NSIMBO DISTRICT COUNCIL
KANOGE SECONDARY SCHOOL
PHYSICS DEPARTMENT
HOLIDAY PACKAGES

Force gravity, weight and friction:

Questions 1

i. Briefly explain the difference between mass and weight.

ii. Explain why:

a) The weight of body changes if it is taken from the equator towards one of the poles.

b) An astronaut is often weight less when in an earth-orbiting spacecraft.

Questions 2

i. What is a meant by friction? Illustrate your answer by reference to the effect of a steadily increasing horizontal force applied to a block of wood at rest on rough horizontal table.

ii. Discuss the frictional force between the tyres of motor car and the ground when the car:

a) Starts from rest.

b) Skids in the forward direction.

Questions 3

If the surface of a frozen pond were perfectly smooth so that it would be impossible to walk across it, could you get from one part of it to another by lying down and rolling?

Speed, velocity and acceleration:

Questions 1

i. Define the term "velocity" and "acceleration". Choose one of these term and explain what is a meant when the quantity is said to be "uniform"

ii. A car runs at a constant speed of 15m/s for 300 second and then accelerate uniformly to a speed of 25m/s over a period of 20 seconds. This aped is maintained for 300 seconds before the car is brought to rest with uniform deceleration in 30 seconds. Draw a velocity time-graph to represent the journey described above. From the graph find:
   a) The acceleration while the velocity change from 15m/s to 25 m/s.
   b) The total distances travelled in the time described.
   c) The average speed over the time described.

Questions 2

i. Describe laboratory experiment by which you would measure the acceleration of free fall. State clearly the apparatus used, how it arranged, the observation you would make and their use in obtaining final results.

ii. A stone is thrown from ground level vertically upwards with a velocity of 40m/s. find the maximum height to which the stone raises and its total time of flight, neglecting air resistance. Sketch a graph height of the stone against time. (plot the height on the vertical axis of the graph)

Questions 3

i. A small solid sphere falls freely from rest, in air, with an acceleration of $10m/s^2$. How far does it fall in 5.0second? Explain why there would be a difference in the distances fallen by a larger hollow sphere, of the same mass, the same time.

Questions 4

Describe an experiment to measure acceleration of free fall (due to gravity). Your answer should include:

a) A labelled diagram of the apparatus.
b) An account of the measurement you would make.
c) An account of how these measurements would be used to calculate the final results.

Newton's law of motion:

Questions 1

i. State newton's laws of motion and explain how the second law may be used to define a unit of force, the newton's.
ii. A breakdown track tows a car of mass 1000kg along a level road, and accelerate at $0.5m/s^2$. What is the tension in towline?
iii. If towline breaks when the car reach a speed of 36km/h, how far will the car travel before coming to rest if a braking force of 5000N is applied.

Questions 2

i. Describe, with the aid of clearly labeled diagram, the experiment which you would perform in order to investigate the relationship between the force acting on a body and the acceleration produced. Show clearly how you would calculate the acceleration from measurement taken in the experiment and indicate the conclusion reached.
ii. An arrow of mass 100g is shot into a block of wood of mass 400g lying at rest on smooth surface of ice rink. If at the moment of the impact the arrows travel horizontal at 15m/s, calculate the common velocity after the impact. Also calculate the common velocity if the block is the struck by a second similar arrow travelling in the same direction but with horizontal velocity of 12m/s.

Questions 3

State the law of conservation of momentum. Explain why the recoil velocity of a gun is much less than velocity of the bullet. Describe an experiment to illustrate your answer and show how the results is calculated.

Questions 4

Describe how you would investigate experimental the relationship between extension of light spring and the load which it support. State what you understand by elastic limit and, assuming that the spring is not loaded beyond this point, sketch the graph which would expect to obtain from your readings. Explain how you would use the apparatus and the graph to find a weight of a stone which is less than the maximum load you put on the string.

Work, Energy and Power.

Questions 1

i. When does a force do work? How the work it does is measured? What is a meant by the term power?

ii. Define the term potential energy and kinetic energy. State the principle of conservation of energy and illustrate it by discussing the energy changes which occur when a pendulum bob is draw to one side and allowed to oscillate. Why does a bob eventually come to rest and what has become of its energy?

iii. State four of the transfers of energy which occur at a power station which uses coal as its fuel.

iv. State the energy changes which occur when a moving car brought to rest by its brakes and the car is then driven to the top of a hill.

v. A man has to raise a box of mass 40kg on to a platform 160cm vertically above the ground. He decide to do this by pushing the box up a straight plank (with negligible friction) set at an angle to the ground. Calculate in joule the potential energy gained by the box when is on the platform.
Explain as fully as possible how the work done and effort force needed to raise the box depend on the angle between the plank and the horizontal. Discuss briefly the practical value of using the plank.
If the box falls from the platform calculate its kinetic energy and velocity just before it hits the ground.

Vectors.

Questions 1

i. What is a meant by:
   a) The resultant.
   b) The equilibrant of two or more forces?

ii. Find by drawing or calculation the resultant of two forces each 5.0N acting at the point at an angle of 60^0 with each other.