MCQ 50 marks

1. **B.** 16
Explanation: DAP = $(NH_4)_2HPO_4$
N = 2, H = 8 + 1 = 9, P = 1, O = 4
So, total atoms = 2 + 9 + 1 + 4 = 16

2. **D. i and ii**
Explanation: Food spoilage is caused by microbes, enzymes and metal ions.
Enzymes cause oxidation and decomposition of food, and Cu^{2+}, Fe^{3+} ions act as catalysts in the oxidation of oils and fats.
Therefore, i and ii are correct.

3. **D. Pickle**
Explanation: Case-hardening means hardening the surface of food by drying in strong sunlight.
Pickle is preserved in oil and vinegar, not by sun-drying, so case-hardening is not applicable to it.

4. **D.** $-5°C$ **to** $-10°C$
Explanation: In deep freezing, the temperature is $-5°C$ to $-10°C$.
In this range, the bacterial cytoplasm freezes and the bacteria become completely inactive.

5. **D. Osmosis**
Explanation: Concentrated syrup draws out the water from bacterial cells.
This is osmosis, and as a result the bacteria are destroyed.

6. **D. Soft drink → γ-rays**
Explanation: CO_2 is used to preserve soft drinks, not γ-rays.
γ-rays are used to preserve grains and seeds.

7. **D.** 2
Explanation: H_2SO_4 is used in leather pickling.
H_2SO_4 has 2 replaceable H atoms, so its basicity is 2.

8. **B. Propyl gallate**
Explanation: Propyl gallate is a free-radical absorbing antioxidant, not an antimicrobial agent.

9. **B.** 83.4%
Explanation: $[H^+] = 10^{-3.5} = 3.16 \times 10^{-4}\ molL^{-1}$
$\frac{[C_6H_5COO^-]}{[C_6H_5COOH]} = \frac{K_a}{[H^+]} = \frac{6.3\times10^{-5}}{3.16\times10^{-4}} = 0.199$
Undissociated fraction = $\frac{1}{1+0.199} = 0.834$
So, undissociated benzoic acid = 83.4%

10. **A.** 6.5
Explanation: Sorbate salts remain effective in suppressing bacteria up to a maximum pH of 6.5.

11. **D. botulism**
Explanation: Nitrite salts rupture the cell membrane of Clostridium botulinum bacteria.
The food poisoning caused by this bacterium is called botulism.

12. **A.** $K_2S_2O_5$
Explanation: The metabisulphite (pyrosulphite) ion is $S_2O_5^{2-}$.
So, the formula of potassium metabisulphite is $K_2S_2O_5$.

13. **C. 2-Hydroxypropane-1,2,3-tricarboxylic acid**
Explanation: The structure of citric acid is $HOC(CH_2COOH)_2COOH$.
Its IUPAC name is 2-hydroxypropane-1,2,3-tricarboxylic acid.

14. **C. i and iii**
Explanation: Free-radical absorbing antioxidants: BHA, BHT, TBHQ, propyl gallate.
Therefore, i and iii are correct.

15. **A.**
Explanation: Propyl gallate is the propyl ester of 3,4,5-trihydroxybenzoic acid.
Its ring carries three $-OH$ groups and one $-COO-C_3H_7$ group.

16. **A.** $C_{15}H_{24}O$
Explanation: BHT = 2,6-di-tert-butyl-4-methylphenol

It consists of the ring C_6H_2, $-OH$, $-CH_3$ and 2 $-C(CH_3)_3$ groups.
C = 6 + 1 + 8 = 15; H = 2 + 1 + 3 + 18 = 24; O = 1
So, the molecular formula is $C_{15}H_{24}O$.

17. **A.** 6**;** 1 : 2
Explanation: EDTA is a hexadentate ligand, so the coordination number is 6.
Donor atoms: 2 N atoms and 4 O atoms (of the carboxylate groups).
So, N : O = 2 : 4 = 1 : 2

18. **A. i and ii**
Explanation: Malic acid and fumaric acid are used as chelating agents in food.
Therefore, i and ii are correct.

19. **B. The food is heated in boiling water or steam for** 5 **to** 10 **minutes**
Explanation: Blanching means heating the cut pieces of food in boiling water or steam for 5 to 10 minutes.
This removes unpleasant odour, slimy substances and harmful microorganisms.

20. **A.** 115°C **to** 121°C**,** 30 **to** 100 **min**
Explanation: In the pressure canning method, retorting is done at 115°C to 121°C for 30 to 100 minutes.

21. **B. invertase, zymase, acetobacter**
Explanation: Sucrose splits into glucose and fructose in the presence of invertase (X = invertase).
Glucose is converted to ethanol and CO_2 in the presence of zymase (Y = zymase).
Ethanol is oxidised in the presence of acetobacter to give ethanoic acid and water (Z = acetobacter).

22. **C. The** N **atom of the** $-NH-$ **of the peptide bond**
Explanation: $CH_3COOH \rightleftharpoons CH_3COO^- + H^+$
H^+ binds to the lone pair of electrons on the N atom of the peptide bond.
As a result, the active site of the enzyme is destroyed and the bacteria die.

23. **C.** 300 nm
Explanation: For the Tyndall effect, the size of colloid particles $\approx \frac{\lambda}{2}$
Here $\lambda = 600$ nm
So, particle size = $\frac{600}{2} = 300$ nm

24. **B. i and ii**
Explanation: Zinc stearate (a mild antiseptic) and boric acid (an antiseptic) are used in talcum powder.
Therefore, i and ii are correct.

25. **A.** 3
Explanation: The moisturizer in lipstick is glycerol.
$CH_2OH - CHOH - CH_2OH$ has 3 $-OH$ groups.

26. **B. Peat → Lignite → Bituminous → Anthracite**
Explanation: Under heat and pressure, peat is gradually transformed into lignite (brown), bituminous (black, soft) and anthracite (hard).

27. **B.** N_2
Explanation: $2NO + 2CO \rightarrow 2CO_2 + N_2$
So, NO is reduced to the harmless gas N_2.

28. **B. Removing the hardness of water**
Explanation: $Na_4P_2O_7$ acts as a water softener.

29. **D.** CaO
Explanation: Portland cement contains about 61.5% CaO, the highest among all its components.

30. **D.** 1.935×10^6
Explanation: Mass of sulphur = $2.0 \times 10^7 \times 0.018 = 3.6 \times 10^5$ kg = 3.6×10^8 g
Moles of S = $\frac{3.6 \times 10^8}{32} = 1.125 \times 10^7$ mol
$S \rightarrow SO_2 \rightarrow CaSO_3 \rightarrow CaSO_4 \cdot 2H_2O$ (mole ratio 1 : 1 : 1 : 1)
Molar mass of gypsum = 172 $gmol^{-1}$
So, gypsum = $1.125 \times 10^7 \times 172 = 1.935 \times 10^9$ g = 1.935×10^6 kg

31. **A.** 3 : 2
Explanation: Mullite: $3Al_2O_3 + 2SiO_2 \rightarrow 3Al_2O_3 \cdot 2SiO_2$
So, $Al_2O_3 : SiO_2 = 3 : 2$

32. **B.** $3CaO \cdot Al_2O_3$

Explanation: Tricalcium aluminate ($3CaO \cdot Al_2O_3$) reacts quickly with water and sets rapidly.
Gypsum ($CaSO_4 \cdot 2H_2O$) combines with it and slows down its setting.

33. **C.** 4.0 **to** 4.3
Explanation: Chrome tanning uses $Cr_2(SO_4)_3$, $NaHCO_3$ and raw hide (collagen).
The condition is that the pH of the solution is 4.0 to 4.3.

34. **D.** $CH_3CH = CH - CH = CH - COOH$
Explanation: Sorbic acid is an unsaturated carboxylic acid used as a preservative in food. Its structural formula is $CH_3CH = CH - CH = CH - COOH$
and its molecular formula is $C_6H_8O_2$

35. **A. Liquid waste treatment plant**
Explanation: ETP (Effluent Treatment Plant) is a plant that treats the liquid waste of a factory. It removes harmful components so that the waste is fit to be released into the environment.

36. **D. Propyl paraben**
Explanation: Propyl paraben is the preservative used in cold cream. It stops the growth of bacteria and fungi, so the cream can be stored for a long time.

37. **A.** Na_2SO_4
Explanation: The main ingredients of soda-lime glass are SiO_2, Na_2CO_3 and CaO (or $CaCO_3$). These three are used in glass production, so the compound that is not used is Na_2SO_4.

38. **D.** $2CO + N_2$
Explanation: Producer gas is obtained by passing a limited supply of air over red-hot coke.
Reaction: $2C + O_2 + 4N_2 \rightarrow 2CO + 4N_2$
Therefore, producer gas is mainly a mixture of CO and N_2.

39. **B. Boric acid**
Explanation: Boric acid is used as a mild antiseptic in baby powder. It prevents germ infection on the skin.

40. **C. Colloid**
Explanation: In an aerosol, solid or liquid particles remain dispersed in a gaseous medium, and the particle size is in the colloidal range. Therefore, an aerosol is a colloid.

41. **C. Casein**
Explanation: About 82% of milk protein is casein and the remaining 18% is whey protein. Therefore, the main protein of milk is casein.

42. **B. Dust**
Explanation: Crushing raw materials, burning and transport during cement making release a large amount of dust into the air. Therefore, the biggest pollutant of a cement factory is dust.

43. **B.** Cr
Explanation: Chromium salts are used in tanning leather.
So tannery waste contains chromium (Cr) in the greatest amount, which is harmful to the environment and to health.
Therefore, the correct answer is Cr.

44. **C.** Na_2O
Explanation: The main components of cement clinker are CaO, SiO_2, Al_2O_3 and Fe_2O_3. Na_2O is not a component of clinker.

45. **B.** 36
Explanation: The condition for canning:
$a_w \leq 0.8$
Again, $a_w = \frac{\text{amount of water in the food}}{\text{amount of water vapour in the surroundings}}$
Here, the amount of water vapour in the surroundings = $45\ gL^{-1}$
So, the water in the food $\leq 0.8 \times 45$
Therefore, the maximum water in the food = $36\ gL^{-1}$

46. **D.** $NaOH$
Explanation: Cleaners used to remove drain blockages contain sodium hydroxide ($NaOH$).
It is a strong base that turns fats and grease into soap and dissolves them.
Therefore, the correct answer is $NaOH$.

47. **A.** $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$

Explanation: The chemical formula of china clay (kaolin) is $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$.

48. **C.** 10^{-9} m – 10^{-7} m
Explanation: The size of a nanoparticle is about 1 nm to 100 nm.
Here, 1 nm = 10^{-9} m
and, 100 nm = 10^{-7} m
Therefore, the range is 10^{-9} m – 10^{-7} m

49. **A. Bituminous**
Explanation: Bituminous coal has a high carbon content and a high heating value, so it is the best fuel among these.

50. **C. Liquid paraffin**
Explanation: Liquid paraffin (mineral oil) is used in making cold cream, as it keeps the skin smooth and moisturised.