TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN ANALYTICAL CHEMISTRY

APS 2101: PHYSICS 1

END OF SEMESTER EXAMINATION

SERIES: MAY 2016

TIME:2HOURS

Instructions to Candidates

You should have the following for this examination
Answer Booklet
examination pass
mathematical table or calculator
student ID
This paper consists of **FIVE** questions.
Attempt question ONE (Compulsory) and any other TWO questions.
This paper consists of 5 printed pages

Do not write on the question paper.

Question ONE (30mks)

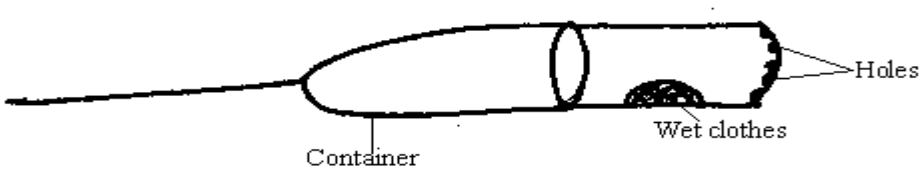
a) The rate of flow of a liquid out of a tube of radius *r* and length *x* is given by

$\frac{V}{t} = \frac{Pr^4}{Dx}$ where *V* is the volume and *P* is pressure in SI units of kg/(s^2 m). Find the units of the viscosity, *D.* (3mks)

b)A runway for an airport is designed such that the lowest acceleration rate for the plane is3m/s^2. The take off speed for the plane is 65m/s. Determine the minimum length for the runway. (3mks)

c) State two factors affecting centripetal force. (2mks)

d) The figure below shows a container with small holes at the bottom in which wet clothes have been put.



When the container is whirled at high speeds, it's observed that the clothes dry faster. Explain how the rotation of the container causes the clothes to dry faster. (3mks)

e) Explain the principle of superposition (2mks)

f) Explain what is meant by diffraction of a wave. (1mk)

g) A trawler is in a heavy swell. The trawler captain notices that his boat moves up and down with the waves 12 times every minute and that the waves are 40 metres from peak to peak. Calculate the speed of the waves. (3mks)

h) Explain in details the following terms as used in optics

Reflection (2mks)

Refraction (2mks)

i) The figure below shows a displacement-time graph for a wave motion

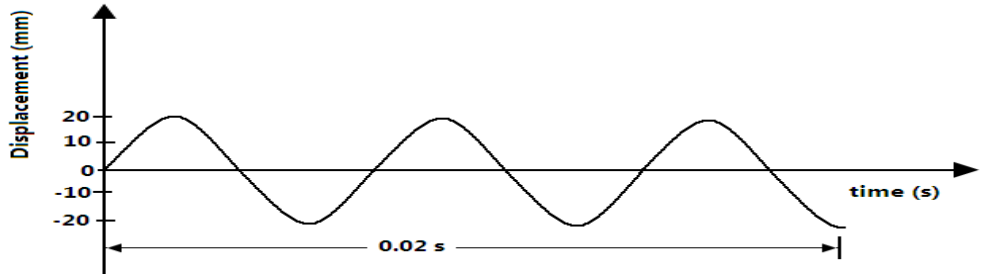
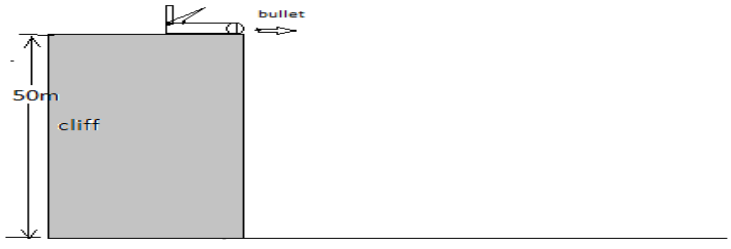


Figure 6

What is the frequency of the wave? (3mks)

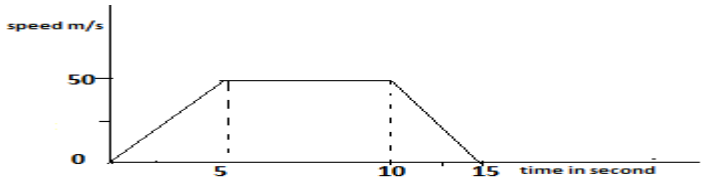
j) A bullet is fired horizontally at a velocity of 400m/s from a cliff which is 50m tall as shown below.



(i) Find the time taken for the bullet to hit the ground. (2mks)

(ii) Find the range. (2mks)

k) Below is a velocity-time graph of a public service vehicle.



Determine the distance covered. (2mks)

Question TWO (15mks)

a) Optical fibre works under the principle of total internal reflection. Explain how it works and highlight its application in day to day life (4mks)

b) Explain how transmission, reflection and absorption take place when electromagnetic wave

c) Explain any five uses of E.M Spectrum: (5mks)

Question THREE (15mks)

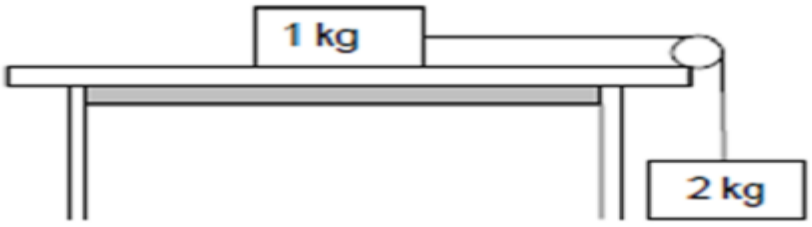
a) An aluminum rod has a length of exactly one meter at 300K. How much longer is it when placed in a 400°C oven? Coefficient of linear expansion of aluminum $\alpha = 23\times10^{-6}\ (^0k)^{-1}$) (3mks)

b) Explain any three heat transfer mechanisms (6mks)

c) Explain what is meant by thermometry and give its applications (6mks)

Question FOUR (15mks)

a) In the diagram below, a 1 kg mass on a rough horizontal surface is joined to a 2kg mass by a light inextensible string running over a frictionless pulley. The coefficient of kinetic friction between the 1kg mass and the surface is 0.13.



i) State Newton's first and second law of motion (3mks)

Calculate the magnitude of the following

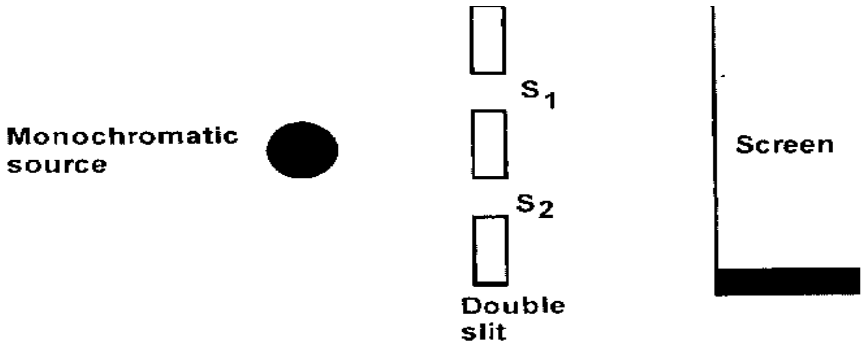
ii) kinetic frictional force acting on the 1kg mass (3mks)

iii) acceleration of the 1kg mass (6mks)

b) The rough surface is now replaced with a smooth frictionless surface. The 2kg mass again released and strikes the ground before the 1kg mass reaches the end of the horizontal surface. Will the 1kg mass move at a lower, higher or zero acceleration? Briefly explain the answer referring to Newton's laws of motion (3mks)

Question FIVE (15mks)

a) In an experiment to observe interference patterns of light waves, a double slit is placed close to the source as shown below.



i) State the function of the double slit. (1mk)

ii) Briefly describe what is observed on the screen. (2mks)

iii) State and explain what is observed on the screen when the slit separation S_1- S_2 is reduced (2mks)

iv) State and explain what is observed on the screen when white light is used in place of the monochromatic light. (3mks)

b) The figure below shows an arrangement used to observe interference pattern of red light.

S_1 and S_2 are slits; **B** is a source of light images or fringes that are formed on the screen. State what happens to the separation of fringes when;

(i) Slit separation is increased (1mk)

(ii) Green light is used (1mk)

(iii) State with a reason what is observed on the screen (2mks)

(iv) Explain why interference pattern is due to both diffraction and interference. (2mks)

c) Give a condition necessary for diffraction of waves to occur. (1mk)

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