MENGO SENIOR SCHOOL
SENIOR 5 END OF TERM I, 2004
PHYSICS I
TIME : 11/2 HRS.

INSTRUCTIONS: 1.   Attempt all questions.
2.   Assume where necessary;
-acceleration due to gravity $g = 9.81 ms^{-2}$

1.   a)   (i)   What is meant by <u>Dimensions of a physical quantity?</u>

(ii)   The velocity V of sound traveling along a rod made of a material depends
on Young's modulus Y, and density   of the material.
Derive an expression for the relation between the quantities if Young's
modulus is (stress/strain)

b)   The frequency of vibration of a drop will depend on the surface tension S of t
he drop, its density   and the radius r of the drop, as shown:

$$f = KS^{x} \quad r^{z}$$

What are the values of x, y and z if K is a dimensionless constant.   (3mks)

c)   i.   What is meant by scalar and vector quantities?   2mks)
ii.   Identify scalar   vector quantities from the following;
momentum, density, acceleration, impulse, pressure and temperature.

d)   i.   What is meant by <u>uniformly accelerated motion</u>?

ii.   Sketch speed – time and distance – time graphs for a body moving with
uniform acceleration.   (2mks)

e)   A ball A is thrown vertically upwards at $25 m^{s-1}$ from a point P. Three seconds
later a second ball B is also thrown vertically upwards from the point P at $25 ms^{-1}$.
Calculate:
i.   How long A has been in motion when the balls meet.   (3mks)
ii.   The height above P at which A and B meet. (2mks)

2.   a)   Five forces of 1.7N, 3.5N, 2.3N, 2.5N and 5.4N act on a particle as shown.

Find the magnitude and dissection of the resultant force.   (6mks)

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b) A body of mass 5kg, initially at rest on a smooth horizontal surface is pulled along the surface by a constant force P inclined at 45^0 above the horizontal. In the first 5 seconds of motion, the body moves a distance of 10m along the surface. Find the acceleration of the body, the magnitude of P and the normal reaction between the body and the surface. (5mks)

c) The diagram below shows a mass m on a surface inclined at an angle of 30^0 to the Horizontal.
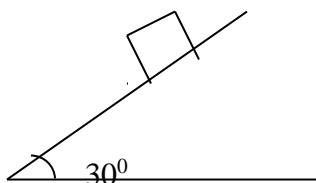
A horizontal force P acts on the body and causes it to accelerate up the plane. If R is the normal reaction between the body and the plane, prove that: (5mks)

$$P = m(2a + g)$$
$$3$$

d) A car AP is moving at a velocity of 8k/hr in a direction $N80^0W$, and a car Q is moving at a velocity of 5km/h in a direction of S 25ºW.
Find the magnitude and direction of the resultant of the velocities of the 2 cars. (4mks)

3. a) Define the following terms:
   i. Displacement (2mks)   ii. Speed (2mks)
   iii. linear acceleration

   b) i. What is meant by free fall? (2mks)

   ii. A stone is projected vertically upwards from ground level at a speed of $24.5ms^{-1.}$ Find how long after projection the stone is at a height of 19.6m above the ground.
   - For the first time (4)
   - For the second time. (4mks)

   c) i. For streamline flow of a non-viscous, incompressible fluid, the pressure, P at a point is related to the height h and the velocity, V by the equation $(P – a) = g(h – b) + ½ (v^2 – d)$, where a, b and d are constants and is the density of the fluid and g is the acceleration due to gravity. Given that the equation is dimensionally consistent, find the dimensions of a, b and d.