



**THE KENYA POLYTECHNIC UNIVERSITY
COLLEGE**

DEPARTMENT OF SURVEYING & MAPPING

DIPLOMA IN LAND SURVEY

END OF YEAR I EXAMINATIONS

NOVEMBER 2007

PHYSICS

3 HOURS

INSTRUCTIONS TO CANDIDATES:

You should have the following for this examination:

Answer booklet

Scientific calculator

Answer any FIVE of the following EIGHT questions.

Use neat sketches where applicable.

All questions carry equal marks and the maximum marks for each part of a question are as shown.

This paper consists of 3 printed pages.

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1. (a) Explain:
 - (i) The significance of field lines in a gravitational field.
 - (ii) How temperature changes mechanical and internal energy of a body. (4 marks)
- (b) Of a 500kg vehicle accelerating at 6ms^{-2} and a 2ton vehicle accelerating at 1.5ms^{-2} , identify the one with a greater force. (2 marks)
- (c) (i) Apart from a force moving a distance, state other conditions that must be met for work to have been done.
(ii) Explain the fact that gravity does negative work on a stone thrown upwards. (4 marks)
- (d) List FIVE sources of energy. (5 marks)
- (e) If the resultant of a force 60° from its original direction is 50N, calculate the original force. (5 marks)
2. Prove Kepler's first and third laws of planetary motion. (20 marks)
3. (a) Compare and contrast mercury and water as thermometric liquids. (10 marks)
- (b) Advise Faith on how to use her yellow, white and black dresses on different weather conditions, based on colour alone. (5 marks)
- (c) Calculate the acceleration required to change the velocity of a vehicle from 12ms^{-1} to 20ms^{-1} in 10 seconds. (5 marks)
4. (a) Draw a labeled diagram of the gas thermometer. (10 marks)
- (b) The original vertical velocity of a ball kicked at 60° is 26ms^{-1} . Calculate the velocity at which it was kicked. (5 marks)
- (c) Calculate the power of a pump that lifts 200kg of water 6m in 10 seconds. (5 marks)
5. (a) Explain the land and breeze sea phenomenon. (5 marks)
- (b) Four bodies on heating have the following colours: violet, yellow, blue and red. List them in terms of their temperatures, starting with the hottest. (4 marks)

- (c) Give reasons as to why most gases are real and not ideal. (6 marks)
- (d) A car on traveling 4m on a round-about covers 30° at the centre. Calculate the radius of the round-about. (5 marks)
6. (a) Explain the following:
- Absolute zero temperature is unattainable in any physical process.
 - A tin container with a small hole approximates a black body. (4 marks)
- (b) List factors upon which the rate of conduction of heat depends. (4 marks)
- (c) State the cause of diffuse reflection. (2 marks)
- (d) If the period of revolution of a body is 1.5seconds, calculate its angular velocity. (5 marks)
- (e) If all the kinetic energy of a 1000kg car traveling at 20m/s is converted into heat in the steel brake-drums, find the rise in temperature of the 20kg steel brake-drums when the vehicle brakes to rest. Take the specific heat capacity of steel as $450\text{Jkg}^{-1}\text{K}^{-1}$. (5 marks)
7. (a) Draw diagrams illustrating how a prism can be used to turn:
- a ray by 90°
 - a ray by 180°
 - an inverted image upright (15 marks)
- (b) Calculate the acceleration of a 1.5ton vehicle that has a force of 60, 000N. (5 marks)
8. (a) Prove that plane mirror images are as far behind the mirror as the object is in front. (10 marks)
- (b) A spring extended using a force of 50N is found to have an elastic potential energy of 2.5J. Calculate the extension of the spring. (5 marks)
- (c) 40g of copper at 200°C are added to 50g of water at 10°C in a copper calorimeter of mass 52g. Calculate the final temperature if specific heat capacity of copper is $400\text{Jkg}^{-1}\text{K}^{-1}$ and that of water is $4200\text{Jkg}^{-1}\text{K}^{-1}$. (5 marks)