NATIONAL UNIVERSITY OF LESOTHO

B.SC.ED. EXAMINATION

SCE 3251 – 08 SECONDARY LABORATORY WORK IN PHYSICS

JANUARY 2024 **MARKS: 100** **TIME:3HRS**

INSTRUCTION:

Answer any Four Questions.

Each Question Carries 25 Marks.

Question 1

The extract below comes from the Grade 9 LGCSE Physical Science syllabus.

Concepts	**Teacher and learners**	**Learners:**		
Force Extension Load Hooke's Law Resultant force Terminal velocity Mass Weight **Skills** Observation Recording Interpretation Manipulation Reporting Communication	• revise mass and weight. • revise: - types of force - effects of force on direction, speed, shape and size **Learners** • perform activities to investigate relationship between load and extension. • use the equation F = ke to calculate force or extension. • explore ways in which force may change the motion of	• perform activities involving interpretation of extension-load graphs • perform activities to investigate motion of falling bodies with air resistance including terminal velocity	use the equation W = mg. relate the effect of gravitational field strength to the weight of an object. state the relationship between force and extension (Hooke's Law). draw and interpret extension-load graphs. define terminal velocity describe how falling bodies attain terminal velocity.	Spring Spring balance Slotted masses / load Ruler Retort stand clamps

(a) Using the information from the extract, design a practical work to address Hooke's Law. The following points are the guidelines.

- Aim(s)/objective(s)
- Materials
- Procedure
- Expected results
- Conclusion

[12]

(b) In the practical work in (a) above, describe the activities that will help students develop any **three (3)** of the listed skills.

[6]

(c) Mention the **six (6)** technological pedagogical content knowledge (TPACK) knowledge components.
Hence, explain what TPACK is.

[7]

[25]

Question 2

(a) A Physics teacher claims that students should not be allowed to perform experiments on thermal physics because of safety concerns.

(i) State one health hazard in performing practical work in thermal physics that a teacher may be concerned about.

[1]

(ii) Suggest how the teacher could let students perform the practical work safely.

[6]

(b) With the help of elaborate examples, describe any **three (3)** other topics (or concepts) in LGCSE Physics that could pose health hazards to students when performing practical work.

[9]

(c) Explain how a teacher could use the Predict-Observe-Explain-Explore (POEE) strategy to engage his students when demonstrating thermal physics practical work due to health hazards.

[6]

(d) Suggest how grouping students could minimise health risks associated with laboratory work in thermal physics.
Support your answer with example(s).

[3]

[25]

Question 3

Mr. Pula is teaching his Grade 8 students the law of reflection: **when a ray of light strikes a mirror surface, it leaves at the same angle as when it arrived**.

Mr. Pula must decide how he will teach the lesson. He has the following options:

A. I would ask students to find out facts about light behaviour around mirrors by exploring on their own with an assortment of available items, including light ray sources, mirrors, and protractors. Then, the students would report what they did and what they found out.

B. I would write the law of reflection on the board and illustrate it with a diagram. Next, I would show them a real example, using a light ray source, mirror, and protractor. Then, we would discuss questions students might have.

C. I would first pose a question about reflection for the students to explore. The students could investigate using light ray sources, mirrors, and protractors and then discuss their findings. I would close the lesson by giving them a summary of the law of reflection.

D. I would write the law of reflection on the board and illustrate it with a diagram. Then, I would have the students verify the law using light ray sources, mirrors, and protractors. We would then discuss their findings.

(a) Decide on an option most similar to how you would teach the lesson. Explain why you chose the preferred option and why you did not choose the other options.

[13]

(b) For your preferred option in (a) above, write
    (i) lesson objective(s),

[2]

(ii) assumed knowledge and

[2]

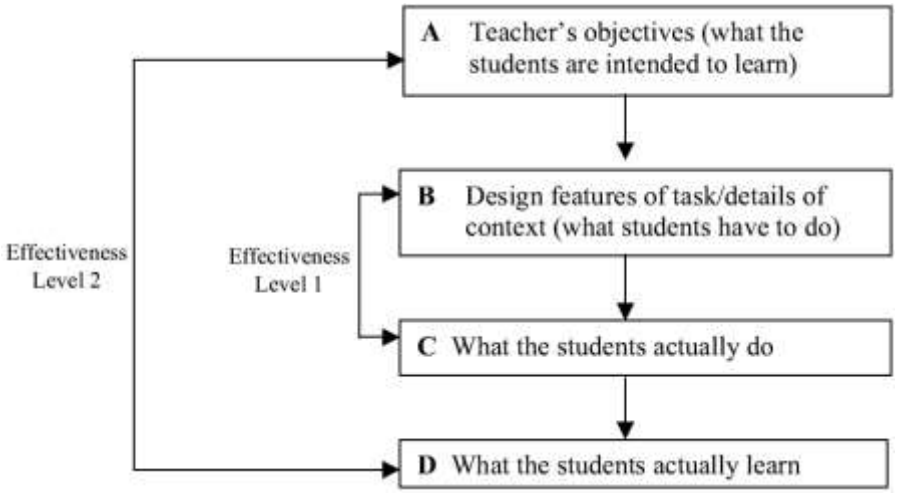
(c) Discuss the importance of engaging students in practical work when teaching the law of reflection.

[8]

[25]

Question 4

Below is a diagram showing a model of the processes involved in designing and evaluating a practical task proposed by Millar et al. (1999).



(a) Describe how you may use this model in designing and facilitating effective practical work on parallel and series electric circuits.

[10]

(b) Suggest how a teacher may use this model to evaluate the effectiveness of practical work on the density of irregularly shaped solids.
In your answer, describe what effectiveness at level 1 and effectiveness at both levels would mean.

[12]

(c) Explain why practical work is **unlikely** to be effective at Level 2 when it is not effective at Level 1.

[3]

[25]

Question 5

The extract below is from the LGCSE Grade 9 Physical Science syllabus.

The learning outcome is: **at the end of Grade 9, learners should be able to investigate electromagnets**.

Concepts Magnets Magnetization Demagnetization Magnetic properties: Iron Steel Electromagnets **Skills** Observation Recording Communication Interpretation Manipulation **values and attitudes** Cooperation Curiosity Awareness Honesty	• Teacher and learners review magnetization and demagnetization. • Learners perform experiments to magnetise using direct current. • Learners perform experiments to demagnetise using alternating current. • Learners perform activities to investigate magnetic properties of iron and steel. • Teacher and learners deduce the term electromagnets. • Learners design and use electromagnets. • Learners discuss everyday use of electromagnets and permanent magnets.	• Learners determine polarity using Right hand grip rule.	describe experiments to magnetise using direct current. determine polarity using Right hand grip rule. describe experiments to demagnetise using alternating current. investigate magnetic properties of iron and steel. define electromagnets. explain how to make and use electromagnets. state everyday use of electromagnets and permanent magnets.	Solenoid. Iron nails. Steel pins. Paper clips. Circuits boards. Batteries. Connecting wires. Steel bars/rod. Insulating bar.

(a) With the help of a labelled diagram, describe an electromagnet Grade 9 student can make.

[5]

(b) Draw a lesson plan for a forty minutes lesson involving practical work addressing one of the concepts from the extract.

[12]

(c) With reference to the practical work in (a) above,

(i) Describe the difference between a practical test and an alternative to practical test.

[4]

(ii) Suggest, with the aid of at least **two (2)** examples, why offering practical examinations to all LGCSE candidates in Lesotho is challenging.

[4]

[25]