



**TECHNICAL UNIVERSITY OF MOMBASA**  
**FACULTY OF APPLIED AND HEALTH SCIENCES**

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DEPARTMENT OF PURE AND APPLIED SCIENCES

**UNIVERSITY EXAMINATION FOR:**  
**DIPLOMA IN NAUTICAL SCIENCES**

ANS 2102: APPLIED SCIENCE

END OF SEMESTER EXAMINATION

**SERIES: MAY 2016**

**TIME: 2HOURS**

**Instructions to Candidates**

You should have the following for this examination

*Answer Booklet*

*examination pass*

*mathematical table or calculator*

*student ID*

This paper consists of **FIVE** questions.

Attempt question ONE (Compulsory), question two or three **AND** question four or five.

This paper consists of 4 printed pages

**Do not write on the question paper.**

**Question one(30mks)**

- (a) (i) Define matter (1mark)
- (ii) state and differentiate between three phases of matter. (6marks)
- (b) Define and give two examples of (i) intensive property. (6marks).
- (ii) Extensive property. (6marks).
- (c) Define chemical properties and give four examples. (2marks)
- (d) Explain the three mechanisms of heat transfer (3mks)
- (e) A lagged calorimeter of mass 0.75kg contains 0.9kg of water at 20°C. A bolt of mass 0.8kg is transferred from an oven at 400 to the calorimeter and a steady temperature of 50 is reached by the water after stirring. Calculate the specific heat capacity of the material of bolt. (Specific heat capacity of copper is  $400 \text{ JKG}^{-1}\text{K}^{-1}$  and that of water  $4200 \text{ JKG}^{-1}\text{K}^{-1}$ ). (3mks)
- (f) Define the following terms
- i) Latent heat of fusion (1mk)
- ii) Specific latent heat of fusion (1mk)
- g) An object weighs 2.6 N in air and 2.2N when completely immersed in water. Determine the relative density of the object (3mks)
- h) State Faraday's law (1mk)
- i) State Lenz's law (1mk)
- j) State the laws of refraction (2mks)

**Question two(15mks)**

- a) Explain why hydrometer has wide bulb with air in it. (2mks)
- b) A wooden block of mass 375g and density  $750 \text{ kg/m}^3$  is held under water by tying it to the bottom of the container with a light thread. Determine the tension in the thread. (Density of water;  $\rho = 1000 \text{ kgm}^{-3}$ ) (3mks)
- c) Explain the propagation of sound (2mks)
- d) State the properties of electromagnetic waves (2mks)
- e) State the difference between X-rays and Gamma rays in the way in which they are produced. (2mks)

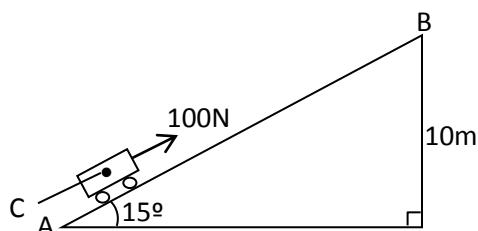
f) What do we mean by the term passive components or devices (2mks)

g) Explain how doping produces an n- type semi conductors from a pure semi conductor material. (2mks)

**Question three(15mks)**

a) State the law of conservation of energy (1mk)

b) The figure below shows an inclined plane, a trolley of mass 30kg is pulled up a slope by a force of 100N, parallel to the slope. The trolley moves so that the centre of mass C travels from points A to B.



- (i) What is the work done on the trolley against the gravitational force in moving from A to B.? (3mks)
- (ii) Determine the work done by the force in moving the trolley from A to B. (2mks)
- (iii) Determine the efficiency of the system. (3mks)
- (iv) Determine the work done in overcoming the frictional force. (3mk)
- (v) Determine the mechanical advantage of the system. (3mks)

**Question four (15mks)**

- (a) Define an acid and a base according to Arrhenius theory . (2marks)
- (b) Differentiate between dissociation and dissolving with respect to chemical compounds (2marks).
- (c) State any two properties of a base. (2marks)
- (d) Calculate pH of  $10^{-3}$  M HCL (2marks)
- (e) (i) Define a salt. (2mark)
- (ii) State three types of salts. (3marks)

(f) Solid salts are non electrical conductors while molten salts are good electrical conductors

Explain. (2marks).

**Question five (15mks)**

(a) Explain the common ion effect with reference to solubility of salts. (4marks)

(b) (i) write electronic configuration in form of spdf notation of the following elements.

${}_9\text{F}$  and  ${}_{11}\text{Na}$  (2marks)

(ii) With a reason, state the elements group and period on the periodic table. (2marks)

(c) Define a REDOX process and give an example. (4marks)

(d) Use three ways to define a reduction process (3mks)