CHAP 9: EXAMINATION TECHNIQUES

The most common complaint of the examiners is "candidate failing to answer the question." This complaint is expressed in a number of ways. Examples include:
- answer too long.
- answer too short.
- irrelevant material included.
- relevant material excluded.
- answer suffers from lack of substance.
- absence of diagram(s)/calculations/graphs that are clearly asked for.
- entire parts of questions missing.
- failure to give correct responses to questions beginning with the direction words like define, state, describe, explain, discuss e.t.c

"Answering the question" is a skill that will only gradually be perfected as the student practises answering questions.

A common difficulty among candidates is the judgement of the length required for an answer. The candidate can judge the length by:

(i) using the **mark scheme** provided on the question paper (normally marks are related to the time needed to complete an answer.)

(ii) using the **direction words** of the question (e.g state, describe, list) to determine the length of the answer.

The candidate must write clearly and precisely because it is not how much is written that is important but its content.

For the examination, the candidate must know how to answer questions of both descriptive and manipulation nature.

To be able to achieve good academic performance in the A-level Physics examinations, the candidate ought to know what is assessed in the examinations. The following are assessible skills in A-level Physics (theory) examinations as usually set by UNEB:

1. **Knowledge with understanding:** Candidates should be able to demostrate knowledge and understanding in relation to :-
- Scientific phenomena, facts, laws, definations, concepts and theories.
- Scientific vocubulary, terminology and conventions (including symbols, quantities and units).
- Standard experiments and techniques, main experimental observations and facts, main generalizations, physical equations and their applications. Questions testing this skill will often begin with one of the following words; **define, state, describe, list, explain, what is mean't by ------.**

Examples:

(a) State Newton's laws of motion.

(b) Explain qualitatively the origin of the lift force on an aeroplane at take off.

(c) Describe how the temperature coefficient of resistance of a material of wire can be determined using a simple metre bridge.

(d) List four principal features of photoelectric emission.

2. **Comprehension**:

Candidates should be able to demostrate:-
- the ability to translate information in diagrammatic, graphical and mathematical forms into other forms.
- the ability to understand and explain common phenomena using physical laws and models.
- ability to understand physical laws and principles and apply them to solve standard type of questions.
- ability to draw conclusions from experimental observations and to spot mistakes and to test the validity of an argument.

Examples:

(a) Explain, using the molecular theory of matter, the mechanism of heat conduction in metals.

(b) In an experiment with a vacuum photocell, the maximum kinetic energy ($K.E_{max}$) of the photoelectrons was measured for different wavelengths λ,of the illuminating radiation. The following results were obtained.

$K.E_{max} \times 10^{-19}$J	3.26	2.56	1.92	1.25	0.58
$\lambda \times 10^{-7}$ m	3.00	3.33	3.75	4.29	5.00

(i) Plot a suitable graph and use it to obtain Planck's constant, the threshold frequency and the workfunction of the metal surface.

(ii) If the experiment were repeated with radiation of wavelength

t.c.r $\alpha = 8.0 \times 10^{-4}/°C$

L = ?

(Write down any relevant equations)

$$R = \frac{\rho L}{A} \quad \text{where} \quad A = \frac{\pi d^2}{4}$$

$R_\theta = R_0(1 + \alpha\theta)$ where R_θ is the resistance at θ°C and R_θ is the resistance at θ°C.

(**State any assumptions made**).

Neglecting any thermal expansion of the wire, the length L and the diameter d of the wire have the same values at 25°C and at 100°C.

Using $R_\theta = R_0(1 + \alpha\theta)$ where R_o is the resistance at 0°C.

$$R_{100} = R_o (1 + 100\alpha) \text{ --------(1)}$$

$$R_{25} = R_o(1 + 25\alpha) \text{ ----------(2)}$$

eq.(2) divided by eq.(1)

$$R_{25} = \frac{(1 + 25\alpha)}{(1 + 100\alpha)} R_{100} = \frac{[1 + (25 \times 8.0 \times 10^{-4})]}{[1 + (100 \times 8.0 \times 10^{-4})]} \times 20$$

$$R_{25} = \frac{1.02 \times 20}{1.08} = 18.89\ \Omega$$

Using $R = \frac{\rho l}{A}$ where $A = \frac{\pi d^2}{4}$

$$A = \frac{\pi d^2}{4} = \frac{3.14 \times (3 \times 10^{-4})^2}{4} = 7.065 \times 10^{-8}\ m^2$$

$$R_{25} = \rho_{25} \frac{L}{A}$$

$$L = \frac{R_{25}A}{\rho_{25}} = \frac{18.89 \times 7.065 \times 10^{-8}}{1.26 \times 10^{-7}} = 10.59$$

(Remembering the units and the number of significant figures).

Required length of wire = **L = 0.6m**

Answering questions of the quantitative nature

Questions in Physics examinations, may use any of the following direction (or key words); state, define, explain, mention, list, discuss, compare, describe, comment, deduce e.t.c. They all have different meanings and candidates are expected to give the correct responses to these words. Interpreting them wrongly can be very expensive in terms of marks or time lost. Candidates should appreciate that the meaning of a term must depend in part on the context.

Examples:

1. **Define (the term(s)** ...) is intended literally. Only a formal statement or the defining equation with symbols identified, is required. Definations must be absolutely precise. There cannot be a nearly correct definition.

Problem:
Define an ampere
Ans:
An ampere is that current, which when flowing in each of two infietely-long parallel straight wires of negligible cross-section area separated by a distance of 1 metre in vacuo, produces a force between the wires of 2×10^{-7} newton $metre^{-1}$.

2. **State** implies a concise answer with no supporting argument. Just like definations, statement of physical laws must be precise. Where a mathematical expression is used for the statement, the symbols must be identified.

Problem:
State Ohm's law.

before emerging finally from the water droplets.

(ii) Secondary rainbow is formed by rays which have undergone two total internal reflections before emerging finally from the water drops. It is fainter and subtends at angle of 52.5° at the eye of the observer. It shows the colours of the solar spectrum with violet on the outside and red on the inside.

5. **List:** requires a number of points with no elaboration. Where a given number of points is specified, this should not be exceeded.

Problem:

List two properties of electromagnetic radiations.

Ans:

(1) Electromagnetic radiations are not deflected by electric and magnetic fields.

(2) They travel in free space with a speed of 3×10^8 m/s.

6. **Describe:** requires candidates to state in words (using diagrams where appropriate) the main points of the topic. It is often used with reference either to a particular phenomena or to particular experiments. In the former instance, the term usually implies that the answer should include reference to observations associated with the phenomena. The amount of description intended should be interpreted in the light of the indicated mark value.

In the latter case, full details of the method, measurement, apparatus and treatment of results are needed.

NB. The candidate must be careful to cut back on the detail if the question asks to "describe concisely", here the candidate's ability to isolate the key features of the experiment / topic is being tested.

7. **Deduce,** implies that the candidate is not expected to produce the required answer by recall but by logical connection between other pieces of information. Such information may be wholly given in the question or may depend on answers extracted in an earlier part of the question.

In a small volume like this one , it is not possible to exhaust all the possible terms and their required responses.