

UNIVERSITY OF SWAZILAND

FACULTY OF EDUCATION

FINAL EXAMINATION PAPER MAY 2006

B. Ed. II AND PGCE

TITLE OF PAPER : Curriculum Studies in Physics I

COURSE NUMBER: EDC 282

TIME ALLOWED Three (3) hours

INSTRUCTIONS

1. This paper contains FIVE questions
2. Question 1 is COMPULSORY. You may then choose ANY THREE questions from questions 2, 3, 4, 5
3. Each question is worth 25 marks
4. Any piece of material or work which is **not** intended for marking purposes should be clearly **CROSSED OUT**
5. Ensure that responses to questions are **NUMBERED CORRECTLY**

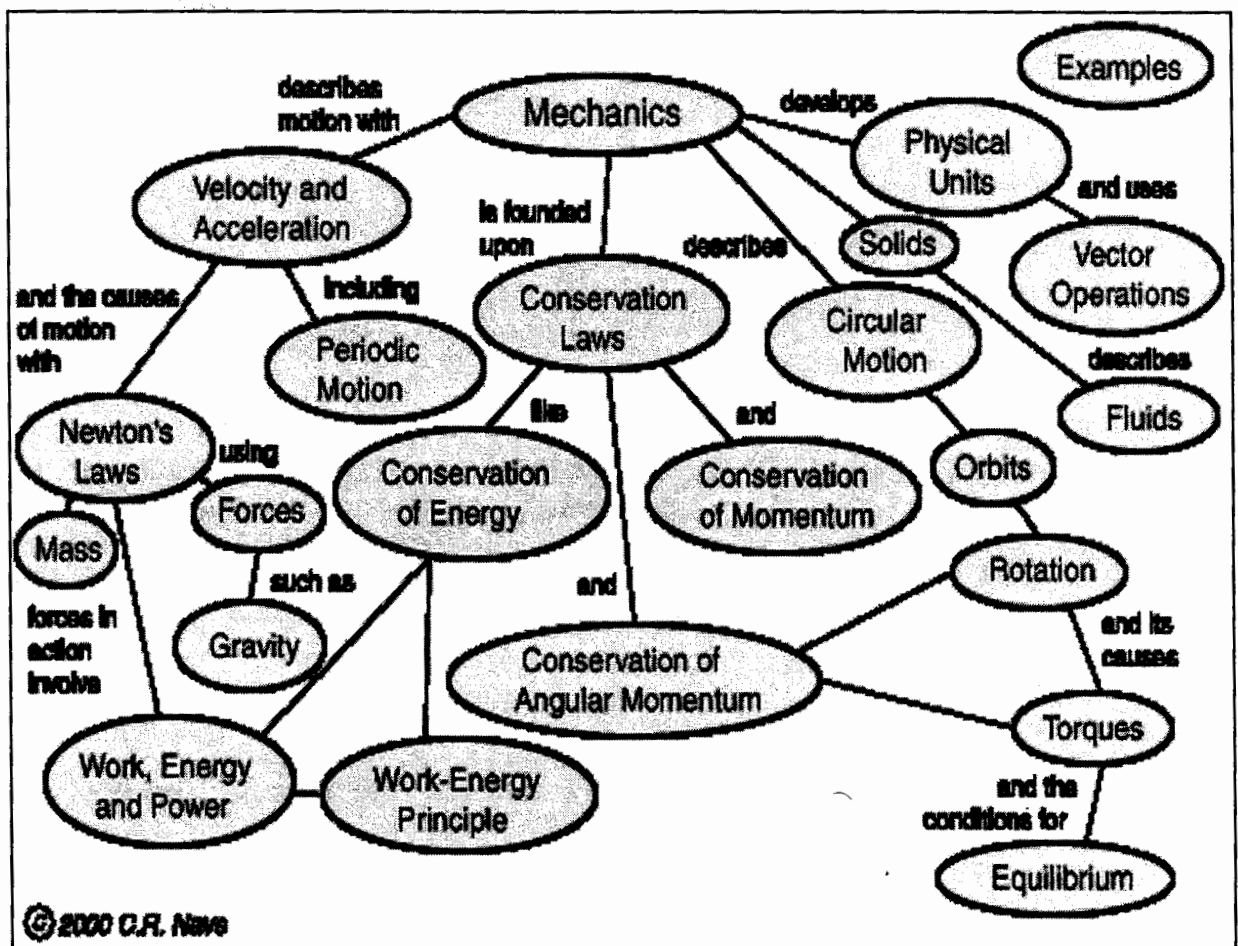
SPECIAL REQUIREMENTS NONE

THIS PAPER SHOULD NOT BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR

SECTION A

QUESTION 1 COMPULSORY

- a. The correct use of units is a necessary skill in physics for investigating relationships between variables and making correct references to quantities.
- i. A pupil realizes that 1Joule can be expressed as 1Nm and hence gives the unit of a moment of force in Joules. Identify the pupil's problem and show how you could help him/her formulate the correct concept. [4]
 - ii. IGCSE uses the SI system of units. Why is it necessary for the scientific community to have the SI system? [4]
 - iii. Measurement is one of the first skills that a learner of physics must be able to do. Briefly analyze the fundamental role of measurement skills for all physics learning. [6]
- b. The concept map below shows how different concepts in mechanics are related and the natural progression from general to particular concepts. At each level of education the learner establishes more links between concepts.



- i. Show how the concept of conservation of energy underlies work, power and energy. [6]
- ii. Construct a similar concept map for the mechanics concepts in the General Physics section of the Physical Science (0652) syllabus supplied. [9]

SECTION B Answer any three questions

QUESTION 2

- a. For the given different pedagogical situations, make detailed descriptions of how you can use these teaching aids to help students learn physics. In each situation, consider: teacher's role, pupil involvement and how the critical ideas are arrived at. [2x10]

Situation 1	Equipment:	OHP, projection micro ammeter, coil, bar magnet, 2 connecting leads
	Concept to be studied	Faraday's Laws of induction.
	Subject & level	Subject: IGCSE Physics Form 4
Situation 2	Equipment	Computer, printer, Excel software,
	Concepts	Variation of a pd and current in different materials. diode, filament bulb, constantan (SWG) 22 wire
	Subject & level	IGCSE Physics Form 5

- b. Discuss the essential characteristics and limitations of teaching aids. [5]

QUESTION 3

Mathematical skills are essential for physics concepts. For the given mathematical concepts, examples have been given of some common quantities that are calculated in physics.

Rates of change	$Force = \frac{\Delta mv}{\Delta t}$, $acceleration = \frac{\Delta v}{\Delta t}$,
Gradients of graphs	$y = mx + c$, $V = IR$,
Area under graphs	displacement, work,
Indices	scientific notation e.g. 6.02×10^{23}

- a. Mathematical skills are developed in the subject mathematics and used extensively in physics, which is usually in a different department and taught by different teachers. Outline a strategy you would recommend for the teaching of mathematical concepts and the physics ideas that require those concepts. [10]
- b. Some students are limited in understanding physics because of the mathematical relationships. How could you help a student who says "Sir I understand the physics of jet propulsion, I just can't work out the problems"! [10]
- c. The concept of 'half life' is central to radioactivity, cooling, and many higher concepts of physics. Design a simple model that can be used to explain the idea of a half life at secondary school. [5]

QUESTION 4

- a. Distinguish between learner- and subject-centered aims in science education [5]
- b. One of the critical aims of physics education is given in the box below.

1. provide, through well designed studies of experimental and practical science, a worthwhile educational experience for all students, whether or not they go on to study science beyond this level and, in particular, to enable them to acquire sufficient understanding and knowledge
 - 1.1 to become confident citizens in a technological world, to take or develop an informed interest in matters of scientific import;
 - 1.2 to recognise the usefulness, and limitations, of scientific method and to appreciate its applicability in other disciplines and in everyday life;
 - 1.3 to be suitably prepared for studies beyond the IGCSE level in pure sciences, in applied sciences or in science-dependent vocational courses.

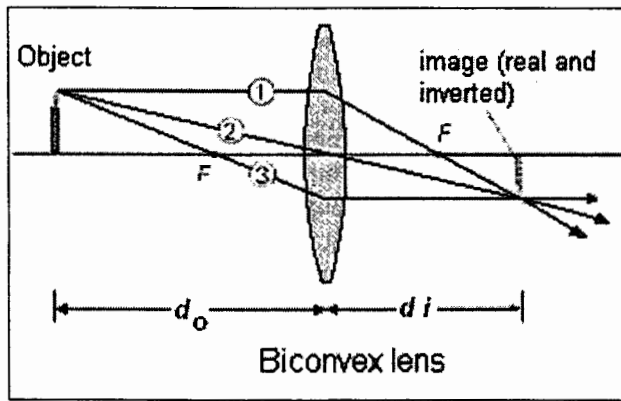
Source: IGCSE Physics syllabus 2006

How can each of the following methods be used to achieve this goal?

- i. A study of the history of science [5]
- ii. Field trip to a thermal or hydro-electricity generator [5]
- iii. A term long project research on how to harness wind or solar energy [5]
- iv. An assignment to investigate saving domestic of electrical energy over a week. [5]

QUESTION 5

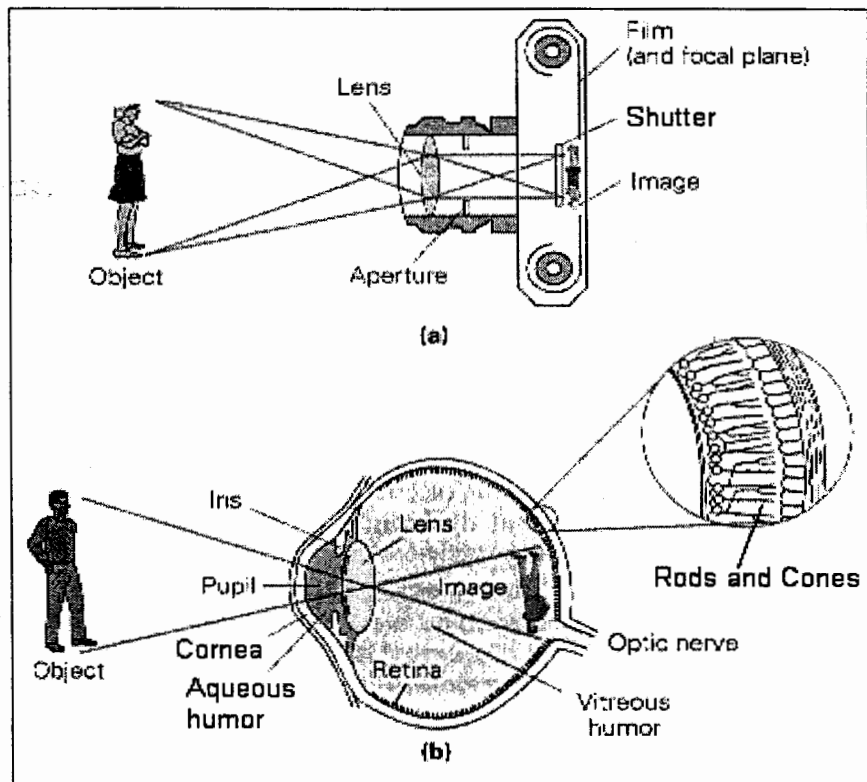
- a. What is a misconception? [2]
- b. Briefly outline the character of misconceptions and how they can be elicited [8].
- c. *Didaktikogenic* misconceptions originate from teachers and textbooks. Many introductory physics books show lens ray diagrams in which the light rays mysteriously change direction along the mid plane of the lens. This example is from a text often used in introductory college physics courses, and also comes in a nearly identical "high school edition". *We don't identify the title, author, or publisher, to protect the guilty!*



Box 1. Source <http://www.lhup.edu/~dsimanek/scenario/miscon.htm>

Identify the misconception in this ray diagram of a biconvex lens in Box 1.

[5]



Box 2. Source: <http://www.lhup.edu/~dsimanek/scenario/miscon.htm> Nov. 2005

The diagrams in Box 2 attempt to compare a camera and a human eye. Explain the optical misconceptions propagated in each.

[2x5]

END OF EXAMINATION PAPER.