do? Taking acceleration due to gravity $g = 9.8 \text{ m/s}^2$. (1)

- A. + 800 J
- B. - 800 J
- C. + 390 J
- D. - 160 J

5.9 What would be the resultant force if applied forces are 10 N and 15 N as shown by the free body diagram below, respectively?



What is the resultant force? (1)

- A. 5 N east
- B. 10 N east
- C. 15 N west
- D. 5 N west

- 5.10 If the fridge of mass 350 kg is moved with force of 70 N. What is the acceleration of the fridge? (1)
- A. 0.2 m/s^2
 - B. 70 m/s^2
 - C. 5 m/s^2
 - D. 24500 m/s^2
- 5.11 A neutron and a proton are _____ . (1)
- A. nucleons
 - B. positively charged
 - C. negatively charged
 - D. unlike charged
- 5.12 A proton is a charge which attracts to _____ . (1)
- A. neutron
 - B. an electron
 - C. a proton
 - D. none of the above
- 5.13 _____ hold quarks together. (1)
- A. Gravity
 - B. Electromagnetic force
 - C. Strong nuclear force
 - D. Weak nuclear force
- 5.14 A gas produced by burning fossil fuels and cause 'greenhouse effect' is known as _____. (1)
- A. sulphur dioxide
 - B. natural gas
 - C. oxygen
 - D. carbon dioxide
- 5.15 Which one is a neutral particle of the nucleon? (1)
- A. Proton
 - B. Atom
 - C. Electron
 - D. Neutron

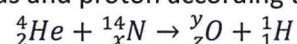
5.16 Which of the following instruments is used to measure an electric energy? (1)

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

8.17 A measure of how much energy electrical charges receives is known to be _____. (1)

- A. electrical device
- B. voltage
- C. resistance
- D. none of the above

5.18 The successful bombardment of nitrogen atom with alpha particle resulted in the formation of oxygen nucleus and proton according to the reaction,



What are the values x, y and z? (1)

- A. x = 7, y = 14 and z = 8
- B. x = 7, y = 17 and z = 8
- C. x = 8, y = 17 and z = 7
- D. x = 8, y = 14 and z = 7

8.19 Which one is an electromagnetic radiation with high frequency? (1)

- A. alpha
- B. gamma
- C. beta
- D. None of the above

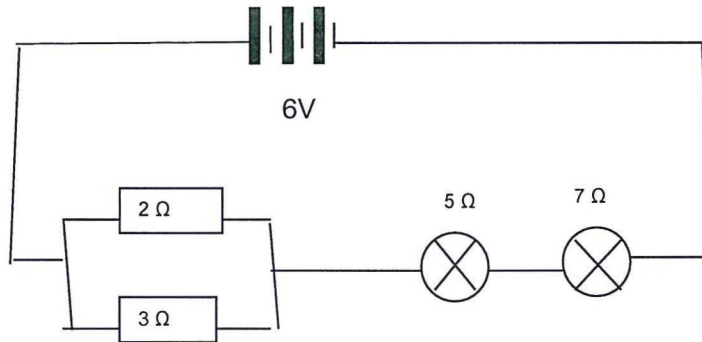
5.20 The _____ is the time it takes for half of the original sample of radioactive material to decay to half its original. (1)

- A. decay rate
- B. half-life
- C. radioactive decay
- D. radioactivity

QUESTION 6: Structured questions

[10]

6.1 Study the circuit with appropriate electrical components below:



Determine:

- (i) the resistance in parallel (2)
- (ii) resistance in series (1)
- (iii) The total resistance of the circuit. (1)

6.2 Match the term in **COLUMN A** with either **renewable** or **non-renewable** energy source in **COLUMN B**. (2)

COLUMN A	COLUMN B
Crude oil	i.
Geothermal	ii.

6.3 Which two types of energy are produced from water? (2)

6.4 State any two advantages of wind power. (2)

END

PERIODIC TABLE OF THE ELEMENTS

1	2											13	14	15	16	17	18
1 H 1.00794	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	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	57 Lu 174.967	58 Hf 178.49	59 Ta 180.948	60 W 183.85	61 Re 186.207	62 Os 190.2	63 Ir 192.22	64 Pt 195.08	65 Au 196.967	66 Hg 200.59	67 Tl 204.383	68 Pb 207.2	69 Bi 208.908	70 Po (209)	71 At (210)	72 Rn (222)
87 Fr (223)	88 Ra 226.025	89 Lr (260)	90 Rf (261)	91 Db (262)	92 Sg (263)	93 Bh (264)	94 Hs (265)	95 Mt (268)	96 Uun (269)	97 Uuu (272)	98 Uub (269)	99 Uuq (269)	100 Uuh (269)	101 Uuq (269)	102 Uuh (269)	103 Uuh (269)	104 Uuh (269)

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
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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)
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