THE UNITED REPUBLIC OF TANZANIA
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ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION
2019 PHYSICS 1

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- Identify two basic rules of dimensional analysis.

- The frequency n of vibration of a stretched string is a function of its tension F , the length, l and mass per unit length m . Use the method of dimensions to derive the formula relating the stated physical quantities.

- What causes systematic errors in an experiment? Give four points.

- Estimate the numerical value of drag force $D = 1/2C\rho AV^2$ with its associated error given that the measurements of the quantities C , A , ρ and v were recorded as (10 ± 0.00) unit less (5 ± 0.2) cm^2 , (15 ± 0.15) g/cm^3 and (3 ± 0.5) cm/sec^2 respectively.

- A rocket of mass 20 kg has 180 kg of fuel. If the exhaust velocity of the fuel is 1.6 km/sec, calculate;

    - The minimum rate of fuel consumption that enable the rocket to rise from the ground.
    - The ultimate vertical speed gained by the rocket when the rate of fuel consumption ts 2 kg/sec.

- Determine the least number of pieces required to stop the bullet if a rifle bullet loses 1/20 of its velocity when passing through them.

- A man of 100 kg jumps into a swimming pool from a height of 5 m. If it takes 0.4 seconds for the water in a pool to reduce its velocity to zero, what average force did the water exert on the man?

- Justify the statement that projectile motion is two dimensional motion.

- A rocket was launched with a velocity of 50 m/s from the surface of the moon at an angle of $40°$ to the horizontal, Calculate the horizontal distance covered after half time of flight.

- Show that the angle of projection $\theta°$ for a projectile launched from the origin is given by $\theta° = tan^{-1}(4h_m/R)$, where R stand for horizontal range and h_m is the maximum vertical height.

- Determine the angle of projection for which the horizontal range of a projectile is $4\sqrt{3}$ times its maximum height.

- Provide two typical examples of simple harmonic motion (S.H.M).

- Why the velocity and acceleration of a body executing simple harmonic motion are out of phase?

- The period of a particle executing simple harmonic motion (S.H.M) is 3 seconds. If its amplitude is 25 cm, calculate the time taken by the particle to move a distance of 12.5 cm on either side from the mean position.

- A person weighing 50 kg stands on a platform which oscillates with a frequency of 2 Hz and of amplitude 0.05 m. Find his/her minimum weight as recorded by a machine of the platform.

- In which aspect does circular motion differ from linear motion?

- Why there must be a force acting on a particle moving with uniform speed in a circular path?

- A stone tied to the end of string 80 cm long, is whirled in a horizontal circle with a constant speed making 25 revolutions in 14 seconds. Determine the magnitude of its acceleration.

- Why the weight of a body becomes zero at the centre of the earth?

- How far above the earth surface does the value of acceleration due to gravity becomes 36% of its value on the surface?

- Compute the period of revolution of a satellite revolving in a circular orbit at a height of 3400 km above the Earth's surface.

- Prove that the angular momentum fora satellite of mass M_s revolving round the

    - earth of mass M_e in an orbit of radius r is equal to $(GM_e \, M_s^2 r)^{1/2}$.

- Why water is preferred as a cooling agent in many automobiles?

- A thermometer has wrong calibration as it reads the melting point of ice as $-10°\text{C}$. If it reads $40°\text{C}$ in a place where the temperature reads $30°\text{C}$, determine the boiling point of water on this scale.

- Analyze three practical applications of thermal expansion of solids in daily life situations.

- A closed metal vessel containing water at $75°\text{C}$, has a surface area of 0.5 m^2 and uniform thickness of 4.0 mm. If its outside temperature is $15°\text{C}$, calculate the head loss per minute by conduction.

- Sketch the graph to illustrates how the energy radiated by a black body is distributed among various wavelengths.

    - What information would be drawn from the graph above? Give three points.

- Why stainless steel cooking pans are made with extra copper at the bottom?

- At what temperature will the filament of a 10 W lamp operate if it is supposed to be a perfectly black body of area 1 cm^2 ?

- Elaborate three significance of dielectric material in a capacitor.

- Give the reason behind a loss of electrical energy when two capacitors are joined either in series or parallel.

- A researcher has 2 g of gold and wishes to form it into a wire having a resistance of 80Ω at 0°C . How long should the wire be?

- What is the potential difference between two points if 5 Joules of work are required to move 10 Coulombs from one point to another?

- Why does a room light turn on at once when the switch is closed? Give comment.

- A current of 3.0 mA flows in a Television resistor R when a potential difference of 6.0 V is connected across its terminals. Determine the value of conductance.

- Why transistors can not be used as rectifiers?

- In NPN transistor circuit the collector current is 5 mA. If 95% of the emitted electrons reach the collector region, calculate the base current.

- What causes damage to transistors?

- Distinguish between inverting OP-AMP and non-inverting OP-AMP.

  - Give one application of each type of OP-AMP described above.

- Identify three basic elements of a communication system.

- Why sky waves are not used for transmission of TV signals?

- What 's meant by epicentre and wind belt as used in Geophysics?

- Give two positive effects of wind on plant growth.

- Identify three types of seismic waves.

  - Outline two characteristics of each type of wave described above.