

THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
ADVANCED CERTIFICATE OF SECONDARY
EDUCATION EXAMINATION
2018 PHYSICS 1

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May 27, 2020

- How can random and Systematic errors be minimized during an experiment?
- Estimate the precision to which the Young's modulus, γ of the wire can be determined from the formula $\gamma = (4Fl)/(\pi d^2 e)$, given that the applied tension, $F = 500$ N, the length of the loaded wire, $l = 3$ m, the diameter of the wire, $d = 1$ mm, the extension of the wire, $e = 5$ mm and the errors associated with these quantities are 0.5 N, 2 mm, 0.01 mm and 0.1 mm respectively.
- State the law of dimensional analysis.
- If the speed v of the transverse wave along a wire of tension, T and mass, m is given by, $V = \sqrt{T/m}$. Apply dimensional analysis to check whether the given expression is correct or not.
- Under what condition a passenger in a lift feels weightless?
- Calculate the tension in the supporting cable of an elevator of mass 500 kg which was originally moving downwards at 4 m/s and brought to rest with constant acceleration at a distance of 20 m.
- The rotating blades of a hovering helicopter swept out an area of radius 2 m imparting a downward velocity of 8 m/s of the air displaced. Find the mass of a helicopter.
- Compute the mass of water striking the wall per second when a jet of water with a velocity of 5 m/s and cross-sectional area of $3 \times 10^{-2} \text{ m}^2$ strikes the wall at right angle losing its velocity to zero.
- How does projectile motion differ from uniform circular motion?
- A rifle shoots a bullet with a muzzle velocity of 1000 m/s at a small target 200 m away. How high above the target must the rifle be aimed so that the bullet will hit the target?
 - Where does the object strike the ground when thrown horizontally with a velocity of 15 m/s from the top of a 40 m high building?

- Find the speed of travel when a man jumps a maximum horizontal distance of 1 m spending a minimum time on the ground.
- What is meant by the following terms as used in simple harmonic motion (S.H.M)?
 - Periodic motion.
 - Oscillatory motion.
- List four important properties of a particle executing simple harmonic motion (S.H.M).
- Sketch a labeled graph that represents the total energy of a particle executing simple harmonic motion (S.H.M).
- The periodic time of a body executing S.H.M is 4 seconds. How much time interval from time, $t = 0$ will its displacement be half its amplitude?
- A satellite of mass 600 kg is in a circular orbit at a height 2×10^6 km above the earth's surface. Determine the:
 - Orbital speed.
 - Gravitational potential energy.
- What would happen if gravity suddenly disappears?
- Two base of a mountain are at sea level where the gravitational field strength is 9.81 N/kg . If the value of gravitational field at the top of the mountain is 9.7 N/kg, calculate the height of the mountain above the sea level.
- Why is flywheel designed such that most of its mass is concentrated at the rim? Briefly explain.
- Estimate the couple that will bring the wheel to rest in 10 seconds when a grinding wheel of radius 40 cm and mass 3 kg is rotating at 3600 revolutions per minute.
- Why an ice skater rotates at relatively low speed when stretches her arms and a leg outward?
- Calculate the moment of inertia of a sphere about an axis which is a tangent to its surface given that the mass and radius of the sphere are 10 kg and 0.2 m respectively.
- Which type of thermometer is most suitable for calibration of other thermometers?
- Why at least two fixed points are required to define a temperature scale?
- List two qualities which makes a particular property suitable for use in practical thermometers.
- Describe how mercury in glass thermometer could be made sensitive.
- What is meant by triple point of water?
- Evaluate the temperature in Kelvin if the pressure recorded by a constant volume gas thermometer is $6.8 \times 10^4 \text{ Nm}^{-2}$ given that the pressure at triple point 273.16 K is $4.6 \times 10^4 \text{ Nm}^{-2}$.
- One gram of water becomes 1671 cm^3 of steam at a pressure of 1 atmosphere. If the latent heat of vaporization at this pressure is 2256 J/g, determine the:

- external work done.
- increase in internal energy
- Why during emission of radiations from black body its temperature does not reach zero Kelvin?
- A black ball of radius 1 m is maintained at a temperature of 30°C . How much heat is radiated by the ball in 4 seconds?
- What do you understand by the term node as applied to electric circuit?
- Outline three important points which are usually referred as sign convention in solving Kirchhoff's second law problems.
- How is ohmic conductor differ from non-ohmic conductor? Give one example in each case.
- Why the emf of a cell is sometimes called a special terminal potential difference?
- Calculate the current flowing in the circuit when three similar cells each of emf 1.5 V and internal resistance 0.3Ω are connected in parallel across a 2Ω resistor.
- Mention four types of energy losses suffered by a transformer.
- Why choke coil is preferred over resistance to control alternating current?
- Identify two difficulties which would arise when two straight wires are used to transmit electricity direct from the source to the city station.
- Explain what could be done to light a 30 V bulb from a 220 volt A.C. supply?
- A series LCR circuit with inductance, $L = 0.12\text{H}$, capacitance, $C = 480\text{ nF}$ and resistance, $R = 23\Omega$ is connected to a 230V variable frequency supply. Determine the:
 - Maximum current flowing in the circuit.
 - Source frequency for which the current is maximum.
- List two chief properties of semiconductors.
- Why is it easier to establish the current in a semiconductor than in an insulator?
- State a condition that could be employed to make an insulator conduct some electricity.
- Distinguish between conductors and semiconductors on the basis of their energy band structures.
- What is meant by depletion layer as used in pn-junction device?
- Describe the effect of applying a reverse bias to the junction diode.
- Sketch the graph of transfer characteristic of a transistor.
 - State the significance of the slope from the graph above.
- What is the basic condition for a transistor to operate properly as an amplifier?
- Briefly explain how a junction transistor can be connected to act as a current operated device.

- Why the magnitude of output frequency of a full wave rectifier is twice the input frequency?
- Draw a simple basic transistor switching circuit diagram.
- What is meant by a logic gate?
- List three basic logic gates that make up all digital circuits.
- What is meant by solar constant?
- List two factors on which the solar constant depends.
- Give two advantages of photovoltaic system.
- Briefly explain how photovoltaic cells work.
- Estimate the maximum power available from 10 m^2 of solar panels. Calculate the volume of water per second which must pass through if the inlet and outlet temperature of the panels are at 10°C and 60°C respectively. (Assume the wave carries away energy at the same rate as the maximum power available)