education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

REVISION GUIDE AND FREQUENTLY ASKED QUESTIONS

AGRICULTURAL SCIENCES

2017

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FOREWORD

The purpose of this manual is to assist grade 12 learners in preparation for their 2017 end of year examination preparation

The activities in this document are meant to be a guide and not to replace any study material/ text book.

The manual focuses on selected challenging content topics informed by experience of dedicated curriculum implementers and analysis of June results 2017

This manual is distributed free of charge as a learning support material to all Agricultural Sciences teachers and learners in Mpumalanga Province and is fully funded by Mpumalanga Department of Education

The guide is compiled from different sources. We hope that the guide will serve as a valuable and helpful resource for both teachers and learners

PAPER 1

1 . Animal Nutrition :

A. Concepts

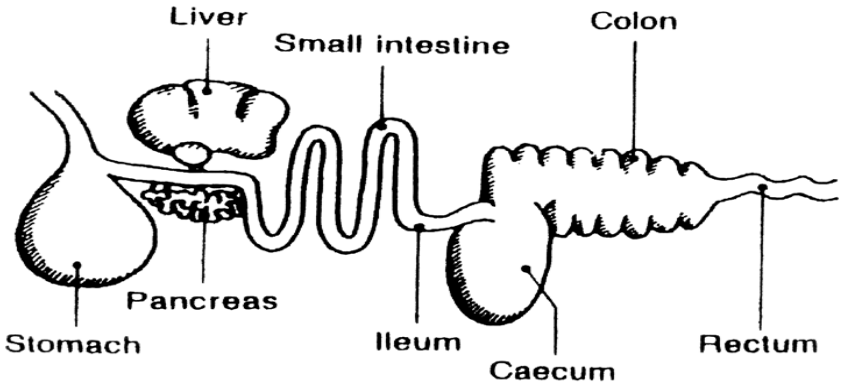
- Ruminant: Animal with a complex/compound stomach [eg. Cattle, Sheep, Goats]
- Non-ruminant (monogastric): Animal with a single/simple stomach [eg. Pigs, Poultry, Horses]
- Rumination: The process of bringing back the cud/bolus food into the mouth for re-chewing, re-insalivation and re-swallowing.
- Peristalsis: The movement of food through the alimentary canal / rhythmic contraction and relaxation of muscles of the alimentary canal.
- Retroperistalsis /regurgitation: The bringing back of food from the stomach to the mouth cavity.
- Chyme : The contents of the stomach
- Chyle: The contents of the small intestines
- Biological value (BV): The quality of proteins in the feed.

B. Diagrams.

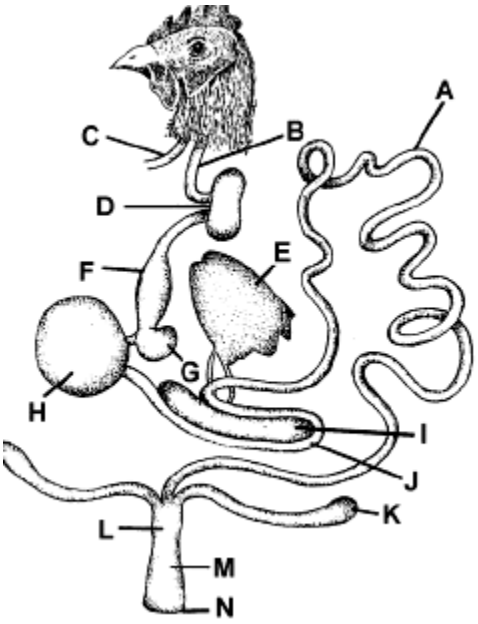
Possible diagrams.

I. Alimentary canal for a pig

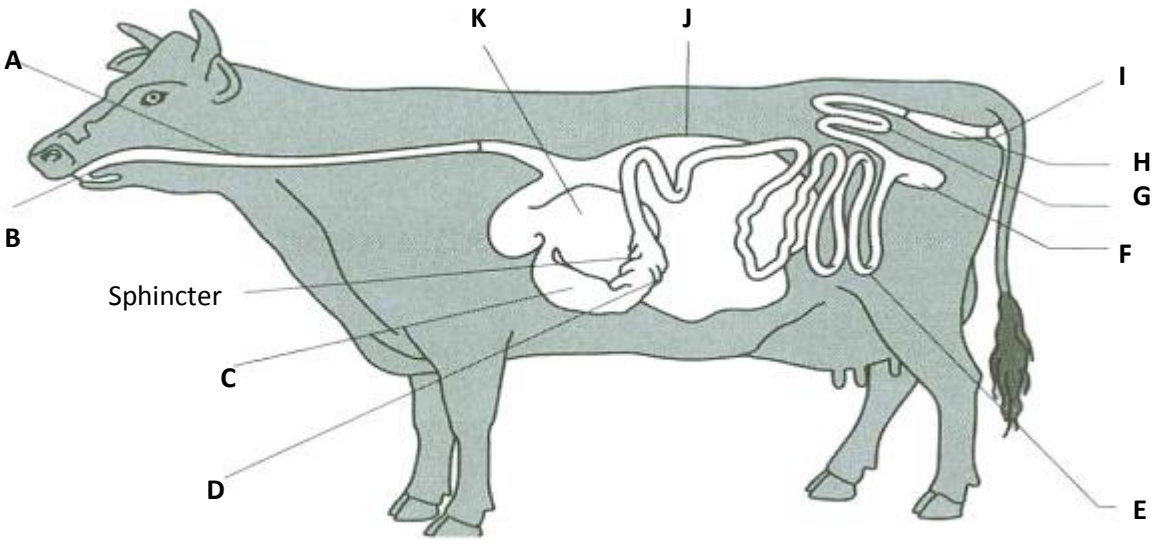
Carefully take note of the main parts of the alimentary canal of a pig and locate their functions in the process of digestion.



II. Alimentary canal for poultry
Attempt to label all labeled parts and the functions of D, H and N.

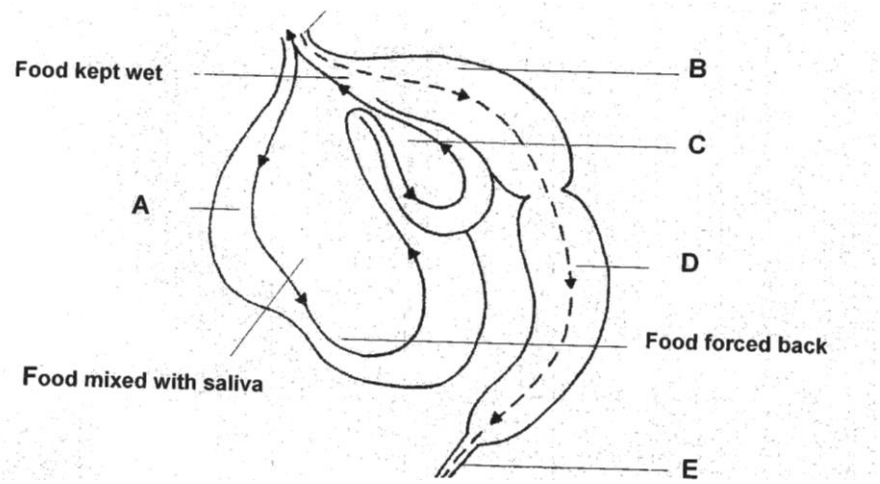


III. Alimentary canal for cattle
Identify all labeled parts and supply functions for C, D, L,



IV. Process of rumination

This process is critical in ruminants. It ensures that food ingested is properly chewed and re-swallowed for chemical digestion to continue.



C. Calculations

NB: In all calculations, don't forget to use a calculator.

I. Digestibility coefficient:

Note the formula and the calculations for digestibility coefficient

$$\text{Digestibility coefficient t} = \frac{(\text{Feed intake} - \text{moisture}) - \text{DM Excreted}}{(\text{Feed intake - moisture})} \times 100$$

OR

$$\text{Digestibility coefficient} = \frac{\text{Dry matter intake} - \text{Dry matter of manure}}{\text{Dry matter intake}} \times 100$$

E.g. A cow eats 10kg of maize with a 10% moisture content and excreted 4kg of dry matter

$$= \frac{9\text{ kg} - 4\text{ kg}}{9\text{ kg}} \times 100$$

$$= \frac{5\text{ kg}}{9\text{ kg}} \times 1OO$$

$$= \frac{500\text{ kg}}{9\text{ kg}}$$

= 55,6 % (56 %)

ii. Nutritive ratio (NR)

Note the following:

- Know the Definition of Nutritive Ratio

NR is defined as a ratio used to determine the protein content of feed for animals

- Know the formula of NR
- Interpretation/implication of the Narrow and Wide ratios

$$NR = 1: \frac{\%\ \text{Non-nitrogen substances}}{\%\ \text{Digestible Protein (DP)}}$$

OR

$$NR = 1: \frac{\%\text{Total digestible nutrient (TDN)} - \%\text{Digestible protein (DP)}}{\%\ \text{Digestible Protein (DP)}}$$

Calculate the NR— (a). Maize has a TDN of 80% and DP of 10%

(b) Soya bean has a TDN of 72% and DP of 12%

(c) Oats has a TDN of 95% and DP of 5%

$$NR = 1: \frac{80 - 10}{10}$$

$$= 1: \frac{70}{10}$$

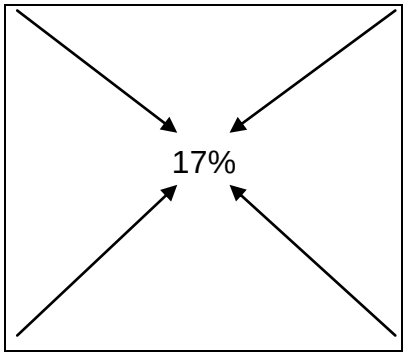
= 1:7 (Wide NR) above 1:6 .Suitable for Maintenance(more carbohydrates and less proteins)

NB IF NR is 1:5 or less(Narrow NR) the feed is Suitable for growth , production and reproduction(MORE Proteins and Less carbohydrates).

iii. Pearson square

A Pearson square is used to balance rations. If for instance, a farmer has got Sorghum meal that contains 13% digestible protein (DP) and oilcake meal with digestible protein content of 23% . The farm animals kept require 17% digestible protein (DP), then the calculation for balancing the rations is done as follows:

Sorghum meal 13% 6 parts



oil cake meal 23%
4 parts

2. Animal Production Protection and Control:

A. Concepts

i. Animal Production

- Intensive production system
- Extensive production system
- Subsistence farming
- Commercial farming

ii. Protection and Control

- Internal parasites
- External parasites
- Plant poisoning

B. Structures

Handling facilities

C. Life Cycles

3. Animal Reproduction : -

A. Concepts

i. Primary and secondary reproductive organs (Male and Female)

ii. Spermatogenesis : -

iii. Oogenesis/Ovigenesis

iv. Ovulation

v. Oestrus

vi. Gestation/Pregnancy

vii. Parturition

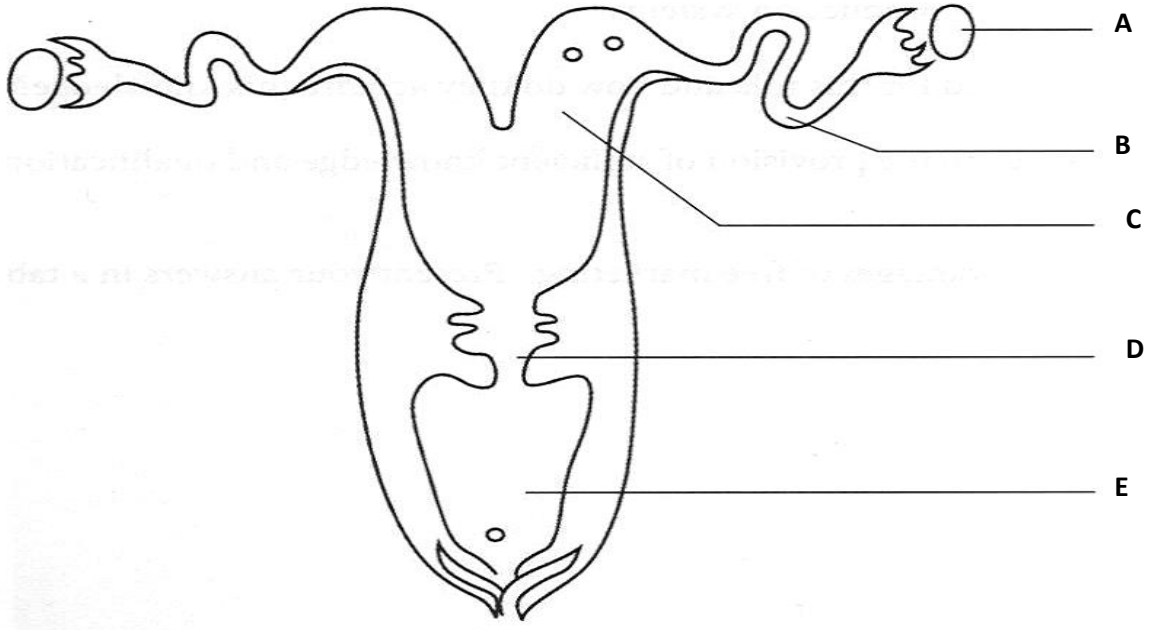
viii. Lactation

ix. Dystocia

D. Diagrams

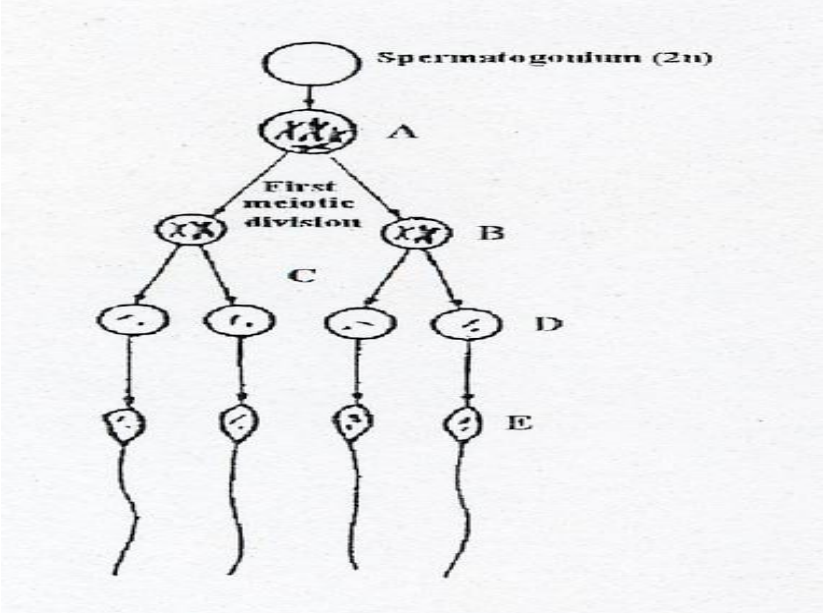
i. Female reproduction system

Identify labels in the diagram below:

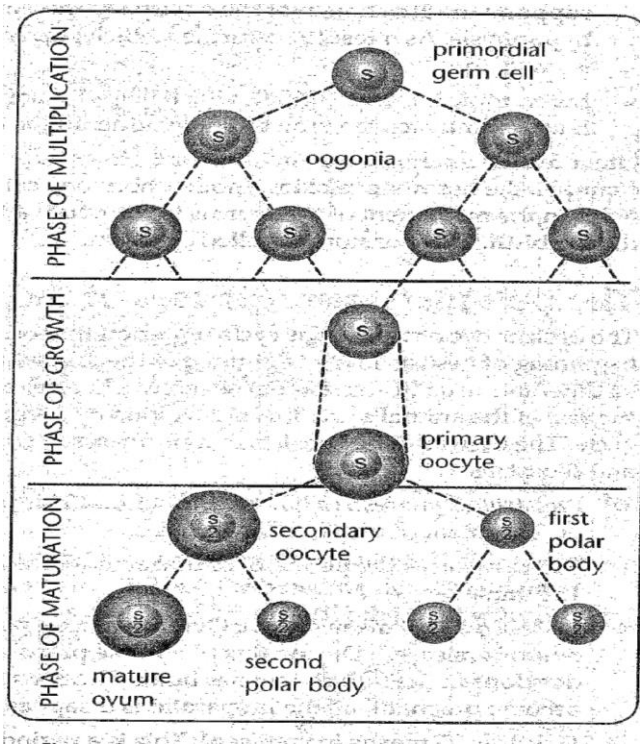


ii. Spermatogenesis

Take note of how the process unfolds in the testes



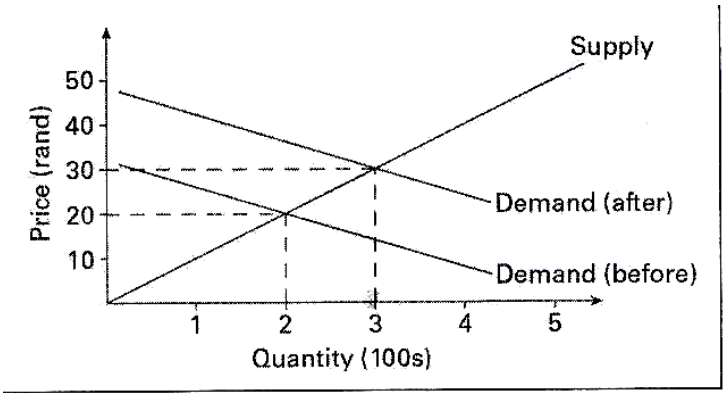
iii. Oogenesis



PAPER 2

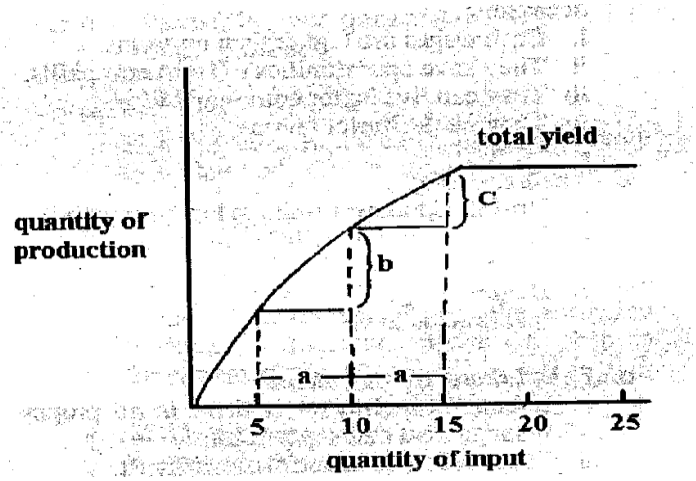
1. Agric. Management and Marketing :-
   A. Concepts
      i. Demand
      ii. Supply
      iii. Market equilibrium
      vi. Market
   B. Graphs
   Demand, supply curve and market equilibrium

C.



2. Production factors
   A. Concepts
   i. Land
   ii. Labour (labour legislations)
   iii. Capital
   Iv. Management

   B. Graph
   Law of diminishing returns



C. NB: KNOW the differences between Liabilities and assets.

For you to do: Differentiate between Liabilities and assets

3. Basic Agricultural genetics

A. Concepts

i. GMOs (definition, benefits and risks)

II. Phenotypes

iii.Genotypes

vi.dominance

v. Atavism

vi. Prepotency

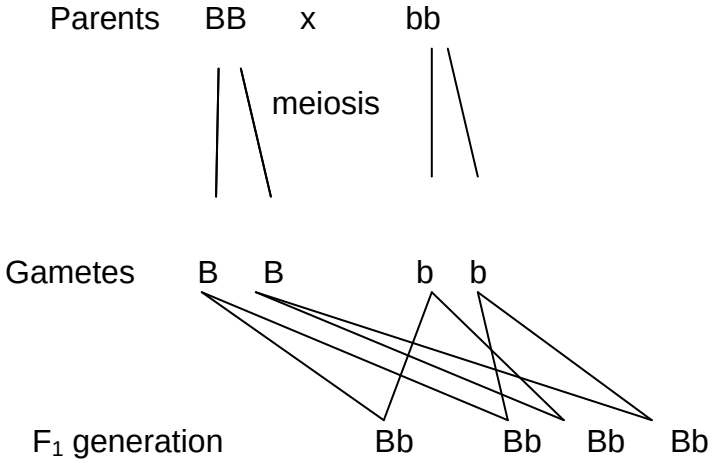
vii. Mutation

viii. Variation

xi. Selection

x. Monohybrid & Dihybrid crosses(Mendel's laws)

B. illustration and schematic representation



Ii.Punnet square

Gametes	B	B
B	Bb	Bb
B	Bb	Bb

BASIC GENETICS IN DETAIL
PAPER 2
GRADE 12

A. GENETIC CONCEPTS:

***Monohybrid cross /monohybridism**= when a **single** factor is involved in cross breeding. Eg Tallness x shortness

***Dihybrid cross /dihybridism** = when **two** factors are involved in cross breeding. eg Tall &Light x short & dark

***Phenotype** ======= physical/outward appearance of an organism

***Genotype** ======= genetic composition of an organism

***Alleles** ======= alternate forms of genes/pairs of Genes (TT, Tt, tt, WW, Ww, ww)

***Homozygous alleles**== similar/identical pairs of Genes (TT, tt ,WW, ww, BB, bb)

***Heterozygous alleles**== dissimilar pairs of genes(Tt, Ww, Bb Zz, Ll, Dd)

***Prepotency=**====== ability of an organism/individual to transmit its characteristics to the offspring/progeny.

***Atavism**======== Reappearance of ancestral characteristics

B.**MONOHYBRID CROSS**

-when a single factor is involved in cross breeding

B.1.WITH DOMINANCE (COMPLETE DOMINANCE)

T=tall, t=short

enotype**= P1**: TT x tt (homozygous parents)

Meiosis

T T t t (gametes)

F1: Tt Tt Tt Tt (**All** hybrid **tall** & **heterozygous** offspring)

	t	t
T	Tt	Tt
T	Tt	tt

Punette square

Tt x Tt (tall & heterozygous)

T t T t (gamete)

F2: TT Tt Tt tt

Punette Square

	T	t
T	**TT**	**Tt**
t	**Tt**	**tt**

RATIOS: Phenotype==

Genotype===

% : Tall===

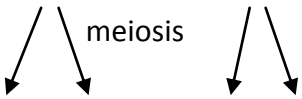
Pure bred (very) tall===
Hybrid (medium) tall==
Reccessive (very) short

B.2. WITHOUT DOMINANCE (INCOMPLETE DOMINANCE)

*Mendell used flowers of different colours

eg Red flowers(R) and a White flower(r)

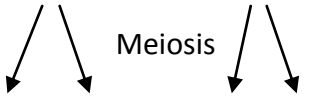
Genotype: P1 = RR x rr



R R r r (gametes)

	r	r
R	Rr	Rr
R	Rr	Rr

Rr x Rr (**Pink and heterozygous**)



R r R r

F2== RR Rr Rr **rr** **(How many colours do you see?)**

Punette square
F2 Generation

	R	r
R	RR	Rr
r	Rr	rr

For you to do:

Give the ratio of each of the following:

Phenotype=

Genotype=

Give the % of : Red flowers=

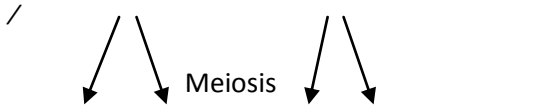
Pink flowers=

White flowers=

C. CO-DOMINANCE

- There is **NO** Recessiveness
- Both characteristics (colours) **are dominant**
- Both colours of the parents will equally appear in the offspring
- The offspring will have a **Roan** colour

Eg. BB (Black bull) x WW (White cow)



B B x W W (gametes)

F1 BW BW BW BW (Roan colour)

Summary:

	DOMINANCE	INCOMPLETE DOMINANCE	CO-DOMINANCE
COLOUR OF OFFSPRING	• One colour is dominant and the other is recessive. • The offspring resembles one of the parents	• There is no dominance • None of the parents' colours will be visible to the offspring • The offspring has **one** colour which is completely different from its parents	• There is no recessiveness • Both colours are dominant • Both colours of the parents equally appear in the offspring • This colour of the offspring is called a **Roan colour (**White and Black spots/patches)

C.DIHYBRID CROSS

-Two factors are involved in cross breeding

Mendell used seeds

Round (R) and Yellow (Y) x Wrinkled (r) and green (y)

Genotype: P1 = RRYY x r r yy

↓ Meiosis ↓

RY RY RY RY ry ry ry ry **(gametes**) genes in pairs

F1: === **RrYy (All Round and Yellow & heterozygous**)

Punette Square- F1

RY	ry	ry	ry	Ry
RY	**RrYy**	**RrYy**	**RrYy**	**RrYy**
RY	**RrYy**	**RrYy**	**RrYy**	**RrYy**
RY	**RrYy**	**RrYy**	**RrYy**	**RrYy**
RY	**RrYy**	**RrYy**	**RrYy**	**RrYy**

RrYy x RrYy (heterozygous)

↓ Meiosis ↓

RY Ry rY ry RY Ry rY ry (gametes) genes in pairs.

Punette Square

	RY	Ry	rY	ry
RY				
Ry				
rY				
Ry				

RATIO: Phenotype: Round &Yellow

Round & green

wrinkled & Yellow=

wrinkled & green=

MENDELL'S LAWS OF INHERITANCE

First Law : **When Mendell discovered GENES**

- Genes are transmitted from one generation to the next.

Second Law : **Dominance and Recessiveness**

-Some genes are dominant and others are recessive

Third Law **: Law of Segregation**

- During meiosis pairs separate to form gametes

eg

RR

/ meios**is **

R R

Fourth Law: **Independent assortment /Dihybrid cross /Dihybridism**

-Independent pairs of genes are released during meiosis

eg RRYY

/ meios**is **

RY RY RY RY

AGRICULTURAL SCIENCES

TOPIC: TIPS AND FREQUENTLY ASKED QUESTIONS

1.TIPS FOR SUCCESS IN AGRICULTURAL SCIENCES: GRADE 12

Do your learners often struggle with the data response questions in the final exam? Try these hints to help them cope:

1.1. Analyse the question before rushing to answer!

The learners should first read the case studies, scenarios, data tables graphs and passages slowly and carefully, and then once more. The first task is to make quite sure that they understand case studies, scenarios, data tables graphs and passages and at what level they are being asked to answer it. So they must reread the question, underline key words and then decide what is being asked of them.

They can use these questions to guide them:

- What is the topic about? What is the issue?
- What am I asked to do?
- What knowledge is required?
- Am I asked for an opinion that I must motivate?
- Must I provide a counter opinion (different view) as part of my answer?

1.2. Common Agricultural Sciences key words

Here are some common key words in Agricultural Sciences. They ask for different kinds or levels of thinking, and different kinds of answers. Explain them to your learners. These words ask for simple information in different ways:

Define Give the exact meaning of a term or concept, using your own words or mathematical symbols. *Example: Define the term digestion.*

Describe Outline a process, structure, phenomenon or investigation in your own words (use diagrams when asked). *Example: Describe gaseous exchange.*

Identify or indicate Choose or single out from other information. ***Example: Identify part the letter that represents the organ for excretion.***

List State briefly, in point form or one underneath the other. ***Example: List four compartments of a ruminant stomach.***

State Give or say, without any supporting arguments. ***Example: State three reasons why it is necessary to supplement roughage.***

Deduce A question to make a conclusion based on information/data provided. **Example: Deduce the relationship between demand and supply**

Calculate Use a formula to work out an answer. (Show all calculations.)

Example: Calculate the nutritive ratio (NR) of feed A.

Tabulate Present responses in a table. **Example: tabulate the differences between intensive and extensive production systems**

Select Choose from the information provided. ***Example: Select two sources of finance on a farm.***

1.2. Dos and don'ts

- **Don't** put in long sentences and personal emotional comments. Stick to presenting the facts and viewpoints as straightforwardly as possible. If asked for your personal opinion, as well as pie charts
- **Read** the questions very carefully and present your answers according to the action words in the questions. For example compare, tabulate, explain and/or describe.
- Don't provide drawings or flow charts if not asked.
- **Make** sure that you have a deep understanding of all the key concepts (for Agricultural Sciences in all knowledge areas)
- **Make** sure that you are able to interpret line, bar graphs and tables

2.FREQUENTLY ASKED QUESTIONS (FOR THE PAST FOUR YEARS) : AGRICULTURAL SCIENCES				
PAPER 1				
TOPICS	**2012 November**	**2013 November**	**2014 November**	**2015 November**
1. Animal Nutrition	Alimentary canal of a ruminant(Labeling, Requirements of rumen micro organisms	Alimentary canal of a ruminant(Labeling, functions of major parts)	Diagram illustrating the route of food in ruminant stomach	Alimentary canal of a non-ruminant(Labeling , functions of major parts)
	Calculation of (digestibility co-efficient.	Calculation of digestibility co-efficient – implication of calculated value	Calculation of digestibility co-efficient – implication of calculated value	Calculation of (digestibility co-efficient). Processes used to improve digestibility of feeds
	Calculation of nutritive ratio NR)	Calculation of nutritive ratio NR(Suitability of NR)	Calculation of nutritive ratio NR(Suitability of NR)	
	• Calculation of Pearson Square	Calculation of Pearson – Square(ratio & percentage of feeds)	Calculation of Pearson – Square(ratio & percentage of feeds • Fodder flow programme (bar graph – cost effective measures for better utilization of feeds)	• Calculation of Pearson Square • Fodder Flow (Calculation)

	• Enzymatic digestion • Structure of the villus (Labeling and absorption)	• Adaptation of parts for absorption) • Absorption of fat molecules	Nutritional value of pasture on micro organisms	
	Vitamin A (Functions and deficiency symptoms) Methods of supplementing vitamins & minerals	• Deficiency symptoms of vitamins & minerals	vitamins & minerals	Water (functions) Deficiency symptoms of vitamins & minerals
2. Animal production, protection and control	• Extensive production system(optimizing production, primary products)	Characteristics of intensive production system	Extensive and intensive production system (characteristics, measures to increase production in an extensive system) Free range production system (advantages & disadvantages	Extensive and intensive production system(Differences)
	• Animal handling and behavior(Behavioural patterns)	• Animal behaviour • Impact of temperature on production	• Handling and management of farm animals (structure used to handle animals)	

	• External parasites(passage on ticks, economical value of ticks, life cycle of bont tick, biological control of external parasites • Vaccination programme • The role of state in animal protection	• Pest and disease management • Indigenous farm animals (case study) • Disease control measures (indigenous v/s chemical)	• External parasites(control & diseases) • The role of state over medication • Characteristics of eco- • friendly chemicals • Plant poisoning(examples and control measures)	External parasites(method used to administer remedies)
	• Fat content(graph)	• Feed consumption v/s production • Broiler production	• Impact of temperature on production	•
3. Animal reproduction	• Male reproductive system (spermatogenesis, structure of spermatozoon)	• Artificial insemination(AI) • Pregnancy (stages)	• Female reproductive system(labeling)	• Parturition(stages in pictures) • Signs of parturition

	• Hormones [graph] (oestrogen & progesterone)	• Hormones [graph] (oestrogen & progesterone) • Signs of oestrus • Adaptability of infundibulum to • capture ova	• Oestrogen & progesterone (role in oestrus cycle) • Structure of spermatozoon(labeling & • functions) • Artificial insemination(AI) – definition & requirements • Embryo transfer(ET) – stages and benefits	• Hormones[graph] Oestrogen & progesterone) • Oogenesis • Cloning
ADD YOUR OWN NOTES:				

PAPER 2				
TOPICS	**2012 November**	**2013 November**	**2014 November**	**2015 November**
1. Agricultural marketing and management	• Supply and demand (market equilibrium, inelasticity of supply, role of processing in supply) • Developing marketing strategy(marketing elements) • Business plan(items to be included • Characteristics of successful entrepreneur • Marketing systems	• Comparing prices using a bar graph • Agri-business chain • Demand and supply • Price trend in a market system • Sequence in decision making process	• Line graph on supply • Market strategy to increase supply • Agri-business chain • Economic reasons for decrease in supply • Marketing strategies and procedures • SWOT analysis • Aspects of feasibility study	• Marketing type • Relationship between price , supply and demand • Graph
2. Production factors	• Case study on production factors • Forms of assets • Problems of capital and	• Case study on land (land reform policy, aims of equity schemes) • Capital (forms and sources)	• Labour contracts (type of farm labour signing a contract) • Labour legislation • Impact of HIV/AIDS	• Case study

	ways to increase capital • Management as a production factor • Land (Ways to improve land productivity) • Labour (ways to improve labour productivity, HIV/AIDS on labour productivity) • Net value (definition & calculation) • Law of diminishing returns (causes of decrease in production output)	• Farm labour (characteristics of a permanent labourer, causes for loss of farm labour)	on farm labour • Capital (examples from a diagram, assets and liabilities) • Land (law of diminishing returns, measures to increase land productivity) • External factors impacting on farm business • Essential farm records	• Labour legislation • Labour (ways to improve labour productivity • Land (law of diminishing returns, measures to increase land productivity)

3. Basic agricultural genetics	• GMOs (dangers of GMO food, benefits of GMO food) • Phenotypic and genotypic ratios • Drawing of a Punnet square • Selection and variation(uses of variation in breeding, importance of variation) • Importance of index value • Cloning (Steps and importance/advantages) • Role of co-dominance	• Incomplete and co-dominance • Genotypic and phenotypic percentages • Calculation of Estimated breeding value(EBV) • Species crossing(importance) • GMO (techniques used, conventional seeds vs GMO seeds, advantages of GMO)	• Hybrid crossing(phenotype and genotype) • Drawing of a Punnett square • Comparison of upgrading, line breeding and crossbreeding. Disadvantages of line breeding • The difference between co-dominance and incomplete dominance • GMO (methods / techniques used, disadvantages.) • Differences between continuous and discontinuous variation • Selection (methods and definition)	• Monohybrid cross • Breeding system (upgrading) • Difference in yield(GMO & non-GMO) • Pontential benefits (Advantages) • Pontential risks (Disadvantages)