MENGO SENIOR SCHOOL

END OF TERM 1 2003 EXAMS

S.5 PHYSICS P510/1

TIME: 1:40 HOURS

INSTRUCTIONS:

-Attempt 3 questions
-Assume where necessary g= 9.81 ms^{-2}
NOTE: Begin each number on a fresh sheet of paper.

1(a)(i) What is meant by Dimensions of a Physical Suantity? (2 marks)

(ii) The volume per second of a liquid flowing through a horizontal pipe of length L is given by $\frac{kpa^x}{L}$

Where k is a constant, P, is the pressure across the pipe and is the viscosity having dimensions $ML^{-1}>$ Find by dimensional analysis, the value of x.

(b)(i) Define the terms:

(i) Displacement. (1 mark)

(ii) Speed (1mark)

(ii) What are the dimensions of power? (2 marks)

Five forces act on a particle as shown. Find the resultant of the forces.
(6 marks)

(c) Write the equations of uniformly accelerated motion. (3 marks)

2(a)(i) State the laws of solid friction. (3 marks)

(ii) What is meant by limiting friction? (1 mark)

(iii) Describe a simple experiment used to determine the coefficient of statistic friction between a wooden block and a rough surface. (3 marks)

(b)(i) A car of mass M and tractive force F, moves up a plane inclined at an angle to the horizontal, with uniform speed. The coefficient of friction between the tyres and the plane is μ . If the height of the cliff is h m, show that the work done by the car moving from the bottom of the incline to the top is given by:

$Mgh(\tan\mu + 1)$ (3 marks)

(c) A car of mass 1000kg climbs a track, which is inclined at an angle of 30^0 to the horizontal. The speed of the car at the bottom of the track is 36km/hr. If the coefficient of friction is 0.3 and the engine of the car exerts a force of 4000N,

(i) How far up the incline does the car move in 10s?

(ii) What is the speed of the car at this point?

(iii) What is the power developed by the engine then?

3(a)(i) What is meant by the term linear momentum

(ii) State:

- The principle of conservation of energy. (1 mark)
- The principle of conservation of linear momentum. (1 mark)

(b) A body of mass M_1 and velocity u_1 collides head on with a body of mass M_2 having velocity u_2 in the same direction as u_1. Use Newton's laws of motion to show that the quantity $M_1u_1+M_2u_2$ is conserved. (4 marks)

(c)(i) What is : a projectile. (1 mark)

-trajectory (1 mark)

(ii) Use equations of motion to show that when a body is projected upwards the mechanical energy is conserved. (4 marks)

(d)(i) Describe an expression for the maximum horizontal distance travelled by a projectile in terms of its initial speed u, and the angle of projection , to the horizontal. (3 marks)

(ii) A body is projected at such an angle to the horizontal, that the horizontal range it covers is three times the greatest height attained. (2 marks)

- Find the angle of projection.
- If with this angle the range is 400m, find the necessary speed as projection and time of flight. (3 marks)

END