UNIVERSITY OF ESWATINI

Faculty of Education

Department of Curriculum and Teaching

Main Examination Paper

April 2021

PGCE

Title of Paper: **Curriculum Studies in Physics I**

Course Number: **CTE 533**

Time allowed: **Three Hours (3hrs)**

Information and INSTRUCTIONS

1. This paper contains TWO Sections.
2. Section 1 is **COMPULSORY** and carries 40 marks.
3. Choose any **THREE** questions from Section 2. Each question carries 20 marks.
4. Any written material not intended for marking should be CLEARLY CROSSED OUT.
5. Start EACH question on a FRESH page.
6. **ADDITIONAL MATERIAL**
    COLOUR PLATES OF DIGRAMS TO QUESTIONS 1 , B1 AND B5

THIS PAPER SHOULD NOT BE OPENED UNTIL INSTRUCTED BY THE INVIGILATOR

SECTION A   COMPULSORY   [40 marks]

A teacher at Phakhama Rural School devises a Cartesian co-ordinate system to index (CODEX) the positions of items in a Physics laboratory. The lab width is marked A to F and the length is in 100cm units marked 1 to 7, the height of the lab is 3m. The lab door is position B1, stool at the near table is F6. Each table has 4 drawers of height 15 cm each. The school cannot employ a Laboratory technician. There are 40 new HP computers only for the ICT class of 40; there is Wi-Fi. Students cannot use the computers for any other subject. Teachers use computers when there is no ICT class. ICT students do not all do Physical Science.

The Physical science class has 36 students. The Physics teacher is guided by the TPCK Theory and Constructivism.
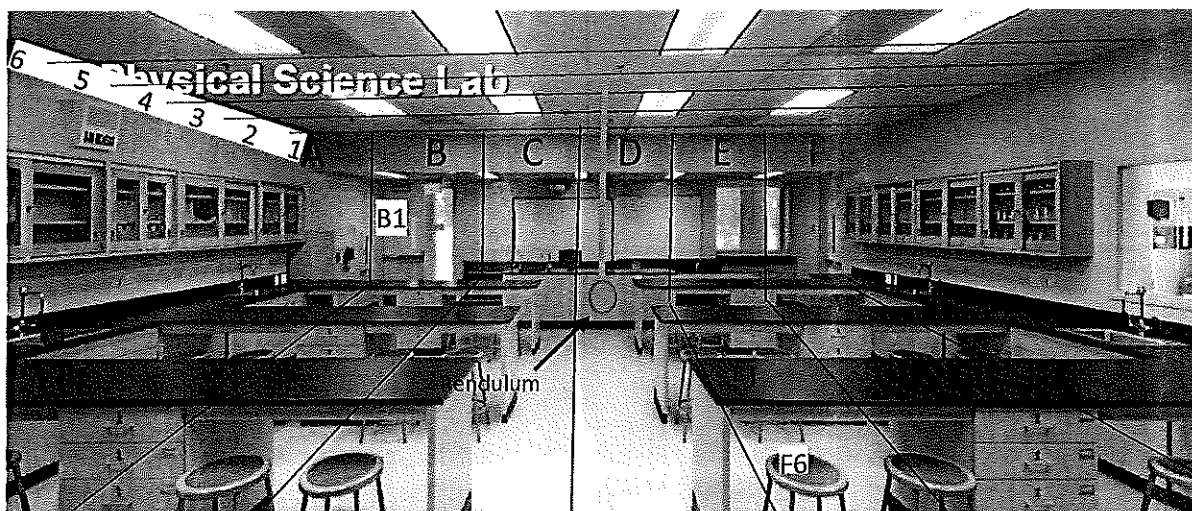

Figure 1 Perspective of Phakhama Rural school Physical Science Laboratory

a. Use the CODEX system to specify 3-D positions of each red arrow   [5]

b. Identify five advantages of the CODEX system at a school without a lab technician?
                                                                            [5]
c. How can a teacher and 36 students use this laboratory effectively, while observing Covid-19 regulations?   [6]
d. In an experiment on the properties of a simple pendulum, examine activities that can achieve

    i.   Vygotsky Social constructivism   [4]

    ii.   Piagetian Cognitive constructivism.   [4]

    iii. Accuracy and precision   [6]

e. Justify five reasons why the school must allow learners to use smartphones in the Physical Science class.   [10]

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Section B.

Answer any THREE questions. [20marks each]

Question B1 **[20 marks]**

a. Outline the six skills in Halpern Critical Thinking Assessment (HCTA) [6]

Hanna does the following experiment: she brings a positively charged rod close to a metal can. Doing the experiment shows that the can is attracted to the rod. Hanna is puzzled with the result of her experiment. She expected the negative electrons on the metal would be attracted to the rod while the positive nuclei are repelled, and opposite forces cancel out, which would mean that the can remains at rest.
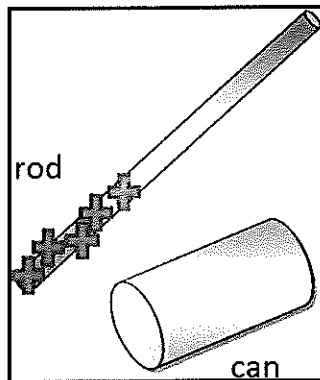

Figure 2 HANNAS Experiment   Adapted from Int J of Sci and Math Educ

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Student Arguments

THABO MANDELA: The electrons move through the two bodies. If we approach the can with the rod, more electrons will move to the surface causing the rod and the can to attract each other. We get a redistribution of charges. As the rod is positively charged, there are more protons in the rod than electrons.

MBONGENI TSOLA: Because negative electrons are attracted and positive ions are repelled, the can will have a positive and a negative side. As the electric force decreases with distance ($F \sim \frac{1}{r^2}$)), the negative side will be attracted more strongly that the positive side is repelled. The can will move toward the rod because there is net force toward the rod.

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b. Make an Argument analysis of the two student answers and grade them out of a possible maximum of 4 marks each. [4x2]

c. Identify a Hypothesis and explain an inherent error in Hanna's thinking. [6]

Question B2   [20 marks]

Table B2: Common Analogy of Forces from many Physics textbooks

Coulomb's law	Newton 's law of Gravitation
$$F = k\frac{Q_1 Q_2}{r^2}$$ F is the force between two charges Q_1 and Q_2 at a distance r apart $k=\dfrac{1}{4\pi\varepsilon}$ constant of proportionality ε= absolute permittivity of space	$$F = G\frac{M_1 M_2}{R^2},$$ F is the force attraction due to gravity between any two objects m_1 and m_2, distance r apart G= 6.67 x 10^{-11} Nm^2kg^{-2} universal constant of Gravitation

a. Outline any TWO alternative conceptions students are likely to create from the analogy of forces in Table B2?   [4]

b. Sketch a curve to show the ONE true analogy in these two force fields.   [4]

c. Advanced level Physics is to be offered in Swati schools. Here is one use of a Mathematical Model encountered in AS and A Level mechanics.

> Consider an object thrown up at a vertical velocity V_0. Establish the differential equation representing the movement of the object at a moment t. Find the expressions for height and speed. To solve this question, student teachers must use the theoretical approach which makes reference to the second law of Newton.

Outline the three techniques used by teachers and students when applying a Mathematical model to a problem.

i.   Correct technique   [4]

ii.   Makeshift technique   [4]

iii. Heart technique   [4]

Question B3   [20 marks]

1. Field study of science is related to

A. Real life situations B. Experimental situations C. Laboratory situations D. None of these

2. Which of the following knowledge helps a teacher to develop an ICT based lesson plan

A. Content Knowledge   B. Pedagogic Knowledge C. Technological Knowledge

D. Technological Pedagogical Content Knowledge

3. The most essential aspect of a techno pedagogue

A. Skills to use technology for lesson transaction B. Efficiency in participatory approach

C. Skill to introduce a lesson   D. Efficiency in online searching

4. Shooting a video lesson for the topic " atmosphere " after preparing a lesson script will help to

A. Give live experience on the layers of atmosphere B. Reduce teacher efforts to give clarity on different concepts C. Motivate the learner's interest on the topic D. All the above

5. Online quiz sessions enable the learner's
   A. Self-study   B. Self-correction C. Self-evaluation   D. All of them

6. In writing outcomes and objectives for technology enhanced lessons, which of the following should teachers always consider
   A. Technology skills to be learned B. Skills and attitude to be learned C. Technology approaches to be used   D. Learning processes to be used

7. Which one of the following is not an informal learning context?
   A. Science laboratory   B. Museum   C. Playground   D. Historical monuments

8. Who speaks about the dimension of existential intelligence ?
   A. Gardner   B. Ausubel   C. Piaget   D. Bruner

9. Who designed jigsaw technique
   A. Frank Lyman   B. William Gordon C. Jerome S Bruner D. Elliot Aronson

10. ....is the first satellite for education launched by ISRO in 2004
    A. IRNSS-IE   B. IRNSS-IF   C. EDUSAT   D. IRNSS-IG

11. Concept mapping was developed by
    A. Gagne   B. Gardner   C. Vygotsky   D. Joseph D Novak

12. Instructional package of data in electronic form is known as
    A.   E-learning   B. E-content   C. Website surfing   D. None of these

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13. The scoring key to evaluate the presentation of the students with the help of specific criteria is termed as
   A. Rubrics   B. Feedback   C. Portfolio   D. None of these
14. An example of online community for sharing instructional resources for teaching including videos, audio's, photos
   A. Facebook   B. Websites   C. Teacher tube   D. Tube mate

15. Maximum participation of students during teaching is possible through?
   A. Lecture method   B. Demonstration method   C. Inductive method   D. Text book method

16. During the course of class teaching the teacher should take his students from
   A. Known to known   B. Unknown to known
   C. Known to unknown   D. Unknown to unknown

17. Which is not a maxim of teaching physical science
   A. Simple to complex   B.Whole to parts C. Proceed inductively D. Abstract to concrete

18. The major proponent of brainstorming strategy
   A Jerome S Bruner   B. Hilda Taba   C. Richard Pleyman   D. A H Osborne

19. A method used for the acquisition of skill is
   A. Inquiry learning   B. Team teaching C. Discovery learning D. Micro teaching

20. Which of the following is an example of projected aid
   A. Black board   B. Poster   C. Chart   D. LCD

Question B4   [20 marks]

a. What are the purposes of practical work in school physics?   [8]

b. Outline two advantages of the alternative-to-practical examination?

[4]

c. Outline two pedagogical approaches you could use to prepare students for an alternative to practical examination.   [4]

d. How do public examinations guarantee validity and reliability of assessment in practical skills?   [4]

Question B5   [20 marks]

Given the following items: plasticine, 1pkt drinking straws, masking tape

		Plasticine
Drinking straws	Masking tape	
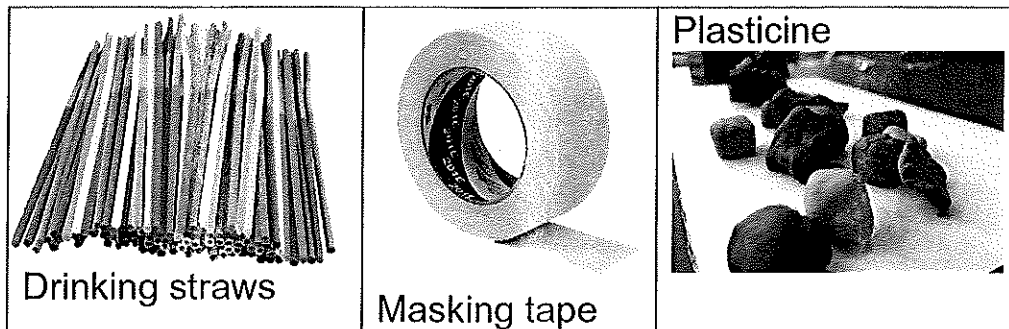
a. Design and draw an improvised model wave machine.   [10]

b. Show how can your model be used to demonstrate:

  i.   Amplitude

  ii.   Frequency

  iii. Wavelength

  iv.   Transverse wave transmission

  v.   Super positioning.   [10]