DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

T. B. C. : AAC – 2023-24

Test Booklet Series

A

TEST BOOKLET

ASSISTANT ANALYTICAL CHEMIST

Sl. No. **10353**

Time Allowed : 3 Hours | **Maximum Marks : 200**

: INSTRUCTIONS TO CANDIDATES :

1. IMMEDIATELY AFTER COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET **DOES NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET OF THE SAME SERIES ISSUED TO YOU.
2. ENCODE CLEARLY THE TEST BOOKLET SERIES **A, B, C** OR **D**, AS THE CASE MAY BE, IN THE APPROPRIATE PLACES IN THE ANSWER SHEET USING BALL POINT PEN (BLUE OR BLACK).
3. You have to enter your **Roll No.** on the Test Booklet in the Box provided alongside. **DO NOT** write *anything else* on the Test Booklet.
4. **YOU ARE REQUIRED TO FILL UP & DARKEN ROLL NO., TEST BOOKLET / QUESTION BOOKLET SERIES IN THE ANSWER SHEET AS WELL AS FILL UP TEST BOOKLET / QUESTION BOOKLET SERIES AND SERIAL NO. AND ANSWER SHEET SERIAL NO. IN THE ATTENDANCE SHEET CAREFULLY. WRONGLY FILLED UP ANSWER SHEETS ARE LIABLE FOR REJECTION AT THE RISK OF THE CANDIDATE.**
5. This Test Booklet contains **200** items (questions). Each item (question) comprises of four responses (answers). You have to select the correct response (answer) which you want to mark (darken) on the Answer Sheet. In case, you feel that there is more than one correct response (answer), mark (darken) the response (answer) which you consider the best. In any case, choose **ONLY ONE** response (answer) for each item (question).
6. You have to mark (darken) all your responses (answers) **ONLY** on the **separate Answer Sheet** provided by **using BALL POINT PEN (BLUE OR BLACK INK)**. See instructions in the Answer Sheet.
7. All items (questions) carry **equal marks**. All items (questions) are compulsory. Your total marks will depend only on the number of correct responses (answers) marked by you in the Answer Sheet. **There shall be 0.25 mark deducted for each wrong response (answer)**.
8. Before you proceed to mark (darken) in the Answer Sheet the responses (answers) to various items (questions) in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per the instructions sent to you with your **Admission Certificate**.
9. After you have completed filling in all your responses (answers) on the Answer Sheet and after conclusion of the examination, you should hand over to the Invigilator the Answer Sheet issued to you. You are allowed to take with you the candidate's copy / second page of the Answer Sheet along with the **Test Booklet**, after completion of the examination, for your reference.
10. Sheets for rough work are appended in the Test Booklet at the end.

SEAL

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

1. Choose the word with the ***correct*** spelling.

(A) Omelette

(B) Omlet

(C) Omelet

(D) Omlett

2. Sanjay always ____ breakfast before going to work.

(A) eat

(B) eats

(C) eaten

(D) eating

3. This smartphone is mine, not

(A) your

(B) yours

(C) you

(D) yours'

4. Next year, I ____ moving to another city.

(A) will be

(B) was

(C) am

(D) hope to

5. ____ the door when you go out.

(A) Closed

(B) Closes

(C) Close

(D) Closing

6. ____ Raju see the movie last night?

(A) Did

(B) Does

(C) Do

(D) Was

7. ____ is a good exercise.

(A) To swim

(B) Swimmer

(C) Swim

(D) Swimming

8. If he ____ hard, he will pass the exam.

(A) study

(B) studied

(C) studies

(D) studying

9. Rashmi decided ____ a new house.

(A) buys

(B) to buying

(C) to buy

(D) buy

10. The letter ____ by Pradeep.

(A) was written

(B) written

(C) writes

(D) is writing

11. Sunaina is ____ intelligent ____ hardworking.

(A) both / and

(B) neither / or

(C) either / nor

(D) both / or

12. By the time we arrived, the movie

(A) started

(B) had started

(C) has started

(D) starting

13. Neither of the boys ____ able to win yesterday.

(A) is

(B) are

(C) was

(D) were

14. ____ by the news, Maria burst into tears.

(A) Shocked

(B) Shocking

(C) Shock

(D) Hearing

15. Supriya ____ for the company for more than ten years now.

(A) worked

(B) has been working

(C) working

(D) works

16. Had Seema ____ the instructions, she would not have failed.

(A) followed

(B) follow

(C) follows

(D) following

17. Shalini can play the piano and so ____ her brother.

(A) do

(B) can

(C) does

(D) did

18. The book, ____ cover is blue, is on the shelf.

(A) which

(B) who

(C) whose

(D) whom

19. They made ____ progress on the project due to constant interruptions.

(A) little

(B) a little

(C) few

(D) a few

20. How many books ____ on the table?

(A) is there

(B) are there

(C) there are

(D) will there

21. By next year, Asha ____ at the company for three decades.

(A) will be working

(B) has been working

(C) will have been working

(D) works

22. Rarely ____ such a beautiful piece of art.

(A) I have seen

(B) have I seen

(C) I saw

(D) I see

23. Parvati dislikes ____ in public.

(A) be seen

(B) being seen

(C) to seen

(D) be seer

24. Can you tell me ____?

(A) where is the station

(B) where the station is

(C) where are the station

(D) where the station be

25. Roopa, it's high time you ____ to bed.

(A) go

(B) went

(C) gone

(D) goes

26. If I ____ you, I would apologize to her immediately.

(A) am

(B) was

(C) were

(D) be

27. Having ____ the assignment, she felt relieved.

(A) finishing

(B) finished

(C) finish

(D) been finished

28. ____ by the sound of the alarm, he ran outside.

(A) Startle

(B) Startled

(C) Startling

(D) Was startled

29. No sooner ____ the bell rang than the students rushed out of the class.

(A) has

(B) was

(C) had

(D) did

30. The sentence "She said, I will be leaving next week" can be reported as "She said that she ____ next week."

(A) will be leaving

(B) would leave

(C) would be leaving

(D) would have left

Direction (Q. Nos. 31–40) : Read the passage below and answer the questions following it by choosing the ***correct*** answer from the choices given.

Odisha, a coastal State in eastern India, is characterized by its rich cultural heritage and diverse culinary practices. The health and food habits of the people of Odisha are profoundly influenced by the region's tradition, geography and climate.

The cuisine of Odisha is known for its simplicity and use of natural ingredients. Rice is the staple food and it is often accompanied by a variety of lentils, vegetables and fish. Given its coastal location, seafood forms an integral part of the diet, with fish being particularly popular. The use of mustard oil and *panch phoron* (a blend of five spices) is common in Odia cooking, adding unique flavors to the dishes.

One of the most celebrated aspects of Odia cuisine is the variety of *pithas,* which are rice-based cakes prepared during festivals and special occasions. These can be sweet or savory and highlight the culinary creativity of the region. Additionally, sweets such as *rasagolla* and *chhena poda* are famous not just within Odisha but across India.

Healthwise, the traditional food habits of Odisha are aligned with nutritional balance. The inclusion of ample vegetables, greens and legumes provides essential vitamins and minerals. However, modernization and urbanization have introduced changes in dietary patterns. There is a growing inclination towards processed and fast foods, particularly among the younger population, raising concerns about the rise of lifestyle-related diseases such as obesity, diabetes and hypertension.

Another significant aspect of health in Odisha is the prevalence of malnutrition, especially in rural areas. Despite having a rich agricultural base, issues such as poverty, lack of education and inadequate healthcare infrastructure contribute to this persistent problem. Government initiatives, alongside non-governmental organizations, are actively working to combat malnutrition through various nutrition programs and awareness campaigns.

The State also has a tradition of using natural and home remedies for common ailments. Herbal concoctions made from locally available plants are popular, especially in rural communities. These practices are often passed down through generations and form an essential part of the healthcare regimen for many Odias.

While the food habits of the people of Odisha reflect a combination of tradition and modern influences, there are critical health challenges that need to be addressed. Balancing cultural heritage with modern dietary needs and ensuring access to proper nutrition and healthcare are crucial for the overall well-being of the population.

31. The staple food of Odisha is

(A) wheat

(B) rice

(C) barley

(D) maize

32. Which of the following adds unique flavour to Odia dishes?

(A) Olive oil

(B) Ghee

(C) Palm oil

(D) Mustard oil

33. 'Pithas' are

(A) rice-based cakes

(B) spicy soups

(C) fruit salads

(D) fried snacks

34. The major health problem that persists in rural Odisha is

(A) dental issues

(B) heart disease

(C) malnutrition

(D) cancer

35. Which type of food forms an integral part of the Odia diet due to the State's coastal location?

(A) Dairy

(B) Vegetable

(C) Seafood

(D) Poultry

36. Which traditional sweets from Odisha are mentioned in the passage?

(A) Rasagolla and Chhena poda

(B) Gulab Jamun and Jalebi

(C) Kheer and Rasmalai

(D) Laddu and Barfi

37. A concern about the younger population's dietary patterns in Odisha is that they

(A) are avoiding traditional foods

(B) go for processed and fast foods

(C) consume too much dairy products

(D) eat too many vegetables

38. Odisha tries to combat malnutrition by

(A) reducing seafood consumption

(B) launching nutrition programs and awareness campaigns

(C) limiting rice production

(D) increasing taxes on fast food

39. Which traditional healthcare practice is common in rural Odisha?

(A) Yoga and meditation

(B) Use of antibiotics

(C) Herbal concoctions

(D) Frequent hospital visits

40. Which of the following is ***not*** described as a lifestyle-related disease?

(A) Diabetes

(B) Obesity

(C) Hypertension

(D) Influenza

Direction (Q. Nos. 41–50) : Read the passage below and answer the questions following it by choosing the ***correct*** answer from the choices given.

Food safety is a critical aspect of public health that involves preventing foodborne illnesses through proper handling, preparation and storage of food. This field is deeply interdisciplinary, blending knowledge from microbiology, chemistry and public health to ensure that food remains safe from production to consumption. The implications of failing to uphold food safety standards can be profound, sometimes precipitating extensive outbreaks of illness.

Pathogens such as *Salmonella*, *E. coli* and *Listeria monocytogenes* are prevalent agents responsible for foodborne diseases. These microorganisms can infiltrate the food supply chain at various points, making stringent hygiene practices essential. The contemporary food supply chain, characterized by vast global interconnections, exacerbates these challenges. Therefore, international cooperation and robust regulatory frameworks are indispensable.

One exemplary approach to food safety is the Hazard Analysis and Critical Control Points (HACCP) system, which prioritizes the identification and prevention of potential hazards rather than relying solely on end-product testing. This preventative model has been instrumental in mitigating risks effectively.

Consumer awareness also plays a critical role in maintaining food safety. Educated consumers who adhere to proper food handling and storage guidelines can significantly diminish the risk of contamination. For instance, understanding the importance of maintaining the cold chain for perishable items and preventing cross-contamination can make a substantial difference.

Technological advancements are providing new tools to enhance food safety. Innovations such as molecular diagnostic techniques improve the detection and identification of pathogens with greater speed and accuracy. Additionally, blockchain technology offers a promising solution for ensuring transparency and traceability in the food supply chain, allowing for the rapid identification of contamination sources.

In conclusion, food safety is a complex and evolving field that necessitates a multi-faceted approach. Through international cooperation, advanced technology, rigorous regulation and consumer education, it is possible to protect public health and ensure a safer food supply.

41. According to the passage, a critical aspect of public health is

(A) food advertising

(B) food packaging

(C) food safety

(D) food pricing

42. *Salmonella*, *E. coli* and *Listeria monocytogenes*

(A) enhance food flavour

(B) are responsible for foodborne diseases

(C) are types of food preservatives

(D) are helpful bacteria

43. Stringent hygiene practices are essential in the food supply chain to

(A) improve the taste of food

(B) reduce cooking time

(C) increase food sales

(D) prevent pathogen infiltration

44. _____ exacerbates the challenges of food safety in the contemporary food supply chain.

(A) Global interconnections

(B) Traditional farming methods

(C) Organic food trends

(D) Localized food production

45. HACCP stands for

(A) Hazard Analysis and Critical Control Points

(B) Hazard Assessment and Control Procedures

(C) Hygiene and Analysis of Critical Points

(D) Health and Contamination Control Protocol

46. The role of consumer awareness in food safety is to

(A) increase food prices

(B) promote food advertising

(C) reduce food variety

(D) help diminish the risk of contamination

47. Molecular diagnostic techniques enhance food safety by

(A) improving packaging design

(B) providing faster detection of pathogens

(C) increasing food flavour

(D) reducing the need for refrigeration

48. Blockchain technology offers _____ to the food supply chain.

(A) better speed

(B) enhanced transparency and traceability

(C) greater food variety

(D) lower costs

49. _____ is integral to maintain food safety from production to consumption.

(A) Product advertising

(B) Increasing food additive

(C) Decreasing global trade

(D) Proper handling, preparation and storage

50. The antonym of the word 'exacerbates' used in the passage is

(A) aggravates

(B) complicates

(C) alleviates

(D) amplifies

51. The hydrogen emission spectrum comprises radiation of discrete

(A) frequency

(B) wavelength

(C) energy

(D) None of the above

52. The character of *p*-orbital which determines the geometry of molecules is

(A) non-directional

(B) directional

(C) vertical

(D) horizontal

53. What is the shielding constant experienced by a 2*p* electron in the nitrogen atom?

(A) 4.9

(B) 8.1

(C) 10.9

(D) 3.10

54. Consider the following statements :

I. In ionic bond formation, electropositive element donates electron to electronegative element.

II. Ionic bonds are quite strong and they are omnidirectional.

(A) Both Statement I and Statement II are true

(B) Statement I is true but Statement II is false

(C) Statement I is false but Statement II is true

(D) Both Statement I and Statement II are false

55. The ***correct*** statements among the following for fluorite structure are

I. In fluorite structure, Ca^{2+} ion is surrounded by six F^- ions.

II. The coordination numbers in fluorite structure are 6 and 4, so this is called 6 : 4 arrangement.

III. Ca^{2+} ions form hexagonal close-packed arrangement.

(A) I and II only

(B) II and III only

(C) I, II and III

(D) None of the above

56. Match the following ***Column—I*** and ***Column—II*** for the shape of the molecules :

Column—I	***Column—II***
(a) I_3^-	*(i)* Linear
(b) NH_4^+	*(ii)* Tetrahedral
(c) I_3^+	*(iii)* Bent
(d) SF_4	*(iv)* Distorted tetrahedral

(A) *(a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)*

(B) *(a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)*

(C) *(a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)*

(D) *(a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)*

57. The hybridizations of $[Co(NH_3)_6]^{3+}$, $[CoCl_6]^{3-}$ and $[Ni(CN)_4]^{2-}$ respectively are

(A) d^2sp^3, sp^3d^2, sp^3

(B) sp^3d^2, d^2sp^3, dsp^2

(C) d^2sp^3, sp^3d^2, dsp^2

(D) sp^3d^2, d^2sp^3, sp^3

58. Using MO theory, arrange the following species in the increasing order of their bond lengths O_2, O_2^+, O_2^{2+}, O_2^-, O_2^{2-} :

(A) $O_2 < O_2^+ < O_2^{2+} < O_2^- < O_2^{2-}$

(B) $O_2^+ > O_2 > O_2^{2+} > O_2^- > O_2^{2-}$

(C) $O_2^{2+} < O_2^+ < O_2 < O_2^- < O_2^{2-}$

(D) None of the above

59. The number of antibonding electrons in CO molecule is

(A) 0

(B) 2

(C) 4

(D) 6

60. Which of the following is the ***correct*** order of stability?

(A) $CN < NO^+ < NO^-$

(B) $NO^- < CN < NO^+$

(C) $NO^+ < CN < NO^-$

(D) $CN < NO^- < NO^+$

61. The IUPAC nomenclature of $Na_3[Ag(S_2O_3)_2]$ is

(A) Sodium di(thiosulphato)silver(II)

(B) Sodium bis(thiosulphato) argenate(I)

(C) Sodium bis(thiosulphato) argenate(III)

(D) Bis(thiosulphato)argenate(I) sodium

62. The complexes $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5ONO]Cl_2$ are examples of

(A) linkage isomers

(B) ionisation isomers

(C) geometrical isomers

(D) coordination isomers

63. The complex with spin-only magnetic moment of 4.9 BM is

(A) $[Fe(CN)_6]^{3-}$

(B) $[Fe(CN)_6]^{4-}$

(C) $[Fe(H_2O)_6]^{3+}$

(D) $[Fe(H_2O)_6]^{2+}$

64. The CFSE for octahedral (Δ_o) and tetrahedral (Δ_t) complexes are related as

(A) $\Delta_t \simeq 4/9\,\Delta_o$

(B) $\Delta_t \simeq 1/2\,\Delta_o$

(C) $\Delta_o \simeq 2\Delta_t$

(D) $\Delta_o \simeq 4/9\,\Delta_t$

65. In $[FeF_6]^{3-}$ and $[CoF_6]^{3-}$

(A) $[FeF_6]^{3-}$ is coloured and $[CoF_6]^{3-}$ is colourless

(B) $[FeF_6]^{3-}$ is colourless and $[CoF_6]^{3-}$ is coloured

(C) $[FeF_6]^{3-}$ and $[CoF_6]^{3-}$ both are colourless

(D) $[FeF_6]^{3-}$ and $[CoF_6]^{3-}$ both are coloured

66. The metal present in Vitamin-B_{12} is

(A) iron

(B) copper

(C) magnesium

(D) cobalt

67. Due to pollution, a sample of water was found to be basic. Its pH would be

(A) 2.4

(B) 4.2

(C) 6.2

(D) 8.2

68. The composition of gemstone is

(A) Al_2O_3

(B) $Be_3Al_2(SiO_3)_6$

(C) $Mg_3Al_2(SiO_4)_3$

(D) $Na_3Li_3Al_6(BO)_3(SiO_3)_6F_4$

69. Water gas is a mixture of

(A) $CO + H_2$

(B) $CO + N_2$

(C) $CO_2 + H_2$

(D) $CO + CH_3$

70. The corrosion is the reverse process of

(A) metal extraction

(B) metal production

(C) metal coating

(D) metal moulding

71. Which compound is used for making perfumes and dyes?

(A) Ethyl alcohol

(B) Ethyl acetate

(C) Ethanoate

(D) Ethanone

72. Name a hydrocarbon which is a main component of natural gas.

(A) Ethyl

(B) Methyl

(C) Methane

(D) Ethane

73. Aluminum is getting popular worldwide today as a 'Green Metal'. Which among the following properties of Aluminum makes it a Green Metal?

(A) Aluminum has been providing a replacement of wood for saving forests and contributes in environment protection

(B) Aluminum is a light metal and it is resistant to corrosion

(C) Aluminum has fairly high rate of recycling and it can be re-used repeatedly without its quality deteriorating

(D) The lands after the Bauxite mining can be restored very quickly and easily

74. Hard acid-base interactions are predominantly

(A) covalent

(B) electrostatic

(C) dipole-dipole

(D) acid-base

75. Which of the following radio isotopes is used in the treatment of breast cancer?

(A) Co-60

(B) B-10

(C) P-30

(D) I-131

76. The bond angle of Cl_2O is

(A) smaller than that of F_2O

(B) smaller than that of H_2O

(C) greater than that of H_2O

(D) same as that of F_2O

77. Among the following ions, $P_\pi - P_\pi$ overlap is present in

(A) NO_3^-

(B) CO_3^{2-}

(C) PO_4^{3-}

(D) NO_2^-

78. Which of the following combinations can be regarded as soft acids?

(A) BF_3, CO_2

(B) Cu^{2+}, Cd^{2+}

(C) Li^+, AlH_3

(D) K^+, Ag^+

79. The absorption at λ_{max} 279 nm ($\varepsilon = 15$) in the UV spectrum of acetone is due to

(A) $\pi - \pi^*$ transition

(B) $n - \pi^*$ transition

(C) $\sigma - \sigma^*$ transition

(D) $\pi - \sigma^*$ transition

80. H_2O_2 reduces

(a) $[Fe(CN)_6]^{3-}$

(b) KIO_4

(c) $Ce(SO_4)_2$

(d) SO_3^{2-}

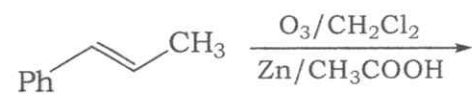
(A) *(a)* and *(b)* only

(B) *(b)* and *(c)* only

(C) *(c)* and *(d)* only

(D) *(d)* and *(a)* only

81. Give major product of the following :



Major product

(A) $PhCHO + CH_3CHO$

(B) $PhCHO + CH_3COOH$

(C) $PhCOOH + CH_3COOH$

(D) $PhCHO + HCHO$

82. Which of the following statements is ***true*** for sucrose?

(A) Reducing sugar

(B) Non-reducing sugar

(C) Undergoes mutarotation

(D) It is a monosaccharide

83. Sulphonation of thiophene gives

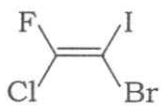
(A) thiophene-3-sulphonic acid

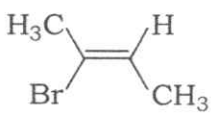
(B) thiophene-4-sulphonic acid

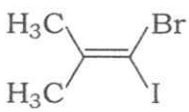
(C) thiophene-2-sulphonic acid

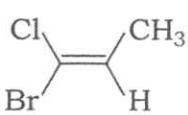
(D) thiophene-2,4-disulphonic acid

84. Which of the following compounds ***does not*** show geometrical isomerism?

(A) 

(B) 

(C) 

(D) 

85. When cyclohexanone oxime is treated with H_2SO_4, the ring expansion takes place which is due to

(A) Curtius rearrangement

(B) Beckmann rearrangement

(C) Favorskii rearrangement

(D) Claisen rearrangement

86. Which product is formed in Gattermann-Koch reaction?

(A) Benzoic acid

(B) Benzophenone

(C) Benzoyl chloride

(D) Benzaldehyde

87. Paal-Knorr method is used to synthesise which of the following heterocyclic compounds?

(A) Pyridine

(B) Quinoline

(C) Indole

(D) Furan

88. Which of the following is ***true*** for aromatic compounds?

(A) Cyclic

(B) Planar

(C) Obey Huckel rule

(D) All of the above

89. What kind of product is formed in S_N1 reaction?

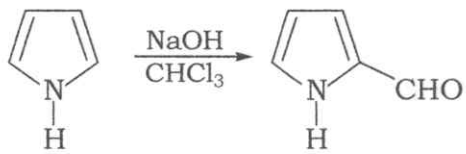
(A) Inversion product

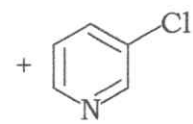
(B) Retention of configuration product

(C) Racemic mixture product

(D) Isomerization product

90. The following conversion is an example of





(A) Arndt-Eistert homologation

(B) Mannich reaction

(C) Reimer-Tiemann reaction

(D) Chichibabin reaction

91. Racemic modification can be resolved by

(A) the use of enzymes

(B) mechanical method

(C) chemical method

(D) All of the above

92. Which of the following reducing agents is/are used for the conversion of keto (C=O) into the CH_2-group?

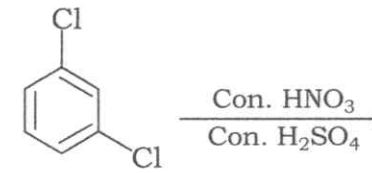
(A) Zn/Hg, HCl

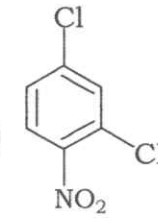
(B) $NaBH_4$

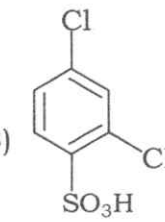
(C) $LiAlH_4$

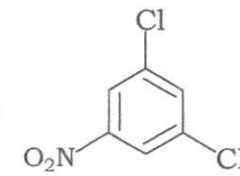
(D) 1,3-BH_3; H_2O_2/NaOH

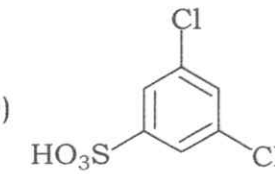
93. The major product formed in the following reaction is



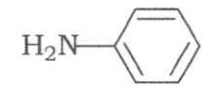
(A) 

(B) 

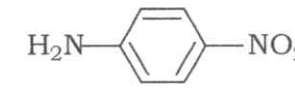
(C) 

(D) 

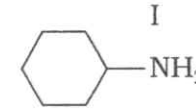
94. Rank the following compounds in the order of decreasing basicity :



I



II



III

(A) I, II, III

(B) III, II, I

(C) II, I, III

(D) III, I, II

95. The priority sequence for assigning R, S configuration of lactic acid is

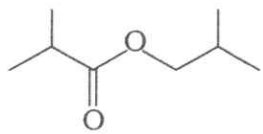
(A) $-CH_3$, $-COOH$, $-OH$, $-H$

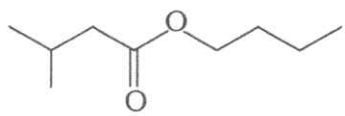
(B) $-COOH$, $-OH$, $-CH_3$, $-H$

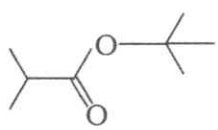
(C) $-OH$, $-CH_3$, $-COOH$, $-H$

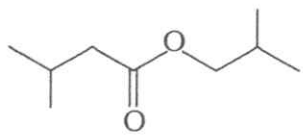
(D) $-OH$, $-COOH$, $-CH_3$, $-H$

96. An organic compound *A* ($C_8H_{16}O_2$) on treatment with an excess of methyl magnesium chloride generated two alcohols *B* and *C*, whereas reaction of *A* with lithium aluminium hydride generated only a single alcohol *C*. Compound *B*, on treatment with an acid, yields an olefin (C_6H_{12}) which exhibited only a singlet at 1.6 ppm in ^1H NMR spectrum. The compound *A* is

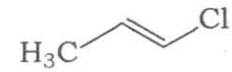
(A) 

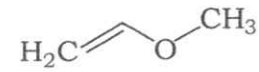
(B) 

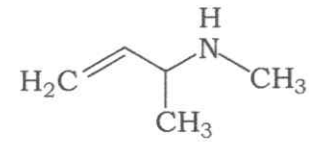
(C) 

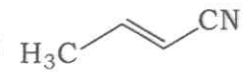
(D) 

97. In which of the following molecules, I-effect and R-effect reinforce with each other?

(A) 

(B) 

(C) 

(D) 

98. The number of isomers for the compound with molecular formula C_2HFBrI is

(A) 3

(B) 4

(C) 5

(D) 6

99. Which of the following is/are achiral?

I. Trans-1,3-dichlorocyclobutane

II. Trans-1,4-dibromocyclobutane

III. Trans-1,2-dimethylcyclopentane

IV. Cis-1,3-dichlorocyclohexane

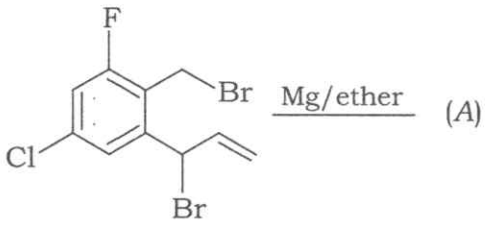
(A) I, II and III only

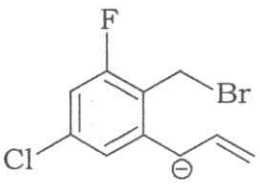
(B) IV only

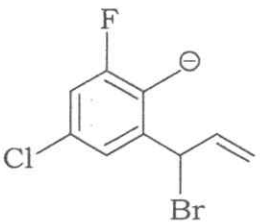
(C) I, II and IV only

(D) III only

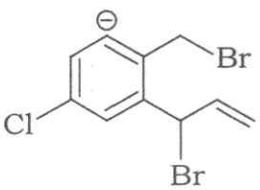
100. The intermediate carbanion (*A*) formed in the following reaction is



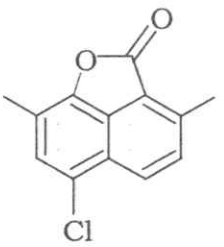
(A) 

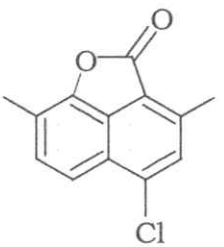
(B) 

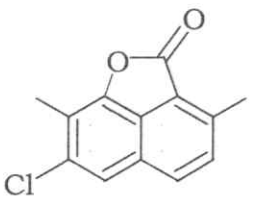
(C) 

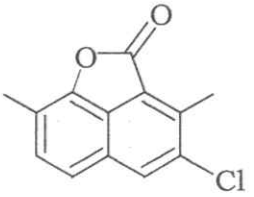
(D) 

101. The product of monochlorination of the following compound is

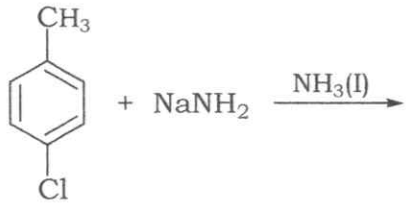
(A) 

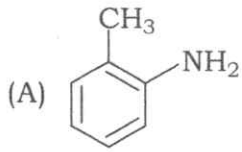
(B) 

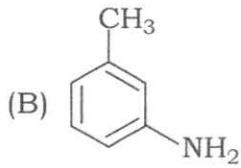
(C) 

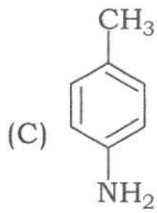
(D) 

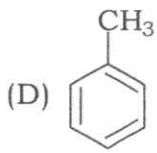
102. The major product of the following reaction is



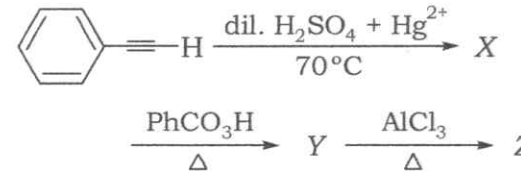
(A) 

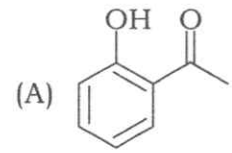
(B) 

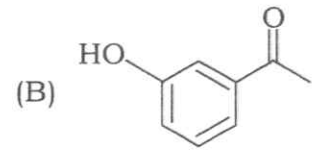
(C) 

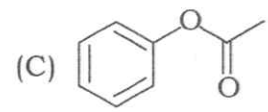
(D) 

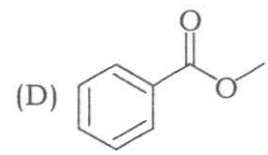
103. The major product *Z* for the following reaction is



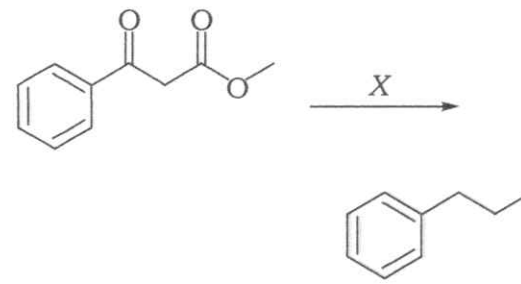
(A) 

(B) 

(C) 

(D) 

104. The reagent *X* in the following conversion is

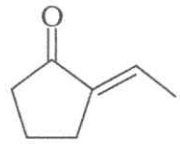


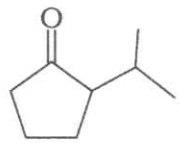
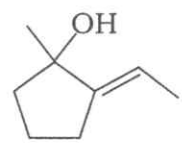
(A) $H_2NNH_2/\overset{\ominus}{O}H$

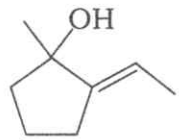
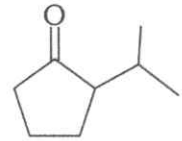
(B) Zn-Hg/Conc. HCl

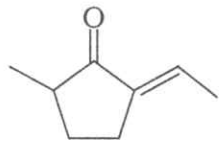
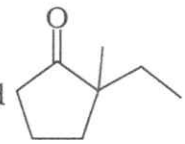
(C) $LiAlH_4$

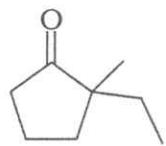
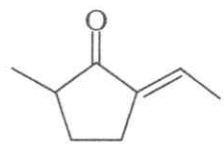
(D) Red P + HI

105. $X \xrightarrow[\text{(ii) } H_2O]{\text{(i) } (CH_3)CuLi}$  $\xrightarrow[H_2O]{CH_3Li/ether} Y$

(A)  and 

(B)  and 

(C)  and 

(D)  and 

106. The specific rotations of pure α- and β-D-mannopyranose are +29.3° and −17.0° respectively. When either of them is dissolved in water, mutarotation occurs and the rotation charges until a final rotation of +14.2° is observed. The percentages of α- and β forms at the equilibrium condition are

(A) 20%, 80%

(B) 32.6%, 67.4%

(C) 67.4%, 32.6%

(D) 55.4%, 44.6%

107. An electric current is passed through an aqueous solution of a mixture of alanine (isoelectric point 6.0), glutamic acid (3.2) and arginine (10.7) buffered at pH 6.0. At this pH,

(A) alanine migrates to cathode

(B) arginine migrates to anode

(C) glutamic acid migrates to cathode

(D) arginine migrates to cathode

108. Kinetic energy of a single molecule is given by the expression

(A) RT

(B) RT/N

(C) nRT

(D) $1.5RT/N$

109. Molar refraction is

(A) an additive property

(B) a constitutive property

(C) both additive property and constitutive property

(D) a thermodynamic property

110. A container of volume 5.0 L is divided into two compartments of equal size. In the left compartment, there is nitrogen at 1.0 atmosphere pressure and 25 °C temperature, in the right compartment there is hydrogen at the same temperature and pressure. What will happen when the partition is removed?

(A) The entropy increases and the free energy decreases

(B) The entropy decreases and the free energy decreases

(C) The entropy increases and the free energy increases

(D) The entropy decreases and the free energy increases

111. Plants and living beings are the examples of

(A) isolated system

(B) adiabatic system

(C) open system

(D) closed system

112. Which of the following is the primary reference electrode for the measurement of electrode potential?

(A) Glass electrode

(B) Normal calomel electrode

(C) Silver-silver chloride electrode

(D) Standard hydrogen electrode

113. In a second order reaction $2A \rightarrow$ products, if the concentration of A is doubled, $t_{1/2}$ of the reaction is

(A) doubled

(B) quadrupled

(C) halved

(D) unchanged

114. In physical adsorption, the forces of attraction are

(A) ionic

(B) covalent

(C) H-bonding

(D) van der Waals

115. The rate constant for the second-order decomposition of N_2O follows the following equation :

$$N_2O \rightarrow N_2 + O_2$$

$(k = 5.00 \times 10^{11}\ dm^3\ mol^{-1}\ s^{-1})$ $e^{(-29000\ K/T)}$. The activation energy of the reaction is

(A) 5.76 kJ mol^{-1}

(B) 24.1 kJ mol^{-1}

(C) 57.6 kJ mol^{-1}

(D) 241.1 kJ mol^{-1}

116. The molecular weight of NaCl, assuming 100% dissociation in solution, as determined by elevation of boiling point method, is

(A) 58.5

(B) 29.25

(C) greater than 58.5

(D) zero

117. The phase diagram of KI-H_2O is of simple eutectic type. The eutectic composition is 28.3 weight% KI and it freezes at –23.1 °C. The phases present in a solution containing 18 weight % of KI at –20 °C are

(A) Ice + KI solution

(B) Ice + solid KI

(C) KI + pure water

(D) KI + saturated KI solution

118. A concentration cell consisting of two zinc electrodes are immersed in 0.01 molal and 0.1 molal $ZnSO_4$ solutions at 25 °C. The two solutions are separated by a salt bridge. The EMF of the cell is (the activity coefficient of the electrolyte may be assumed to be unity)

(A) 0.0147 V

(B) 0.0591 V

(C) 0.0295 V

(D) 0.1182 V

119. The conductivity of 0.01 M NaCl solution is 0.00147 $ohm^{-1}\ cm^{-1}$. When 50 ml of water is added to the above solution, its conductivity

(A) increases

(B) decreases

(C) remains unchanged

(D) first increases and then decreases

120. The EMF of Daniell cell at 298 K is E1, $Zn|ZnSO_4$ (1 M) || $CuSO_4$ (1 M)|Cu, when the concentration of $ZnSO_4$ is 1.0 M and that of $CuSO_4$ is 0.01 M, the EMF changed to E2. The relationship between E1 and E2 is

(A) $E2 = 0 \neq E1$

(B) $E1 > E2$

(C) $E1 < E2$

(D) $E1 = E2$

121. The hydrogen ion concentration of a solution with pH value 2.69 is given by

(A) 2.29×10^{-3} M

(B) 3.69×10^{-2} M

(C) 4.31×10^{-4} M

(D) 2.042×10^{-3} M

122. The substances, when exposed to light radiations of short wavelength emitting light of longer wavelength, are called

(A) photosensitized substances

(B) phosphorescent substances

(C) fluorescent substances

(D) non-radiative substances

123. For strong electrolytes, the plot of molar conductance vs $\sqrt{C}$ is

(A) parabolic

(B) linear

(C) sinusoidal

(D) circular

124. The standard potential of Cu/Cu^{2+} electrode is 0.337 V. It corresponds to the reaction

(A) $Cu \rightarrow Cu^{2+} + 2e^-$

(B) $\frac{1}{2}Cu^{2+} + e^- \rightarrow \frac{1}{2}Cu$

(C) $Cu^{2+} + 2e^- \rightarrow Cu$

(D) $Cu^{2+} + e^- \rightarrow Cu^+$

125. The rate law for a reaction between the substances *A* and *B* is given by Rate = $K[A]^n [B]^m$. On doubling the concentration of *A* and *B*, having the concentration of *B*, the ratio of the new rate to the earlier rate of the reaction will be

(A) $m + n$

(B) $(n - m)$

(C) $2^{(n-m)}$

(D) $1/2^{(m+n)}$

126. A beam of X-rays from a copper target, with wavelength 154.1 pm is passed at low angles onto the surface of a silver crystal. As the angle is increased from the glancing angle, a beam of reflected X-rays is observed at $\theta = 22.20°$. The spacing between the planes of silver atoms that gives rise to this reflection is

(A) 51 pm

(B) 102 pm

(C) 255 pm

(D) 204 pm

127. A gaseous mixture contains 56 g of nitrogen, 44 g of CO_2 and 16 g of methane. The total pressure of the mixture is 720 mm Hg. The partial pressure of methane is

(A) 180 mm

(B) 360 mm

(C) 540 mm

(D) 720 mm

128. Which of the following spectroscopic techniques will be useful to distinguish between M-SCN and M-NCS binding modes?

(A) NMR

(B) IR

(C) UV-visible

(D) Mass

129. The rotational constant of $^{14}N_2$ is 2 cm^{-1}. The wave number of incident radiation in a Raman spectrometer is 20487 cm^{-1}. What is the wave number of first scattered Stokes line (in cm^{-1}) of $^{14}N_2$?

(A) 20479

(B) 20499

(C) 20495

(D) 20475

130. Isothermal, which has fractional coverage, linearly dependent at low pressure but almost independent at high pressure is called

(A) BET isotherm

(B) Langmuir isotherm

(C) Freundlich isotherm

(D) Temkin isotherm

131. Suppose the ground stationary state of a harmonic oscillator with force constant K is given by $\Psi_0 = e^{[-AX^2]}$ the A should depend on K as

(A) $A \propto K^{-1/2}$

(B) $A \propto K$

(C) $A \propto K^{1/2}$

(D) $A \propto K^{1/3}$

132. The energy of a hydrogen atom in a state is $-\frac{hcR_H}{25}$ (R_H = Rydberg constant). The degeneracy of the state will be

(A) 5

(B) 10

(C) 25

(D) 50

133. The dipole moment of the HCl is $3{\cdot}697 \times 10^{-30}$ C.m and the bond length is 127·5 pm. What are the net charges on the H and Cl atoms?

(A) 1·81e

(B) 0·181e

(C) 18·1e

(D) $0{\cdot}181 \times 10^{-10}$e

134. Which one of the following statements is ***not true***?

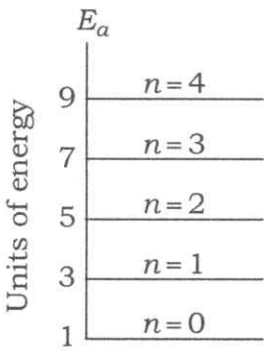
(A) Partially miscible liquids are liquids that mix in all proportions at all temperature

(B) A catalyst does not affect the equilibrium constant

(C) Thermodynamic equilibrium constant is expressed in terms of activities

(D) A eutectic is the mixture with the lowest melting point

135. The figure shown in the energy level diagram is corresponding to



(A) particle in a box

(B) particle tunnelling

(C) hydrogen atom

(D) harmonic oscillator

136. A series of 3 coloured glass plates of equal thickness are placed in a light beam. Each sheet absorbs one quarter of the light incident upon it. What is the intensity of the light transmitted by the third glass plate?

(A) 1·56%

(B) 42·19%

(C) 56·25%

(D) 75·00%

137. Consider the fission of $^{236}_{92}U$ represented by the overall reaction

$$^{236}_{92}U \rightarrow {}^{94}_{40}Zr + {}^{140}_{58}Ce + 6\,{}^{0}_{-1}e + 2\,{}^{1}_{0}n$$

The total energy released in the fission reaction is around (Given : 236U = 236·0457, 94Zr = 93·90610, 140Ce = 139·9054, $^{0}_{-1}e$ = 0·00055, $^{1}_{0}n$ =100867)

(A) 200 MeV

(B) 20 MeV

(C) 2 MeV

(D) 20 eV

138. A polymer sample is made of 30% molecules of mass 20000, 40% of 30000 mass and the rest mass of 60000. Its average molecular mass is

(A) 36000

(B) 46000

(C) 50000

(D) 360000

139. In solvent extraction, what term describes the ratio of the concentration of solute in the organic phase to its concentration in the aqueous phase?

(A) Molarity

(B) Solubility product

(C) Partition coefficient

(D) Stoichiometry

140. An error that consistently occurs in the same direction in repeated measurements is known as

(A) random error

(B) systematic error

(C) absolute error

(D) relative error

141. The R_f value in Thin Layer Chromatography (TLC) is calculated as

(A) distance travelled by sample/ distance travelled by solvent front

(B) distance travelled by solvent front/distance travelled by sample

(C) distance travelled by stationary phase/distance travelled by mobile phase

(D) None of the above

142. What is the application of redox titrations?

(A) Measurement of pH

(B) Detection of alkali metals

(C) Determination of hardness of water

(D) Quantification of organic compounds

143. Which type of titration curve exhibits a sharp equivalence point?

(A) Strong acid vs Strong base

(B) Weak acid vs Strong base

(C) Weak base vs Weak acid

(D) None of the above

144. Which one of the following equations is related to column chromatography?

(A) $Id = 708n\ CD^{1/2}\ m^{2/3}\ t^{1/6}$

(B) $V_R = t_R F_C$

(C) $E = E^0 - RT \log[H^+]/nF$

(D) $A = €bc$

145. The current remains zero and graph is plotted between E versus volume of titrant in

(A) amperometric titration

(B) potentiometric titration

(C) conductometric titration

(D) voltametry

146. Which of the following is ***not*** an advantage of laminar flow burner used in flame photometry?

(A) Noiseless

(B) Stable flame for analysis

(C) Efficient atomization of sample

(D) Sample containing two or more solvents can be burned efficiently

147. van Deemter's equation describes the relationship between

(A) pressure and flow rate

(B) efficiency and column length

(C) peak width and linear velocity

(D) mobile phase viscosity and temperature

148. In ion exchange chromatography, what is the primary mechanism of separation?

(A) Molecular weight differences

(B) Charge interactions between ions and resin

(C) Boiling point differences

(D) Hydrogen bonding

149. Indicators used in EDTA titrations are typically sensitive to

(A) pH change

(B) colour change

(C) temperature change

(D) pressure change

150. What does Mohr's method use as the indicator in silver nitrate titrations?

(A) Potassium chromate

(B) Dichlorofluorescein

(C) Barium sulfate

(D) Silver sulphide

151. The steel city of Odisha is

(A) Jajpur

(B) Sambalpur

(C) Koraput

(D) Rourkela

152. As per the local language Sadri, from where it originated, the name 'Rourkela' means

(A) My Village

(B) Your Village

(C) Our Village

(D) Golden Village

153. Which of the following is ***not true*** for Birsa Munda International Hockey Stadium?

(A) It is situated in Rourkela

(B) It co-hosted Hockey World Cup, 2023

(C) It has permanent seating capacity of 10000

(D) It is recognized by the Guinness World Records for the largest fully seated hockey arena in the world

154. Bhubaneswar replaced Cuttack as capital of Odisha (formerly Orissa) in the year

(A) 1962

(B) 1964

(C) 1966

(D) 1968

155. The modern city of Bhubaneswar was designed by

(A) German architect Otto Konigsberger

(B) Swiss-French architect Le Corbusier

(C) Polish architect Maciej Nowicki

(D) American planner Albert Mayer

156. The Hathigumpha inscription at the Udayagiri and Khandagiri caves at Bhubaneswar belongs to

(A) Mauryan dynasty

(B) Mahameghavahana dynasty

(C) Murunda dynasty

(D) Naga dynasty

157. Which temple in Odisha is called the 'Black Pagoda'?

(A) Lingaraja Temple, Bhubaneswar

(B) Jagannath Temple, Puri

(C) Sun Temple, Konark

(D) Brahmeswara Temple, Bhubaneswar

158. The Thakurani Jatra, one of the State festivals of Odisha, is related to

(A) sea products

(B) wooden crafts

(C) dairy products

(D) silk products

159. Which city is known as 'Silk City' of Odisha?

(A) Berhampur

(B) Jajpur

(C) Bhawanipatna

(D) Keonjhar

160. Which place has a Central University?

(A) Bhubaneswar

(B) Rourkela

(C) Koraput

(D) Burla

161. Similipal National Park is located in which district?

(A) Sundargarh

(B) Keonjhar

(C) Balasore

(D) Mayurbhanj

162. The district situated at the south of Keonjhar is

(A) West Singhbhum district

(B) Angul

(C) Jajpur

(D) Mayurbhanj

163. A National Park of Odisha situated near the sea is

(A) Similipal National Park

(B) Bhitarkanika National Park

(C) Mukurthi National Park

(D) Dudhwa National Park

164. The highest peak in the State of Odisha is

(A) Deomali Peak

(B) Daringbadi

(C) Mandasaru

(D) Malayagiri

165. Daringbadi, a famous hill station in Odisha, is named after

(A) a local deity

(B) British officer

(C) a freedom fighter

(D) a renowned king

166. Which of the following districts is ***not*** in the central region of Odisha State?

(A) Angul

(B) Boudh

(C) Kandhamal

(D) Koraput

167. Constitution Day is observed in India on

(A) 26th January

(B) 31st October

(C) 26th November

(D) 26th December

168. The southernmost district of Odisha having seashore is

(A) Ganjam

(B) Gajapati

(C) Rayagada

(D) Malkangiri

169. The electricity production capacity (in MW) of Odisha in the order of high to low are

(A) thermal, hydro, renewable

(B) hydro, thermal, renewable

(C) renewable, thermal, hydro

(D) thermal, renewable, hydro

170. When is the Navy Day celebrated in India?

(A) 2nd December

(B) 3rd December

(C) 4th December

(D) 5th December

171. The Food Safety and Standards Act, 2006 was published in the Gazette of India on

(A) 22nd August, 2006

(B) 23rd August, 2006

(C) 24th August, 2006

(D) 25th August, 2006

172. As per the Food Safety and Standards Authority of India, the full form of GMP is

(A) Good Manufacturing Practices

(B) Good Methods of Packaging

(C) Good Methods of Preparation

(D) Good Mixing Practices

173. _____ is the process of adding hydrogen to an edible vegetable oil using a catalyst to produce a fat with semi-solid consistency.

(A) Pasteurisation

(B) Hydrogenation

(C) Sterilisation

(D) Refined vegetable oil

174. As per Food Safety and Standards (Laboratory and Sample Analysis) Regulations, 2011, _____ is the notified Food Laboratory for Import.

(A) Central Food Laboratory, Ernakulum

(B) Central Food Laboratory, Chennai

(C) Central Food Laboratory, Mysore

(D) Central Food Laboratory, Puducherry

175. The wholesalers or distributors are liable for the supply of _____ under the Food Safety and Standards Act, 2006.

(A) food after the date of its expiry

(B) unsafe or misbranded food

(C) food received from unidentifiable manufacturer

(D) All of the above

176. _____ food includes additives, flavourings, enzymes or processing aids that are not products of animal origin.

(A) Ayurveda

(B) Vegan

(C) Functional

(D) Carnivore

177. The infant formula may contain galactooligosaccharides and fructooligosaccharides in the combination of _____ ratio respectively.

(A) 50 : 50

(B) 70 : 30

(C) 80 : 20

(D) 90 : 10

178. Food Safety and Standards (Health Supplements, Nutraceuticals, Food for Special Dietary Use, Food for Special Medical Purpose, Functional Food and Novel Food) Regulations, 2016 came into force on

(A) 1st January, 2016

(B) 1st July, 2016

(C) 1st January, 2018

(D) 1st July, 2018

179. Every package of health supplement shall carry _____ information on the label.

(A) the words 'HEALTH SUPPLEMENT'

(B) an advisory warning 'FOR MEDICINAL USE'

(C) a statement that the health supplement be used as a substitute for a varied diet

(D) a statement that the product is required to be stored in a refrigerator

180. Pasteurization refers to the process of heating every particle of milk of different classes for at least _____ and holding it at such temperature continuously for at least 30 minutes.

(A) 28 °C

(B) 63 °C

(C) 100 °C

(D) 138 °C

181. _____ are the functions of the Food Safety and Standards Authority of India.

(A) Laying down guidelines for accreditation of laboratories

(B) Framing regulations on food standards

(C) Promoting awareness about food safety and standards

(D) All of the above

182. The extract of _____ is the only Vegan Society and Vegetarian Society registered vitamin D3 that shall need prior approval of the Food Authority.

(A) lichen/algae

(B) mushroom

(C) fish liver oil

(D) spinach

183. As per the Food Safety and Standards Act, 2006, any person who manufactures, stores, sells, distributes or imports sub-standard food for human consumption shall be liable to a penalty of up to

(A) ₹ two lakhs

(B) ₹ five lakhs

(C) ₹ eight lakhs

(D) ₹ ten lakhs

184. Section 38 of the Food Safety and Standards Act of 2006 focuses on the powers of the

(A) Commissioner

(B) Designated Officer

(C) Food Safety Officer

(D) Food Analyst

185. Food Safety and Standards (Contaminants, Toxins and Residues) Regulations, 2011 came into force on

(A) 21st October, 2010

(B) 5th August, 2011

(C) 21st October, 2011

(D) 5th August, 2012

186. _____ refers to the process of deliberately increasing the content of essential micronutrients in food to improve the nutritional quality of food and to provide public health benefits with minimal health risks.

(A) Food Fortification

(B) Food Adulteration

(C) Food Irradiation

(D) Food Quality Assurance

187. _____ refers to the average daily dietary nutrient intake level sufficient to meet the nutrient requirement of nearly all (97 to 98 percent) healthy individuals in a particular life stage and gender group.

(A) Balanced diet

(B) Food pyramid

(C) Nutrition claim

(D) Recommended Dietary Allowance

188. Packaging material that encloses the primary food packaging and does not come in direct contact with food products is known as _____ food packaging.

(A) primary

(B) secondary

(C) tertiary

(D) multilayer

189. _____ is important for fetal development and blood formation.

(A) Vitamin A

(B) Iodine

(C) Folic acid

(D) Riboflavin

190. Food Safety and Standards (Safe food and balanced diets for children in school) Regulations, 2020, School Authority shall ensure that no person shall sell food products high in _____ on school premises.

(A) saturated fat

(B) added sugar

(C) sodium

(D) All of the above

191. Food Safety and Standards (Packaging) Regulations, 2018 came into force on

(A) 1st July, 2017

(B) 1st July, 2018

(C) 1st July, 2019

(D) 1st July, 2020

192. Section 22 of the Food Safety and Standards Act of 2006 states the regulations of

(A) genetically modified foods, organic foods, functional food and proprietary food

(B) pesticides, veterinary drug residues, antibiotic residues and microbiological counts

(C) packaging and labelling of foods

(D) contaminants, naturally occurring toxic substances and heavy metals

193. Printing inks for use on food packages shall conform to

(A) IS : 10500

(B) IS : 13428

(C) IS : 14543

(D) IS : 15495

194. As per FSSAI, a value of below _____ is considered a low glycemic index where the carbohydrate in the food is slowly broken down into glucose and absorbed from the gut into the blood.

(A) 45

(B) 55

(C) 65

(D) 75

195. Every package of food fortified with iron shall carry the words 'fortified with iron' and the logo with a tagline _____ under the logo.

(A) adorable nutrition, inside and out

(B) smiles taste better with nutritious snacks

(C) people with thalassemia may take under medical supervision

(D) eat well, smile big

196. _____ is food for infants from six months up to twenty-four months of age, which is intended for use as a liquid part of the complementary diet when prepared in accordance with instructions for use.

(A) Follow-up formula

(B) Infant formula

(C) Milk cereal-based complementary food

(D) Processed cereal-based complementary food

197. Food Safety and Standards (Alcoholic Beverages) Regulations, 2018 came into force on

(A) 1st April, 2018

(B) 1st July, 2018

(C) 1st April, 2019

(D) 1st July, 2019

198. _____ means any substance not intentionally added to food, but which gets added to articles of food in the process of their production, manufacture, processing, preparation, treatment, packing, packaging transport or holding of articles of such food as a result of environmental contamination.

(A) Adulterant

(B) Fortificant

(C) Pollutant

(D) Crop contaminant

199. The Food Safety Appellate Tribunal is established by the Central or State Government under _____ of the Food Safety and Standards Act of 2006.

(A) Section 68

(B) Section 69

(C) Section 70

(D) Section 71

200. As per FSSAI, the full form of FSDU is

(A) Food for Special Dietary Use

(B) Fortified Special Dietary Use

(C) Food for Special Deficiency Use

(D) Fortified for Special Deficiency Use

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