UNIVERSITY OF SWAZILAND

FACULTY OF EDUCATION

EXAMINATION PAPER 2009

PGCE F/T

TITLE OF PAPER: Curriculum Studies in Physics

COURSE NUMBER: EDC 282

TIME ALLOWED Three (3) hours

INSTRUCTIONS

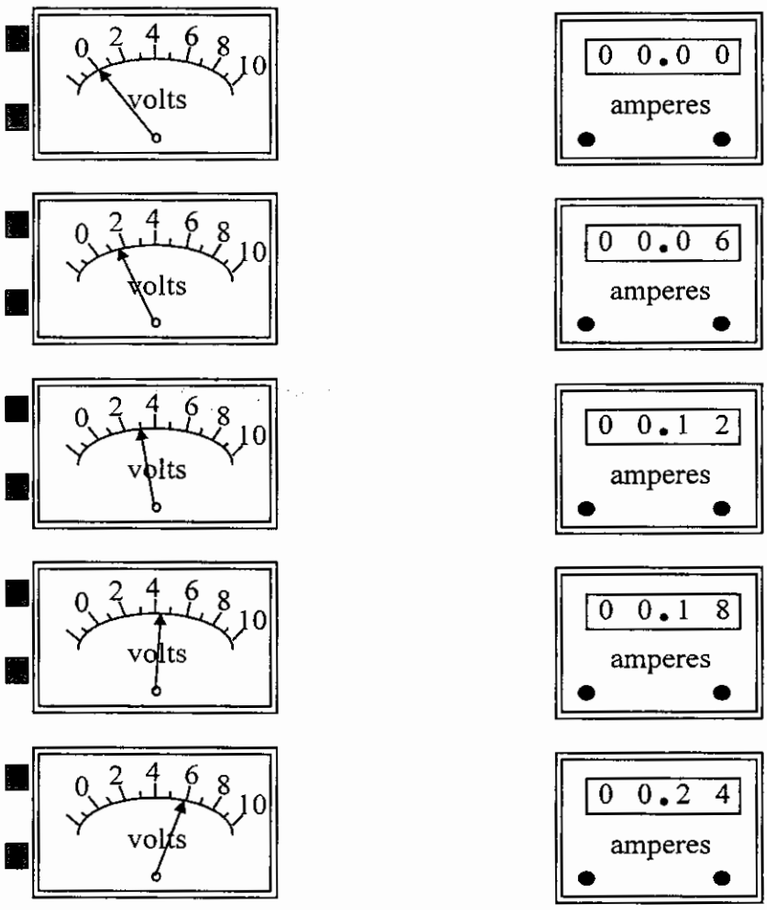
1. This paper contains FIVE questions
2. Question 1 is COMPULSORY. You may then choose ANY THREE questions from questions 2, 3, 4, 5
3. Each question is worth 20 marks
4. Any piece of material or work which is **not** intended for marking purposes should be clearly CROSSED OUT
5. Ensure that responses to questions are NUMBERED CORRECTLY

SPECIAL REQUIREMENTS: **Graph pad.**

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

Question 1 Compulsory. (40 marks)

For a single class of 62 learners, a teacher photocopied diagrams of meters measuring the current through a wire, kept at constant temperature, and the potential difference across the wire.



i. What pedagogical benefits would this approach give to the class? [6]

ii. What limitations are expected when using this approach? [4]

iii. How should the class proceed in order to calculate
   a. resistivity,
   b. resistance [6]

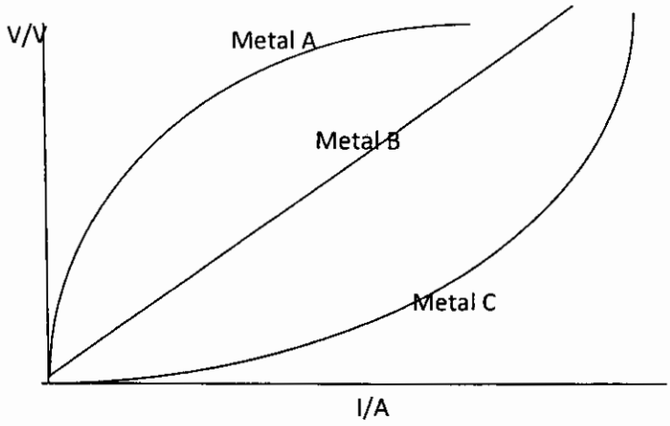
iv. Using the readings, show how experimental uncertainties can be dealt with in calculating resistance. [6]

v. Explain to class why the temperature needed to be kept constant. [4]

vi. How can a graph be used to investigate the resistance in the circuit. [4]

Students suspect Voltage (V/V) and current (*I/A*) are related by the equation $\boldsymbol{V = \frac{\rho I l}{A} + k}$ where ρ is the resistivity of the material of the wire, A is the cross-sectional area of the wire and k is a constant.

vii. What information about the resistive property can be deduced from a graph of V against *I* [4]

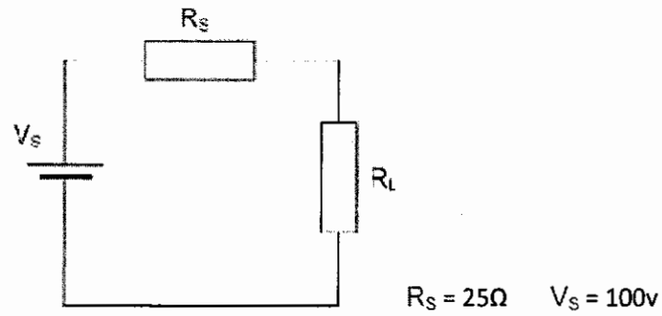


Three metal samples are tested in a circuit and produce results as shown in the graph. Deduce the applications which can be made of the resistive properties of the metals shown. [6]

Section B (60marks)

Answer **ANY THREE** questions from this section.

Question 2



R_L is variable between 0 - 100Ω

Figure 1

Figure 1 shows a circuit that is used to investigate the maximum power that can be transferred from a power source of internal resistance R_s to a load resistance R_L. Recordings of load resistance and calculated power are indicated in the Table.

R_L/Ω	I/	P/W
0	0	0
5	3.3	55
10	2.8	78
15	2.5	93
20	2.2	97
25	2.0	100
30	1.8	97
40	1.5	94
60	1.2	83
100	0.8	64

a. Use Ohm's law to show how the power can be calculated from the given parameters. **[4]**

b. Draw a graph to investigate variation of power transferred with load resistance R_L **[10]**

c. Deduce the value of R_L at maximum power transfer. **[2]**

d. What is the implication of R_L at maximum power for devices such as power transformers and loudspeakers receiving signals from an amplifier? **[4]**

Question 3

Pictures A and B show very poorly managed laboratories.

a. Circle and label ten hazards in either or both pictures. **[10]**
b. Design changes you could do to make this laboratory safer. **[10]**

Question 4

Design an activity to guide Form 5 learners for experiment entitled 'Treatment of random errors in measurement of gravitational acceleration ***g***, using the period of a pendulum'. The activity must engage the pupil in actual measurement, recording and analyzing data. [20]

Question 5

Resources for the teaching of physics are very limited in Swaziland. Discuss how you could make use of the following as teaching resources in Swaziland.

a. On-line computers [5]
b. Amusement parks [5]
c. Recoverable 'junk' material from industry. [5]
d. Domestic electricity consumption. [5]

Question 6

The following is an abstract from a journal article entitled

'Measuring the coefficient of restitution using a digital oscilloscope' by AjayWadhwa

We introduce a new method of determining the coefficient of restitution (COR) of a ball–surface combination by using the sound produced by the impact/collision of the ball with the surface. Using a digital electronic circuit, the electrical signal is amplified and fed to a digital storage oscilloscope through a relay circuit for measuring the time interval between two successive collisions of the ball with the surface. This time interval is then used to determine the COR.

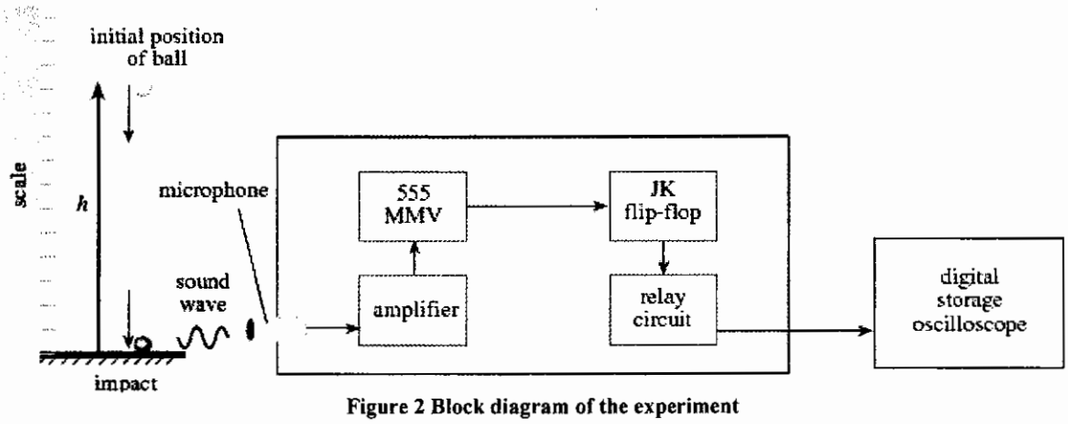
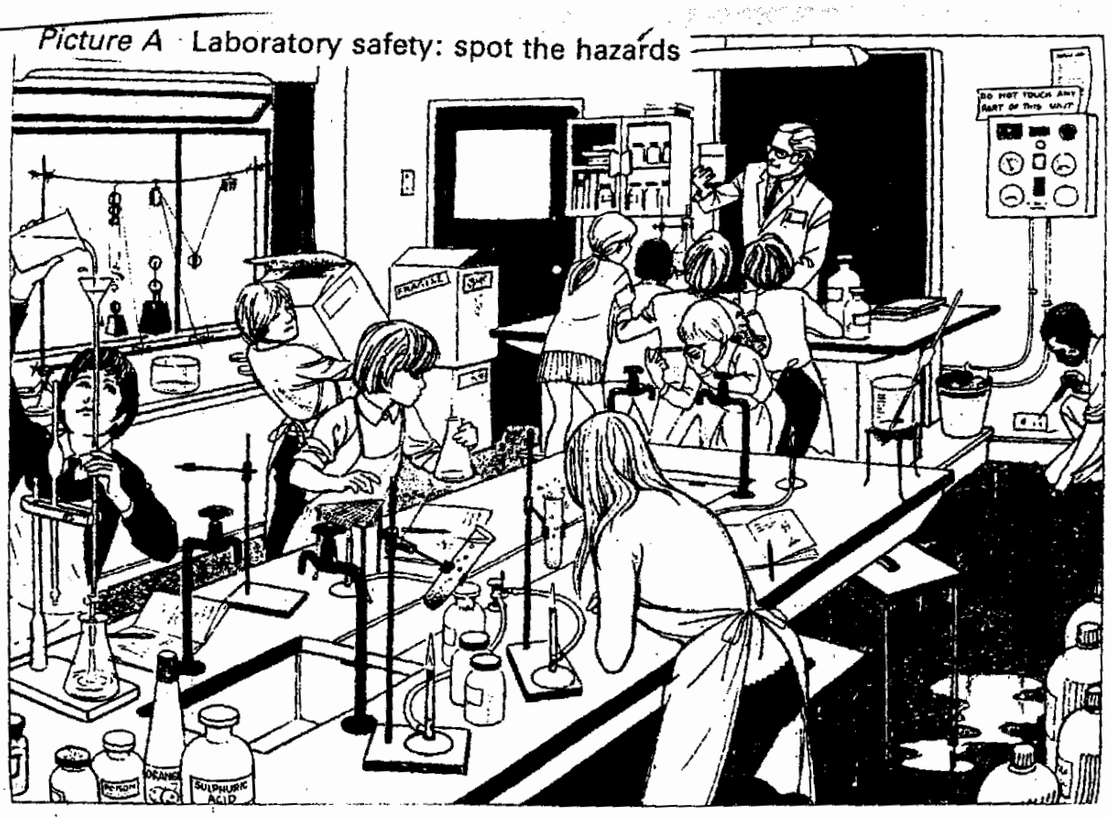


Figure 2 Block diagram of the experiment

Physics Education Vol. 44, No 5 (September 2009)

a. What is meant by coefficient of restitution? **[4]**
b. Explain how measurement of time between bounces enables accurate determination of coefficient of restitution. **[6]**
c. Explain the experimental advantage of using a CRO in this determination of coefficient of restitution. **[5]**
d. Two varieties of floor tile epoxy resins are compared in securing floor tiles. Explain how determination of coefficient of restitution can be used to compare the cementing properties of the resins. **[5]**

Picture A Laboratory safety: spot the hazards



Picture B Laboratory safety: spot the hazards