

Here are the answers for **Q.3 (Brief Answers)** from the years 2024, 2023, 2022, 2019, and 2018. These are concise answers (2-3 lines) suitable for the examination format.

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## Year: 2024

### 3.1 Use of NPN compounds in ruminants 1

Non-Protein Nitrogen (NPN) compounds like urea and biuret are used to replace a portion of costly dietary protein. Rumen microbes hydrolyze NPN to ammonia, which they utilize to synthesize high-quality microbial protein, provided there is a sufficient source of fermentable carbohydrates (energy) available.

### 3.2 Flushing 2

Flushing is the practice of increasing the plane of nutrition (energy and protein) for female animals (especially ewes and sows) 2-3 weeks prior to breeding. This stimulates the endocrine system to increase the ovulation rate, leading to higher fertility and litter size.

### 3.3 Calf starter 3

Calf starter is a high-energy, high-protein (22-24% CP) solid concentrate mixture introduced to calves from 2 weeks of age. Its fermentation produces butyrate and propionate, which are essential for the physical and chemical development of rumen papillae and early weaning.

### 3.4 Obligate carnivores 4

Obligate carnivores, such as cats, biologically require nutrients found only in animal flesh to survive. They cannot synthesize specific nutrients like Taurine, Arachidonic acid, and Vitamin A (retinol) from plant-based precursors and must obtain them directly from the diet.

### 3.5 Hind gut fermenter 5

These are non-ruminant herbivores (e.g., horses, rabbits) that ferment fibrous plant material in their enlarged caecum and colon (hindgut) rather than the stomach. They are less efficient at fiber digestion than ruminants but can process larger volumes of low-quality forage.

### 3.6 Fasting catabolism 6

Fasting catabolism refers to the breakdown of body tissue (fat and protein) to generate

energy and maintain vital functions when an animal is deprived of feed (fasting) or is in a negative energy balance. It represents the basal energy requirement needed to sustain life.

### 3.7 Essential amino acids for poultry 7

Poultry cannot synthesize these amino acids in sufficient quantities and must obtain them from the diet. The most critical (limiting) ones are Methionine, Lysine, and Tryptophan. Others include Arginine, Glycine (essential for chicks), Leucine, Isoleucine, Valine, Histidine, Phenylalanine, and Threonine.

### 3.8 Azoturia 8

Also known as "Monday Morning Disease" or Exertional Rhabdomyolysis in horses. It occurs when horses on high-grain diets are rested (accumulation of muscle glycogen) and then suddenly exercised, causing massive muscle breakdown (rhabdomyolysis) and dark urine (myoglobinuria).

### 3.9 Rumen filling effect 9

This refers to the physical limitation of voluntary feed intake caused by the distension of the rumen by bulky, high-fiber, low-digestibility roughages. The animal stops eating because the rumen is physically full, even if energy requirements are not met.

### 3.10 Dietary cation anion balance (DCAD) and milk fever 10

DCAD is the difference between major cations ( $\text{Na}^+$ ,  $\text{K}^+$ ) and anions ( $\text{Cl}^-$ ,  $\text{S}^{2-}$ ). A negative DCAD (anionic) diet fed pre-calving induces mild metabolic acidosis, which enhances the sensitivity of parathyroid hormone (PTH) receptors, helping mobilize bone calcium to prevent milk fever (hypocalcemia).

### 3.11 Pregnancy toxæmia in ewes 11

A metabolic disorder in ewes during late gestation (especially those carrying twins/triplets) caused by negative energy balance. The rapid fetal growth exceeds energy intake, leading to fat mobilization, ketosis, hypoglycemia, and neurological signs.

### 3.12 Piglet anaemia 12

A condition in suckling piglets caused by iron deficiency. Sows' milk is extremely low in iron, and piglets grow rapidly, depleting liver iron stores within a week. It causes pale skin, "thumps" (labored breathing), and poor growth; prevented by iron injections at day 3.

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## **Year: 2023**

### **3.1 Coprophagy 13**

Coprophagy is the consumption of one's own feces, commonly observed in rabbits (caecotrophy) and rats. It allows hindgut fermenters to recover microbial protein and B-vitamins synthesized in the caecum that were not absorbed during the first passage through the digestive tract.

### **3.2 Feeding standard 14**

A feeding standard is a set of tables indicating the quantities of nutrients (energy, protein, minerals, vitamins) required by different classes of animals for various physiological functions (maintenance, growth, lactation, work), serving as a guide for formulating balanced rations.

### **3.3 Phase feeding in poultry 15**

Phase feeding involves changing the nutrient density of the diet at specific stages of the bird's life to match their changing requirements. For example, protein levels are reduced while energy levels are maintained or increased as broilers move from starter to finisher phases, optimizing cost and efficiency.

### **3.4 Challenge feeding 16**

Also known as lead feeding, this is the practice of starting a dairy cow on a lower level of concentrate post-calving and gradually increasing it (challenging the cow) day by day until her milk production no longer increases. This determines her peak physiological potential.

### **3.5 Limiting amino acids 17**

These are essential amino acids that are present in the lowest quantity in a feedstuff relative to the animal's requirement. Protein synthesis stops when the first limiting amino acid runs out. In poultry, Methionine is typically the first limiting AA, followed by Lysine.

### **3.6 Flushing ration 18**

A high-energy, high-protein ration fed to breeding females (ewes/sows) 2-3 weeks before mating. It improves body condition and increases the ovulation rate, thereby increasing the chances of multiple births (twinning/large litters).

### 3.7 Adlibitum 19

"Ad libitum" (or ad lib) feeding means providing feed (and water) without restriction, allowing the animal to consume as much as they voluntarily desire at any time. It is commonly used for broilers, growing pigs, and lactating animals.

### 3.8 Steaming Up ration 20

Steaming up is the practice of feeding extra concentrates to pregnant dairy cows or ewes during the last few weeks of gestation. This promotes udder development, builds body reserves for lactation, and adapts rumen microbes to the high-grain diet required after calving.

### 3.9 Folivores 21

Folivores are herbivores that specialize in eating leaves. They often have specialized digestive adaptations (like prolonged retention times or salivary tannins binders) to handle high fiber content and plant secondary metabolites (toxins) found in foliage (e.g., Sloths, Koalas, some primates).

### 3.10 Pseudo-ruminants 22

Pseudo-ruminants (e.g., Camels, Llamas, Alpacas) have a multi-chambered stomach (C1, C2, C3) and chew the cud like true ruminants but lack the omasum (the "manyplies"). Their fermentation occurs in the foregut, similar to ruminants.

### 3.11 Transition period 23

The transition period in dairy cattle is defined as roughly 3 weeks before calving to 3 weeks after calving. It is a critical physiological phase characterized by immense metabolic stress, immune suppression, and a shift from gestational to lactational nutrient demands.

### 3.12 Protein bumps 24

These are small, allergic-reaction-like swellings (hives/urticaria) that can appear on the skin of horses (and sometimes cattle) due to hypersensitivity to certain dietary proteins or sudden excess protein intake.

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**Year: 2022**

### 3.1 Define starch equivalent 25

Starch Equivalent (SE), developed by Kellner, expresses the energy value of a feed relative to the net energy value of pure starch for fattening. One kg of SE is equivalent to the energy (2360 kcal or 2.36 Mcal) required to produce the same amount of body fat as 1 kg of pure digestible starch.

### 3.2 What is Caecotrophy? 26

Caecotrophy is a specialized form of coprophagy in rabbits where they produce and consume "soft feces" (caecotropes) directly from the anus, usually at night. These are rich in microbial protein and B-vitamins synthesized in the caecum.

### 3.3 Importance of phase feeding in poultry 27

(See Answer 2023 3.3)

It minimizes nutrient wastage (especially nitrogen), reduces feed costs, and reduces environmental pollution by closely matching the diet's nutrient density to the bird's declining protein and changing energy requirements as they age.

### 3.4 Write about crumble feed 28

Crumble feed is produced by first pelleting the mash and then breaking the pellets into smaller, granular consistency coarse particles. It combines the benefits of pellets (reduced wastage, better flow) with a size suitable for young chicks (starters) who cannot swallow large pellets.

### 3.5 Discuss "Thumps" in brief 29

"Thumps" is the clinical sign of labored, jerky breathing (abdominal respiration) observed in piglets suffering from severe iron-deficiency anemia. It occurs because the low hemoglobin levels reduce oxygen-carrying capacity, forcing the heart and lungs to work harder.

### 3.6 Importance of challenge feeding 30

(See Answer 2023 3.4)

It prevents underfeeding of high-genetic-merit cows. By challenging the cow with more feed, farmers can identify her maximum milk potential and prevent ketosis by ensuring energy intake rises to meet the high energy output of peak lactation.

### 3.7 What is creep feed? 31

Creep feed is a high-quality, palatable supplementary feed offered to nursing young (piglets, calves, foals) in a specialized enclosure (creep) accessible only to them. It supplements mother's milk, promotes faster growth, and accelerates rumen/gut development.

### 3.8 Enumerate use of probiotics in poultry 32

Probiotics (e.g., Lactobacillus, Bifidobacterium) are direct-fed microbials that:

1. Competitively exclude pathogenic bacteria (Salmonella/E. coli) in the gut.
2. Improve feed digestibility and nutrient absorption.
3. Enhance the immune system and overall gut health.

### 3.9 Feeding of Bypass fat in ruminants 33

Bypass fats (inert fats like Calcium soaps) are fed to high-yielding dairy cows to increase the energy density of the ration without interfering with fiber digestion in the rumen. They pass unchanged through the rumen and are digested in the small intestine, helping prevent negative energy balance.

### 3.10 Importance of restricted feeding in poultry 34

Restricted feeding is crucial for broiler breeders and growing pullets to prevent obesity. It delays sexual maturity (improving egg size), improves fertility and hatchability, reduces metabolic disorders (like ascites), and lowers maintenance feed costs.

### 3.11 What is cannibalism? 35

Cannibalism is a behavioral vice in poultry where birds peck at the toes, vents, feathers, or bodies of other birds. It is caused by management stress (overcrowding, high light intensity) or nutritional deficiencies (sodium, protein/methionine, or fiber deficiency).

### 3.12 Write about calf/starter feed 36

(See Answer 2024 3.3)

It is the first solid feed for calves, critical for stimulating rumen development (specifically papillae growth via VFA production). It should be highly palatable, low in fiber, and contain 22-24% CP and >70% TDN.

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## Year: 2019

### 3.1 Coprophagy 37

(See Answer 2023 3.1)

The ingestion of feces. In nutrition, it primarily refers to the physiological behavior in rabbits (caecotrophy) and rodents to recover nutrients (microbial protein, Vitamin K, and B-complex) synthesized in the hindgut.

### 3.2 Examples of enzyme feed additives used in poultry<sup>38</sup>

1. **Phytase:** Breaks down phytate phosphorus in grains, increasing phosphorus availability.
2. **Non-Starch Polysaccharidases (NSPases):** Such as **Xylanase** and **Beta-glucanase**, which break down viscous fiber in wheat/barley, improving digestion and reducing wet litter.

### 3.3 Calf Starter 39

(See Answer 2024 3.3)

A palatable concentrate mixture fed to young calves starting from 2 weeks of age to transition them from a liquid diet to solids. It is essential for developing the rumen mucosa and facilitating early weaning.

### 3.4 Flushing 40

(See Answer 2024 3.2)

A management practice of increasing nutrient intake (energy/protein) for female livestock prior to breeding to enhance body condition, ovulation rate, and subsequently litter size.

### 3.5 Obligate carnivores 41

(See Answer 2024 3.4)

Animals like cats that must consume animal tissue to meet specific metabolic requirements. They lack enzymes to synthesize Taurine, Retinol (Vit A), Arachidonic acid, and Niacin from plant precursors.

### 3.6 Laboratory animals 42

These are small animals (mice, rats, guinea pigs, rabbits) reared under controlled environmental and nutritional conditions for biomedical research. Their nutrition is highly standardized (e.g., NIH-07 open formula) to ensure experimental reproducibility.

### 3.7 Examples of hind gut fermenter 43

Examples include the Horse, Rabbit, Guinea Pig, Elephant, and Rhinoceros. These animals have a simple stomach but a highly developed and voluminous caecum and/or colon where microbial fermentation of forage occurs.

### 3.8 Broiler bird 44

A broiler is a strain of chicken bred specifically for rapid meat production. They have a very high growth rate and feed conversion efficiency, typically reaching a market weight of 2.0–2.5 kg in 35–42 days.

### 3.9 Roughage 45

Roughages are bulky feedstuffs high in crude fiber (>18% CF) and generally low in total digestible nutrients (TDN). Examples include hay, straw, silage, and green fodder. They are essential for maintaining rumen function and motility in ruminants.

### 3.10 Fasting catabolism 46

(See Answer 2024 3.6)

The metabolic breakdown of body tissues (adipose and muscle) to provide energy for essential life processes (respiration, circulation) when an animal is in a fasted state or severe negative energy balance.

### 3.11 Digestion trial 47

An experimental procedure used to determine the digestibility of a feed. It involves measuring the exact amount of feed consumed and the amount of feces excreted over a specific period.

$$\text{Digestibility Coefficient} = \frac{\text{Nutrient consumed} - \text{Nutrient in feces}}{\text{Nutrient consumed}} \times 100\%$$

### 3.12 Balanced ration 48

A balanced ration is the amount of feed mixture consumed by an animal in 24 hours that supplies all required nutrients (energy, protein, minerals, vitamins, water) in the proper proportions and amounts to support maintenance and a specific level of production.

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## Year: 2018

### 3.1 Ration 49

A ration is the total allowance of feed (diet ingredients) given to an animal during a 24-hour period. It may or may not be balanced; a "balanced ration" meets specific nutritional needs, whereas a generic ration is simply the daily food intake.

### **3.2 Unconventional feeds 50**

These are feed resources not traditionally used in animal feeding or used only in specific regions (e.g., Neem seed cake, Sal seed meal, poultry litter, fruit processing waste). They are often used to reduce feed costs during scarcity but may contain anti-nutritional factors requiring treatment.

### **3.3 National Research Council (NRC) 51**

The NRC (USA) is an organization that publishes nutrient requirement standards for various livestock species (Nutrient Requirements of Dairy Cattle, Swine, Poultry, etc.). These standards are widely used globally as a reference for formulating animal diets.

### **3.4 Roughage 52**

(See Answer 2019 3.9)

Feeds containing more than 18% crude fiber and less than 60% TDN on a dry matter basis. They provide bulk to the diet, stimulate chewing/salivation, and are necessary for maintaining rumen pH and health.

### **3.5 Feed supplement 53**

A feed supplement is a concentrated source of nutrients (minerals, vitamins, proteins) added to a basic ration to correct deficiencies or improve performance. Examples include mineral mixtures, vitamin premixes, or protein concentrates like soybean meal.

### **3.6 Alfalfa meal 54**

Alfalfa (Lucerne) meal is ground, dried alfalfa hay. It is an excellent source of protein (15-20%), calcium, and pigments (xanthophylls) for poultry (to color egg yolks). It is also a source of unidentified growth factors.

### **3.7 BIS 55**

Bureau of Indian Standards. It is the national body that formulates standards for various products, including livestock feeds (e.g., BIS specifications for poultry feed, compounded cattle feed, mineral mixtures) to ensure quality and safety in the Indian market.

### **3.8 TDN 56**

Total Digestible Nutrients. It is a measure of the energy value of a feed, calculated as the sum of digestible protein, digestible fiber, digestible nitrogen-free extract, and digestible fat (multiplied by 2.25).

$$\text{TDN} = \text{DCP} + \text{DCF} + \text{DNFE} + (\text{DEE} \times 2.25)$$

### 3.9 Nutrient 57

A nutrient is any chemical substance in food that provides energy, builds tissue, or supports metabolism. The six major classes are Water, Carbohydrates, Lipids, Proteins, Minerals, and Vitamins.

### 3.10 NPN 58

Non-Protein Nitrogen. Nitrogen derived from sources other than amino acids/peptides, such as urea, biuret, and ammonia. Ruminants can utilize NPN via rumen microbes to synthesize microbial protein, unlike monogastrics.

### 3.11 Feeding standards 59

(See Answer 2023 3.2)

Scientific guidelines presenting the nutrient requirements of animals for different physiological states (e.g., NRC, ARC, ICAR standards). They serve as the basis for calculating balanced rations.

### 3.12 Flushing 60

(See Answer 2024 3.2)

The practice of increasing nutrient intake for dams 2-3 weeks before breeding to enhance ovulation rates and subsequent litter size.