**Chapter 6: Milk Technology**

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**Refresher Points:**

1. In India, market milk industry was started in 1950-51 i.e., Central dairy of Aarey milk colony Mumbai.
2. 1951- Pandit Jawaharlal Nehru had inaugurated the central dairy of Aarey milk colony Mumbai.
3. Oldest military dairy farms in India-Allahabad,1889
4. Oldest co-operative milk union in India- Allahabad,1913.
5. NDDB was established in the year 1965.
6. Pasteurization milk will not clot with rennet.
7. Consumers judge the quality of milk on the basis of cream line.
8. Phosphatase test is used to detect inadequate pasteurization.
9. Milk is heavier than water (specific gravity of milk is more than water)
10. Common types of lactometers are Zeal, Quevenne, etc.
11. Most common types of microbial growth occurs in milk within the PH range of 5.6-7.5
12. Milk and milk products order (MMPO) was founded in the year 1992
13. ICMR recommendation for percapita availability of milk in India is 250 grams
14. The major lipid component of bovine milk is Triglycerides
15. Sweet curdling in UHT milk is caused by *Bacillus cereus*
16. Ropiness in raw milk is caused by *Alkaligenes viscolactis*
17. Dr.Verghese Kurien is known as milk man of India
18. The first dairy co-operative was started in the year 1913 at Allahabad
19. Hehner’s test is used to check adulteration of milk with Formalin
20. Galacto toxin in milk are produced due to contact of milk with copper vessels
21. Most (> 95%) milk fat exists as globules of 0.1-15 μ diameter.
22. Cow milk fat globules: ~ 3-8 μ, Buffalo milk fat globules: ~ 4-10 μ.

**Expansions:**

WTO: World Trade Organization

GATT: General Agreement on Tariffs and Trade

TBT: Technical Barriers to Trade

SPS: Sanitary and Phytosanitary

CAC: Codex Alimentarius Commission

DGHS: Director General of Health Services

FSSR: Food Safety and Standards Rules

BIS: Bureau of Indian Standards

ISI: Indian Standards Institution

HACCP: Hazard Analysis Critical Control Point

EIC: Export Inspection Council

MPO: Meat Product Order

VOCO: Vegetable Oils Control Order

FPO: Food Products Order

ISO: International Organization for Standardization

FRA: Food Regulation Authority

CCFS: Central Committee on Food Standards

NDRI: National Dairy Research Institute, Karnal (Haryana)

**TABLES**

|  |  |  |
| --- | --- | --- |
| **S.No** | **IMPORTANT EVENT** | **YEAR** |
| 1 | Market milk industry was started in India  | 1950-51 |
| 2 | Oldest military dairy farms in India at Allahabad | 1889 |
| 3 | Oldest co-operative milk union in India at Allahabad | 1913 |
| 4 | NDDB was established  | 1965 |
| 5 | Milk and milk products order (MMPO) | 1992 |
| 6 | Operation flood was launched  | 1970 |
| 7 | Operation flood I  | 1970-1980 |
| 8 | Operation flood II | 1981-1985 |
| 9 | Operation flood III  | 1985-1996 |
| 10 | Amul was established in the year  | 1846 |
| 11 | World Trade Organization (WTO) | 1995 |
| 12 | International Organization for standardization (ISO) | 1947 |
| 13 | World Health Organization (WHO) | 1948 |
| 14 | Food and Agriculture Organization (FAO) | 1945 |
| 15 | Office International des Epizooties (OIE)-old nameThe world organization for Animal Health (OIE)-New name | 1924 |
| 16 | Codex alimentarius | 1963 |
| 17 | Indian Standards Institutions (ISI) | 1946 |
| 18 | Bureau of Indian Standards (BIS) | 1986 |
| 19 | National Standards Body of India (NSBI) | 2015 |
| 20 | Food safety and standards Act  | 2006 |

**According to Prevention of food adulteration rules, 1976 for standards for different milk**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Class of milk** | **Designation** | **Locality** | **Min Fat %** | **Min SNF %** |
| Goat or sheep milk | Raw, Pasteurized boiled, flavoured and sterilized | Assam, Andaman and Nicobar, Andhra Pradesh, Bihar, Delhi, Daman and Diu, Dadra and Nagar— Haveli: Gujarat, Goa, Himachal Pradesh. Kamataka Kerala, Lakshadweep, , Maharashtra: Madhya pradesh, Manipur. Nagaland, NEFA= Orissa, Pondicherry; Rajasthan, Tripura, Tamil Nadu, Uttar Pradesh, West Bengal | 3 | 9 |
| Cow milk | Raw, Pasteurized boiled: flavoured and sterilized | Assam: Andaman and Nicobar, Andhra Pradesh, Bihar, Chandigarh D elhi, Daman and Diu, Dadra and Nagar— Haveli, Gujarat, Haryana, Goa, Himachal Pradesh, Kamataka Kerala, Lakshadweep, Maharashtra, Madhya pradesh, Manipur, Nagaland; NEFA, Orissa, Pondicherry, Punjab, Rajasthan, Tripura, Tamil Nadu, Uttar Pradesh: West B engal | 3.5 | 8.5 |
| Cow milk | Raw: Pasteurized boiled, flavoured and sterilized | Chandigarh, Haryana, Punjab | 4 | 8.5 |
| Mixture of milk from different species | Raw, Pasteurized:boiled, flavoured and sterilized | All India | 4.5 | 8.5 |
| Buffalo milk | Raw, Pasteurized, boiled, flavoured and sterilized | Andaman and Nicobar, Andhra Pradesh,Dadra and Nagar — Haveli, Goa,Daman and Diu- Kerala: Himachal Pradesh, Lakshadweep, Tamil Nadu, Madhya pradesh: Manipur, Kamataka, Nagaland# NEFA:OrissaePondicheny,Rajasthan, Tripura | 5 | 9 |
| Buffalo milk | Raw, Pasteurized; boiled, flavoured and sterilized | Assam, Bihar, Chandigarh, Delhi: Gujarat, Maharashtra: Haryana: Punjab, Uttar Pradesh, West Bengal | 6 | 9 |

**Chemical composition of milk of different species**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Name of the species** | **Percentage composition**  |
| **Water** | **Fat** | **Protein** | **Lactose** | **Ash** |
| 1 | Buffalo | 84.2 | 6.6 | 3.9 | 5.2 | 0.8 |
| 2 | Cow | 86.6 | 4.6 | 3.4 | 4.9 | 0.7 |
| 3 | Ewe | 79.4 | 8.6 | 6.7 | 4.3 | 1.0 |
| 4 | Goat | 86.5 | 4.5 | 3.5 | 4.7 | 0.8 |
| 5 | Human | 87.7 | 3.6 | 1.8 | 6.8 | 0.1 |
| 6 | Mare | 89.1 | 1.6 | 2.7 | 6.1 | 0.5 |
| 7 | Sow | 89.6 | 4.8 | 1.3 | 3.4 | 0.9 |
| 8 | Dog | 75.4 | 9.6 | 11.2 | 3.1 | 0.7 |
| 9 | Cat | 84.6 | 3.8 | 9.1 | 4.9 | 0.6 |

**Composition of milk from various species**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Species** | **Water** | **Casein** | **Whey protein** | **Lactose** | **Ash** | **Energy (Kcal/100g)** |
| Horse | 88.8 | 1.3 | 1.2 | 6.2 | 0.5 | 52 |
| Cow | 87.3 | 2.6 | 0.6 | 4.6 | 0.7 | 66 |
| Goat | 86.7 | 2.6 | 0.6 | 4.3 | 0.8 | 70 |
| Camel | 86.5 | 2.7 | 0.9 | 5 | 0.8 | 70 |
| Human | 87.1 | 0.4 | 0.5 | 7.1 | 0.2 | 72 |
| Zebu | 86.5 | 2.6 | 0.6 | 4.7 | 0.7 | 74 |
| Water Buffalo | 82.8 | 3.2 | 0.6 | 4.8 | 0.8 | 101 |
| Sheep | 82 | 3.9 | 0.7 | 4.8 | 0.9 | 102 |
| Rabbit | 67.2 | 9.3 | 4.6 | 2.1 | 1.8 | 202 |
| Reindeer | 66.7 | 8.6 | 1.5 | 2.8 | 1.5 | 214 |
| *(Source: Jenness and Sloan,1970, Dairy science abstracts,32,599-612)* |

**Characteristics of the primary structural components of milk**

|  |  |  |
| --- | --- | --- |
| **Structural elements of milk** | **Fat globules** | **Plasma** |
| **Casein micelles** | **Serum** |
| **Globular proteins** | **Lipo— protein particles** |
| **Main components** | Lipids | Casein, Water, Salts | Serum proteins | Lipoprotein particles |
| **Considered as** | Emulsion | Fine dispersion | Colloidal solution | Colloidal dispersion |
| **Content (%D.M)** | 3.8 | 2.8 | 0.6 | ~0.01 |
| **Volume fraction** | 0.042 | 0.06 | 0.006 | ~0.0001 |
| **Particles Diameter** | 0.1-10 um | 10-300 nm | 3-6 nm | ~10 nm |
| **Number per ml** | 1010 | 1014 | 1017 | 1014 |
| **Surface area (cm2/ml milk)** | 700 | 40000 | 50000 | 100 |
| **Density (200C) g/ml** | 0.92 | 1.11 | 1.34 | 1.1 |
| **Visible with** | Microscope | Ultra microscope | Electron Microscope | Electron Microscope |
| **Light scattering** | Very turbid, white | Turbid bluish | Light haze | Negligible |
| **Separable with** | Dairy separator | High — speed centrifuge | Gel filtration | Gel filtration |
| **Filterable with** | Fine sintered glass | Chamberland filter | Cellophane | Cellophane |
| **Diffusion rate (mm in 1 hr)** |  | 0.1-0.3 | 0.6 | 0.4 |
| **Flocculation** | By agglutinin in cold | By acid or by rennet | By heat |  |
| **Isoelectric pH** | ~3.8 | ~4.6 | ~4.5-5.5 | ~4 |
| (Source: Dairy Chemistry and Physics, Walstra and Jenness, 1984) |

**Classification of milk proteins**

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**Factors effecting milk composition**

|  |  |
| --- | --- |
| **Factors** | **Effects** |
| Species | Variation in milk composition |
| Breed | High milk yield → low fat percentage, vice versa |
| Individual Variation | Milk composition characteristic of each cow |
| Season | Fat and SNF variation throughout the year |
| Age | Fat increases until 3rd lactation, then remains unchanged until age affects the animal |
| Milking Interval | Longer intervals → more yield, less fat; vice versa. Little effect on SNF |
| Completeness of Milking | Incomplete milking → less fat |
| Irregularity in Milking | Frequent changes → less fat, little effect on SNF |
| Yield | Increased yield → higher lactose, lower fat and solids |
| Lactation Effect | Colostrum high in globules and chlorides, low lactose. Fat and SNF decrease with higher yield |
| Exercise | More exercise → increased fat, no effect on SNF |
| Excitement | Excitement → decreased fat, no effect on SNF |
| Hormones | Prolactin, thyroid hormone increases fat percentage; oestrogen's effect varies |
| Udder Diseases | Mastitis → low lactose, casein %, increase in chloride. Subnormal SNF |
| Physiological Condition | Healthy condition → high fat, SNF content |
| Pasture Feeding | Increases fat and SNF, unsaturated fatty acids |
| Feeding | Palm oil, coconut oil → increased fat; cod liver oil → decreased fat. Starvation → increased unsaturated fatty acids |
| Milker | Change in milker affects composition and quantity due to incomplete letting down of animal |

**Energy values of milk**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Milk constiuent** | **Energy value** |
| 1 | Milk fat | 9.3 C/g |
| 2 | Milk Protein | 4.1 C/g |
| 3 | Milk Sugar | 4.1 C/g |
| 4 | Cow milk  | 75 C/100g |
| 5 | Buffalo milk | 100 C/100g |

**Minimum legal requirements for different types of milk**

|  |  |  |
| --- | --- | --- |
| **Type** | **Fat %** | **SNF %** |
| Standardized Milk | 4.5% | 8.5% |
| Recombined Milk | 3% | 8.5% |
| Toned Milk | 3% | 8.5% |
| Double Toned Milk | 1.5% | 9% |
| Skim Milk | 0.5% | 8.7% |
| Full Cream Milk | 6.0% | 9.0% |
| Flavoured milk | 1-2% | - |

**Physico-chemical properties of milk**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Character** | **Species** |  **Value**  |
| 1 | Total acidity (%) | Cow milk | 0.13-0.14 |
| Buffalo milk | 0.14-0.15 |
| 2 | PH | Cow milk | 6.4-6.6 |
| Buffalo milk | 6.7-6.8 |
| 3 | Specific Gravity | Cow milk | 1.028-1.030 |
| Buffalo milk | 1.030-1.032 |
| Skim milk | 1.035-1.037 |
| Water  | 1.000 |
| Solid not fat  | 1.616 |
| Fat | 0.93 |
| Protein | 1.346 |
| Lactose  | 1.666 |
| Salt  | 4.12 |
| 4 | Freezing Point  | Cow milk | 0.547 0C |
| Buffalo milk | 0.549 0C |
| Bulk milk samples | 0.530 0C |
| Meat | -1.547 |
| 5 | β-carotein content | Cow milk | 30 μg/g |
| Buffalo milk | 0.25-0.48 μg/g |

**Physico- chemical properties of milk**

|  |  |
| --- | --- |
| **Property** | **Description** |
| Physical state of milk | Water as continuous phase, other constituents dissolved/suspended. Fat in emulsion, protein in colloidal suspension. |
| Acidity | Natural acidity from casein, phosphates, citrates. Developed acidity from lactic acid via bacterial action on lactose. |
| pH | Cow milk: 6.4-6.6, Buffalo milk: 6.7-6.8. Deviations indicate udder infection. |
| Density | Measured by hygrometer at 20°C. Cow milk: 1.028-1.030, Buffalo milk: 1.030-1.032. |
| Specific gravity | Ratio of substance density to water density. Cow milk: 1.028-1.030, Buffalo milk: 1.030-1.032. |
| Freezing point | Milk freezes slightly lower than water due to soluble constituents. Average depression: -0.547°C (cow), -0.549°C (buffalo). |
| Colour | Cow milk: Yellowish creamy white. Buffalo milk: Creamy white. Depends on factors like breed, feed, fat percentage. |
| Flavor | Blend of lactose sweetness, mineral saltiness, damped by proteins. Abnormal flavor due to various factors. |
| Boiling point | Milk boils at 100.15°C due to dissolved particles. Addition of water lowers boiling point. |
| Electrical conductivity | Depends on ion concentration, obstructed by fat and colloids. Ranges from 0.003 to 0.005 mho/min. |
| Refractive index | Ranges from 1.344 to 1.3485 at 20°C. Used to indicate watering adulteration. |
| Viscosity | Resistance to flow, varies from 1.5-2 centipoise at normal temperature. Homogenization increases viscosity. |
| Surface tension | Milk: 50 dynes/cm at 20°C. Related to protein, fat, phospholipids, and fatty acids. |
| Specific heat | Ranges from 0.92-0.93, highest at 15°C. Changes with temperature. |
| Coefficient of thermal expansion | Ratio of volume increase per degree temperature increase. |
| Thermal conductivity | Determines heating/cooling rate. Milk: 13.5x10^4 Cal/cmS°C. Depends on concentration, temperature. |
| Heat stability | Time/temperature to induce coagulation. Governed by salt balance. |
| Buffering action | Acts as complex buffer due to several buffering substances present |

**Physico-chemical properties of milk**

|  |  |
| --- | --- |
| Property | Value/Range |
| Color and Optical Properties | Turbidity due to light scattering. |
| Carotene influences color (white to yellow). |
| Flavour | Natural sweetness. |
| Undesirable flavours due to feed, bacteria, enzymes, and processing. |
| Specific Gravity  | Cow milk specific gravity: 1.018 to 1.036. |
| Buffalo milk specific gravity: 1.018 to 1.038. |
| Density | Density at 20°C: 1.027 to 1.033 kg/cm³. |
| Viscosity | Whole milk viscosity at 25°C: about 2.0 cP. |
| Surface Tension | Milk surface tension at 20°C: 50 dyne/cm. |
| Freezing and Boiling Points | Cow milk freezing point: -0.512 to -0.572ºC. |
| Buffalo milk freezing point: -0.521 to -0.575ºC. |
| Boiling point: 100.17ºC. |
| pH | Fresh milk pH: 6.5 to 6.7. |
| Acidity | Titratable acid: 0.14 to 0.18% (as lactic acid). |
| Heat Stability | Coagulation temperature or time varies based on caseins, salt balance, citrates, phosphates, and calcium |

**Properties of Lactoferrin and Lactoperoxidase**

|  |  |  |
| --- | --- | --- |
| **Protein** | **Lactoferrin** | **Lactoperoxidase** |
| Structure | Single-chain, metal-binding glycoprotein | Oxido-reductase enzyme with a single polypeptide chain |
| Color | Red-colored iron-binding protein | - |
| Functions | Mediates inflammation, regulates immune system | Antibacterial, antifungal, anti-endotoxin, antiviral activities |
| Antimicrobial | Inhibits enteropathogenic organisms by binding iron | Preserves raw milk |
| Growth Promotion | Promotes growth of beneficial bacteria like bifidobacteria | - |
| Natural Occurrence | Tears, blood, breast milk, saliva, mucus | Milk, saliva, tears, cervical mucus |
| Concentration | Human milk: ~1 g/LHuman colostrum: ~7 g/L.Lower concentration in cow milk (one-tenth of human milk). | Cow milk: 1.4 units/ml, Buffalo milk: 0.9 units/ml |
| Thermal Stability | - | Higher in buffalo milk compared to cow milk |
| Preservation Amount | - | 0.5-1 mg/L for preservation, much lower than cow milk (30 mg/L) |

**Vitamins in milk**

|  |  |
| --- | --- |
| **Vitamins** | **Concentration (per litre)** |
| **Fat soluble** |
| Vitamin A | 1590 I.U. |
| Vitamin D | 22.1 I.U. |
| Vitamin E | 1.0 mg |
| Vitamin K | 0.04 mg |
| **Water Soluble** |
| Vitamin B 1 | 0.4 mg |
| Vitamin B2 | 1.5 mg |
| Pantothenic acid | 3.0 mg |
| Biotin | 50 µg |
| Niacin | 0.2-1.2 mg |
| Pyoidoxine B6 | 0.7 µg |
| Folic acid | 1.0 µg |
| B12 | 7.0 µg |
| Vitamin C | 20 mg |
| Inositol | 180 mg |
| Choline | 150 mg |
| Source: Text book of Dairy Chemistry by Mathur/et.al., 2005) |

**Milk adulteration tests**

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Adulterants** | **Test** |
| 1 | Detergent | Methylene blue |
| 2 | Urea | DMAB |
| 3 | Ammonium salts | Nessler |
| 4 | Sucrose | Seliwanoff |
| 5 | Glucose | Barfoed |
| 6 | Malto-dextrin | Iodine |
| 7 | Starch | Iodine |
| 8 | Salt | Silver nitrate test |
| 9 | Nitrate | Diphenylamine |
| 10 | Sulphate | Barium chloride  |
| 11 | Hydrogen peroxide | Iodometric test |
| 12 | Formaldehyde | Leach, Hehner |
| 13 | Neutralizers | Rosolic acid |

**Platform test of milk**

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Contents** | **Observations** |
| 1 | **Appearance** | Observe each can for floating extraneous matter, off color, or partially churned milk. Normal color, absence of churned fat globules, and minimal floating extraneous material are essential. |
| 2 | **Smell (Odour)** | Quick assessment of organoleptic quality by smelling the headspace in each can.Experienced graders use a 'trained nose' to decide acceptance/rejection. Milk should be free from off flavors. |
| 3 | **Temperature** | The delivered temperature indicates milk quality. Regular temperature checks help assess quality, with a grader able to gauge coldness by touching the can. Satisfactory temperature: 5°C or below. |
| 4 | **Sediment** | Shows visible foreign matter in milk. Not daily but frequent testing recommended using a reliable sediment tester. Low sediment is desirable.BIS standards: Excellent (0 mg), Good (0.2mg), Fair (0.5mg), Poor (1mg) and Very Poor (2mg) |
| 5 | **Acidity** | 'Natural' or 'apparent' acidity is desirable for heat stability. 'Developed acidity' (Natural + Developed = Titratable acidity) adversely affects quality. Quality milk must be processable in pasteurizer. |
| 6 | **Lactometer Reading** | Detects water adulteration, as water addition lowers milk density. Cow milk reading: 28 to 30; Buffalo milk reading: 30 to 32 (at 15.5°C). Important for identifying potential adulteration with water. |

**Minimum legal requirements for different types of milk**

|  |  |  |
| --- | --- | --- |
| **Type** | **Fat %** | **SNF %** |
| Standardized Milk | 4.5% | 8.5% |
| Recombined Milk | 3% | 8.5% |
| Toned Milk | 3% | 8.5% |
| Double Toned Milk | 1.5% | 9% |
| Skim Milk | 0.5% | 8.7% |
| Full Cream Milk | 6.0% | 9.0% |
| Flavoured milk | 1-2% | - |

**Time and temperature for specific purposes**

|  |  |  |
| --- | --- | --- |
| **Purpose** | **Temp. to be kept for 30 minutes** | **Temp. to be kept for 15 seconds** |
| Cream line reduced | 62.20 C | 72.20 C |
| Pasteurization requirement | 61.70 C | 71.70 C |
| To destroy phosphatase | 61.10 C | 71.10 C |
| To kill tubercle bacilli | 58.90 C | 70.00 C |

**Raw milk Prerequisites for UHT**

|  |  |
| --- | --- |
| Flavour and Taste  | Normal and fresh  |
| pH | More than 6.6 |
| Acidity | Less than 0. 14% LA |
| Spore count | 200- 500/ml |
| 72% Alcohol | Negative |

**Different types of bacteria classified on the basis of optimum growth temperature are as follow:**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Class** | **Temperature 0C** |
| 1 | Psychrotropic | 5-7 0C |
| 2 | Mesophilic | 20-40 0C |
| 3 | Thermophilic  | 50 0C |
| 4 | Thermoduric | 55-70 0C |

**Bacteriological standards of raw milk**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Standard plate count (SPC/ml)** | **Grade** |
| 1 | 2,00,000 | Very good |
| 2 | 2,00,000-10,00,000 | Good |
| 3 | 10,00,000-50,00,000 | Fair |
| 4 | >50,00,000 | Poor |

**Milk-borne infections**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.**  | **Infection**  | **Causative pathogen**  | **Disease/ disorder**  | **Possible source of entry**  |
| 1  | Food infection  | *Salmonella typhii*and related species  | Typhoid, salmonellosis (food poisoning)  | Dung  |
| *Shigella dysenteriae* | Shigellosis (dysentery)  | Faecal contamination  |
| *Streptococcus* sp. (enterococci)  | Septic sore throat, scarlet fever, food poisoning  | Faecal contamination  |
| 2  | Food intoxication: Bacterial  | *Staph. aureus*  | Food poisoning  | Human beings  |
| *Cl. botulinum*  | Botulism (food poisoning)  | Soil, water, inadequate processing  |
| *E. coli*  | Summer diarrhoea  | Faecal contamination  |
| *V. cholerae*  | Cholera  | Water  |
| Fungal  | *Aspergilus flavus*  | Aflatoxicosis  | Poor storage & handling  |
| Other toxigenic mold spp.  | Mycotoxicosis  |
| 3  | Toxic infection  | *Bacillus cereus*  | Food poisoning  | Soil, water, inadequate processing  |
| *Cl. perfringens*  | Gas gangrene  | Soil, water, inadequate processing  |
| 4  | Other milk-borne disorders (uncertain pathogenesis)  | *Aeromonas* spp.  | Food poisoning  | Water  |
| *Proteus* spp.  | Human intestinal tract, soil, water  |
| *Klebsiella* spp*.*  | Enteric sources  |
| *Pseudomonas* spp*.*  | Soil, water, sewage  |
| 5  | Some other important pathogens  | *Listeria monocytogenes*  | Listeriosis  | Soil, human beings  |
| *Yersinia enterocolitica*  | Diarrhoeal disease  | Water  |
| *Campylobacter jejuni* | Dung |
| *Vibrio parahaemolyticus*  | Water  |
| 6  | Other milk-borne diseases: - Bacterial  | *Mycobacterium tuberculosis*  | Tuberculosis  | Humans  |
| *Brucella abortus*  | Brucellosis |

**Quality control tests for milk and Significance**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Test Name** | **Significance** | **Type**  |
| 1 | Acidity | To determine final acceptance/ rejection | Platform test |
| 2 | Ethanol/Alcohol test | To determine heat- stability of milk | Platform test |
| 3 | Clot on boiling | To determine heat- stability of milk | Platform test |
| 4 | Alcohol- Alizarin test  | To determine Heat stability and PH | Platform test |
| 5 | Lactometer | To detect adulteration of milk with water | Platform test |
| 6 | Resazurin reduction test | To determine the extent of bacterial contamination and growth in milk | Platform test |
| 7 | Dye reduction test | Extent of bacterial contamination and growth of milk | Laboratory test  |
| 8 | Methylene blue reduction test | Extent of bacterial contamination and growth of milk | - |
| 9 | Standard plate count | Extent of bacterial contamination and growth of milk | Laboratory test  |
| 10 | Freezing point  | To detect adulteration of milk with water | Laboratory test  |
| 11 | Fat/ SNF | To make payment for milk received | Laboratory test  |

**Pasteurization requirements**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Particulars** | **30 min.** | **15 sec** |
| 1 | To kill T.B. germs | 138 0F/58.9 0C | 158 0F/70 0C |
| 2 | To inactivate phosphotase | 142 0F/61.1 0C | 160 0F/71.1 0C |
| 3 | Pasteurization requirements | 143 0F/61.7 0C | 161 0F/71.1 0C |
| 4 | Cream line reduced | 144 0F/62.2 0C | 162 0F/72.2 0C |

**Different Methods of pasteurization temperature**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Particulars** | **30 min.** | **15 sec** |
| 1 | In- Bottle pasteurization | 63-66 0C/ 145-150 0F | - |
| 2 | Batch/ Holding pasteurization | 63 0C/ 145 0F | - |
| 3 | Low temperature long time | 63 0C/ 145 0F | - |
| 4 | High temperature short time | - | 72 0C/161 0F |
| 5 | Stassanization | 74 0C/7 sec or 165 0F |
| 6 | Ultra High temperature | 135-150 0C/ no hold 275-302 0F/ no hold  |
| 7 | Uperization/ Ultra- pasteurization | 150 0C/fraction of sec302 0F/fraction of sec |

**Multiple choice Questions**

|  |  |  |
| --- | --- | --- |
| 1 | Purpose of the Hansa Test |  |
|  | A) | To determine mixing of cow & buffalo milk | B) | To determine mixing of cow & sheep milk |
|  | C) | To determine mixing of goat & sheep milk | D) | None |
| 2 | Which of the following statement is true |
|  | A)Operation flood was started by the NDDB in 1970 |
|  | B)it was the largest integrated dairy development programme in the world |
|  | C)the father of operation flood was Dr.Verghese Kurien |
|  | D)all of the above |
|  3 | Temperature and time protocol for HTST pasteurization |
|  | A) | 630C/30minutes | B) | 720C/15 sec |
|  | C) | 740C/7 sec | D) | 130-1350C/fraction of sec |
|  4 | Temperature and time protocol for LTLT pasteurization |  |
|  | A) | 630C/30minutes | B) | 720C/15 sec |
|  | C) | 740C/7 sec | D) | 130-1350C/fraction of sec |
| 5 | Which of the following statement is true |  |
|  | A)the Holstein Friesian cow is the highest milk producing breed in the world |  |
|  | B)it produces A1 milk |  |
|  | C)it is originated from Holland |  |
|  | D) all of the above |  |
|  6 | Temperature and time protocol for Stassanization pasteurization |  |
|  | A) | 630C/30minutes | B) | 720C/15 sec |
|  | C) | 740C/7 sec | D) | 130-1350C/fraction of sec |
|  7 | Temperature and time protocol for UHT pasteurization |  |
|  | A) | 630C/30minutes | B) | 720C/15 sec |
|  | C) | 740C/7 sec | D) | 130-1350C/fraction of sec |
|  8 | Temperature and time protocol for Uperization |  |
|  | A) | 630C/30minutes | B) | 720C/15 sec |
|  | C) | 740C/7 sec | D) | 1500C/fraction of sec |
| 9 | Which of the following statement is true |
|  | A)gerber method is also known as fucoma test |
|  | B)milk fat is made up of fatty acid molecules, glycerol a 3 carbon compounds |
|  | C)the most common type of fat is triglyceride or triglycerol |
|  | D) all of the above |
|  10 | Purpose of COB test |  |
|  | A) | Heat stability of milk | B) | Faecal contamination |
|  | C) | Acidity of milk | D) | PH of the milk |
|  11 | Purpose of coliform count test |  |
|  | A) | Heat stability of milk | B) | Faecal contamination |
|  | C) | Acidity of milk | D) | PH of the milk |
|  12 | Purpose of alcohol precipitation test |  |
|  | A) | Heat stability of milk | B) | Faecal contamination |
|  | C) | Acidity of milk | D) | PH of the milk |
|  13 | Purpose of organoleptic test |  |
|  | A) | colour | B) | Flavor |
|  | C) | taste | D) | All |
| 14 | Which of the following statement is true |
|  | A)lactometer is an instrument used to find the purity of milk |
|  | B)hydrometer measures the specific gravity of milk |
|  | C)the specific gravity of the milk ranges from 1.000 to 1.032 |
|  | D)fat percent in the milk is 0.5% |
| 15 | Most variable components of milk |
|  | A) | Fat | B) | SNF |
|  | C) | Temperature | D) | All |
| 16 | Which of the following statement is true |  |
|  | A)plate pasteurizer is also known as flash pasteurizer/HTST |  |
|  | B)temperature of HTST 720C for 15 sec |  |
|  | C)It is used for less viscous liquid like Apple juice,Liquid egg products etc |  |
|  | D) all of the above |  |
| 17 | Normal PH of the milk---- |  |
|  | A) | 5-6 to 5-8  | B) | 6.0 to 6.2 |
|  | C) | 6.4 to 6.6 | D) | 6.8 to 7.0 |
| 18 | For removal of milk stones on vessels dairymen use--- |  |
|  | A) | Teepol | B) | Soap |
|  | C) | Mild acids | D) | Hot water |
| 19 | Which of the following statement is true |  |
|  | A)cans for handling upto 2000 litres of milk per day |
|  | B)in milk transportation, capacity of tankers for milk handling ranges from 2000 – 5000/day |
|  | C)rail tankers for handling 10000 litres  |  |
|  | D) all of the above |  |
| 20 | Babcock method of testing of milk helps in finding— |  |
|  | A) |  Sickness in cow  | B) | Fat in milk |
|  | C) | SNF in milk | D) | Protein in milk  |
| 21 | Sandy ice cream due to-- |  |
|  | A) | Deposit of milk protein | B) | Deposit of minerals |
|  | C) | Presence of acidity in Ice cream | D) | Crystalization of alpha lactose |
| **22** | **Which of the following statement is false about nutrients in milk** |
|  | A)milk is a good source of calcium |
|  | B) milk is a good source of protein |
|  | C) milk is a good source of vitamin C  |
|  | D) milk is a good source of vitamin D |
| 23 | Casein can be removed from fresh milk by-----  |  |
|  | A) | Heating  | B) | Freezing |
|  | C) | Filtering through  | D) | Vigorous shaking |
| 24 | Term total solids in milk refers to----- |  |
|  | A) | Fat and Protein | B) |  Fat and Sugar  |
|  | C) | Total dry matter  | D) | Fat, Protein and sugar |
| 25 | Para casein is formed when casein is precipitated with---- |  |
|  | A) | High fat | B) | High protein |
|  | C) | Rennin | D) | High minerals |
| **26** | **Which of the following statement is true** |
|  | A)cartons are commonly used for both bulk and retail sale |
|  | B)perga U.K |
|  | C)Purepak USA |
|  | D) all of the above |
| 27 | Stripping contains------- |
|  | A) | Less fat  | B) | Higher fat  |
|  | C) | Less SNF | D) | High SNF |
| 28 | Human milk contains-------  |  |
|  | A) | High fat | B) | High protein |
|  | C) | High lactose  | D) | High minerals |
| **29** | **Which of the following statement is true** |
|  | A)Distribution of milk is the last stage of market milk industry |
|  | B)ZUPACK, BLOCKPACK -Western germany |
|  | C)Tetra pack - Sweden |
|  | D) all of the above |
| 30 | The efficiency of pasteurization is determined by------ |
|  | A) | Lipase  | B) | Phosphatase  |
|  | C) | Protease | D) | Peroxides |
| 31 | A milli liter of milk at 600F Weighs---  |  |
|  | A) | 1.032 gm | B) | 0.5 gm  |
|  | C) | 1 gm  | D) | 1.5 gm |
| **32** | **Which of the following statement is true** |
|  | A)mild acids are used to remove milk stone |
|  | B)nitric acids are used as dairy detergent for stainless steel surface |
|  | C)weak alkali is used for dissolving the proteins |
|  | D) all of the above |
| 33 | Index organism for pasteurization |
|  | A) | Coxiella | B) | Mycobacterium |
|  | C) | Leptospira | D) | Listeria |
| 34. | Gerber‘s acid is used to estimate |  |
|  | A) | Fat percentage of milk | B) | SNF percentage of milk |
|  | C) | Protein percentage of milk | D) | None |
| 35. | Average density of milk fat--- |  |
|  | A) | 0.39 | B) | 0.93 |
|  | C) | 0.59 | D) | 0.69 |
| 36 | **Which of the following statement is true** |
|  | A)commonly used dairy sanitizer were steam,hot water and chemicals |
|  | B)surface active agents are Teepol |
|  | C)strong alkali-Saponify the fat |
|  | D) all of the above |
| 37 | Father of white revolution |
|  | A) | Sardhar vallabhai Patel | B) | M.K.Gandhi |
|  | C) | Lal bahadur sastri | D) | Verghese kurien |
| **38** | **Which of the following statement is true** |
|  | A) NAOH-caustic soda |
|  | B)NA2CO3- washing soda |
|  | C)NA2HCO3-Baking soda |
|  | D) all of the above |
| 39 | Milk from Zebu Cattle |  |
|  | A) | A2 milk | B) | A4 milk |
|  | C) | A3 milk | D) | A1 milk |
| 40 | Natural acidity of milk is due to |  |
|  | A) | Casein and phosphates | B) | Chlorides |
|  | C) | Temperature | D) | Drugs |
| 41 | Least variable factor |  |
|  | A) | Fat  | B) | SNF |
|  | C) | Cream | D) | Lactose |
| 42 | **Which of the following statement is true** |
|  | A)Verdigris toxicity is due to copper |
|  | B)rust is due to iron |
|  | C)stainless steel is widely used for milk products contact surfaces |
|  | D) all of the above |
| 43 | In processed milk Cooked flavor is due to-- |
|  | A) | Acidity | B) | Lactose |
|  | C) | Sulphydrl group | D) | Casein  |
| 44 | Specific gravity of cow milk-- |  |
|  | A) | 1.022-1.032 | B) | 1.028-1.032 |
|  | C) | 1.028-1.030 | D) | 1.020-1.030 |
| **45** | **Which of the following statement is true** |
|  | A)for milk cans tinned steel is commonlyused |
|  | B)milk received at the dairy plant should be 50C/below |
|  | C)milk pricing policy based on fat & SNF components  |
|  | D) all of the above |
| **46** | **Which of the following statement is true** |
|  | A)to prevent corrosion in milk cans stainless steel is used (invisible film of CrO2 is present) |
|  | B)grading should be based on organoleptic test |
|  | C) very convienent to handle common preservative in milk is 40% formaldehyde |
|  | D) all of the above |
| 47 | Specific gravity of buffalo milk-- |
|  | A) | 1.022-1.032 | B) | 1.028-1.032 |
|  | C) | 1.030-1.034 | D) | 1.020-1.030 |
| 48 | Boiling point of milk-- |  |
|  | A) | 1000C to 1020C | B) | 100.170C to 1010C |
|  | C) | 1000C to 1050C | D) | None |
| 49 | -----used as coolant in HTST. |  |
|  | A) | Glycol | B) | Lysine |
|  | C) | Acids  | D) | None |
| 50 | **Which of the following statement is true** |
|  | A) common preservative which is easy to handle was K2CR2O7 |
|  | B)pasteurization temperature is 600C for 1 sec |
|  | C)common microorganisms grow at a temperature of 10-150C |
|  | D)critical temperature of milk 550C |
| **51** | **Which of the following statement is true about disinfectant** |
|  | A)kill the all pathogenic and non-pathogenic organisms |
|  | B)kill harmful bacteria and viruses from surface |
|  | C)freedom from manure and dust |
|  | D)kill the pathogenic microorganisms |
| 52 | Milk saltiness is due to--- |
|  | A) | Lactose | B) | Lactoalbimun  |
|  | C) | Chloride content | D) | All  |
| 53 | Thickening agents used in milk ---  |  |
|  | A) | Cane Sugar | B) | Starch |
|  | C) | Gelatin | D) | All |
| 54 | ------is responsible for milk fat synthesis |  |
|  | A) | Acetate | B) | Glycol  |
|  | C) | Butyric  | D) | Propionic  |
| 55 | Which is known as milk sugar |  |
|  | A) | Lactose | B) | Glucose  |
|  | C) | Glucose | D) | Sucrose  |
| 56 | Specific gravity of skim milk--- |  |
|  | A) | 1.030-1.032 | B) | 1.035-1.037 |
|  | C) | 1.025-1.035 | D) | 1.023-1.035 |
| **57** | **Which of the following statement is true is true about cleanliness** |
|  | A)kill the all pathogenic and non-pathogenic organisms |
|  | B)kill harmful bacteria and viruses from surface |
|  | C)freedom from manure and dust |
|  | D)kill the pathogenic microorganisms |
| 58 | NDDB head quarters  |
|  | A) | Hyderabad, Telangana  | B) | Anand, maharastra  |
|  | C) | Anand, Gujarat | D) | New delhi  |
| 59 | NDRI located |  |
|  | A) | Hyderabad, Telangana  | B) | Karnal, Haryana  |
|  | C) | Anand, Gujarat | D) | None  |
| **60** | **Which of the following statement is true is true about sterilizing** |
|  | A)kill the all pathogenic and non-pathogenic organisms from surface |
|  | B)kill harmful bacteria and viruses from surface |
|  | C)freedom from manure and dust |
|  | D)kill the pathogenic microorganisms |
| 61 | Common milk micro organisms grow best between---0C |
|  | A) | 20 and 60  | B) | 20 and 40  |
|  | C) | 40 and 80  | D) | 10 and 20  |
| 62 | Specific gravity of milk is lowered by  |  |
|  | A) | Removal of water and cream  | B) | Addition of fat and cream  |
|  | C) | Removal of fat and cream  | D) | Addition of water and cream  |
| 63 | HACCP means |  |
|  | A) | Hazard analysis of critical control point | B) | Hazard analysis of critical point |
|  | C) | Hazard analysis of control point | D) | None |
| **64** | **Which of the following statement is true about freezing point** |
|  | A)mastitis milk shows increase the freezing point |
|  | B) freezing point is lower than the 0.5300C indicates added water |
|  | C)freezing point can detect skimmilk |
|  | D)freezing point test can detect 1 % of milk adulterated with water |
| **65** | **Which of the following statement is true about dairy detergent** |
|  | A)wetting agent is idet-10 |
|  | B)alkali-tartaric acid  |
|  | C)acid-sodium silicate |
|  | D)polyphosphate and chelating chemical-gluconic acid |
| 66 | SNF of milk composed of -- |  |
|  | A) | Protein | B) | Lactose |
|  | C) | Ash | D) | All of the above |
| 67 | Specific gravity of milk is increased by  |  |
|  | A) | addition of skim milk | B) | Removal of fat |
|  | **C)** | A,B correct | D) | None |
| 68 | For machine milking, minimum herd size should be -- |  |
|  | A) | 10 | B) | 30 |
|  | C) | 25 | D) | 20 |
| 69 | Dairy cooperatives in India follows-- |  |
|  | A) | Two- tier system | B) | Three- tier system |
|  | C) | One- tier system | D) | None  |
| **70** | **Which of the following statement is true about certified milk** |
|  | A)certified raw milk is safe and healthy to drink  |
|  | B)it is more nutritious and healthier than pasteurized milk |
|  | C)it is not heated at all |
|  | D) all of the above |
| **71** | **Which of the following statement is true about Grade A milk** |
|  | A) Grade A milk is also known as fluid grade milk |
|  | B)have a direct microscopic clump count of not more than 1 lakh/ml |
|  | C)it is regulated under federal milk marketing orders |
|  | D) all of the above |
| 72 | Energy value of milk fat-- |
|  | A) | 9.3 Calorie /g | B) | 5.5 Calorie /g |
|  | C) | 6.5 Calorie /g | D) | 11.0 Calorie /g |
| 73. | Energy value of milk protein-- |  |
|  | A) | 7.5 Calorie /g | B) | 4.1 Calorie /g |
|  | C) | 8.5 Calorie /g | D) | 6.0 Calorie /g |
| 74. | Green colour of whey is attributed to--- |  |
|  | A) | Folicacid | B) | Niacin |
|  | C) | Riboflavin | D) | Thiamin  |
| 75. | Storage site of milk in animals  |  |
|  | A) | Alveoli | B) | Glands |
|  | C) | Cisternae  | D) | All  |
| **76** | **Which of the following statement is true about milk constituents** |
|  | A)major constituents of milk : water,fat,protein,lactose,ash |
|  | B) minor constituents of milk :Phospholipids,sterol,vitamin,enzymes |
|  | C)True constituents of milk :milk fat,casein, lactose |
|  | D)All the above |
| 77 | Higher PH values for fresh milk indicates-- |  |
|  | A) | Udder infection | B) | Bacteria action |
|  | C) | Mastitis  | D) | All correct |
| 78. | Boiling point of milk ranges from-- |  |
|  | A) | 103 | B) | 100-101.70C |
|  | C) | 102 | D) | 105 |
| 79. | The correct method of milking dairy animal is-- |  |
|  | A) | Fisting | B) | Knuckling |
|  | C) | Full hand milking | D) | Stripping |
| **80** | **Which of the following statement is true about milk fat** |
|  | A)fat globule size 2-5micron |
|  | B)oil -in –water type emulsion |
|  | C)composed of number of glyceride-esters of fatty acids |
|  | D)All of the Above |
| 81. | Psychotropic bacteria can grow at ----0Ctemp. |
|  | A) | 7-8 | B) | 10-11 |
|  | C) | 5-7 | D) | 12-18 |
| 82. | Mesophilic bacteria can grow at ----0Ctemp. |  |
|  | A) | 20-40 | B) | 25-60 |
|  | C) | 60-80 | D) | 70-80 |
| 83. | As per the PFA ,skim milk contain minimum of ----% fat and -----% SNF |  |
|  | A) | 0.5 and 8.7 | B) | 3.0 and 9.5 |
|  | C) | 3.0 and 8.5 | D) | 6.0 and 8.5 |
| 84. | The energy value of cow milk furnishes--- /100 g. |  |
|  | A) | 55 | B) | 25 |
|  | C) | 65 | D) | 75 |
| 85. | Themophilic bacteria can grow at ----0C temp. |  |
|  | A) | 20 | B) | 30 |
|  | C) | 50 | D) | 40 |
| **86** | **Which of the following statement is true about Grade A milk** |
|  | A)Optimal temperature 2.2-2.30C |
|  | B)shelf life lasts for 7-10 days |
|  | C)Actually defined under Federal Grade A Pasteurized Milk Ordinance (PMO) |
|  | D)All of the above |
| 87. | Long threads of milk are formed while pouring |
|  | A) | Sandiness  | B) | Ropiness |
|  | C) | Foaminess  | D) | None  |
| 88. | Pasteurized milk have -----SPC/ml |  |
|  | A) | 30,000 | B) | 3,00,000 |
|  | C) | 20,000 | D) | None |
| 89. | Suitable packaging material for Liquid milk-- |  |
|  | A) | HDPE | B) | LDPE |
|  | C) | PEG | D) | None |
| **90** | **Which of the following statement is true about milk sugar** |
|  | A) true solution in the milk serum |
|  | B)defect –sandiness in ice cream and sweet condensed milk |
|  | C)composed of glucose and galactose |
|  | D)All of the above |
| 91. | As per the PFA ,Recombined milk contain minimum of ----% fat and -----% SNF |
|  | A) | 3.0 and 8.5 | B) | 3.0 and 9.5 |
|  | C) | 4.0 and 7.5 | D) | 6.0 and 8.5 |
| 92. | Normal acidity of Cow milk --- |
|  | A) | 0.13-0.14 | B) | 1.13-0.14 |
|  | C) | 0.13-1.14 | D) | 0.13-1.04 |
| 93. | Richness of flavor of milk due to--- |
|  | A) | Casein  | B) | Lactose |
|  | C) | Fructose  | D) | Lecithin |
| **94** | **Which of the following statement is true about casein** |
|  | A) casein is in the form of Calcium caseinate-phosphate complex |
|  | B)Alpha –casein is also known as calcium insensitive casein |
|  | C)K- casein is also known as calcium sensitive casein |
|  | D)Richest repository of fat |
| 95. | Milk sugar is -- |
|  | A) | Casein  | B) | Fructose  |
|  | C) | Lactose | D) | Lecithin |
| 96. | The energy value of buffalo milk furnishes--- C /100g |  |
|  | A) | 25 | B) | 75 |
|  | C) | 35 | D) | 100  |
| **97** | **Which of the following statement is true about Grade A raw milk** |
|  | A)milk produced on dairy farms that meet strict sanitary regulations  |
|  | B) have coliform count of not more than 10/ml |
|  | C)have bacterial plate count of not more than 20000/ml |
|  | D) all of the above |
| 98. | Milk protein is --- |
|  | A) | Fructose  | B) | Casein |
|  | C) | Lecithin | D) | None |
| 99. | Acidity of buffalo milk --- |  |
|  | A) | 1.14-0.15 | B) | 0.14-1.15 |
|  | C) | 0.14-0.15 | D) | 1.14-1.15 |
| 100. | As per the PFA , Standardized milk contain minimum of ----% fat and -----% SNF |  |
|  | A) | 4.5 and 8.5 | B) | 3.5 and 8.5 |
|  | C) | 7.5 and 8.5 | D) | 8.5 and 8.5 |
| 101 | MBRT conducted for- |  |
|  | A) | To check quality | B) | To check quantity |
|  | C) | To check bacterial count  | D) | None  |
| 102 | Titrable acidity is usually expressed as-- |  |
|  | A) | % of Citric acid | B) | % of Butyric acid |
|  | C) | % of acetic acid | D) | % of lactic acid |
| **103** | **Which of the following statement is true about certified milk** |
|  | A)it means clean milk can be pasteurized/unpasteurized |
|  | B)pressure 10 lbs for an hour  |
|  | C)milk that is processed in dairies that follow official medical standards of sanitation |
|  | D)all of the above |
| 104. | Specific gravity of cow milk |
|  | A) | 1.028-1.029 | B) | 1.027-1.029 |
|  | C) | 1.028-1.030 | D) | 1.026-1.030 |
| 105. | Specific gravity of buffalo milk |  |
|  | A) | 1.023-1.032 | B) | 1.030-1.032 |
|  | C) | 1.030-1.035 | D) | None  |
| 106. | Oldest dairy farm in India |  |
|  | A) | Allahabad, 1889 | B) | Allahabad, 1898 |
|  | C) | Allahabad, 1913 | D) | Allahabad, 1885 |
| 107. | Oldest co-operative milk union in India |  |
|  | A) | Allahabad, 1889 | B) | Allahabad, 1898 |
|  | C) | Allahabad, 1913 | D) | Allahabad, 1885 |
| 108. | National milk day celebrated every year on  |  |
|  | A) | 1st June | B) | 26th November |
|  | C) | 1st December  | D) | None |
| 109 | International milk day celebrated every year on  |  |
|  | A) | 1st June | B) | 26th November |
|  | C) | 1st December  | D) | None |
| 110. | Fat splitting enzyme |  |
|  | A) | Analase | B) | Peroxidase  |
|  | C) | Phosphate  | D) | Lipase  |
| 111. | Milk is heavier than |  |
|  | A) | Fat | B) | Butter |
|  | C) | Water | D) | Milk solids  |
| 112. | Copper +Alloy= |  |
|  | A) | Verdigris | B) | Rust |
|  | C) | Taint | D) | Vergris |
| 113. | PMO means |  |
|  | A) | Pasteurized milk ordinance | B) | Packet milk ordinance |
|  | C) | Paneer maintenance ordinance | D) | None |
| 114. | ----is a technique that permits concentration and separation without heat |  |
|  | A) | Cold sterilization  | B) | Membrane processing |
|  | C) | Irradiation  | D) | None |
| 115. | ---- is a membrane separation process, driven by a pressure gradient in which the membrane separates the solvent from other component of a solution. |  |
|  | A) | Hyper-filtration  | B) | Concentration process |
|  | C) | Reverse osmosis  | D) | None  |
| 116. | ---- is a membrane separation process, driven by a pressure gradient in which the membrane fractionates dissolved and dispersed components of a liquid. |  |
|  | A) | Hyper-filtration  | B) | Concentration process |
|  | C) | Reverse osmosis  | D) | Ultra filtration |
| 117. | ----- play important role in physic-chemical properties of milk fat  |  |
|  | A) | FA | B) | UNFA |
|  | C) | SFA | D) | None |
| 118. | ---- used for demineralization of milk products and whey for infant formula and special dietary products. |  |
|  | A) | Ultra filtration | B) | Reverse osmosis  |
|  | C) | Hyper-filtration  | D) | Electrodialysis |
| 119. | Fat control process is called --- |  |
|  | A) | Hyper-filtration  | B) | Ultra filtration |
|  | C) | Standardization  | D) | Sterilization  |
| 120. | ---can be used for milk fat fractionation, bacteria and spore removal , casein production, whey fat reduction |  |
|  | A) | Micro-filtration  | B) | Ultra filtration |
|  | C) | Hyper-filtration  | D) | Electrodialysis |
| 121. | Most suitable packaging material for liquid milk  |  |
|  | A) | LDPE | B) | HDPE |
|  | C) | PE | D) | Vegetable parchment paper  |
| 122. | Which type of milk is considered as safe for human consumption  |  |
|  | A) | A1 | B) | A2 |
|  | C) | B1 | D) | B2 |
| 123. | Milk sourness due to |  |
|  | A) | Lactic acids | B) | Annatto |
|  | C) | Volatile acids | D) | Coal tar dye  |
| 124. | Fishy odour due to  |  |
|  | A) | LAB | B) | Gums |
|  | C) | Ketonic  | D) | Kephalin |
| 125. | Textbook of outlines of Dairy technology written by |  |
|  | A) | V .K. Tanja | B) | M. M. Razivuddin  |
|  | C) | Sukumar De | D) | G.C.Banerjee |
| 126. | No. of teat canal present in asian buffalo |  |
|  | A) | 4 | B) | 1 |
|  | C) | 3 | D) | 2 |
| 127. | Freezing point measured by |  |
|  | A) | Gerbers butyrometer | B) | Quevenne lactometer |
|  | C) | A and B correct | D) | Hortvet cryoscope |
| 128. | Main objective of SPC of raw milk  |  |
|  | A) | To estimate dead bacteria in curd | B) | To estimate live bacteria in curd |
|  | C) | To estimate viable bacteria in milk | D) | A and B correct |
| 129. | ------is one of the premier institute in the dairy sector |  |
|  | A) | IVRI | B) | CIRB |
|  | C) | NDRI | D) | CIDK |
| 130. | Rainbow revolution  |  |
|  | A) | Agriculture & Fishery  | B) | Forestry & animal husbandry  |
|  | C) | Horticulture & poultry  | D) | All of the above  |

**Fill in the blanks**

1. PFA-prevention of Food Adulteration rules,--------
2. As per ICMR recommendations, an average daily intake of milk --------
3. Percapita availability/consumption of milk in India--------
4. Percapita availability of milk is highest in --------------- India
5. Overall livestock population is highest in ------------in India
6. ------------is performed to judge the cleanliness of milk
7. Average milk produced by India is ------
8. India’s rank, in world total milk production is -------
9. Second largest share in total milk production is by ----------
10. National milk day is celebrated on ---------
11. International milk day is celebrated every year on ------
12. Chloride concentration in excess of ------in effluent discharged to streams can

 result in chlorine toxicity to sensitive water insects such as Daphania Magna

13. Taste of milk depends on it ------------concentration

14. Lactose is also known as ----------

15. Average size of milk fat globule is --------

16. Fat globule membrane is made up of ----------

17. ------------contribute richness to the flavor of milk

18. Precursors of vitamin-A is ---------

19. Total acidity = --------------

20. Most common microbial growth in milk occurs within the PH range of --------

21. Ropiness in milk is due to ---------

22. Critical temperature of milk is -------

23. Rheology is derived from -------verb

24. -----------is defined as the science of deformation and flow of matter

25. Standing up property / resistance to deformation under its own weight is an essential quality

 of -------

26. Rheology means--------

27. In Grading of several dairy products, considerable importance is given to -----------

28**. -----------**of butter are both influenced by the composition of milk fat and condition

 under which the cream is processed before churning.

 29. the plastic bowl and ------------are the method employed for measuring firmness of

 the cheese coagulum before cutting.

 30.Luotocapillary agglutination test in milk is used for the diagnosis of ----

 31. World milk day is celebrated on----------every year

 32. The pasteurization process was introduced by the scientist name--------

 33. AMUL system of milk marketing follows the principle of --------

 34. Presence of neutralizers in milk is identified by using --------

 35.------ is the immediate test to judge the quality of milk

 36. The essential amino acid present in the milk which gets converted to niacin is-------

 37. Artificially prepared milk is referred as ------------

 38. ------is used as coolent in HTST pasteurization.

 39. when the milk is adulterated with water, the specific gravity of milk -----

 40. If the temperature is increases, the specific gravity of milk was ------

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **I** | **Matching** |  |  |
|  | 1 | In bottle pasteurization | ( ) | A)720C/ 15 Sec. OR 161 0F |
|  | 2 | Low Temperature Long Time | ( ) | B)Butter making |
|  | 3 | High Temperature Short Time | ( ) | C)63-660C /30 min. OR 145-150 0F |
|  | 4 | Vacreation | ( ) | D)740C / 7sec. OR 165 0F |
|  | 5 | Stassanization | ( ) | E)630C /30 min. OR 145 0F |
|  | **II** | **Matching** |  |  |
|  | 1 | Ultra High temperature | ( ) | A)150 0C / fraction of sec OR 302 0F |
|  | 2 | Uperization | ( ) | B)Swedan |
|  | 3 | Pure pak | ( ) | C)135-1500C /No Hold  |
|  | 4 | Tetra pack | ( ) | D)U.K |
|  | 5 | Perga | ( ) | E)U.S.A |
|  | **III** | **Matching** |  |  |
|  | 1 | To kill T.B. germs  | ( ) | A)138 0F /30 min. |
|  | 2 | To inactivate Phosphatase  | ( ) | B)61.1 0C /30 min. |
|  | 3 | Pasteurization | ( ) | C)161 0F /15 sec. |
|  | 4 | Cream-line reduction  | ( ) | D)72.2 0C / 15 sec. |
|  | 5 | To kill T.B. germs  | ( ) | E)70 0C/ 15 Sec. |
|  | **IV** | **Matching** |  |  |
|  | 1 | Surface active agents | ( ) | A)Dissolve protein  |
|  | 2 | Strong alkali  | ( ) | B)Removal of Milk stone  |
|  | 3 | Nitric acids  | ( ) | C)Acinol- N |
|  | 4 | Mild acids  | ( ) | D)Stainless steel surface  |
|  | 5 | Week alkali  | ( ) | E)Saponify fat |
|  | **V** | **Matching** |  |  |
|  | 1 | NaOH | ( ) | A)Washing Soda |
|  | 2 | Na2CO3 | ( ) | B)Idet-10 |
|  | 3 | Wetting agents | ( ) | C)Caustic soda |
|  | 4 | Acid rinse | ( ) | D)Sulphidril compounds |
|  | 5 | Cooked flavor | ( ) | E)Phosphoric acid  |
|  | **VI** | **Matching** |  |  |
|  | 1 | Disinfectant  | ( ) | A)Freedom from extraneous matters |
|  | 2 | Cleanliness | ( ) | B)Kill harmful bacteria and viruses from surface |
|  | 3 | Safety  | ( ) | C)Kill all pathogenic organisms only |
|  | 4 | Pasteurization | ( ) | D)Kill all micro organism from surface |
|  | 5 | Sterilizing | ( ) | E)Freedom from pathogenic micro-organism |

**Chapter 6: Milk Technology Answers**

**Multiple choice Questions**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| A | D | B | A | D | C | D | D | D | A |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 18 | 20 |
| B | C | D | A | A | B | C | C | B | B |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| D | C | C | C | C | D | B | C | D | B |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| A | D | A | A | B | D | D | D | A | A |
| 41 | 12 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| D | D | C | B | D | D | C | B | A | A |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| B | C | D | A | A | B | C | C | B | A |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| B | D | A | B | A | D | C | D | B | D |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| D | A | B | C | A | D | D | B | A | D |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| C | A | A | D | C | A | B | A | B | D |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| A | A | D | A | C | D | D | B | C | A |
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 |
| A | D | D | C | B | A | C | B | A | D |
| 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 |
| C | A | A | B | C | D | B | D | C | A |
| 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
| A | B | C | D | C | B | D | C | C | D |

**Fill in the blanks**

|  |  |
| --- | --- |
| **S.No** | **Answers** |
|  | 1976. |
|  | 280-300 gram/day |
|  | 427 gram/person |
|  | Punjab |
|  | Uttar Pradesh |
|  | Sediment test or off the bottom test |
|  | 187MT/year |
|  | 1st rank |
|  | Tamil Nadu |
|  | 26th November |
|  | 1st June |
|  | 400mg/Lit |
|  | milk fat |
|  | milk sugar |
|  | 2-5 micron |
|  | Phospholipids and proteins |
|  | Lecithin |
|  | carotene |
|  | Natural acidity + Developed acidity |
|  | 5.6-7.5 |
|  | *Alkaligenes viscolactis* and *Enterobacter aerogenes* |
|  | 100C |
|  | Greek |
|  | Rheology |
|  | Butter |
|  | to flow |
|  | Body and texture |
|  | body and texture |
|  | Torsiometer |
|  | Q-fever |
|  | June-1st  |
|  | Louis Pasteur  |
|  | Co-operative |
|  | Rosalic acid test |
|  | Organoleptic test |
|  | Tryptophan |
|  | Synthetic milk |
|  | Glycol |
|  | Decreases |
|  | Decreases |

**Matching**

|  |  |
| --- | --- |
| **S.No** | **Answers** |
| **I** | **Matching** |
| **1** | C |
| **2** | E |
| **3** | A |
| **4** | B |
| **5** | D |

|  |  |
| --- | --- |
| **S.No** | **Answers** |
| **II** | **Matching** |
| **1** | C |
| **2** | A |
| **3** | E |
| **4** | B |
| **5** | D |

|  |  |
| --- | --- |
| **S.No** | **Answers** |
| **III** | **Matching** |
| **1** | A |
| **2** | B |
| **3** | C |
| **4** | D |
| **5** | E |

|  |  |
| --- | --- |
| **S.No** | **Answers** |
| **IV** | **Matching** |
| **1** | C |
| **2** | E |
| **3** | D |
| **4** | B |
| **5** | A |

|  |  |
| --- | --- |
| **S.No** | **Answers** |
| **V** | **Matching** |
| **1** | C |
| **2** | A |
| **3** | B |
| **4** | D |
| **5** | E |

|  |  |
| --- | --- |
| **S.No** | **Answers** |
| **VI** | **Matching** |
| **1** | B |
| **2** | A |
| **3** | E |
| **4** | C |
| **5** | D |

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