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 SCIENCES
SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: MARCH 2025
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 the answer Booklet:

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) State and explain any two basic properties of matter **(2 Marks)**
(b) What is a non-linear device **(1 Marks)**
(c) State newton's laws of motion (**3 Marks**)
(d) A glass container has a cross- sectional area of $20cm^2$. A stone of mass 120g is completely immersed in the water and the level of water rises by 2cm.Determine the density of the material which makes the stone. (3 **Marks**)
(e) Define the following terms as used in simple harmonic motion. (**3 Marks**)
(i) Periodic motion (1 Marks)
(ii) Amplitude (1 Marks)

(f)Differentiate the following terms as used in kinematics
(i) Distance and displacement (2 Marks)
(ii) Speed and Velocity (2 Marks)
(g)A piece of gold ingot with a mass of 290g has a volume of $16.5cm^3$. Calculate the density of gold.

(h) A body of mass 25 kg moving with uniform acceleration has an initial momentum of 60 kg m/s and after 10 seconds the momentum is 90 kg m/s. What is the acceleration of the body. (3 Marks)

(i)John pulls a block of wood of mass 5kg along a horizontal surface by applying a constant force of 16N.Calculate the coefficient of friction on the surface. (3 Marks)

(j) Define viscosity and terminal velocity as applies to fluids (3 Marks)

(k)A Segment of steel railroad track has a length of 30m when the temperature is is 0^{o} c. What is the length when the temperature is 35^{o}C (Coefficient of linear expansion of steel is given as $a=11x10^{-6}(^{0}C)^{-1}$ (3 Marks)

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) 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 $10_{S.}$

(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 FOUR (**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 10_{S} describe an arc length 4cm.Determine

(i) Angula 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)

Question FIVE (15 Marks)

1.32g of amental carbonate with the formular X_2CO_3 was dropped into a 250 ml volumetric flask.100ml of distilled water was then added in it and then stirred until the crystal dissolved. The volume of the solution was then topped to the mark.25ml of this solution was pipped with standard solution of 0.5MHCL in 250ml conical flask. The

finding showed that a bout 25ml of the acid reacted with carbonates. Given (H=1.0 CL=35.5 C=12.0 O=16.0)

(a) Write a balanced chemical equation for the reaction between hydrochloric acid and X_2CO_3 carbonate solution. How many of the acid took part in the reaction. (3 Marks)

(b)Calculate the molarity of the carbonate solution in moles/dm^3. (3 Marks)

(c)Calculate the concentration of the metal carbonate solution in g/dm^3 (3 Marks)

(d)Calculate the relative formula mass of the metal carbonate X_2CO_3. (2 Marks)

(e) Calculate the relative atomic mass (R.A.M) of X. (2 Marks)

(f)Identify metal X with the help of periodic table. (2 Marks)