NATIONAL UNIVERSITY OF LESOTHO

FACULTY OF HUMANITIES

COMMUNICATION AND STUDY SKILLS UNIT

ELG 1305: COMMUNICATION AND ACADEMIC LITERACY FOR BSc. EDUCATION

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

GROUP D2

INSTRUCTIONS:

- **ANSWER ALL QUESTIONS**
- **BEGIN EACH QUESTION ON A FRESH PAGE**
- **WRITE YOUR STUDENT NUMBER AND GROUP NUMBER CLEARLY**
- **WRITE LEGIBLY**

QUESTION 1: ESSAY WRITING

Read the passages below and write a DESCRIPTIVE ESSAY on the following topic:

Laboratory in Teaching of Science at High School

NB: In your essay, discuss the benefits and challenges of laboratory in teaching of science at high school. Also, suggest some solutions to overcome those challenges you have raised in your essay.

Guidelines:

- Your essay should be **1½-2 pages**.
- Select relevant material from the given passages.
- Include **one direct** and **more than one indirect quotation** in your essay.

- Sources are also provided for citation and compilation of bibliography, and each entry is jumbled. Re-arrange them as you compile the list of references.
- Marks will be awarded for the following:

Correct format
Appropriate content
Relevant quotations
Effective paragraphs
Correct grammar
Academic style
Complete reference list

[60]

Passage 1: **The Laboratory in Chemistry Education: Thirty Years of Experience with Developments, Implementation and Research**

Kelly and Lister (1965), based on comprehensive research findings, suggested that the science laboratory is a unique mode of teaching and learning, and that the abilities of students in the laboratory are only slightly correlated with their abilities in other non-practical learning experiences. Support for this was provided at a later stage by Tamir (1972) and more recently by Yeany, Larossa, and Hale (1989). A study on modes of learning and teaching in the context of chemistry was conducted by Ben-Zvi, Hofstein, Samuel and Kempa (1977). The main goal of this study was to identify relationships between modes of learning in the chemistry laboratory and other modes of learning that prevail in high school chemistry. The study was undertaken in the context of a laboratory centred programme: *Chemistry for High School* (1972), developed at the Weizmann Institute of Science. This programme was developed and implemented in the Israeli education system to replace the adopted version of the CHEMSudy programme. To this end, a battery of tests were developed to cover at least the first three phases of performance in the chemistry laboratory (Kempa & Ward, 1976; Kempa, 1986; Giddings & Hofstein, 1990; Giddings, Hofstein, & Lunetta, 1991): *planning and design* (formulating questions, predicting results, formulating hypotheses, to be tested designing experimental procedures); *performance* (in conducting an experiment, manipulating materials and equipment, making decisions about investigative techniques, observing and reporting findings); *analysis and interpretation*

(processing data, explaining relationships, developing generalizations, examining the accuracy of data, outlining limitations, formulating new questions based on the investigation conducted); and *application* (making predictions about new situations, formulating hypotheses on the basis of investigative results, applying laboratory techniques to new experimental situations). These phases refer both to psychomotor skills (manipulation and observation) and to cognitive abilities, i.e. investigation and processing of a problem and its solution by practical means. The battery of tests included two practical tests using a scheme and criteria originally developed by Eglen and Kempa (1974), an observational test (Kempa & Ward, 1976), two paper and pencil achievement tests, and an attitude and interest questionnaire. This battery of tests was administered to a sample of 233, 10th grade students (in 12 classes from 5 schools) in Israel. Correlation of the results followed by factor analytic investigation revealed the following:

- Cognitive achievement in chemistry measured by written paper and pencil tests and achievement in the chemistry laboratory constitute independent modes.
- Factor analytic investigation of the various variables showed that the practical domain can be subdivided into three distinct modes: -problem-solving abilities; -skills in performing routine laboratory tasks; -the ability to observe.

Source: Vol.5, No.3, Journal of Chemistry Education: Research and Practice. Avi Hofstein. pp. 247-264. 'The Laboratory in Chemistry Education: Thirty Years of Experience with Developments, Implementation and Research'. 2004.

Passage 2: **Learning How to Teach Experiments in School Physics Laboratory**

Physics is not only theory, concepts, laws and formulas; it is also an experimental science. Laboratory work is at the heart of physics. In Turkey, although the National Curriculum includes experiments, physics classes often do not include experimentation. Requirements for high-stake exams restrict teachers' instruction time available to teach lab work.

In physics education, many secondary students experience difficulties in the laboratory. The literature provides a range of difficulties that secondary pupils encounter in the school science laboratory [1–5]. Many research studies support the lack of a fundamental understanding of

scientific evidence in secondary students. For example, studies on performance on lab work questioned the assumption that students understand the nature of measurement and experimentation [6,7]. This work has led to the development and refinement of various laboratory teaching materials [8]. After completing a traditional laboratory course, the majority of students have ideas about measurement that are inconsistent with the generally accepted scientific model. For example, as Séré and her team found, a large proportion of students view the ideal outcome of a single measurement as an "exact" or "point-like" value. Only if a measurement is considered really "bad" would it be reported in terms of an interval [6]

Pre-service teachers need to develop confidence in teaching physics experiments and in developing assessment goals and methods related to laboratory skills. They need repeated practice in lab skills. There are implications for pre-service physics teacher education, because many of the participants are expected to teach lab work in secondary schools. The development of special courses for the preparation of physics teachers is necessary. Adequate preparation of science teachers is vital to ensuring good teaching of science in secondary schools. The standard lab classes in the physics departments are not enough. They do not address the needs that they will have as teachers.

Source: 2017. Journal of Physics: Conf. Series. Olga Gkioka. https://www.doi.org/10.1088/1742-6596/1286/1/012016. 'Learning how to teach experiments in school physics laboratory'.

Passage 3: **Learning and Teaching in the School Science Laboratory: Analysing Research, Theory and Practice**

The materials selected for use in a particular investigation often play a very important though complex role in promoting or confounding what students observe and learn. The simplicity or complexity and the novelty or familiarity of the materials and technologies to be used in the laboratory are among the important variable that teachers and curriculum developers must consider to promote meaningful learning. Using equipment and materials that students experience regularly in the world around them in laboratory investigations can help the students to understand and apply what they are learning in the laboratory. It is important to note, however, that students often bring long-standing misconceptions about the nature of familiar materials with them to school science.

These misconceptions can interfere with the ways a student thinks about the materials or equipment, their functioning, and their roles as objects of investigation or as tools in the laboratory. Such misconceptions can influence students' expectations, observations, and understanding of the phenomena they are studying as illustrated earlier in this chapter when a student's failure to understand the design and purpose of simple light bulb socket interfered seriously with her ability to interpret a simple electric circuit. Equipment that is novel and not part of a students' prior experience can also influence their learning in the laboratory (Olson and Clough, 2001).

Source: Learning and Teaching in the School Science Laboratory: Analysing research, theory, and practice. 2005. https://www.researchgate.net/publication/272680843. Vincent N. Lunetta, Avi Hofstein and Michael P. Clough.

QUESTION 2: READING COMPREHENSION

Read the following passage and answer the questions that follow.

Historical Perspective of Laboratory Work: Why Have Laboratories?

By Reid and Shah (2007)

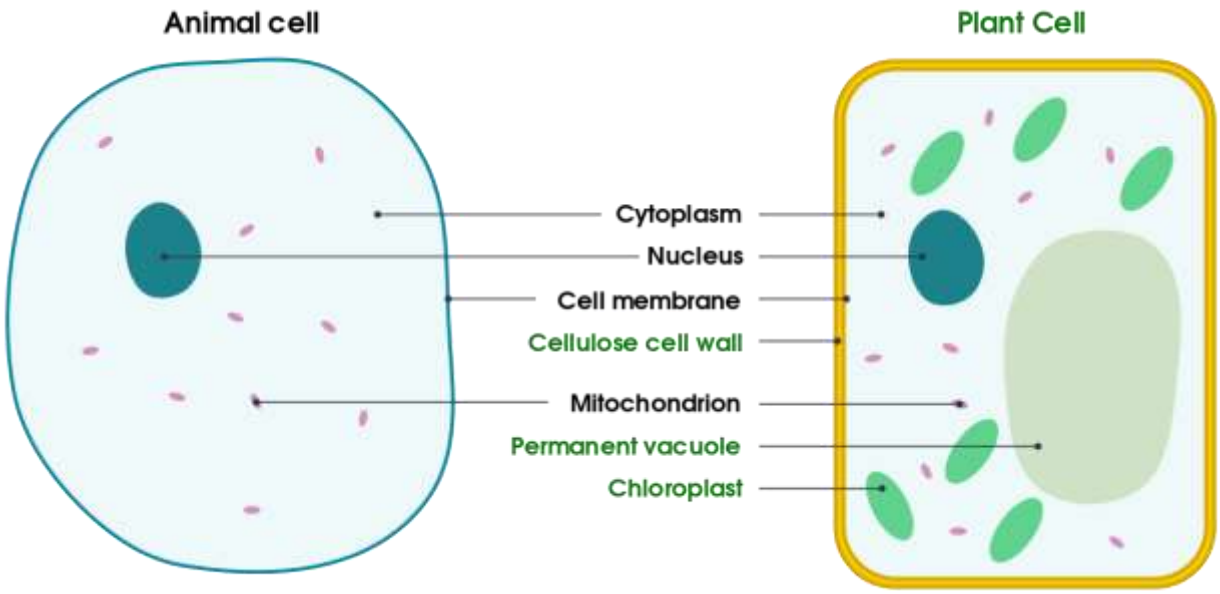
The first teaching laboratory in chemistry in Britain was established by Thomas Thomson in the University of Edinburgh in 1807. In 1819, he introduced this to the University of Glasgow, when he joined this University. In 1824, Liebig established a Chemistry Laboratory at the University of Giessen. Laboratory classes then gradually developed over the next fifty years until eventually, in 1899, it came to be considered necessary that school pupils be allowed to carry out experiments for themselves.

Laboratories are one of the characteristic features of education in the sciences at all levels. It would be **rare** to find any science course in any institution of education without a substantial component of laboratory activity. It is assumed to be necessary and important. One of the main reasons to question the place of laboratory teaching is that laboratory programmes are very expensive in terms of facilities and materials, but also, more importantly, in terms of staff time (Carnduff and Reid, 2003). University students' reactions to practical work are often negative, and this may reflect a student **perception** that there is a lack of any clear purpose for the experiments: they go through the experiment without **adequate** stimulation.

It is important to think about goals, aims and objectives in the context of laboratory work. Laboratory work here is used to describe the practical activities, which students undertake using chemicals and equipment in a chemistry laboratory. Of course, the word 'practical' can include other activities as well, and it is interesting to note the use of the word in so many titles in papers. Many years ago in a school's context, Rose and Seyse (1974) raised a **fascinating** question: could many important aims still be attained even if practical work were abolished? They suggested that this depends partly on our view of science. Science can be seen as established human knowledge, a problem-solving activity, or concerned with the relation between theory and experiments. In some ways, this starts to define what could be the important aims, which can be uniquely achieved

through laboratory courses. Animal and plant cells shown in figure 1 below are also seen in the laboratory.

Figure 1: Animal and plant cells (Adapted from Wikimedia Commons)



QUESTIONS

a) What is science? (2)

b) Who is the pioneer in the teaching of laboratory in chemistry at the University of Edinburgh and the University of Glasgow? (2)

c) When and where did Liebig establish a Chemistry Laboratory? (2)

d) Mention the challenge of implementing laboratory teaching. (2)

e) In your own words, explain how the university students react towards practical work. (2)

f) Can we conclude that laboratories are taught only at universities? Provide **two** points to support your answer. (5)

g) Figure 1 shows the structure of animal and plant cells. Write **two** similarities and **two** differences of the cells. (4)

h) Based on your Biology background and experience, name the instrument used to observe the cells, and state why it is used. (3)

i) In **not more than 100 words**, summarise the goals and objectives achieved through laboratory courses. (10)

j) Based on how the **bolded** words are used in the passage, provide their meaning. Their equivalent words should be a word or phrase of not more than **eight** words.

(i) Adequate

(ii) Rare

(iii) Perception

(iv) Fascinating (8)

[40]