**ANIMAL NUTRITION**

**Chapter 3: Nutrient Requirements**

***(Dr. Muteeb ullah Rafiqui, PhD Scholar; Dr. Jan Mohd. Muneeb.PhD Scholar***

***ICAR-IVRI, Izatnagar, Bareilly)***

* **Feedstuffs are classified in roughages and concentrates.**
* Roughages are classified into succulent and non-succulent, leguminous and non-leguminous, green, and dry.
* **Based on nutritive value……**
* Maintenance type (3-5%DCP e.g. Non legumes: cereal fodders, grasses, and their hay).
* Productive type (more than 5% DCP e.g. legume fodders and their hay).
* Non-maintenance type (below 3% DCP e.g. Straw & strovers).
* **Concentrates are classified into three categories based on digestible protein and energy.**
* Carbonaceious--- Rich in energy and low in DCP (cereal grains).
* Proteinous--- very rich in DCP (oilseed meals and cakes)
* Products with energy and protein in intermediary position--- brans, husk and chunies.
* **Energy and protein are the most limiting factors in the diet.**
* **DM requirement of an animal depends on its body weight & its status of productivity.**

|  |  |
| --- | --- |
| Zebu cattle: | 2 to 2.5 Kg/100 Kg body weight |
| Crossbred cow & Buffalo: | 2.5 to 3Kg/100 Kg body weight |
| Sheep: | 3% of body weight |
| Meat goat: | 3% of body weight |
| Dairy goat: | 4 to 6% of their live weight |
| Adult mature horse: | 1.5 to 2.5% of body weight |
| Camel: | 2% of body weight |

**BIS Specifications for Cattle Feeds:**

|  |  |  |
| --- | --- | --- |
| **Item** | **Type I** | **Type II** |
| Moisture, % max | 11 | 11 |
| CP, % min | 22 | 20 |
| Ether Extract, % min | 3 | 2.5 |
| CF, % max | 7 | 12 |
| AIA, % max | 3 | 4 |

* **DCP and TDN requirement for ruminants:**
* Zebu cattle, buffaloes & crossbred animals------ 2.84g of DCP & 33.74 g TDN per unit metabolic body size
* Sheep-------- DCP 2.73 g/kg W0.75 & TDN 27.3 g/kg W0.75
* Goat--------- DCP 3.0g/kg W0.75 & TDN 30g/kg W0.75
* **Maintenance Ration:**

|  |  |  |
| --- | --- | --- |
| Feedstuff | For Zebu cattle | For Crossbred cows &buffaloes |
| Straw | 4 kg | 4-6 kg |
| Concentrate mixture | * + 1. kg | 2kg |

* **Extra allowance during pregnancy:**
* During last trimester……Extra 1.25 kg & 1.75 kg concentrate is recommended for zebu & crossbred cow/buffalo respectively.
* **Extra allowance for milk production:**
* In case of zebu, an additional amount of 1kg concentrate mixture is provided for every 2.5kg of milk over and above maintenance.
* In case of Buffaloes, an additional amount of 1kg concentrate mixture for every 2kg of milk over & above maintenance.
* **Colostrum feeding of calf:**
* Fed @ 1/10th of body weight.
* Should be given fresh as milked from mother within 2 hours.
* Calf should receive colostrum during first three days of its life.
* It should not be warmed as it will clot due to presence of large quantities of protein.
* The protein content of colostrum is 17% as against only 3.5%in ordinary milk…… majority are immunoglobulins (IgM, IgA, IgG).
* The high content of vitamins (A, D&E) and minerals (Ca, Mg, Fe &P) help the calf to resist against diseases.
* Laxative action of colostrum……. clears meconium**.**
* **Feeding Standards**
* Statements of the amounts of nutrients required by the animals.
* Given separately for each function of the animal (for maintenance, for pregnancy) or as overall figures for the combined functions (for maintenance and pregnancy).
* Expressed either in quantities of nutrients or in dietary proportions.

**Classification of feeding standards:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No.** | **Comparative type** | **Productive type** | **Digestible Nutrient Type** |
| **1** | Fjord’s Scandinavian “Feed unit” standard | Kellner’s feeding standard | Wolff’s, Wolff’s-Lehmann’s standard |
| **2** | Thaer’s hay equivalent | Armsby feeding standard | Morisson’s feeding standard (also k/a Modified Wolf-Lehmann standard) |
| **3** |  | Agricultural Research council standard | Savage feeding standard |

* Albert Thaer developed concept of **“Hay Equivalent”** in 1810.
* Meadow hay was used as a unit to compare other feeds**.**
* Grouven formulated the first feeding standard for animal in 1859 with protein, carbohydrate and fat as essential nutrients.
* Wolff’s standard: Based on digestible protein, digestible fat and digestible carbohydrates. However, this standard has not taken care of the quantity and quality of milk produced.
* Wolf-Lehmann standard: Considered the quantity of milk produced but not its quality.
* Haecker’s standard: Showed that nutrient requirements varied not only with quantity of milk produced but also with its quality.
* Atwater’s feeding standard: Based on **available fuel values** of feed.
* Scandinavian feed unit standard: Developed by Professor Fjord in 1884. He considered one pounds of barley as feed unit and compared other feeds with it.
* Starch equivalent system:
* Given by Kellner.
* Based on digestible true protein and net energy.
* Armsby feeding standard:
* Based on true protein and net energy which is also known as Net energy system.
* Morrison’s feeding standard:
* Also known as Modified Wolf-Lehmann’
* Published in 1915 in the 15th edition of his own book “Feed & Feeding”.
* Based on DM, DCP &TDN.
* National Research Council’s standard (NRC):
* USA in 1945
* Concept of metabolizable protein.
* Agricultural Research Council’s Standard (ARC):
* UK in 1959
* It is now replaced by Agricultural and Food research council (AFRC).
* Energy value expressed as Starch equivalent instead of TDN/ME or NE.
* Protein value as RDP & RUDP.
* Indian feeding standard given by Sen & Ray (1964) for feeding of zebu cattle and buffaloes are based on mid Morrison value
* **DM: Water intake**
* **Water requirements are highly related to Dry matter intake of animals.**
* Adult cattle 1:3 to 3.5
* Calves 1:6 to 7
* Sheep & Goats 1:4
* Swine 1:3
* Poultry 1:2
* **Methods Employed in Ration formulation:**
* **Pearson’s square method**
* **Trial & error method**
* **Linear Programming**
* **Linear and stochastic programming method**

**Note: Least cost ration** is the ration which is balanced by using a combination of ingredients with the lowest possible total cost.

* **Feeding of livestock during Scarcity:** scarcity of feed is mostly seen in natural calamities such as drought, floods, etc.
* Animals are fed in groups.
* Complete feed blocks------ crop residues, dry grasses & leaves are chaffed, densified with addition of brans, molasses, minerals and compressed further at the place of availability.
* **Types of Pet food:**
* Semi-moist foods----- 30%water
* Dry foods------ 10% water.
* **Horses:**
* Hindgut fermenter
* DMi ------ 1.5 to 2.5% body weight
* Grain------ oats, barley & maize (oats most common).
* 6 months to 1 year----- 18% CP
* Lactating mare ------- 12-14%CP
* Racehorses ------- 18% CP
* **Swine:**
* Hindgut fermenter.
* Creep feed introduced at 7 to 10 days until 56 days.
* Pig starter/creep feed---------- 20% CP & 3360 kcal/kg ME.
* Pig growth meal ----------- 18% CP & 3170 kcal/kg ME.
* Pig finishing/breeding meal---16% CP & 3170 kcal/kg ME.

**Requirement of chicken broiler feed& layer feed (BIS 2007)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S.No. | Characteristics | Broiler  Prestarter  (1-7days) | Broiler  Starter  (8-21days) | Broiler  Finisher  (22-42days) | Layer  Chick | Layer  Grower | Layer  phase -  I | Layer  phase - II |
| 1 | Moisture, % by mass, max | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 2 | CP%,min | 23 | 22 | 20 | 20 | 16 | 18 | 16 |
| 3 | CF,%,max | 5.0 | 5.0 | 5.0 | 7.0 | 9.0 | 9.0 | 10 |
| 4 | ME (kcal/kg), min | 3000 | 3100 | 3200 | 2800 | 2500 | 2600 | 2400 |
| 5 | Salt %, max | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| 6 | Ca %, min | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 3.0 | 3.5 |
| 7 | EE,%,min | 3.0 | 3.5 | 4.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| 8 | Methionine,%,min | 0.5 | 0.5 | 0.45 | 0.4 | 0.35 | 0.35 | 0.3 |
| 9 | Lysine,%,min | 1.3 | 1.2 | 1.0 | 1.0 | 0.7 | 0.7 | 0.65 |
| 10 | Aflatoxin B1 (ppb), max | 20 | 20 | 20 | 20 | 20 | 20 | 20 |

**QUESTIONS**

1. **NPN compounds such as urea can be used to replace what percentage (%) of the protein requirements of dairy cattle and buffaloes.**

|  |  |
| --- | --- |
| a) 20% | b) 30% |
| c) 40% | d) 60% |

1. **DCP(g/W0.75/day) requirement in cattle can be calculated by using:**

|  |  |
| --- | --- |
| a) 3.84 g/W0.75 | b) 4.84 g/W0.75 |
| c) 2.84 g/W0.75 | d) 1.84 g/W0.75 |

1. **TDN(g/W0.75/day) requirement in cattle can be calculated by using:**

|  |  |
| --- | --- |
| a) 35.2 g/W0.75kg | b) 45.2 g/ W0.75 kg |
| c) 133 g/ W0.75 kg | d) 155 g/ W0.75 kg |

1. **A 400kg crossbred cow require------kg DM/day.**

|  |  |
| --- | --- |
| a) 6kg | b) 8kg |
| c) 10kg | d) 12kg |

1. **What is the DM requirement in case of zebu cattle is:**

|  |  |
| --- | --- |
| a) 1.5-2 % b.w. | b) 2-2.5% b.w. |
| c) 2.5-3 % b.w. | d) 3-3.5 % b.w. |

1. **What is the DM requirement in case of milk goat is:**

|  |  |
| --- | --- |
| a) 2-3 % b.w. | b) 3-5% b.w. |
| c) 4-6 % b.w. | d) 2-4 % b.w. |

1. **What is the DM requirement in case of meat goat is:**

|  |  |
| --- | --- |
| a) 2-2.5 % b.w. | b) 2.5-3 % b.w. |
| c) 3-4 % b.w. | d) 4-5 % b.w. |

1. **As per BIS, max permissible Crude fibre in Type-I feed:**

|  |  |
| --- | --- |
| a) 5% | b) 7% |
| c) 9% | d) 12% |

1. **For proper growth of a calf, up to what age is whole milk feeding desired?**

|  |  |
| --- | --- |
| a) 90 days | b) 180 days |
| c) 60 days | d) 30 days |

1. **What does Calf starter contain?**

|  |  |
| --- | --- |
| a) 18% DCP, 23% CP & 75% TDN | b) 19 % DCP, 25% CP & 75% TDN |
| c) 20 % DCP, 18% CP & 75% TDN | d) 22% DCP, 25% CP & 75% TDN |

1. **Which domesticated ruminant is efficient in recycling blood urea?**

|  |  |
| --- | --- |
| a) Cattle | b) Sheep |
| c) Goat | d) Buffalo |

1. **What is the maintenance ration for zebu cattle is-**

|  |  |
| --- | --- |
| a) 2kg straw & 1kg concentrate | b) 4kg straw & 1kg concentrate |
| c) 6kg straw & 1kg concentrate | d) None |

1. **What is the Production ration for zebu cattle is-**

|  |  |
| --- | --- |
| a) 1kg concentrate per 2kg milk | b) 1kg concentrate per 2.5kg milk |
| c) 1kg concentrate per 3kg milk | d) None |

1. **What is the Production ration for buffalo & cross-bred cow is-**

|  |  |
| --- | --- |
| a) 1kg concentrate per 2kg milk | b) 1kg concentrate per 2.5kg milk |
| c) 1kg concentrate per 3kg milk | d) None |

1. **What does metabolic faecal nitrogen (MFN) depend on?**

|  |  |
| --- | --- |
| a) Energy content of feed | b) Dry matter intake (DMI) |
| c) Protein content of feed | d) None |

1. **The amount of roughage in cattle feeding is-**

|  |  |
| --- | --- |
| a) 2/3% of total DM required | b) 1/3% of total DM required |
| c) 1/4% of total DM required | d) 3/4% of total DM required |

1. **The amount of concentrate in cattle feeding is-**

|  |  |
| --- | --- |
| a) 2/3% of total DM required | b) 1/3% of total DM required |
| c) 1/4% of total DM required | d) 3/4% of total DM required |

1. **What is the level of salt in cattle feeding ?**

|  |  |
| --- | --- |
| a) 2.5% of concentrate | b) 1% of roughage |
| c) 1% of concentrate | d) 1.5% of roughage |

1. **Which is the most limiting amino acid in animal feeds and severely affected by heating:**

|  |  |
| --- | --- |
| a) Tyrosine | b) Methionine |
| c) Leucine | d) Lysine |

1. **During the last trimester of gestation in cattle, how much additional DCP and TDN should be provided respectively?**

|  |  |
| --- | --- |
| a) 90-130g DCP and 1-1.1kg TDN | b) 190-230g DCP and 1-1.8kg TDN |
| c) 90-130g DCP and 1-1.8kg TDN | d) 190-230g DCP and 1-1.1kg TDN |

1. **What is the recommended provision for ruminants during natural calamities to ensure their nutritional needs are met effectively?**

|  |  |
| --- | --- |
| a) Roughages | b) concentrates |
| c) Complete feed blocks | d) None |

1. **What is the approved threshold for Aflatoxin content in cattle feed?**

|  |  |
| --- | --- |
| a) 15 ppb | b) 20 ppb |
| c) 25 ppb | d) 30 ppb |

1. **As per BIS specification, the calcium content of bone meal is:**

|  |  |
| --- | --- |
| a) 7% | b) 12% |
| c) 15% | d) 32% |

1. **As per BIS specification, the phosphorus content of bone meal is:**

|  |  |
| --- | --- |
| **a) 7%** | **b) 12%** |
| **c) 15%** | **d) 32%** |

1. **Calcium (%) content of mineral mixture containing salt (Type I) as per BIS is:**

|  |  |
| --- | --- |
| a) 14 | b) 16 |
| c) 18 | d) 20 |

1. **What is the primary contrast between mineral mixtures (Type I and II) utilized for supplementing cattle feeds, as per BIS specifications?**

|  |  |
| --- | --- |
| a) Type I mix. has 22% salt | b) Type II mix. has 0% salt |
| c) Type I mix. has 0% salt | d) Both a & b are correct |

1. **What is colostrum richer in compared to milk?**

|  |  |
| --- | --- |
| a) Minerals | b) Immunoglobulins |
| c) Vitamin A | d) All of these |

1. **How many grams of metabolic water does 1 gram of starch produce?**

|  |  |
| --- | --- |
| a) 0.40 | b) 0.56 |
| c) 1.07 | d) None of the above |

1. **How many grams of metabolic water does 1 gram of protein produce?**

|  |  |
| --- | --- |
| a) 0.40 | b) 0.56 |
| c) 1.07 | d) None of the above |

1. **1 gm of fat produces……. g of metabolic water**

|  |  |
| --- | --- |
| a) 0.40 | b) 0.56 |
| c) 1.07 | d) None of the above |

**31 How much percent (min.) of fat is essential in sheep ration?**

|  |  |
| --- | --- |
| a) 6% | b) 3% |
| c) 9% | d) 10 % |

1. **What is the daily water requirement in adult cattle?**

|  |  |
| --- | --- |
| a) 4-6 L | b) 6-8 L |
| c) 30 L | d) 40 L |

1. **What is the daily water requirement in calves, sheep, and goat?**

|  |  |
| --- | --- |
| a) 4-6 L | b) 6-8 L |
| c) 30 L | d) 40 L |

1. **The daily requirement of water in swine is**

|  |  |
| --- | --- |
| a) 4-6 L | b) 6-8 L |
| c) 30 L | d) 40 L |

1. **The daily requirement of water in buffalo is**

|  |  |
| --- | --- |
| a) 4-6 L | b) 6-8 L |
| c) 30 L | d) 40 L |

1. **What is the equivalent of 1 kilogram (kg) of Total Digestible Nutrients (TDN)?**

|  |  |
| --- | --- |
| a) 3.616 Mcal of ME | b) 4.41 Mcal of DE |
| c) 0.86 kg SE | d) All of these |

1. **In case of Pigs, ME= ……. DE**

|  |  |
| --- | --- |
| a) 0.78 | b) 0.82 |
| c) 0.96 | d) 0.85 |

1. **As per BIS specifications, Type I cattle feed should contain ……% of Crude Protein**

|  |  |
| --- | --- |
| a) 24.0 | b) 20.0 |
| c) 22.0 | d) 18.0 |

1. **As per BIS specifications, Type II cattle feed should contain ……% of Crude Protein**

|  |  |
| --- | --- |
| a) 24.0 | b) 20.0 |
| c) 22.0 | d) 18.0 |

1. **What is the daily DCP requirement for the maintenance of a 400 kg cow?**

|  |  |
| --- | --- |
| a) 0.154 kg | b) 0.254 kg |
| c) 0.354 kg | d) 0.274 kg |

1. **What is the daily TDN requirement for the maintenance of a 400 kg cow**?

|  |  |
| --- | --- |
| a) 4.03 kg | b) 2.03 kg |
| c) 3.03 kg | d) 1.03 kg |

1. **Colostrum should be fed at the rate of …... body weight in calf.**

|  |  |
| --- | --- |
| a) 1/20th | b) 1/10th |
| c) 1/30th | d) Equal to |

1. **A little amount of calf starter should be given …… day onwards in calf.**

|  |  |
| --- | --- |
| a) 15 | b) 21 |
| c) 10 | d) 30 |

1. **Frizzled feathers and rough feathers in chicks are caused by the deficiency of-**

|  |  |
| --- | --- |
| a) copper | b) Zinc |
| c) calcium | d) Phosphorus |

1. **As per ICAR 2013, ……. gm of anionic mixture/ day is recommended for 3 weeks prepartum.**

|  |  |
| --- | --- |
| a) 90 | b) 60 |
| c) 120 | d) 150 |

1. **Low Milk Fat syndrome in lactating animals is linked with:**

|  |  |
| --- | --- |
| a) Low roughage diets | b) Roughage rich diets |
| c) Low concentrate diets | d) Concentrate rich diets |

1. **Special feeding practice in ewes by providing 25% more nutrients above maintenance needs and given 2-3 weeks prior to breeding season is known as:**

|  |  |
| --- | --- |
| a) Steaming up | b) Flushing |
| c) Challenge feeding | d) All of the above |

1. **Most limiting amino acid in sheep:**

|  |  |
| --- | --- |
| a) Lysine | b) Methionine |
| c) Cysteine | d) Tyrosine |

1. **DCP and TDN requirements for maintenance in sheep:**

|  |  |
| --- | --- |
| a) 2.73g/kg W0.75 & 27.3g/kg W0.75 | b) 2.53g/g W0.75 & 25.3g/kg W0.75 |
| c) 2.93g/kg W0.75 & 29.3g/kg W0.75 | d) None |

1. **DCP and TDN requirements for maintenance in goat:**

|  |  |
| --- | --- |
| a) 2.73g/kg W0.75 & 27.3g/kg W0.75 | b) 3.0g/kg W0.75 & 25.3g/kg W0.75 |
| c) 2.93g/kg W0.75 & 29.3g/kg W0.75 | d) None |

1. **The ratio of Dry matter intake to water consumption in adult cattle is (DMI: Water consumption)-**

|  |  |
| --- | --- |
| a) 1:3 to 3.5 | b) 1:6 to 7 |
| c) 1:4 | d) 1:3 |

1. **The ratio of Dry matter intake to water consumption in calves is (DMI: Water consumption)-**

|  |  |
| --- | --- |
| a) 1:3 to 3.5 | b) 1:6 to 7 |
| c) 1:4 | d) 1:3 |

1. **The ratio of Dry matter intake to water consumption in sheep and goats is (DMI: Water consumption)-**

|  |  |
| --- | --- |
| a) 1:3 to 3.5 | b) 1:6 to 7 |
| c) 1:4 | d) 1:3 |

1. **The ratio of Dry matter intake to water consumption in swine is (DMI: Water consumption)-**

|  |  |
| --- | --- |
| a) 1:3 to 3.5 | b) 1:6 to 7 |
| c) 1:4 | d) 1:3 |

1. **If lipid content in the diet of ruminants increases above 10% then-**

|  |  |
| --- | --- |
| a) Feed intakes fall | b) Activity of rumen microbes are reduced |
| c) The fermentation of fiber gets reduced | d) None |

1. **Salt (or) mineral mixture is added in the ruminant diet at the rate of ……. % of concentrate**

|  |  |
| --- | --- |
| a) 0.5 | b) 1.0 |
| c) 1.5 | d) 2.0 |

1. **Max. Inclusion level of fish meal in the diet of pig ……. % Otherwise, fishy flavour will develop:**

|  |  |
| --- | --- |
| a) 6% | b) 10% |
| c) 15% | d) 20% |

1. **What percentage of Metabolizable Energy (ME) do volatile fatty acids provide for ruminants on most diets?**

|  |  |
| --- | --- |
| a) 45-55% | b) 60-80% |
| c) 25-30% | d) 10-20% |

1. **In case of Pigs, volatile fatty acids may meet……...% of maintenance requirements:**

|  |  |
| --- | --- |
| a) 45-55% | b) 60-80% |
| c) 25-30% | d) 10-20% |

1. **Creep feeding in pigs can be initiated at the age:**

|  |  |
| --- | --- |
| a) 56 days | b) 3 days |
| c) 1 month | d) 7 days |

1. **What is the maximum percentage of Crude Fiber (CF) allowed in the creep ration of pigs?**

|  |  |
| --- | --- |
| a) 5% | b) 6-8% |
| c) 10% | d) 12% |

1. **According to BIS, what is the minimum percentage of Crude Protein (CP) required in the creep ration of pigs?**

|  |  |
| --- | --- |
| a) 14 | b) 16 |
| c) 18 | d) 20 |

1. **According to BIS, what is the minimum percentage of Crude Protein (CP) required in the grower ration of pigs?**

|  |  |
| --- | --- |
| a) 14 | b) 16 |
| c) 18 | d) 20 |

1. **As per BIS the minimum % of CP in finisher ration of Pig is:**

|  |  |
| --- | --- |
| a) 14 | b) 16 |
| c) 18 | d) 20 |

1. **Most limiting amino acid in Pig diets is**

|  |  |
| --- | --- |
| a) Tyrosine | b) Methionine |
| c) Phenylalanine | d) Lysine |

1. **Rations containing maize, soyabean meal, GNC, linseed give rise to body fat with high iodine number in pigs resulting in……. pork**

|  |  |
| --- | --- |
| a) soft pork | b) Hard pork |
| c) Both of the above | d) None |

1. **Rations containing cotton seed cake to pigs produce……. pork**

|  |  |
| --- | --- |
| a) soft pork | b) Hard pork |
| c) Both of the above | d) None |

1. **First limiting amino acid in diets for growing horses:**

|  |  |
| --- | --- |
| a) Tyrosine | b) Methionine |
| c) Phenylalanine | d) Lysine |

1. **Which cereal grain is most preferred for feeding horses?**

|  |  |
| --- | --- |
| a) Maize | b) Oats |
| c) Barley | d) All the above |

1. **Crude protein (%) content in the diet of Race/ High performance Horses:**

|  |  |
| --- | --- |
| a) 20 | b) 16 |
| c) 18 | d) 22 |

1. **Which of the following is true about colostrum feeding in calves:**

|  |  |
| --- | --- |
| a) Colostrum is rich in immunoglobulins which help to fight against diseases | b) Colostrum acts as laxative & clears meconium |
| c) Colostrum provides passive immunity | d) All of the above |

1. **Vitamin A content in the colostrum is……... times the amount of found in normal milk.**

|  |  |
| --- | --- |
| a) 1-3 | b) 3-5 |
| c) 5-15 | d) None |

1. **Iron content in the colostrum is……... times the amount of found in normal milk.**

|  |  |
| --- | --- |
| a) 1-3 | b) 3-5 |
| c) 5-15 | d) None |

1. **Within how many days after calving does milk become normal and lose its colostral properties?**

|  |  |
| --- | --- |
| a) 1 | b) 2 |
| c) 3 | d) None of these |

1. **Which among the following domestic animal has the lowest capacity of crude fiber digestibility?**

|  |  |
| --- | --- |
| a) Swine | b) Ruminants |
| c) Dog | d) Horse |

1. **What are the characteristics of energy feeds or basal feeds, which are concentrate feedstuffs?**

|  |  |
| --- | --- |
| a) CP >20% & CF > 18% | b) CP < 20% & CF > 18% |
| c) CP <20% & CF < 18% | d) CP >20% & CF < 18% |

1. **What are the characteristics of protein supplements, which are concentrate feedstuffs?**

|  |  |
| --- | --- |
| a) CP >20% & CF > 18% | b) CP < 20% & CF > 18% |
| c) CP <20% & CF < 18% | d) CP >20% & CF < 18% |

1. **Comparative type feeding standard based on grains:**

|  |  |
| --- | --- |
| a) Thaer’s Hay equivalent | b) Fjord’s Scandinavian feeding standard |
| c) Armsby feeding standard | d) Kellner’s feeding standard |

1. **Who was the first to suggest feeding standard based on digestible nutrients:**

|  |  |
| --- | --- |
| a) Fjord | b) Morrison |
| c) Wolff | d) Thaer |

1. **Who is credited with providing the concept of Starch Equivalent?**

|  |  |
| --- | --- |
| a) O.Kellner | b) Thaer |
| c) Frap | d) Grouven |

1. **Hay equivalent is given by:**

|  |  |
| --- | --- |
| a) O.Kellner | b) Thaer |
| c) Frap | d) Grouven |

1. **Indian feeding standards are mainly based on -**

|  |  |
| --- | --- |
| a) Kellner feeding standard | b) Armsby feeding standard |
| c) Morrison feeding standard | d) Grouven feeding standard |

1. **As per ARC (1980) protein requirement of ruminants are based on-:**

|  |  |
| --- | --- |
| a) Metabolisable Protein | b) RDP &UDP |
| c) CP | d) DCP |

1. **In dairy cattle, the required amount of Calcium per kg of milk production:**

|  |  |
| --- | --- |
| a) 1.2g | b) 2.2g |
| c) 3.2g | d) 4.2g |

1. **What are the different methods employed in formulating a ration?**

|  |  |
| --- | --- |
| a) Algebraic method | b) Pearson Square |
| c) Trial & error | d) All of these |

1. **Who proposed the concept of Physiological fuel value?**

|  |  |
| --- | --- |
| a) Kellner | b) Armsby |
| c) Morrison | d) Atwater |

1. **Feeding standard based on true protein & net energy (also known as Net Energy system) is introduced by:**

|  |  |
| --- | --- |
| a) Armsby | b) Savage |
| c) Kellner | d) Atwater |

1. **Feeding standard based on digestible true protein & net energy is given by:**

|  |  |
| --- | --- |
| a) Armsby | b) Savage |
| c) Kellner | d) Atwater |

1. **Which of the following is true about Morrison’s feeding standard:**

|  |  |
| --- | --- |
| a) It is also known as Modified Wolf-Lehmann standard | b) Published his own book “Feeds & feeding” |
| c) Based on DM, DCP, TDN, Ca, P& carotene (expressed in range). | d) All of these |

1. **Who expressed protein and energy requirements in terms of DCP & TDN?**

|  |  |
| --- | --- |
| a) Frap | b) Savage |
| c) Morrison | d) Armsby |

1. **In tropical areas, the maintenance energy (ME) requirements of small ruminants are……., while their production requirements remain ……...**

|  |  |
| --- | --- |
| a) higher & identical | b) lower & identical |
| c) identical & higher | d) identical & lower |

1. **Which is the most difficult phase for feeding of lactating animals (Lactation curve).**

|  |  |
| --- | --- |
| a) First Phase | b) Second Phase |
| c) Third Phase | d) Fourth Phase |

1. **What is the ratio of concentrate to forage in hard working horse feed is?**

|  |  |
| --- | --- |
| a) 70:30 | b) 30:70 |
| c) 50:50 | d) 0:100 |

1. **The different characteristics of roughage feedstuff include:**
2. They are less in energy or low TDN value.
3. Bulky & low-density feed.
4. CF >18% & TDN <60%
5. All the statements are correct.
6. **Identify the correct statement about MFN (Metabolic faecal nitrogen):**
7. It is directly proportional to feed intake.
8. It consists principally of spent digestive enzymes, abraded mucosa & rumen bacterial nitrogen.
9. It is about 2 mg/g DMI in rats.
10. All the statements are correct.
11. **Identify the correct statement about endogenous urinary nitrogen (EUN):**
12. EUN is highest for young animal & lowest during hibernation.
13. EUN reflect the protein metabolism.
14. The normal value of EUN is 2mg/kcal of BMR.
15. EUN (mg/day) can be calculated by using 146 W0.72kg.
16. Statement I, II, III are correct.
17. Statement I, II are correct.
18. Statement I, III, IV are correct.
19. All the statements are correct.
20. **The different characteristics of concentrate feedstuff include:**
21. They are more in energy or high TDN value.
22. High-density feed
23. CF <18% & TDN >60%.
24. All the statements are correct.

1. **Identify the correct statement about the etiology of Equine exertional rhabdomyolysis:**
2. Reduced feeding of non-structural carbohydrates along with lack of exercise.
3. Excessive feeding of non-structural carbohydrates along with lack of exercise.
4. Reduced feeding of non-structural carbohydrates along with adequate exercise.
5. Excessive feeding of non-structural carbohydrates along with adequate exercise.
6. **Which of the following statement is/are correct about colostrum feeding:**
7. Colostrum should be given fresh within 2 hours.
8. Colostrum should not be warmed as it will clot due to presence of large quantities of protein.
9. A calf should receive colostrum during first 3 days of its life.
10. Colostrum is richer in globulins than albumins.
11. Statement I and III are correct.
12. Statement I,III and IV are correct.
13. Statement I and II are correct.
14. All the statements are correct.
15. **Which of the following is true about NRC feeding standard:**

I. Feeding standard of USA set up in 1945.

II. The concept of metabolizable protein system has been included in this standard.

III. Nutrient requirements are expressed in single figure (interms of DCP, TDN, Ca, P).

IV. All of the above.

1. **Arrange the feed formulation steps in a correct chronological order:**

I. Determine the amount of available feed ingredients.

II. Calculate the probable DM intake of animals.

III. Calculate the nutrient requirements of animals.

IV. None.

a. I, II, III.

b. II, III, I.

c. III, II, I.

d. None.

1. **Which of the following statement is true about need of bypass protein:**

I. In high yielding animals about 8% of total protein requirement should be in the form of bypass protein.

II. Early lactation period of high yielding milch animals.

III. In case of rapidly growing (1kg/day) calves.

IV. All of these.

1. **Identify the correct statement:**

I. The minimum crude protein content in commercial dog foods should be 15%.

II. Taurine & Arachidonic acid are essential amino acid and fatty acid in cats respectively.

III. As per ICAR 2013, Optimum level of CF in rabbit diet is 10-12 %.

IV. Cat family is not obligate carnivores.

V. Rabbits prefer mesh feeding over pellet feeding.

a. Statements I, II, III are correct.

b. Statements I, II, IV are correct.

c. Statements I, IV, V are correct.

d. Statements II, III, V are correct.

e. All statements are correct.

1. **Identify the correct statement:**

I. A prepartum negative dietary cation anion difference (DCAD) balancing has consistent impact on transition animal health.

II. Ketosis is a metabolic disease in cattle which occurs just before parturition.

III. The trial-and-error method of feed formulation is a laborious one & takes time to reach satisfactory solution.

IV. Ketosis in cattle occurs due to inadequate supply of glucose precursors.

.

a. Statements I, II, III are correct.

b. Statements II, III, IV are correct.

c. Statements I, III, IV are correct.

d. All the statements are correct.

1. **Match:**

|  |  |
| --- | --- |
| **A** | **B** |
| 1. Broiler Starter feed | 1. 156 |
| 1. Broiler finisher feed | 1. 144-150 |
| 1. Chick feed | 1. 141 |
| 1. Growing chicken feed | 1. 140 |
| 1. Laying chicken feed | 1. 160 |

1. **Match:**

|  |  |
| --- | --- |
| **A** | **B** |
| 1. NRC | 1. Kellner |
| 1. ARC | 1. Armsby |
| 1. NE &True protein system | 1. USA |
| 1. NE & digestible True protein system | 1. UK |

1. **Match:**

|  |  |
| --- | --- |
| **A** | **B** |
| 1. Limiting amino acid in sheep | 1. Glycine |
| 1. Limiting amino acid in Pig | 1. Methionine |
| 1. Limiting amino acid in cat | 1. Lysine |
| 1. Limiting amino acid in poultry | 1. Taurine |

1. **Match:**

|  |  |
| --- | --- |
| **A** | **B CP (%min.)** |
| 1. Broiler prestarter | 1. 20 |
| 1. Broiler starter | 1. 22 |
| 1. Broiler finisher | 1. 16 |
| 1. Layer grower | 1. 23 |

1. **Match:**

|  |  |
| --- | --- |
| **A** | **B ME(Kcal/g)** |
| 1. Broiler prestarter | 1. 2500 |
| 1. Broiler starter | 1. 3200 |
| 1. Broiler finisher | 1. 3100 |
| 1. Layer grower | 1. 3000 |

1. **Match:**

|  |  |
| --- | --- |
| **A** | **B CP (%min.)** |
| 1. Layer chick | 1. 16 |
| 1. Layer grower | 1. 18 |
| 1. Layer Phase-I | 1. 16 |
| 1. Layer Phase-II | 1. 20 |

1. **Match:**

|  |  |
| --- | --- |
| **A** | **B ME (Kcal/g)** |
| 1. Layer chick | 1. 2400 |
| 1. Layer grower | 1. 2500 |
| 1. Layer Phase-I | 1. 2600 |
| 1. Layer Phase-II | 1. 2800 |

1. **Match:**

|  |  |
| --- | --- |
| **A** | **B** |
| 1. Wolff’s standard | 1. Modified Wolf -Lehman standard |
| 1. Thaer’s hay equivalent | 1. Digestible nutrient type |
| 1. Starch equivalent | 1. Comparative type |
| 1. Morrison feeding standard | 1. Productive type |

1. **Match:**

|  |  |
| --- | --- |
| **A** | **B** |
| 1. Albert Thaer | 1. Barley grains |
| 1. Fjord | 1. PFV |
| 1. Atwater | 1. RDP &RUDP |
| 1. ARC | 1. Meadow hay |

1. **Hind gut fermenters include:**

|  |  |
| --- | --- |
| a) Horse | b) Rabbit |
| c) Pig | d) All of these |

1. **Fore gut fermenters include:**

|  |  |
| --- | --- |
| a) cattle | b) Sheep |
| c) Goat | d) All of these |

1. **How much ………. % of dietary true protein escapes ruminal digestion?**

|  |  |
| --- | --- |
| a) 20% | b) 40% |
| c) 60% | d) 80% |

1. **Which term refers to live microbial feed supplements administered orally?**

|  |  |
| --- | --- |
| a) Probiotics | b) Prebiotics |
| c) Eubiotics | d) All of these |

1. **Non-digestible food ingredient that beneficially affects the host by selectively stimulating the growth of gut bacteria-**

|  |  |
| --- | --- |
| a) Probiotics | b) Prebiotics |
| c) Eubiotics | d) All of these |

**Fill in the blanks:**

1. Arachidonic acid is synthesized in the body from ………….
2. …….. are the statements of amount of nutrients required by animals.
3. The book manual of cattle feeding was published by ………………….
4. ……. feeding standard considered the quantity of milk produced but not its quality.
5. ……. Is the domesticated ruminant with highest BMR.
6. Racehorses are most susceptible to deficiency of ………………………… (B vitamin).
7. Cats require ………. free amino acid through the diet.
8. As per BIS……... (ppb) max. permissible limit of aflatoxin in poultry feeds.
9. In case of dogs …………… is the essential fatty acid.
10. The site of VFA absorption is………. & ……….. in horses.
11. In pet foods, Moisture content of less than……… are classified as Dry pet foods.
12. Rabbits fall under ……… because they eat grass.
13. Birds require ………. because their metabolism doesn’t include the urea cycle.
14. ……… is the desired Ca: P ratio for cats.
15. As per BIS broiler pre starter ration CP ………. % .
16. Energy requirement of broiler finisher is …………. ME Kcal/kg diet.
17. …………. Is the most limiting amino acid in soyabean based poultry diets*.*
18. …………. Is the most limiting amino acid in maize-based poultry diets.
19. As per BIS ……. is the min. CP (%) requirement for laboratory rats.
20. ………. % min. calcium requirement for Layer phase-II.
21. Most commonly use NPN in ruminant rations ……………...
22. In cattle & buffaloes, the faecal material contains about …………………. of water.
23. Ruminant diets contain ………. % of Rumen degradable protein & …… % of rumen undegradable protein.
24. Maintenance type of roughages contain ……… % DCP.
25. ………. is the pasture when cut & fed green to an animal in its own stall.
26. Urea can replace ……………. % of DCP requirement in animals.
27. …………………. mg/kg DM is the requirement of taurine in cats.
28. ……. VFA is present in appreciable amounts in peripheral blood.
29. Molasses can be used up to ……… % in ruminant ration & ………. % in poultry feed.
30. ………. is the water intake of an adult cattle for every kg of DM intake.
31. ……….. is the byproduct of any cereal, millet, or legume crop leftover after harvesting, threshing and removal of grains.
32. ………… is the minimum crude protein content in commercial dog foods.

**ANSWER KEY**

1. (b) 30%
2. c) 2.84 g/W0.75
3. a) 35.2 g/W0.75kg
4. c) 10kg
5. b) 2-2.5% b.w.
6. c) 4-6 % b.w.
7. c) 3-4 % b.w.
8. b) 7%
9. a) 90 days
10. b) 19 % DCP, 25% CP & 75% TDN
11. c) Goat
12. b) 4kg straw & 1kg concentrate
13. b) 1kg concentrate per 2.5kg milk
14. a) 1kg concentrate per 2kg milk
15. b) Dry matter intake (DMI)
16. a) 2/3% of total DM required
17. b) 1/3% of total DM required
18. c) 1% of concentrate
19. d) Lysine
20. a) 90-130g DCP and 1-1.1kg TDN
21. c) Complete feed blocks
22. b) 20 ppb
23. d) 32%
24. c) 15%
25. c) 18
26. d) Both a & b are correct
27. d) All of these
28. b) 0.56
29. a) 0.40
30. c) 1.07
31. b) 3%
32. c) 30 L
33. b) 6-8 L
34. a) 4-6 L
35. d) 40 L
36. d) All of these
37. c) 0.96
38. c) 22.0
39. b) 20.0
40. b) 0.254 kg
41. c) 3.03 kg
42. b) 1/10th
43. a) 15
44. b) Zinc
45. a) 90g
46. d) Concentrate rich diets
47. b) Flushing
48. b) Methionine
49. a) 2.73g/kg W0.75 & 27.3g/kg W0.75
50. b) 3.0g/kg W0.75 & 25.3g/kg W0.75
51. a) 1:3 to 3.5
52. b) 1:6 to 7
53. c) 1:4
54. d) 1:3
55. c) The fermentation of fiber gets reduced
56. c) 1.0
57. b) 10%
58. b) 60-80%
59. c) 25-30%
60. d) 7 days
61. a) 5%
62. d) 20
63. c) 18
64. b) 16
65. d) Lysine
66. a) soft pork
67. b) Hard pork
68. d) Lysine
69. b) Oats
70. c) 18
71. d) All of the above
72. c) 5-15
73. b) 3-5
74. c) 3days
75. c) Dog
76. c) CP <20% & CF < 18%
77. d) CP >20% & CF < 18%
78. b) Fjord’s Scandinavian feeding standard
79. c) Wolff
80. a) O.Kellner
81. b) Thaer
82. c) Morrison feeding standard
83. b) RDP &UDP
84. b) 2.2g
85. d) All of these
86. d) Atwater
87. a) Armsby
88. c) Kellner
89. d) All of these
90. b) Savage
91. a) higher & identical
92. a) First Phase
93. a) 70:30.
94. d) All the statements are correct.
95. d) All the statements are correct.
96. c) Statement I, III, IV are correct.
97. d) All the statements are correct
98. b) Excessive feeding of non-structural carbohydrates along with lack of exercise
99. d) All the statements are correct
100. d) All of these.
101. b). II, III, I
102. IV) All of these.
103. d) Statements II, III, V are correct.
104. c) Statements I, III, IV are correct
105. I)...c, II) …e,III…d,IV..a,V….b
106. I)...c, II) …d,III…b,IV..a
107. I)...b, II) …c,III…d,IV..a,
108. I)...d, II) …b,III…a,IV..c
109. I)...d, II) …c,III…b,IV..a
110. I)...d, II) …c,III…b,IV..a
111. I)...d, II).…b,III…c,IV..a
112. I)...b, II) …c,III…d,IV..a
113. I)...d, II) …a, III…b,IV..c
114. d) All of these
115. d) All of these
116. b) 40%
117. a) Probiotics
118. b) Prebiotics
119. Prostagladins
120. Feeding standards
121. Armsby
122. Haecker’s
123. Goat
124. Thiamine
125. Taurine
126. 20 ppb
127. Linoleic acid
128. Caecum &colon
129. 14%
130. Herbivores
131. arginine
132. 1:1
133. 23%
134. 3000 ME Kcal/kg diet
135. Methionine
136. Lysine
137. 24%
138. 3.5%
139. Urea
140. 80%
141. 60%&40%
142. 3-5%
143. Soilage
144. 30%
145. 200mg/kg
146. Acetate
147. 10% & 5%
148. 3 to 5litres
149. Straw
150. 20%