P510/1
PHYSICS
PAPER 1
2Hours 30 Minutes

SENIOR SIX RESOURCEFUL EXAMINATIONS
Physics Theory paper 1
2 HOURS 30 MINUTES

INSTRUCTIONS TO CANDIDATES
*Attempt any **FIVE** questions.*
*Anny additional question(s) answered will **not** be marked*
Non programmable scientific calculators may be used.
Assume where necessary,

Acceleration due to gravity,	$g = 9.81 m/s^2$
Electron charge, e	$= 1.6 \times 10^{-19} C$
Electron Mass , m	$= 9.11 \times 10^{-31} kg$
Mass of Earth	$= 5.97 \times 10^{24} kg$
Planeks Constant, h	$= 6.63 \times 10^{-34} Js$
Stefan's – Baltzmann's constant	$=5.7 \times 10^{-8} Wm^{-2}K^{-4}$
Radius of Earth	$=6.4 \times 10^{6} m$
Radius of the Sun	$=7 \times 10^{8} m.$
Radius of the earth orbit about the sun	$=1.5 \times 10^{11}{}_{m}$
Speed of light in a vacuum, C	$= 3.0 \times 10^{8} ms^{-1}$
Thermal conductivity of air	$=0.7 Wm^{-1}k^{-1}$
Specific heat capacity of water	$=4200 Jkg^{-1}K^{-1}$
Universal Gravitational Constant G	$= 6,67 \times 10^{-11} Nm^2kg^{-3}$
Avogadro's number, NA	$= 6.02 \times 10^{23} mol^{-1}$
Density of water	$=1000 kgm^{-3}$
Gas Constant, R	$=8.31 Jmol^{-1}k^{-1}$
Charge to mass ratio, e/m	$=1.8 \times 10^{11} Ckg^{-1}$
The Constant $\frac{1}{4\pi\varepsilon_{\circ}}$	$=9.0 \times 10^{9} P^{-1}m$
Faradays Constant, F	$= 9.6 \times 10^{4} Cmol^{-1}$

SECTION A

1a . Define the following

i. Newton (01 marks)

ii. Variable velocity (01 marks)

b. A child standing on the ground wants to climb to the top of a vertical pole 11m tall. He climbs 5m in 1s and then slips downwards 3m in the next second. He again climbs 5m in 1s and slips by 3m in the next second and so on.

i. Using a graph paper, draw a displacement time graph for the motion of the child (04 marks)

ii. Find the total time he takes to reach the top of the pole (01 mark)

C i. State the laws of static friction (04 marks)

(ii). A block of mass 2.0kg initially at rest on a horizontal floor moves under the action of an applied horizontal force of 10N. If the coefficient of kinetic friction between the block and the floor is 0.2. Find the work done by friction in 5s (05 marks)

d. Sketch a graph of frictional force against applied force on it illustrates limiting friction, state friction and kinetic friction. (05 marks)

2a. Define the following

i. Dimensions of a physical quantity (01 mark)

ii. Physical quantity (01 mark)

b. The distance X travelled by a body varies with time as follows'

$X = at + bt^2$ where a and b are constants. Find the dimensions of a and b (04 marks)

c. Figure 1 show a rectangular block of mass 5.0kg is pulled from ret along a rough inclined plane by a light inextensible string when passes over a light frictionless pulley P and carries a mass of 10.0kg as shown.

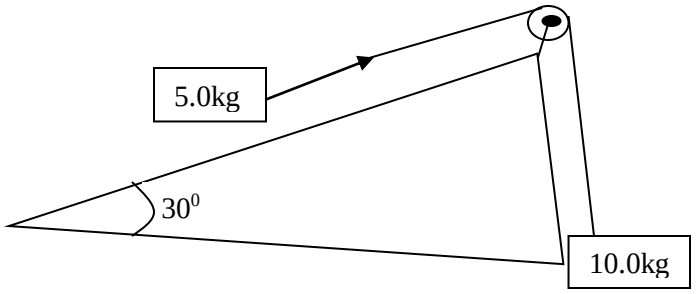


Fig.1

If the coefficient of friction between the block and plane is 0.2 find the acceleration the block Take g= 9.8ms $^{-2}$ (04 marks)

d(i). A man of mass 80kg stands in a light when is moving upwards and decelerating at 0.4ms^{-2}. Calculate the force the floor of the lift exerts on the man. Take g =9.8/ms^{-2} (04 marks)

(ii). Explain the circumstances under when a person in a lift may feel weightless (02 marks)

e. Explain why more energy is required to push a wheel barrow uphill than on a level ground. (03 marks)

3 (a) State Hooke's law (01 mark)

(ii) Explain the energy changes when occur during plastic deformation (04 marks)

(iii). Explain Hooke's law using molecular theory. (04 marks)

b. Devine an expression for the energy stored in a stretched rubber cord when obeys Hooke's law. (03 marks)

c. An elastic rubber cord of negligible mass of unstreched length 2lo is attacked to fixed points A and D. An object of mass 0.1kg is placed at the midpoint C of the cord and pulled to B as shown in figure 2.

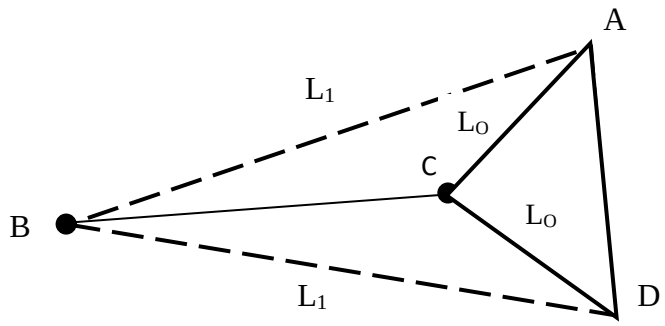


Fig. 2

Given that L_0 = 4.0cm, L_1 = 8.0cm, AD = 6.0cm, the cross – sectional are 9 of the cord is $1mm^2$ and young's modulus for rubber is 5.0×10^8 Nm^{-2}. Calculate;

(i) the tension in the cord (03 marks)

(ii) the stretching force (05 marks)

4a. Define the following terms.

(i) Fluid element (01 mark)

(ii) A fluid line (01 mark)

(iii) Viscosity (01 mark)

b. Explain for the temperature dependency of Viscosity in liquids. (03 marks)

c (i). Explain why large droplets flattens while small ones take on spherical droplets (05 marks)

(ii). with the aid of a labeled diagram, describe an experiment stating precautions to determine coefficient of viscosity of a liquid flowing steadily. (06 marks)

d. Eight spherical rain drops of the same mass and radius are falling down with a terminal speed of $6cms^{-1}$ if they coalesce to form one big drop, what will be its terminal speed. Neglect the buoyant due to air. (03 marks).

SECTION : B

5a(i). Distinguish between reversible and irreversible process. (02 marks)

(ii). List 2 examples for each (02 marks)

(iii). State 3 conditions necessary to achieve a reversible process. (03 marks)

b.) Use the first law of thermodynamics to explain Isothermal process. (04 marks)

C(i). State Boyle's law, explain how humans breathe and exhale. (03 marks)

d.) Describe a simple experiment to verify Boyle's law. (05 marks)

6a. Define the following terms

i. Vapour (01 mark)

ii. Critical temperature (01 mark)

iii. Saturated vapour pressure (01 mark)

b. Explain how cooking at a pressure of 760mmHg and a temperature of 100^0.C may be achieved on top of high mountains. (03 marks)

c. With the aid of a labeled diagram, describe how S.U.P depends on temperature of a heated liquid. (05 marks)

d(i). Two similar cylinders A and B contain different gases at the same pressure when the gas is released from A the pressure remains constant for sometime before it starts dropping. When gas is released from B the pressure continuously drops. Explain the observations above (04 marks)

ii. A narrow tube of length 1m is closed at one end and contains a 76.0cmHg which traps 15.0cm column air when held horizontally. Calculate the length of mercury that will flow out of the tube. (05 marks)

7a. Define Solar Constant (01 mark)

(ii) Explain why the intensity solar radiation on top of the Earth's atmosphere is higher than that on the earth's surface. (03 marks)

b. Describe an experiment to measure thermal conductivity of copper stating the assumptions taken while carrying the experiment. (08 marks)

C. State the laws of black body. (02 marks)

d. A double glazed glass window measures 1.0m by 1.5m. It is made of two glasses each of thickness 4.0mm separated by an air gap of thickness 2.0mm. If the difference in the external temperatures is 10^0C. Calculate the rate of heat flow through the window.
Take thermal conductive for glass and air to be 0.72 and 0.025$Wm^{-1}k^{-1}$ (06 marks)

SECTION C

8a (i). State Einstein's mass energy relation (01 mark)

(ii) What is its physical significance (02 marks)

b. In a certain nuclear, an electron pair is spontaneously produced when radiation of suitable energy is incident on a target of large relative atomic mass.

i. Use Einstein's mass energy relation to calculate the threshold energy required for this process to take place. (03 marks)

ii. Determine the threshold frequency of the incident quantum of radiation (03 marks)

Take Mass of electron = 9.11×10^{-31}Kg
Speed of light C = 3×10^{8} ms^{-1}
Planck's constant, h = 6.63×10^{-34}Js.

C (i) Define specific charge of an electron (01 mark)

(ii). With the aid of a labeled diagram, describe an experiment to determine the specific charge of an electron using fire beam method. (06 marks)

d. Explain briefly the motion of positive rays in magnetic field (04 marks)

9a (i) define carbon dating (2 marks)

(ii) Describe, with the aid of a labeled diagram the essential features and actions of a cloud chamber (06 marks)

(iii). Describe and explain the difference between tasks formed in a cloud chamber by alpha and beta particles. (04 marks)

b. Alcohol vapor is placed in a cloud chamber to provide carbon nuclei that can serve as targets for bombardment by ∝- partices.

Calculate the total Kinetic energy of the fragments in the reaction
$^{12}_{6}C + {}^{4}_{2}He \longrightarrow {}^{15}_{7}N + {}^{1}_{1}H$ if he kinetic energy of the ∝ - particles is 7.68Mev.

Mass of $^{12}_{6}C$ = 12.0000U
Mass of $^{4}_{2}He$ = 4.0026U
Mass of $^{15}_{7}N$ = 15.000IU
Mass of $^{1}_{1}H$ = 1.00078U
IU = 934Mev. (05 marks)

C. State and explain one application of radio isotopes (03 marks)

10a. Define the following

i. Space charge limitation (03 marks)

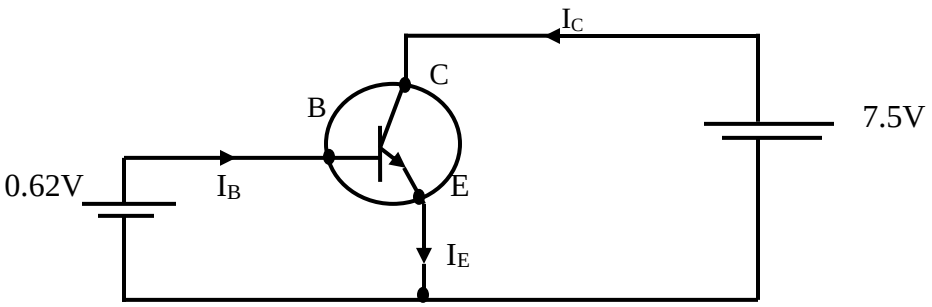
ii. Saturation current (01 mark)

b. With the aid of a labeled diagram, explain how a triode can be used as a voltage amplifier. (06 marks)

C(i). Define a semi- conductor (01 mark)

(ii). Explain how a P-N connection is formed (04marks)

d. Consider the circuit below.



Suppose that I_E = 2.00mA and that 0.50% of the electron diffusing into the base combine there with holes.

(i) Name the transistor above (01)

(ii) Find the values of I_B and I_C. (04 marks)

END