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Module 2 Units 4 – 5

Agricultural Sciences

Animal feed

This support pack for the **Animal feed** module in the **Agricultural Sciences Grade 12 CAPS curriculum** provides valuable revision activities. All activities have the answers provided. Learners can work through these individually at home or these could form the basis of a catch-up class or online lesson. You have permission to print or photocopy this document or distribute it electronically via email or WhatsApp.

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Module 2 – Animal feed

Unit 4 Energy value of feed

Short questions

1. Various possible answers are provided for the following questions. Write only the correct letter (A–D) next to the question number.

1.1 Nett energy is the ……. .

A energy gained from a feed
B digestible energy minus the energy excreted in the faeces
C gross energy minus the energy in urine and gases
D the amount of energy used for maintenance and production

1.2 The speed at which chemical reactions occur inside the body of an animal to release energy is called the ……. rate.

A digestible
B metabolic
C kinetic
D palatability

1.3 Energy is normally measured in ……. .

A kW
B MW
C kJ
D MPa

1.4 Which ONE of the following is the correct calculation for nett energy?

A NE = GE – energy lost in faeces and urine
B NE = GE – energy lost in gases and body heat
C NE = ME – energy lost in faeces and urine
D NE = ME – energy lost as body heat

1.5 ……. is the energy that is actually available for maintenance and production purposes such as growth, lactation and weight gain.

A Nett energy
B Digestible energy
C Metabolic energy
D Gross energy

5 × 2 (10)

2. Supply ONE word/term for each of the following descriptions. Write only the word/term next to the question number.

2.1 The portion of gross energy that is utilised for work, growth and fattening
2.2 The energy that remains after the energy lost in faeces
2.3 A process in the rumen of ruminants that results in the loss of energy by means of eructation of methane and carbon dioxide

3 × 2 (6)

Longer questions

3. A lactating dairy cow was fed 30 kg of fishmeal with a gross energy (GE) value of 18,4 MJ/kg of dry matter (DM) intake. After the feed was digested and absorbed in the digestive tract, the following energy losses from the DM intake occurred: 43% was lost in the faeces, 3% in the urine, 8% as fermentation gases and 15% was lost as body heat. Calculate the following energy values of the fishmeal consumed by the cow:

3.1 digestible energy (DE) (4)
3.2 metabolic energy (ME) (5)
3.3 nett energy (NE) (4)
3.4 nett energy per kg of DM intake (3)

4. Study the following table that represents the energy content of feeds and milk production of three different dairy cows.

Cow	Target milk yield (l/day)	Estimated energy required (MJ/day)	Possible DM intake (kg/day)	Required energy content of feed (MJ/kg of DM/day)
1	20	170	15	
2	23	186	15	
3	25	198	17	

4.1 Calculate the required energy content of the feed per day to reach the milk production target. (6)

4.2 Supply reasons why the lactating dairy cows require such high amounts of energy per day. (4)

4.3 How will the digestibility of a feed affect the energy obtained from the feed? (2)

4.4 Which TWO feed components supply the most energy? (2)

4.5 Briefly explain how the energy level of a feed will influence the milk production of a cow. (4)

Unit 5 Nutritive ratio

Short questions

1. Various possible answers are provided for the following questions. Write only the correct letter (A–D) next to the question number.

1.1 The concept 'nutritive ratio' is used to give an indication of the ……. content of the feed.

A fibre
B mineral
C non-nitrogen
D protein

1.2 A feed with total digestible nutrients (TDN) of 75% and a DP of 12% has a nutritive ratio of ……. .

A 1 : 7,25
B 1 : 5,25
C 1 : 6,25
D 1 : 6,75

1.3 The feed in 1.2 has a non-nitrogen content of ……. .

A 75%
B 87%
C 63%
D 6,25%

1.4 The feed in 1.2 has a ……. content.

A high fibre
B low fibre
C low DP
D lower TDN

1.5 Which ONE does not fit in with a wide nutritive ratio?

A high fibre and low DP
B high fibre and NR greater than 1 : 6
C low fibre and lower TDN content
D low DP and NR greater than 1 : 6

5 × 2 (10)

2. In the table below a description and TWO possible answers are given. Decide whether the description in column B relates to A only, B only, both A and B or neither A nor B of the answers in column A.

Column A			Column B
2.1	A	NR of 1 : 6	More than 60% TDN and low fibre content
	B	NR of 1 : 10	
2.2	A	Concentrate feed	Wide nutritive ratio with a high fibre content
	B	Roughage feed	
2.3	A	High DP content	Concentrate feeds suitable for growth, reproduction and milk production
	B	Low fibre content	
2.4	A	Concentrate feed	Wide nutritive ratio suitable for fattening of farm animals
	B	NR of lower than 1 : 6	
2.5	A	Low fibre and high DP contents	Roughage feeds with a wide nutritive ratio
	B	High fibre and low DP contents	

5 × 2 (10)

Longer questions

3. Nutritive ratio (NR) plays a very important role in the scientific feeding of animals for optimal growth and production. The following two feeds were used in a feeding programme for cattle:

- Feed A has a total digestible nutrient (TDN) content of 81,9% and a digestible protein (DP) content of 6,9%.
- Feed B has a total digestible nutrient (TDN) content of 78,0% and a digestible protein (DP) content of 13,2%.

3.1 Calculate the NR for each of the feeds (A and B). (8)

3.2 Briefly explain what is meant by nutritive ratio of a ration. (2)

3.3 From your calculations in 3.1, deduce the feed type that will be most suitable to raise heifers. Supply reasons for your answer. (6)

3.4 Which one of the two types of feeds would you recommend for fattening of animals? Supply reasons for your answer. (6)

3.5 Animal feed is divided into two main components. Which ONE of these main components determines the nutritive value of a feed or ration? (1)

Memorandum

Unit 4

Short questions

1.1 D **1.2** B **1.3** C **1.4** D **1.5** A (10)

2.1 Nett energy **2.2** Digestible energy **2.3** Fermentation (6)

Longer questions

3.1 DE of 30 kg of DM intake = GE – energy lost in faeces
= (18,4 MJ/kg × 30 kg) – (43% of GE)
= 552 MJ – 237,36 MJ
= 314,64 MJ (4)

3.2 ME of 30 kg of DM intake = DE – (energy lost in urine + energy lost as fermentation gases)
= 314,64 MJ – (3% + 8% of GE)
= 314,64 MJ – (16,56 MJ + 44,16 MJ)
= 314,64 MJ – 60,72 MJ
= 253,92 MJ (5)

3.3 NE of 28 kg of DM intake = ME – energy lost as heat
= 253,92 MJ – (15% of GE)
= 253,92 MJ – (15% of 552 MJ)
= 253,92 MJ – 82,8 MJ
= 171,12 MJ (4)

3.4 NE of 1 kg of DM intake = 171,12 ÷ 30
= 5,704 MJ/kg of DM
= 5,7 MJ/kg of DM (3)

4.1 Cow 1: 11,3 MJ/kg of DM/day (170 ÷ 15)
Cow 2: 12,4 MJ/kg of DM/day (186 ÷ 15)
Cow 3: 11,6 MJ/kg of DM/day (198 ÷ 17) (6)

4.2 Lactating cows' requirements of energy:
- Maintenance of body systems
- Milk production/Lactation/Milk yield/Milk composition
- Maintenance of pregnancy
- Weight gain (4)

4.3 The higher the digestibility of the feed, the higher the metabolic energy the cow will obtain from the feed./The less digestible the feed, the less energy the cow will obtain from the feed. (2)

4.4 Carbohydrates, fats and oils (lipids) (2)

4.5 Effect of energy level of feed on milk production:
- To produce more milk, a cow must consume more dry matter (DM).
- If a feed has a lower energy density, the cow must consume a greater amount of the feed.
- The lower the energy level of the feed, the lower the milk production will be.
- The higher the energy level of the feed, the higher the milk production will be. (4)

Unit 5

Short questions

1.1 D **1.2** B **1.3** C **1.4** B **1.5** C (10)

2.1 A **2.2** B **2.3** Both A and B
2.4 Neither A nor B **2.5** B (10)

Longer questions

3.1

Feed A

% digestible non-nitrogen nutrients in the feed:
% TDN – % DP = % NPN
= 81,9 – 6,9
= 75%

NR of the feed $= 1 : \frac{\text{\% digestible non-nitrogen nutrients}}{\text{\% digestible protein (DP)}}$

$= 1 : \frac{75}{6,9}$

= 1 : 10,86 = 1 : 10,9

Feed B

% digestible non-nitrogen nutrients in the feed:
% TDN – % DP = % NPN
= 78 – 13,2
= 64,8%

NR of the feed $= 1 : \frac{\text{\% digestible non-nitrogen nutrients}}{\text{\% digestible protein (DP)}}$

$= 1 : \frac{64,8}{13,2}$

= 1 : 4,9 = 1 : 5

3.2 Nutritive ratio of a ration refers to the ratio between the digestible proteins (DP) and the digestible non-protein compounds of a feed. (2)

3.3 Feed B

Reasons why feed B is most suitable for raising heifers (any five):

- High concentration of digestible protein that is necessary for growth
- High nutritive value
- Concentrate feed
- Low fibre content
- High biological value
- NR is less than 1 : 6 (ratio is narrow) (6)

3.4 Feed A

Reasons why feed A is most suitable for fattening of animals (any five):

- Relatively few digestible proteins
- Lower nutritive ratio/Higher proportion of other digestible nutrients such as carbohydrates and fats
- Roughage
- High crude fibre content
- Low biological value
- NR is more than 1 : 6 (ratio is wide) (6)

3.5 Dry matter (1)