ZIMBABWE

MINISTRY OF PRIMARY AND SECONDARY EDUCATION

CURRICULUM DEVELOPMENT AND TECHNICAL SERVICES

COMBINED SCIENCE SYLLABUS

SECONDARY SCHOOL LEVEL

FORMS 1-4

2015-2022

TEACHER'S GUIDE

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TABLE OF CONTENTS

ORGANISATION OF THE TEACHER'S GUIDE

This is a document intended for you the teacher to realise the recommended expected conduct towards the fulfilment of the new curriculum demands in the combined science learning area. It guides you to understand and engage you in the participation to implement the new curriculum in combined science.

This teacher's guide is divided into two parts, A and B. Part A focuses on the critical documents you must have as a teacher. Part B deals with curriculum delivery, the content, objectives, methodology, instructional materials, class management and assessment.

PART A

2.0 CRITICAL DOCUMENTS

INTRODUCTION

As a teacher it is important for you to have critical documents.

Rationale

This syllabus develops learners' basic scientific skills in physics, chemistry and biology. The syllabus covers science concepts such as observing, recording, measuring, presentation interpretation of data and analysis. It also imparts practical skills such as handling of apparatus chemicals, plant and animal specimens safely and confidently

Objectives

By the end of this part you should:

a) Identify critical documents you should have
b) Show understanding of each document

You should have the following critical documents:

- Curriculum Framework
- National Syllabus
- School syllabus
- Scheme cum plan or Schemes of Work and lesson plans
- Learner profiling guide
- Assessment framework
- Learner Profile
- Progress Records
- Register of Attendance

UNIT 1

Curriculum Framework for Zimbabwe Primary and Secondary Education 2015-2022

This is a document that outlines the underpinning national philosophy, principles, learning areas, the description and expectations of Ministry of Primary and Secondary education (MOPSE) at policy level, serving as a prescription of government expectations.

Objectives

By the end of unit 1 on critical documents the teacher should be able to:

- Identify key elements of the curriculum
- Demonstrate the understanding of values that defines the curriculum

Key elements

Below are the key elements that define the curriculum:

- Background
- Principles and values guiding the curriculum
- Goals of the curriculum
- Learning areas
- Teaching and learning methods
- Assessment and learning
- Strategies for effective curriculum implementation
- The future

UNIT 2

2.0 SYLLABUS INTERPRETATION

Introduction

The syllabi are key documents for you as a teacher which you should always refer to.

Objectives

By the end of this unit you should be able to interpret the national and school syllabi understanding the following components:

- Aims
- Content
- Assessment
- Objectives
- Methodology
- Assessment and format

Types of syllabi

- National syllabus
- School syllabus

2.1National syllabus

- **Definition**

It is a policy document that outlines and specifies the learning area philosophy, aims and objectives, learning/teaching concepts and content, suggested methodology and assessment criteria at every level. As a teacher, you should always have it to guide you in your day to day teaching and learning activities.

Elements of the national syllabus

acknowledgements.

- Preamble
- Inroduction
- Rationale
- Summary of content
- Methodology and time allocation.
- Assumptions
- Cross cutting themes
- Presentation of the syllabus.
- aims
- Syllabus
- objectives
- topics
- scope and sequence chart.
- Competency matrix
- Assessment

Content

Refer to the combined science form 1 to 4 national syllabus

2.2 School Syllabus

This should be drawn at school level from the National Syllabus by reorganising content taking into account local factors. (see section Syllabus Interpretation)

Factors influencing drafting

- Level of learner performance (knowledge they already have) this can be established from progress reports and evaluations.
- Relevant facilities and resources(efficient and effective allocation of relevant resources)
- Time allocation in the official syllabus
- Local conditions that affect the choice and sequencing of topics
- Education technology
- Community influences

Elements

- Topics/Content
- activities
- time allocation
- methodology (N.B. learner – centered)
- instructional or teaching materials
- assessment

UNIT 3: Schemes of work

It is usually an interpretation of a specification or syllabus and can be used as a guide throughout the course to monitor progress against the original plan.

Components
Week ending dates
Topic/ content
Objectives
Competencies/ skills/ knowledge
SOM and Media
Facility / equipment
Methods / Activities
Evaluation

Example

WEEK ENDING	TOPIC/ CONTENT	OBJECTIVES	COMPETENCIES/ SKILLS/ KNOWLEDGE	SOM/MEDIA	FACILITY /EQUIPMENT	METHODS/ ACTIVITIES	EVALUATION
13 December 2016	**CELLS AND LEVELS OF ORGANISATION** ● Plant cell: cell membrane, cell wall, cytoplasm, nucleus, permanent vacuole ● Animal cell: cell membrane, cytoplasm,	● describe the structure of a plant and an animal cell ● list similarities and differences between plant and animal cells	● Identify plant cells and animal cells ● Describe the structure of the plant cell and animal cell ● Draw and label plant and animal cells ● Pupils learn to appreciate living organisms and to take care of them	combined science form 1 to 4 syllabus page 23 ● Focus on science ● Charts on cells ● Models of cells ● Onion ● Prepared animal cell slides	● ICT tools & Hand lens ● Bioviewer ● Scarpel ● Science laboratory	Using bio viewers and hand lenses pupils to observe and draw cells. (avoid using human blood and cheek cells.) Pupils draw and label plant and animal cells	

UNIT 4

LESSON PLAN

This is a detailed daily plan of what you intend to deliver during the lesson. This is to be used in the event of you having drawn a scheme of work rather than a scheme cum plan.

Components of a lesson plan

Date
Time
Learning area
Topic/content
Sub-topic
S.O.M
Equipment
Number of students
Assumed knowledge
Lesson objectives
Lesson development
Lesson evaluation

DETAILED LESSON PLAN

Date :	17 January 2017
FORM:	3
Time:	11.00 to 12:10
Learning Area	Biology
Topic/Content:	Cells
Sub-Topic:	Plant cells
S.O.M:	Combined science Syllabus form 1 to 4 page 23
Approved textbooks	

Media and Equipment: Onion, chart on plant cells, model on plant cells, iodine solution, prepared plant cell slides for bio-viewers, bio-viewers, hand lenses,scarpel, g lass slides, microscope

Number of students:	45
Assumed Knowledge:	Learners know that plants are living organisms

Lesson Objectives

By the end of the lesson, learners should be able to:

- Identify the structure of plant cells
- Draw and label a plant cell

STAGE/ TIME (Headings to depend on activity being carried out) LESSON EVALUATION:	LEARNER ACTIVITIES	TEACHER ACTIVITIES	POINTS TO NOTE
Introduction 5min	-selected learners introduce the lesson by an impromptu speech on the words cell, nucleus, cell membrane, vacuole,- cell wall, cytoplasm	Selects participants	Restriction of time to one minute per participant.
Preparation of material 15 mins	Collection and setting up of materials and equipment to be used . observing safety precautions	Instructs on material to be collected - Gives steps to follow.	Proper handling of materials and safety in the lab
Skill development 20 mins	- take turns to observe plant cells using bioviewers and microscopes in their groups -draw the plant cells as iindividuals	- demonstrates the use of materials and equipment in Monitors progress	Proper use of microscope and bioviewer
Application 20 mins	- labelling and functions of parts -group discussions -feedbacks	Corrects misconceptions reincforce correct concepts	Anotated diagrams
Summary 5 mins	- narrate main points of the lesson	-Reinforce main points	Structure of plant cells
Conclusion 5 mins	- repeat improtu speeches with different learners	-evaluates achievement of learners	

Strength: .....
.....
.....
.....
Areas to be improved: .....
.....
.....
.....
Way forward: .....
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UNIT 5

RECORD KEEPING

Definition

Records are critical documents on the teaching/learning process which you should keep as a teacher

Records to be kept

- Curriculum framework for primary and secondary education 2015- 2016
- Syllabi (National and school)
- Schemes of work, lesson plan / scheme cum plan
- Class attendance register
- Teacher's guide
- Progress records
- Asset and control register
- Inventory
- Learner profile

UNIT 6

3.0 PART B : CURRICULUM DELIVERY

Introduction

Unit 6 deals with curriculum delivery which involves content, objectives, methodology,learning / teaching materials , evaluation/assessment and class management.

3.1 Objectives

An objective should be Specific, Measurable, Attainable, Relevant and Time framed(SMART)
For example: By the end of the lesson learners should be able to identify and label 5 parts of a plant cell

3.2 CONTENT

This refers to the amount of work to be covered in a particular lesson. For example:

Topic Content

Cells, Plant cells: cell membrane, cell wall, cytoplasm, nucleus

3.3 METHODOLOGY

It refers to strategies or approaches used to achieve set objectives. These should be learner centered and problem solving approaches.

Example

Group discussions

Experiments

3.4TEACHING AND LEARNING MATERIALS

These are tools used by learners and their facilitators during lessons .

Examples
Bio-viewer
microscopes
plants specimens

3.5 ASSESSMENT AND EVALUATION

Definition

Assessment is the systematic collection of data to monitor the success of a course in achieving intended learning outcomes for students.

Evaluation is judgment by the teacher about whether the learning has met its intended goals or not.

Examples

There are two types of assessment and evaluation:

- Formative evaluation(on going / continuous). Continuous assessment is a major innovation in the new curriculum through learner profiling. Examples are:

Inclass tests
Quiz
Projects
Research and assignments

- Summative evaluation; coming at the end of the course i.e Final examinations

3.6 CLASS MANAGEMENT

This is the process of planning, organizing leading and controlling class activities to facilitate effective and efficient learning. It helps to create an effective learning environment, motivate the learners, maintain class discipline and supervise class activities.

UNIT 7

SCOPE OF THE GUIDE

Unit 7 shows the depth and breadth of the content

Below is the list of topics found in the Form 1- 4 combined science Syllabus.

BIOLOGY:

- Laboratory rules and safety
- Cells and levels of organization
- Nutrition
- Respiratory system
- Transport systems
- Reproduction in plants and animals
- Health and diseases

6.2 CHEMISTRY:

- Matter
- Acids, Bases and Salts
- Oxidation and Reduction
- Industrial Processes
- Organic Chemistry

6.3 PHYSICS:

- Measurements
- Force
- Energy
- Magnetism

Electricity

BREAK A TOPIC INTO TEACHABLE UNITS

Example

TOPIC: Industrial processes
Teachable units for the topic are listed below
Contact process

Teachable Unit for the Contact process
List the raw material used in the manufacture of sulphuric acid
Describe the manufacture of sulphuric acid
State the conditions needed for the production of sulphuric acid
State uses of sulphuric acid
The topic has been broken down into teachable units:

Lesson 1
Definition of contact process
List the raw material needed in the manufacture of sulphuric acid

Describe the manufacture of sulphuric acid

Content

RAW MATERIALS

Sulphur dioxide from burning iron pyrites/ sulphur, oxygen from air

CONDITIONS

Pressure: 1atm
Catalyst: Vanadium (V) oxide
Temperature of 450 to 500 degrees celsius

USES

Battery acid
Plastics
Explosives
Fertilizers
Detergents

Activities

Watching video on contact process

Methodology

Live media

Materials

Computer and projector
Flow chart
Recommended textbook

Evaluation

This section gives you information on how the learning area will be assessed, the weighting and skills to be tested, types of question and duration of each paper. This section also has assessment objectives, scheme of assessment, specification grid and assessment model. The assessment in combined science will be based on 40% continuous assessment and 60% summative assessment for form 1- 4.

Impromptu speech
Written exercises
Quiz

The example on the contact process is a way in which the teacher can use to break down a topic into teachable units. As the teacher you are expected to break down all the other topics in the syllabus as given in the example above.

Conclusion

A comprehensive understanding of the combined science syllabus is mandatory to you so that you facilitate learning and teaching for the achievement of syllabus objective as well as learner competencies. Theory must be related to real life situations like safety, risk disaster management gender and equity, HIV and AIDS,enterprise skills and other cross cutting issues.

Annexure 1

7.0 SCOPE AND SEQUENCE

7.1BIOLOGY

TOPIC	Form 1	Form 2	Form 3	Form 4
7.1.1 Laboratory Safety and apparatus	● Laboratory rules, introduction to apparatus			
7.1.2 Cells and levels of organization	● Plant and animal structure ● Similarities and differences of plant and animal cells	● Types of variation: continuous and discontinuous	● Structures and functions of specialized cells ● Use of a microscope	● Ecosystems
7.1.3 Nutrition	● Diet	● Photosynthesis ● Digestive system in humans	● Factors affecting rate of photosynthesis ● Conditions necessary for photosynthesis ● Teeth and digestion	● Human diet: balanced diet ● Deficiency diseases ● Food tests
7.1.4 Respiratory systems	● Respiratory gases	● Respiratory organs ● Breathing mechanism	● Gaseous exchange in alveoli	● Respiration: aerobic and anaerobic respiration
7.1.5 Transport systems	● Osmosis and diffusion ● Components of blood	● Root and stem structure ● Water and ion uptake ● Heart structure and associated, blood vessels	● Transpiration: factors affecting rate of transpiration ● Measurement of transpiration ● Plasmolysis ● Turgidity ● Blood circulation	● Adaptations of plants to reduce transpiration ● Structure of blood vessels

TOPIC	Form 1	Form 2	Form 3	Form 4
7.1.6 REPRODUCTIVE SYSTEMS	● Reproduction in plants: flower structure, pollination, fertilization, seed dispersal ● Human reproductive organs ● Puberty	● Detailed structure of a wind and an insect-pollinated flower ● Functions of Human reproductive organs	● Structure of the seed ● Germination ● Male and female reproductive systems ● Sex cells ● Fertilisation, pregnancy, placenta and child care ● Menstrual cycle	● Asexual and sexual reproduction in plants ● Inheritance ● Methods of contraception ● Contraceptives
7.1.7 HEALTH AND DISEASES	● Health and hygiene ● Methods of transmission of pathogens referring to Common parasitic diseases: Cholera, Ebola, Malaria, Bilharzia Typhoid	● Sexually Transmitted Infections (STIs) ● Life cycle of bilharzia parasite and symptoms of bilharzia	● Sexually Transmitted Infections (STIs) ● Signs and symptoms, causes and treatment/ control of Cholera, Ebola, Malaria and Typhoid ● Abuse of drugs: medicinal uses,addiction hallucination, depressants	● Life cycle of malaria parasite and control at each stage ● HIV/AIDS ● Immunity

7.2 CHEMISTRY

TOPIC	Form 1	Form 2	Form 3	Form 4
7.2.1 SEPARATION	● Filtration ● Magnetism, ● Winnowing, ● Decanting, ● Evaporation	● Applications of filtration, magnetism, winnowing, decanting, evaporation	● Distillation ● Fractional distillation	● Paper chromatography
7.2.2 MATTER	● FStates of matter ● Kinetic theory ● Period table: identification of elements ● Metals and non-metals ● Elements mixtures and compounds	Concentrations of solutions ● Groups and periods	● DStructure of atoms ● Electronic configurations ● Periodic table ;nuclide notation ● Names and groups of elements ● Mole concept; empirical and molecular formulae concentration	● Reactivity series ● Factors affecting rate of reaction

TOPIC	Form 1	Form 2	Form 3	Form 4
7.2.3 ACIDS, BASES AND SALTS	● Identification of acids and bases: litmus paper test	● Acid- base reactions	● pH scale ● preparation of salts ● reactions of metal + acid, acid + base , acid + carbonate	● Titration of bases with acids
7.2.4 INDUSTRIAL PROCESSES	● Production of peanut butter	● Production of soap	● Fractional distillation of liquid ● Electrolysis ● Electroplating	● Haber process ● Contact process
7.2.5 OXIDATION AND REDUCTION	● Rusting: factors	● Chemical reactions:combustion	● Extraction of iron	● Alloy formation
7.2.6 ORGANIC CHEMISTRY	● Types of fuels	● Complete and incomplete combustion	● Alkanes alkenes ● Biogas production	● Ethanol ● Maheu ● Global warming

7.3 PHYSICS

TOPIC	Form 1	Form 2	Form 3	Form 4
7.3.1 DATA PRESENTATION	● Tallies, tables, bar graphs	● straight line graphs	● pie charts, line graphs, interpretation	● pie charts, line graphs, interpretation and analysis
7.3.2 MEASUREMENT	● Physical quantities ● S.I units	● Prefixes ● Conversions ● Density	● Physical quantities, accuracy and precisio ● Density of liquids	● Derived quantities
7.3.3 FORCE	● Effects of force ● Types of force ● Measurement of force	● Moments of force ● Resultant force ● Levers	● Weight and mass machines: inclined plane, pulleys, levers and gears	● Principles of pressure ● Fluid systems ● Pumps
7.3.4 ENERGY	● types of energy ● Energy conversions	● Law of conversion of energy ● Calculations on work ● Properties of light ● Sound energy	● Petrol and diesel engine ● Heat transfer: convection, conduction and radiation	● Heat transfer applications: solar water heater and solar cooker ● Telecommunications

TOPIC	Form 1	Form 2	Form 3	Form 4
7.3.5 MAGNETISM AND ELECTRICITY	● Magnets,poles, fields, compass ● Static electricity: charges ● Current electricity: conductors and insulators ● Circuit components	● Properties of magnets ● Attraction and repulsion ● Circuit symbols and diagrams ● Measurement of electricity	● Electromagnetism ● Motor effect ● Generator effect ● Electroscope ● Lightning ● Ohm's Law ● Resistance ● Resistors ● Electrical power and energy	● Power generation ● Electrical safety ● Domestic electricity