

CHUKA



UNIVERSITY

Knowledge is Wealth (*Sapientia divitia est*) Akili ni Mali

GPHYS 113 GEODYNAMICS

STREAMS: BSc. MINING PHYSICS

JANUARY- APRIL SEMESTER

INSTRUCTIONS

You should have the following for this examination:

- Answer booklet
- Scientific calculator

Where necessary use the following constants

- Stefan-Boltzmann $\sigma = 5.67 \times 10^{-8}$
- Velocity of light in vacuum $= 3 \times 10^8$ m/s
- Radius of the Earth $= 6378$ km

This paper contains FIVE questions

*Attempt question **ONE** and any other **TWO** questions.*

*Question **ONE** carries 30 marks, all other questions carry 20marks*

QUESTION ONE (30 MARKS)

- Define geology and state three branches of study (5 marks)
- Describe the structural relationship of Lithosphere and Asthenosphere (5 marks)
- Draw a well labeled diagram showing the structure and composition of the Earth's interior. (5 marks)
- Define terms plate tectonics and geo-dynamics (4 marks)
- Describe the three modes of flow that dominate the structure of the Earth's mantle (6 marks)

- f) List five thermally controlled processes within Earth (5 marks)

QUESTION TWO (20 MARKS)

- a) Describe two main theories advanced for the origin of the solar system (6 marks)
- b) Explain the significance of The Nebular Theory the Catastrophic-Event Theory (5 marks)
- c) Explain the Tectonic regime - Fault systems (9 marks)

QUESTION THREE (20 MARKS)

- a) Draw a well labeled diagram showing the seven major plates and three minor ones (10 marks)
- b) List the three relative plate movements (3 marks)
- c) List six fundamental structure subsystems (3 end members and 3 intermediate) are generated by regional stresses in lithospheres (7marks)

QUESTION FOUR (20 MARKS)

- a) Describe the earth mantle (8 marks)
- b) What factors are to observed so as to constrain the thermal structure of the oceanic lithosphere. ? (4 marks)
- c) Describe the average chemical composition of the Earth's crust. And the nature and composition of the Earth's interior. (8 marks)

QUESTION FIVE (20 MARKS)

- a) Describe the three possibilities for the source of heat within the earth (9 marks)
- b) State the Fourier's Law of Heat Conduction and write its formula (3 marks)
- States that the heat flux q , or the flow of heat per unit area and per unit time, at a point in a medium is directly proportional to the temperature gradient at the point. In one dimension, Fourier's law takes the form
- $$q = -k \frac{dT}{dy}$$
- where k is the coefficient of thermal conductivity and y is the coordinate in the direction of the temperature variation

- c) Describe four mechanisms have been envisioned to remove continental lithospheric mantle (8 marks)