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These notes were brought to you by Jonathan Reynolds. Jonathan is a graduate of the University of Limerick in Science Education and has experience in teaching in various schools around the country. Jonathan is currently a Junior Certificate Science and Leaving Certificate Science teacher at Ramsgrange Community School, New Ross, Co. Wexford. Jonathan has been teaching Agricultural Science for six years as of 2012. He also corrects mocks and sets mock papers in Agricultural Science for Mocks.ie. Jonathan has had experience in teaching in well established schools such as Yeats College Waterford where he dedicated his time on the farm project and teaching study techniques for the interviews that are held each May.

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AGRICULTURAL SCIENCE

Ordinary and Higher Level courses

Syllabus for written examination:

Soils

- The formation of soils.
- Principal rock groups.
- Weathering of rocks.
- Origin of soils: glaciation, derived soils, soils formed in situ, formation of peats.

Soil Texture

- Size of particles as determined by mechanical analysis. Classification of soils.
- Humus.
- Use of geological maps.
- Map study of soils in Ireland.
- Local soil surveys.
- Physical properties of soils.
- Soil structure; soil air; soil density; soil temperature; soil water and soil water control.
- Principles of soil cultivation with reference to tillage crops and grassland.
- Chemical properties of soils.
- Colloidal properties, pH and flocculation in relation to clay fraction and humus.
- Base exchange.
- Major and minor elements. Fertilisers and liming.
- Living organisms and their effects.
- Macro and micro organisms. Interdependence of animals and plants.
- Decomposition of organic matter; carbon and nitrogen cycles.
- Improving soil fertility.

The General Structure and Function of Plants

- Elementary structure and life cycle of a bacterium, mould, fern, pine and flowering plant.
- The plant cell – types of cells in different plant tissues as seen in roots, stems, leaves.
- Cell division – mitosis, meiosis.
- Parts of the flowering plant – function of each part.
- The flower and seed production.

- Structure of seed – monocot and dicot.
- Germination and establishment.
- Propagation of plants by vegetative means.
- Plant physiology: osmosis, respiration, photosynthesis, transpiration, translocation, food storage.
- Tests for food constituents.
- Essential elements for normal growth.
- Identification of plants of agricultural importance in the school environment and study of characteristics and habitat.
- Principles of classification of plants. Ability to classify plants in at least six natural orders.

Farm Crops – Cereal and Roots

- Cultivation of one cereal and one root crop or potatoes in order to illustrate the agricultural importance of the following:
 - Rotation.
 - Soil suitability.
 - Preparation of seed bed.
 - Nutrition.
 - Choice of variety.
 - Seed dressing.
 - Time, rate and method of seed sowing.
 - Establishment.
 - Diseases, pests, weed control, health.
 - Harvesting, yield, storage, food value and final use.
- At least one scientific investigation should be carried out in both cases.

Farm Crops – Grassland

- Study of inflorescence and vegetative system of the following grasses and clovers: Perennial Ryegrass, Cocksfoot, Timothy, Meadow Fescue, Crested Dogstail, Bent Grass, a Meadow Grass, Red Clover, White Clover.
- Study of pastures (permanent and temporary leys) under the following headings:
 - Establishment – soil, seed bed, manuring, seeds mixtures. Management. Measurement of output of grassland in terms of total weight, dry matter, meat and milk.
 - Conservation of grassland products.
 - Factors influencing the feeding value of pasture, hay and silage.
 - Maintaining fertility.

Tree and Shelter

- Hedgerow trees and shelterbelts in relation to farm animals and crops. Effects of shelter on early growth and total yield of farm crops.

Principles of Genetics

- The cell – structure; mitosis; meiosis.
- Mendel's laws.
- Sex determination, sex linkage.
- Mutations.
- Heritable characters and selection for breeding – see plant and animal sections.

Structure and Function of the Animal Body

- Diversity in animal life. Principles of classification.
- Brief study of one representative of each of the following phyla:

- Protozoa, Platyhelminthes, Nematoda, Annelida, Mollusca, Arthropoda (insect species), Chordata (mammalian species).
- Classification of parasites studied elsewhere in the course.
- Skeleton and muscle – simple anatomical treatment; composition of the bone; the skeleton as a storage organ.
- Growth – bone, muscle and fat deposition in relation to age; composition of muscle and fat.
- Circulation: the heart and blood vessels: composition and functions of the blood.
- Respiration: mechanism of breathing; respiratory function of the blood.
- Ingestion: structure of the mouth of a ruminant and non-ruminant – relevance to feeding habits. Digestion: study of the digestive system of the ruminant, horse, pig and fowl; the digestive juices; the digestive enzymes.
- Function of the kidney. Excretion.
- Regulation of body temperature; normal temperature; heat production and body temperature in relation to microclimatic control; critical temperature of the pig and ox; consideration of farm buildings in relation to environmental temperature and humidity.
- Nervous system and reflex mechanisms: the brain, nerve cells, reflexes.
- The reproductive system: dissection of the rabbit – male and female.
- The endocrine system: simple treatment of the pituitary, thyroid, parathyroid, thymus, pancreas, adrenals and gonads.
- Transport and storage.
 - (a) The blood and lymphatic systems.
 - (b) Liver, adipose tissue and skeleton as storage organs.

The Cow

- Common breeds, general characteristics.
- Breeding principles.
- The cow in production – feeding standards for maintenance, milk production and reproduction with special reference to winter feeding and grassland utilisation.
- The common diseases – cause, symptoms, prevention and control – for oral examination.
- Milk production – the udder; measurement of yield; composition of milk, factors influencing yield and composition; bacteriology in relation to clean milk production. Milk products.
- The calf – rearing for beef and herd replacement. General study of nutrition, growth, health and housing from birth to at least 12 months.

The Sheep

- Common breeds, general characteristics. Breeding principles.
- Nutrition, growth, care and health of lambs from birth to sixteen months.
- Study of wool – types, growth, principal features, use.

Horse

- Study of the horse (or pony) as a farm animal – for school assessment only.

Pig

- Nutrition, management, environmental conditions, health
- Sow – during pregnancy and lactation.
- Bonham – birth to weaning.
- Pig – weaning to slaughter.
- Selection for breeding – based on genetical and visual assessment.
- Factors affecting production costs.

Farm Buildings – *for school assessment only*

- Ability to discuss farm buildings and to illustrate how they provide the environmental conditions required on the farm e.g. in regard to cattle and pigs. Emphasis on temperature, ventilation, insulation, planning for economy of labour.

Farm-House Environment – *for school assessment only*

- The physical/aesthetic layout of the house in relation to the farm, farmyard and general surroundings.
- NOTE: The examination in Agricultural Science will consist of (a) a written examination and (b) an assessment of the work of the candidate during the course. The assessment will be based on material set out in the syllabus and marks, to a total of 100, will be awarded under the headings set out hereunder.
 - (1) Identification of plant and animal types associated with agriculture.
 - (2) Practical experience with crops, livestock, house and farmyard layouts.
 - (3) Investigations carried out relating to ecology, soil science, animal physiology, plant physiology, genetics and microbiology

Leaving Certificate Agricultural Science Project – 100 Marks/25%

Introduction

The introduction should include:

1. Location of farm (e.g. 3 kms from nearest town) , owned or neighbour?
 2. Statement of main enterprise e.g. dairy/tillage and other enterprises e.g beef/potato.
 3. Acreage – total (owned/rented).
 4. If dairying state number of cows divided into beef and dairy.
Tillage – state how much ground for each crop.
 5. Describe breeds of cattle/types of crop etc.
 6. Ownership of farm – family owned? Bought? Who works on the farm? Are you involved in work on the farm?
 7. Infrastructure (roads) on and around the farm.
 8. Brief statement on farm buildings. Cubicle units/slatted/barn/grain storage. Old? New? General/purpose built? Space? Space per animal.
 9. Machinery. Brief statement. Owned/rented?
 10. State what you intend to include in project. Name the sections.
- Introduction should be a page to two pages long.

Questions to ask the farmer:

Ask these questions. Take notes on everything he/she says. Write up in paragraph form and put into relevant sections. Be neat, tidy and consistent with style, font, spacing etc. Take as many photos as possible (include yourself in some).

Is the farm dairy, beef, both or tillage?

Then write up on what is meant by beef, dairy, tillage etc from notes and your own knowledge.

What breeds of animal are on the farm?

What breeds are there? How many of each?

Write up on the main characteristics of each and also any other breeds we cover within the course. Take pictures or download from internet.

How do you take care of your animals?

- Breeding – Do you have a stock bull or use AI? When are cows/heifers put in calf?...
- Feeding – What do you feed your animals? Why? When do you feed them?...What do you feed calves from the time they are born?

Housing

What kind? Function of each house? Space? How close to dwelling house? Photos.

Health

Diseases? How are they treated? Symptoms? Prevention? How often are animals dosed and for what? Write notes on diseases from your coursework.

Breeds of pigs and sheep

Use notes and internet to provide information on the following:

Pigs - Landrace, Large White

Sheep – Mountain Blackface, Cheviot, Suffolk, Texel

Milking Process

How often are cows milked? What is the process? Milking parlour?

Photos.

Farmyard Layout

Ask for copy of OS map and hand draw sketch of farm layout (v. important). Indicate where buildings are. What direction is the farm facing? Fields and what they are used for – show roadways, fencing, shelter, hedgerows...

Silage making/Grazing

What is the land used for? How much is used for silage/hay? How much is used for silage/hay? How much is used for grazing (strip/paddock).

Use notes to describe silage/hay making – when/how many times a year, what type of grass is suitable, yield. Photos of pit and machinery.

Barley/potato

Write up on one of the above under the following headings (include photos):

- Variety
- Rotation
- Cultivation practices
- Establishment
- Harvesting
- Yield

Machinery

Machinery used on farm (make and model). Function. Photos, extras

Anything else of interest – REPS, Nitrates directive etc

Plants/Animals

Sketch/photograph any plants we identify over the year and include in project with common name and family name with importance in agriculture. Photos or internet images of the small animals we come across during the year (e.g. earthworm, wireworm etc.) with importance in agriculture.

Keep a record of websites and books used. Include at the end as references.

It is all about showing as much personal experience as possible. Keep to your own words and make sure you understand everything you include.

It is obvious when you copy – DON'T DO IT!!!

Acknowledgements – thank anyone who helped you.

Experiments

At least one write up on each of the following:

1. Ecology
2. Soil Science
3. Animal physiology – heart dissection
4. Plant physiology – transpiration
5. Genetics – PTC paper
6. Microbiology

Write up in normal way

- Title/Aim
- Apparatus
- Diagram
- Method
- Results
- Conclusion

Include photos if you have taken any

The Agricultural Science – Interview/Oral

First two weeks of May:

Here is a sample of the area the monitor will ask the chosen four candidates in each class:

- Name, exam number, first time leaving certificate, repeat?
- Why are you doing Ag Science? Do you come from a farming background?
- What do you hope to do next year? Will it be in the Ag Science area?
- Name 10 plants and plant families. Give a little information or background on them. What are their yields? Are they notifiable? Are they noxious? What impact can they have on animals and crops?
- Name 3 beef breeds: describe their bodily characteristics and their uses?
- Name 3 dairy breeds: describe their bodily characteristics and their uses?
- Name 3 sheep breeds: describe their bodily characteristics and their uses?
- Name 2 pig breeds; describe their bodily characteristics and their uses?
- Name 10 other animals you would find on the farm.
- Name any other parasites and the phylum they belong to. What impact do they have on crops and/or animals?
- Questions related to all their projects. These would be specific to the individual.
- Questions related to the farm visit and their report on it.