

CHRISTIAN SOCIAL SERVICES COMMISSION (CSSC)
NORTHERN ZONE JOINT EXAMINATIONS SYNDICATE (NZ-JES)



FORM SIX PRE-NATIONAL EXAMINATIONS 2026

PHYSICS 1

131/1

Time: 3:00 Hours

Tuesday, 24th February 2026a.m

Instructions.

1. This paper consists of section A and section B with a total of **ten (10) questions**.
2. Answer **all questions** from section A and **two (02) questions** from section B.
3. Each question carries **ten (10)** marks in section A and **fifteen (15)** marks in section B.
4. Mathematical table and non-Programmable Calculators may be used.
5. Cellular phones are **not allowed** in the examination room.
6. Write your **examination number** on **every page** of your answer booklet(s)
7. The following information may be useful.
 - Acceleration due to gravity, $g = 9.8m/s^2$.
 - Density of air = $1.225kg/m^3$
 - Pie, $\pi = 3.14$
 - Molar gas constant = $8.31J/mol\ K$
 - Plank's constant = $6.62 \times 10^{-34}Js$
 - Speed of light in air = $3 \times 10^8\ m/s$
 - Molar mass of nitrogen $N_2 = 28g$
 - Monatomic gas constant = 1.67
 - Stefan's constant $\sigma = 5.7 \times 10^{-8}Wm^{-2}K^{-4}$
 - Specific heat capacity of copper $C_{copper} = 390kg^{-1}K^{-1}$
 - Atmospheric pressure = $1.01 \times 10^5Nm^{-2}$
 - Atomic mass of oxygen molecules $O_2 = 32g$
 - Ratio of molar heat capacity of diatomic molecules $\gamma = 1.4$
 - Coefficient of viscosity of water $\eta_{H_2O} = 1.0 \times 10^{-3}Pas$

SECTION A (70 Marks)

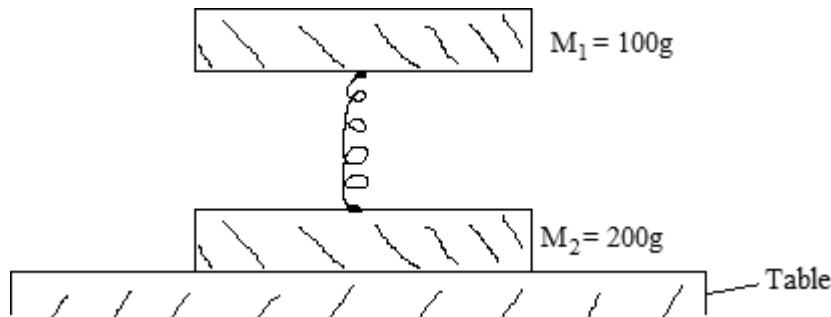
Answer **ALL** questions from this section

1. (a) (i) The thickness of metre ruler is 0.51 ± 0.02 cm. What does this mean? **(02 marks)**
(ii) A body moving through fluid at a speed v experiences opposing force F given by $F = kA\rho v^x$, where A is the surface area of the body, ρ is the density of fluid and k is a dimensional less constant. Deduce the value of x . **(03 marks)**
(b) Estimate the numerical value of the drags force $D = \frac{1}{2}c\rho Av^2$ with its associated error. Given that the measurements of the quantities c, ρ, A and v were recorded as (10 ± 0.01) , $(5 \pm 0.2)cm^2$, $(15 \pm 0.15)g/cm^3$ and $(3 \pm 0.5)cm/sec$ respectively. **(05 marks)**

2. (a) (i) What is meant by the term range of a projectile. **(01 mark)**
(ii) Show that the maximum range of a projectile having an initial velocity u is obtained when it is projected at an angle of 45° to the vertical **(02 marks)**
(b) Find the range of a ball which when projected at a velocity of $29.4m/sec$ just passes over a pole $4.9m$ high. **(04 marks)**
(c) If the horizontal range of the projectile is R and the maximum height it attains is H , show that the velocity of projection is;

$$u = 2g \left(H + \frac{R^2}{16H} \right)^{\frac{1}{2}} \quad \textbf{(03 marks)}$$

3. (a) Briefly explain why a simple pendulum experiment cannot be performed inside a satellite. **(03 marks)**
(b) Consider two discs in the figure below, with mass less spring of force constant $100N/m$. calculate the frequency of oscillation of the spring;
(i) When the system is resting on a table **(03 marks)**
(ii) When the table is removed and system is falling freely. **(04 marks)**



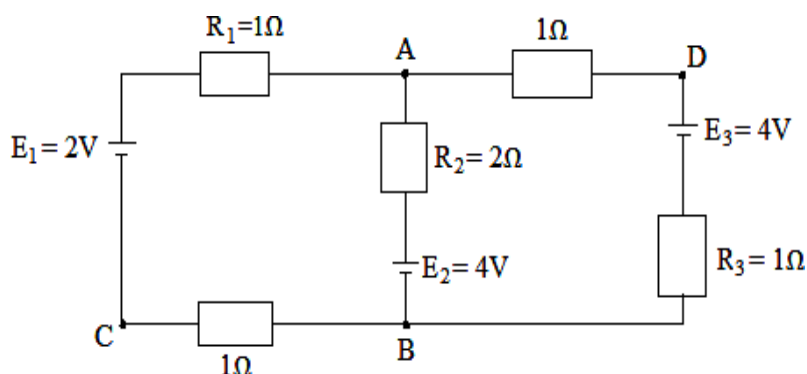
4. (a) (i) Explain what is meant by centripetal force. **(01 mark)**
(ii) Briefly explain why passengers sitting in a vehicle are thrown outward when a vehicle rounds the curve suddenly. **(02 marks)**
(b) (i) For a particle of mass m to be in a circular path, centripetal force is responsible for providing the correct path of the mass. Also in the path, the particle experiences tension on the string to which it is tied. Show that when it is at the lowest point of the motion the minimum velocity of the body is given by $v = \sqrt{5r}$, where r is the radius of its path. **(03 marks)**
(ii) A string of length $1.5m$ is tied to a stone of mass $0.4kg$ and the other end of the string is tied to a pivot on a smooth vertical board. What is the minimum speed of the stone required at its lower most point so that the string does not slack at any point in its motion along the vertical circle? **(01 mark)**
(c) The driver of a truck travelling at a speed v suddenly notices a broad wall in front of him at a distance r . Is it better for him to apply brakes or to make a circular turn without applying brakes in order to just avoid crashing into the wall? **(03 marks)**

5. (a) A thermometer has wrong calibration. If it records the melting point of ice -10°C and it reads 60°C in place of 50°C . What is the temperature of the boiling point of water on this scale? **(05 marks)**
- (b) The resistance R_0 of a particular resistance thermometer at a Celsius temperature θ as measured by constant volume gas thermometer is given by $R_0 = 50 + 0.17\theta + 0.0003\theta^2$. Calculate the temperature as measured on the scale of resistance thermometer which corresponds to a temperature of 60°C on the gas thermometer. **(05 marks)**
6. (a) Briefly explain what is meant by adiabatic process. **(02 marks)**
- (b) In adiabatic process, no heat enters or leaves the system. Briefly explain what happens to the internal energy of the gas under the following conditions;
- (i) When the gas expands adiabatically. **(02 marks)**
- (ii) When the gas is compressed adiabatically. **(02 marks)**
- (c) An ideal monatomic gas of 0.15 moles is enclosed in a cylinder at a pressure of 250KPa and a temperature of 320K. The gas is allowed to expand adiabatically and reversibly until its pressure is 100KPa. Calculate the final temperature and the amount of work done by the gas. **(04 marks)**
7. (a) (i) The main interior of the earth core is believed to be in molten form. What is seismic evidence supporting this believe? **(03 marks)**
- (ii) Explain why the ozone layers on the top of the stratosphere is crucial for human survival? **(03 marks)**
- (b) (i) List down four physical changes that takes place at a location just before onset of an earth quake at that particular location. **(02 marks)**
- (ii) What are the advantages of wind breaks to plant environment? **(02 marks)**

SECTION B

Answer any **Two (02)** questions from this section

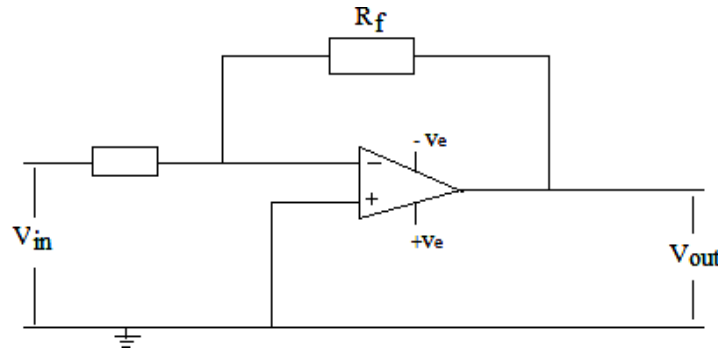
8. (a) (i) Briefly explain why electrical appliances are connected in parallel at home? **(02 marks)**
- (ii) A resistor R in series with capacitor C is connected to 50Hz, 240V supply. Find the value of C so that R absorbs 300W at 100V. **(03 marks)**
- (b) For the circuit shown in the figure below, answer the questions that follow;



- (i) Find the current through R_2 . **(03 marks)**
- (ii) Find the potential difference between point C and D. **(03 marks)**
- (c) (i) What is the advantage of using a greater length of potentiometer wire. **(02 marks)**
- (ii) Why is Wheatstone bridge not suitable for measuring low resistances? **(02 marks)**

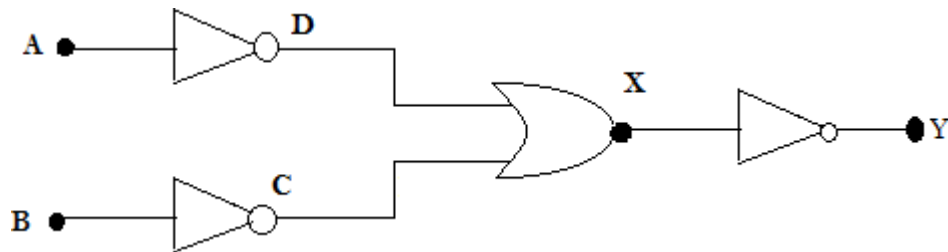
9. (a) (i) An operating amplifier has an open loop gain of 10,000. Calculate the amplifier gain when 50% of the output is fed back to the inverting input. **(03 marks)**

(ii) The figure below has a supply voltage of 15V. The input resistance is $1.6\text{K}\Omega$, and the feedback resistance is $20\text{K}\Omega$. Calculate the output voltage when the input voltage is 1.8V **(02 marks)**



(b) (i) What do you understand by the term logic gate? **(01 mark)**

(ii) In the circuit shown in figure below, identify the equivalent gate of the circuit. **(03 marks)**



(c) (i) Why high frequency carrier waves are needed for effective transmission? **(02 marks)**

(ii) A 10 MHz sinusoidal carrier wave of amplitude 10 mV is modulated by a 5 kHz sinusoidal audio signal wave of amplitude 6 mV. Find the frequency components of the resultant modulated wave and their amplitude. **(04 marks)**

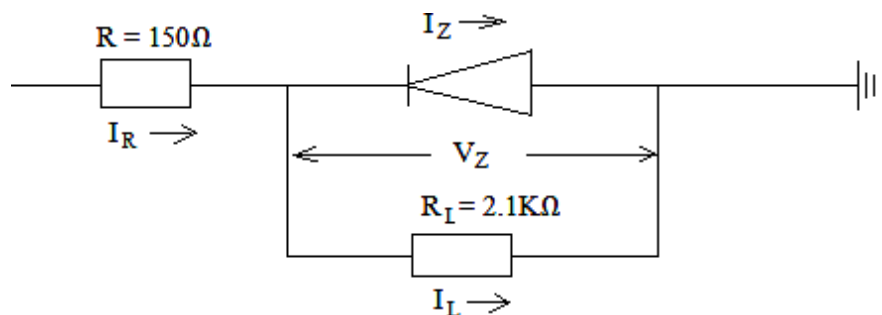
10. (a) (i) Why is the conductivity of an intrinsic semiconductor is very low? **(02 marks)**

(ii) Briefly explain why the energy gap varies with doping? **(02 marks)**

(iii) The forbidden energy gap of silicon is 2.25eV. What is the maximum wavelength at which silicon absorbs energy? **(03 marks)**

(b) (i) Briefly explain why a bridge rectifier is preferred than centre tap rectifier? **(02 marks)**

(ii) Briefly explain if zener diode can be is used as rectifier? **(01 mark)**



(c) In the circuit below, what is the voltage needed to maintain 12V across the load resistor, R_L of $2.1\text{K}\Omega$, assuming that the series resistance R is 150Ω , and the zener requires a minimum current of 8mA to work effectively. What is the zener rating required? **(04 marks)**

