



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING

APS 2101: APPLIED PHYSICS I

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 2012

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- Answer Booklet
- Scientific Calculator/Mathematical Tables

This paper consists of **FIVE** questions. Answer question **ONE** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One (20 Marks)

- a) Use the kinetic theory of matter to explain the change of state for the three states of matter. **(8 marks)**
- b) Calculate the density of a rectangular block of mass 10kg measuring 2m by 50cm by 2cm. **(3 marks)**
- c) (i) Explain using illustrations on how to measure density of solid using density bottle. **(4 marks)**
- (ii) State the precautions observed in c (i) **(2 marks)**
- d) What volume of brass of density 8.5g cm^{-3} must be attached to a piece of wood of mass 100g and density 0.2g cm^{-3} so that the two will just submerge beneath water? Take density of water 1gcm^{-3} **(3 marks)**

Question Two (20 marks)

- a) A rubber cord of catapult has a cross-sectional area of 2mm^2 and initial length of 0.20m and is stretched to 0.24m to fire a small object of mass 10g. Calculate the initial velocity of the object when it just leaves the catapult.
 $E = 6 \times 10^8 \text{ Pa}$ for rubber **(5 marks)**
- b) Define modulus of rigidity. **(2 marks)**
- c) State Hooke's Law and describe with help of a rough graph the behavior of a copper which hangs vertically and is loaded with a gradual increasing load until it finally breaks. **(8 marks)**
- d) A wire of original length 100cm and diameter 0.5cm was stretched to 102cm and its diameter reduced to 0.495cm. Calculate the poisson's ratio. **(3 marks)**
- e) State the SI units of:
i) Stress
ii) Spring constant **(2 marks)**

Question Three (20 marks)

- a) Define capillarity **(2 marks)**
- b) State **THREE** factors affecting capillarity. **(3 marks)**
- $$Y = \frac{r h \rho g}{2}$$
- c) Show that $Y = \frac{r h \rho g}{2}$ where Y = Surface tension, ρ = density, r = radius and g = gravitational acceleration. **(5 marks)**
- d) Differentiate between adhesion and cohesive forces. **(4 marks)**
- e) Illustrate **TWO** ways of measuring angle of contact acute and obtuse **(2 marks)**

- f) Explain how the angle of contact is related to capillarity. (4 marks)

Question Four (20 marks)

- a) Define:
- i) Distance
 - ii) Displacement
 - iii) Velocity
 - iv) Acceleration (8 marks)
- b) A car travels at a uniform velocity of 20m/s for 5s. The brakes are then applied and the car comes to rest with uniform retardation in further 8s. Draw a sketch of the velocity time graph. How far does the car travel after the brakes are applied? (6 marks)
- c) Calculate the range when an object is thrown upward at an angle of 30° with a velocity of 10m/s (4 marks)
- d) Change the following angles to radius: (2 marks)
- i) 305°
 - ii) 60°

Question Five (20 marks)

- a) Show that for a bicycle rider round circular track.

$$\tan \theta = \frac{V^2}{rg}$$

Tan = (5 marks)

- b) Explain how centrifuges work. (4 marks)
- c) A model car moves round a circular track of radius 0.3m at 2 revolutions per second. Determine;
- i) The angular speed
 - ii) The period T
 - iii) Speed V of the car (9 marks)
- d) Explain why a body in circular motion is said to be accelerating and yet it's moving with a constant speed. (2 marks)