

Here are the detailed answers for the **Q.5 (Long Answer)** questions from the years 2024, 2023, 2022, 2019, and 2018. These answers are synthesized based on the context of the questions provided in your file and standard principles of animal nutrition (D.V. Reddy).

Year: 2024

5.1 Describe the methods of protein protection from rumen degradation. 1

Answer:

In high-yielding ruminants, microbial protein synthesis is often insufficient to meet the amino acid requirements for milk/meat production. "Protecting" dietary protein from degradation in the rumen allows it to pass to the abomasum and small intestine (Bypass Protein/UDP), where it is digested and absorbed as high-quality amino acids.

Methods of Protein Protection:

1. **Heat Treatment:**
 - Heating protein sources (like soybean meal) at 140°C for few minutes.
 - **Mechanism:** The Maillard reaction blocks free amino groups (lysine) and creates cross-links, reducing solubility and microbial enzymatic attack.
 - **Caution:** Overheating renders protein indigestible even in the intestine.
2. **Chemical Treatment (Formaldehyde):**
 - Treating oil cakes with 1.0–1.2% Formaldehyde (of CP).
 - **Mechanism:** Formaldehyde forms methylene bridges with amino groups at the acidic pH of the rumen (pH 6-7), making it stable. These bonds break in the acidic abomasum (pH 2-3), releasing the protein.
3. **Tannin Treatment:**
 - Naturally occurring tannins (in tree leaves like Subabul) or added tannins bind to proteins.
 - **Mechanism:** Forms reversible Tannin-Protein complexes stable at rumen pH but dissociating at abomasal pH.
4. **Encapsulation:**
 - Coating amino acids (Methionine/Lysine) with fat or polymers resistant to rumen degradation.
5. **Esophageal Groove Reflex:**
 - In young calves, liquid protein (milk) bypasses the rumen via the reticular groove directly to the abomasum.

5.2 Feeding habits of goat and feeding schedule for a kid from birth to 90 days. 2

Answer:

Feeding Habits of Goats:

- **Browsers:** Goats prefer browsing (eating leaves, shrubs, vines) over grazing grass.
- **Selectivity:** They have mobile upper lips and are highly selective, choosing the most nutritious parts of plants.
- **Adaptability:** Their saliva is rich in proline, which binds tannins, allowing them to consume bitter plants that sheep/cattle avoid.
- **Intake:** Higher Dry Matter Intake (DMI) relative to body weight (3-5% of BW) compared to large ruminants (2-2.5% BW).

Feeding Schedule (Birth to 90 Days):

- **Phase 1: Colostrum (0-3 Days):** Feed within 1 hour of birth. Rate: 10% of body weight spread over 3-4 feeds. Essential for passive immunity.
- **Phase 2: Milk Feeding (4 Days - Weaning):** Kid should suckle or be bottle-fed.
 - Week 1-2: 1/10th of BW (approx. 300-400 ml/day).
 - Week 3-8: Gradually decrease milk as solid food increases.
- **Phase 3: Creep Feed (Introduction at 2 weeks):**
 - Introduce "Creep Feed" (high quality concentrate, 22-24% CP) and high-quality leguminous hay (Lucerne/Berseem).
 - This promotes rumen development.
- **Phase 4: Weaning (90 Days):** By 90 days, the kid should be fully weaned off milk and consuming primarily green fodder and concentrates (approx. 200-300g/day).

5.3 Explain in detail about the ration formulation in dairy cattle with suitable examples. 3

Answer:

Ration formulation involves combining feed ingredients to meet the nutrient requirements (Maintenance + Production) of an animal at the lowest cost.

Steps in Formulation:

1. **Determine Requirements:** Calculate DM, DCP, and TDN needs based on body weight (e.g., 400 kg) and production (e.g., 10 kg milk, 4% fat).
 - *Maintenance:* ~2.84 kg TDN, 250g DCP (varies by standard).
 - *Production:* ~325g TDN, 45g DCP per kg of milk.
2. **Estimate Nutrient Supply from Roughage:**
 - Assume DMI is 2.5% of BW (approx 10 kg DM).
 - Fix roughage (e.g., wheat straw + green fodder) to satisfy gut fill (2/3rd of DMI). Calculate the nutrients provided by this.
3. **Calculate Deficit:** Subtract nutrients provided by roughage from total requirements.
4. **Balance with Concentrates:** Use the **Pearson Square Method** or trial-and-error to mix grains (maize), protein supplements (GNC), and brans to meet the deficit.

5. **Add Minerals/Vitamins:** Add 2% Mineral Mixture and 1% Salt.

Year: 2023

5.1 (a) Describe the feeding of high yielding cows during peri-parturient period. 4

Answer:

The peri-parturient (transition) period covers 3 weeks before and 3 weeks after calving. It is critical to prevent metabolic disorders.

- **Pre-calving (Close-up Dry Period):**
 - **Steaming Up:** Increase concentrate feeding to adapt rumen papillae to high-starch diets.
 - **DCAD Balance:** Feed anionic salts (Chlorides/Sulfates) to induce mild acidosis, helping mobilize calcium to prevent milk fever.
 - **Vitamin E/Selenium:** Supplement to reduce retained placenta/mastitis risk.
- **Post-calving (Fresh Cow):**
 - **Challenge Feeding:** Gradually increase concentrates (start 1-2 kg, increase by 0.5 kg/day) to meet peak milk production demands.
 - **Energy Density:** Use bypass fat or high-quality grains to prevent Negative Energy Balance (Ketosis).
 - **Fiber:** Ensure effective fiber (NDF) to prevent acidosis.

5.1 (b) Briefly discuss the importance of NPN compound in ruminant ration. 5

Answer:

- **Cost-Effectiveness:** NPN sources like Urea and Biuret are much cheaper than natural proteins (oil cakes).
- **Mechanism:** Rumen microbes hydrolyze NPN into ammonia. If fermentable carbohydrates (starch/molasses) are present, microbes use this ammonia to synthesize amino acids (Microbial Protein).
- **Utilization:** Microbial protein is then digested by the cow, providing a high-biological value protein source.
- **Limit:** Urea can replace up to 30% of dietary protein or 1% of total dry matter.

5.2 (a) Describe the feeding of sow from birth to lactation including different physiological life-stages. 6

Answer:

- **Gilt (Growth):** Ad-libitum feeding of grower ration (16-18% CP) until 100 kg BW.
- **Flushing (Pre-breeding):** Increase energy intake 2 weeks before mating to increase ovulation rate and litter size.
- **Gestation (Pregnancy):** Restrict feed intake to prevent obesity. Fat sows have difficult farrowing (dystocia) and crush piglets. Feed ~2.0 - 2.5 kg/day of 14% CP diet.
- **Lactation:** High nutrient demand. Feed ad-libitum or 2 kg for maintenance + 0.5 kg per piglet nursing. High energy and protein (16-18% CP) required to prevent "Thin Sow Syndrome."
- **Dry Period:** Maintain body condition score.

5.2 (b) Discuss the feeding of geriatric pets and different types of commercial pet food. 7

Answer:

Geriatric (Senior) Feeding:

- **Metabolism:** BMR decreases; energy density should often be reduced to prevent obesity, unless the animal is underweight due to poor digestion.
- **Protein:** High-quality, highly digestible protein is needed to maintain muscle mass, but restricted if kidney failure (renal insufficiency) is present.
- **Supplements:** Glucosamine/Chondroitin for arthritis; antioxidants (Vit E) for cognitive function.
- **Texture:** Softer food if dental issues exist.

Types of Commercial Pet Food:

1. **Dry (Kibble):** 6-10% moisture. Economical, good for teeth, easy storage.
2. **Semi-Moist:** 25-35% moisture. Highly palatable, high sugar/salt (preservatives), not ideal for diabetics.
3. **Canned (Wet):** 70-80% moisture. Highly palatable, increases water intake (good for urinary health), expensive.

5.3 (a) What are the feed formulation methods? Describe the steps involve in formulation of broiler starter feed. 8

Answer:

- **Methods:** Pearson Square, Trial and Error, Linear Programming (Computerized Least Cost).
- **Broiler Starter Steps:**
 1. **Standard (BIS 2007):** Target 22-23% CP and 3100 Kcal/kg ME.
 2. **Ingredients:** Maize (Energy), Soybean Meal (Protein), Oil (Energy density), DCP/Limestone (Ca/P).
 3. **Calculation:** Fix Maize at ~50-55%. Fix Soya at ~30-35%. Adjust Oil to hit energy target. Add Methionine/Lysine supplements.
 4. **Additives:** Coccidiostats, toxin binders, and vitamin premix (0.1%).

5.3 (b) Describe the factors affecting nutrient requirements of laboratory animals. 9

Answer:

1. **Genetics/Strain:** Different strains (e.g., Wistar vs. Sprague Dawley rats) have different growth curves.
 2. **Physiological State:** Growth, pregnancy, and lactation drastically increase protein/energy needs.
 3. **Environment:** Temperature stress alters energy needs. Coprophagy prevention (wire bottom cages) increases vitamin requirements (K, B12).
 4. **Research Protocols:** Experimental induction of disease (e.g., diabetes) alters metabolic needs.
 5. **Microbial Status:** Germ-free (axenic) animals require different nutrient fortification as they lack gut synthesis of vitamins.
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Year: 2022

5.1 (A) Discuss nutrient requirement and feeding of broilers as per BIS 2007. 10

Answer:

(See 2024 Q4.1 for Short Note version, expanded here)

- **Phases:**
 - **Pre-Starter (0-7d):** Critical for gut development. 23% CP, 3000 kcal ME. Lysine 1.3%.
 - **Starter (8-21d):** Rapid muscle growth. 22% CP, 3100 kcal ME.
 - **Finisher (22d+):** Fat deposition. 20% CP, 3200 kcal ME.
- **Essential Nutrients:** Limiting amino acids are Methionine and Lysine. Calcium (1.0%) and Non-Phytate Phosphorus (0.45%) must be balanced to prevent leg problems (Perosis/Rickets).
- **Feeding Systems:** Mash, Crumble, or Pellets (Pellets preferred for better feed conversion ratio).

5.1 (B) Discuss calf feeding in details. 11

(See 2024 Q5.2 Feeding Schedule for Kid/Calf).

Key additions for "details":

- **Milk Replacers:** Used when whole milk is sold commercially. Must contain 22-24% protein from milk sources (skim milk powder/whey) and homogenized fat.

- **Rumen Development:** Chemical (VFA from starch fermentation) and Physical (scratch factor from hay) stimulation.
- **Health Management:** Prevention of calf scours (diarrhea) via hygiene and proper colostrum management.

5.2 (A) What are the steps involved in computation of ration, explain with suitable example in cattle. 12

(See 2024 Q5.3 Ration Formulation).

5.2 (B) Discuss feeding of pregnant and lactating mare. 13

Answer:

- **Pregnancy (First 8 months):** Maintenance diet is usually sufficient (Good forage).
- **Late Pregnancy (Last 3 months):** Rapid fetal growth. Energy needs increase by 15-20%. Protein requirements rise. If forage quality is poor, add concentrate. Limit bulk to avoid compressing the fetus.
- **Lactation:** *Highest stress period.* Energy needs double compared to maintenance.
 - High quality hay (Alfalfa/Timothy).
 - Grain supplementation (Oats/Barley) required.
 - Water intake rises significantly (upto 50-70 Liters/day).
 - Monitor Calcium:Phosphorus ratio to prevent bone issues in the foal.

5.3 (A) Write about nutrient requirements, feeds and feeding habits of goats. 14

(See 2024 Q5.2).

5.3 (B) Write about feeding schedule of lion, tiger and panther in captivity. 15

Answer:

- **Diet:** Strict Carnivores. Fed beef, buffalo meat, or chicken.
 - **Quantity:** Roughly 4-6% of body weight per day (e.g., 6-8 kg meat for a Tiger).
 - **Schedule:** Often fed 6 days a week with 1 "starve day" (fasting) to mimic wild hunting patterns and maintain appetite/gut health.
 - **Supplementation:**
 - **Bone Meal/Ca:** Meat is high in Phosphorus but low in Calcium. Supplementation is mandatory to prevent Metabolic Bone Disease (MBD) or "Paper Bone Disease."
 - **Taurine:** Essential amino acid.
 - **Vitamin A:** Preformed source required.
 - **Enrichment:** Feeding whole carcasses or hiding food to stimulate hunting behavior.
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Year: 2019

5.1 Explain in detail about the ration formulation in dairy cattle with suitable examples. 16
(Duplicate of 2024 Q5.3. See answer above).

5.2 Define bypass protein; describe the methods of protein protection from rumen degradation. 17
(Duplicate of 2024 Q5.1. See answer above).

5.3 Feeding of goat under intensive system of rearing. 18

Answer:

Intensive rearing implies zero-grazing (stall feeding).

- **Stall Feeding:** Goats are confined and fed cut fodder.
- **Green Fodder:** Tree leaves (Subabul, Neem, Peepal) should form 50% of fodder due to browsing preference. Legumes (Berseem) and grasses make up the rest.
- **Concentrates:** Higher requirement than extensive systems.
 - *Kids:* Ad-libitum creep feed.
 - *Dry Does:* 200-250g concentrate/day.
 - *Lactating Does:* 300-400g + 150g per liter of milk produced.
 - *Bucks:* 400-500g during breeding season.
- **Minerals:** Salt licks and mineral blocks must be available constantly to prevent pica/deficiencies.

Year: 2018

5.1 Enumerate the benefit of restricted feeding in chicken. Mention about the methods of feed restriction in chicken. 19

Answer:

Benefits:

1. **Controls Body Weight:** Prevents obesity in broiler breeders.
2. **Sexual Maturity:** Delays onset of egg laying, ensuring the reproductive tract is fully developed. Result: Larger initial eggs and better persistency of lay.
3. **Fertility/Hatchability:** Obese hens have poor fertility; restriction improves this.
4. **Reduced Mortality:** Lowers incidence of metabolic disorders like Ascites and Sudden

Death Syndrome.

5. **Cost:** Reduces feed cost during the growing period.

Methods:

1. **Physical Feed Restriction (Quantitative):** Feeding a calculated amount (e.g., 80% of ad-libitum) daily.
2. **Skip-a-Day:** Feeding ad-libitum one day and no feed (or very little) the next. Commonly used in broiler breeders.
3. **Dietary Dilution (Qualitative):** Adding high fiber (rice hulls/bran) to reduce energy density while allowing voluntary intake.
4. **Chemical:** Using appetite suppressants (not common commercially).

5.2 Discuss about the nutrient requirement and feeding of piglets. 20

(See 2023 Q5.2a).

Focus on Piglets:

- **Iron Injection:** Day 3 (100mg Iron Dextran) to prevent anemia.
- **Creep Feeding:** Start Day 7-10. Specs: 20-22% CP. Ingredients: Maize, skim milk powder, sugar (sucrose/dextrose) for palatability, antibiotic growth promoters.
- **Weaning:** Transition stress management. Feed frequently in small amounts. High Zinc Oxide (2000-3000 ppm) sometimes used to prevent post-weaning diarrhea.

5.3 Write the methods adopted for arriving at protein requirement of cattle. 21

Answer:

1. **Factorial Method:**
 - Calculates the sum of protein lost in various bodily functions.
 - $\text{Total CP} = (\text{Endogenous Urinary N} + \text{Metabolic Fecal N} + \text{N in Milk} + \text{N in Tissue} + \text{N in Hair/Scurf}) \times 6.25$.
 - This net protein is then adjusted for Biological Value/Digestibility.
2. **Nitrogen Balance Method:**
 - Feeding trials where $\text{N}_{\text{intake}} - (\text{N}_{\text{feces}} + \text{N}_{\text{urine}} + \text{N}_{\text{milk}}) = \text{Balance}$.
 - The minimum intake required to maintain a "Zero Balance" (Equilibrium) is the maintenance requirement.
3. **Feeding Trials:**
 - Groups of animals are fed varying levels of protein. Performance (growth/milk) is measured. The level yielding optimal performance is set as the requirement.