



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of BUILDING & Civil engineering

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN CIVIL ENGINEERING

DIPLOMA IN BUILDING TECHNOLOGY

APS 2100: PHYSICAL SCIENCE

END OF SEMESTER EXAMINATION

SERIES: AUGUST 2024

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet

-Examination's pass and Student ID

-Show all your work in printed pages:

This paper consists of **five** questions.

Attempt question ONE (Compulsory) and any other TWO questions.

You may use the following constants: Speed of sound in air-340m/s

Question ONE (30 Marks)

(a) Define the following terms as used in science:

- (i) Element
- (ii) Compound
- (ii) Mass

(3 Marks)

(b) State three ways in which a substance can be identified

(3 Marks)

(c) Find the volume of 0.25M HCl required to exactly react with 20cm³ of 0.1M sodium carbonate solution.

(3 Marks)

(d) State disadvantages of hard water.

(3 Marks)

(e) Using (x) and dots (.) draw the structure of carbon (IV) dioxide.

(3 Marks)

The table below shows some properties and electronic arrangements of common ions of elements represented by letters P to X. Study the information in the table and answer the questions that follow:

Element	Ion	Electron arrangement	Atomic radius	Ion radius
P	P ²⁺	2,8,8	0.197	0.099
Q	Q ⁻	2,8	0.072	0.136
R	R ⁺	2,8,8	0.231	0.133
S	S ³⁺	2,8	0.143	0.050
T	T ²⁺	2,8,8	0.133	0.074
U	U ²⁺	2,8	0.160	0.065
V	V ⁺	2,8	0.186	0.095
W	W ⁺	2	0.152	0.060
X	X ⁻	2,8,8	0.099	0.181

i. Give the atomic numbers of the elements P and Q

P –

Q –

ii. Select the most reactive metallic element

iii. Select 3 elements that belong to the same group of periodic tables

iv. Select 3 elements that would react with cold water to evolve hydrogen gas

v. Why is the ion radius of element X larger than its atomic radius?

VI. Write an equation of the reaction between element S and Oxygen

Question TWO (15 Marks)

a) Explain the meaning of hard water

(2 Marks)

b) Discuss five ways of removing hard water

(10 Marks)

c) State three disadvantages of hard water

(3 Marks)

Question THREE (15 Marks)

a) Prepare five methods of preparing salts

(10 Marks)

b) Differentiate between Electrolyte and non-electrolyte salts

(2 Marks)

c) State three uses of Magadi soda

(3 Marks)

Question FOUR (15 Marks)

a) State two factors that affect the period of a simple harmonic oscillator. (3 Marks)

b) A car accelerates uniformly from rest for 20s with an acceleration of 1.5m/s^2 . It then travels at a constant speed for 2mins before flowing down with a uniform deceleration to come to rest in further 10s.

(i) Sketch a velocity-Time graph of the motion

(3 Marks)

(ii) Find the maximum speed

(3 Marks)

(iii) Find the total distance travelled

(3 Marks)

(iv) Find the acceleration while slowing down.

(3 Marks)

Question FIVE (15 Marks)

- (a) A body in a uniform circular motion experiences acceleration despite moving at a constant speed. Explain. (3 Marks)
- (b) A stone is whirled with uniform speed in horizontal circle having radius of 10cm. It takes the stone 10s to describe an arc length 4cm. Determine
- (i) Angular Velocity (2 Marks)
 - (ii) The periodic time (2 Marks)
 - (iii) State two factors affecting centripetal force (2 Marks)
- (c) Differentiate the following terms as used in Kinematics (2 Marks)
- (i) Distance and displacement (2 Marks)
 - (ii) Speed and Velocity (2 Marks)