

**AGA KHAN UNIVERSITY EXAMINATION BOARD  
HIGHER SECONDARY SCHOOL CERTIFICATE**

**CLASS XII**

**ANNUAL EXAMINATIONS 2022**

**Chemistry**

**Total Time: 2 hours 10 minutes**

**Total Marks: 65 (50-Theory & 15-Alternate to Practical)**

**INSTRUCTIONS**

1. Read each question carefully.
2. Answer the questions on the separate answer sheet provided. DO NOT write your answers on the question paper.
3. There are 100 answer numbers on the answer sheet. Use answer numbers 1 to 65 only.
4. Question Distribution:

Theory	Alternate to Practical (ATP)
50 MCQs	15 MCQs

5. In each question, there are four choices A, B, C, D. Choose ONE. On the answer grid, black out the circle for your choice with a pencil as shown below.

Correct Way	Incorrect Ways
1 (A) (B) (C) (D)	1 (A) (B) (C) (D)
	2 (A) (B) (C) (D)
	3 (A) (B) (C) (D)
	4 (A) (B) (C) (D)

Candidate's Signature

6. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
7. DO NOT write anything in the answer grid. The computer only records what is in the circles.
8. The marks obtained on the 50 MCQs will be equated to the total marks of 85 for the theory examination results.
9. You may use a scientific calculator if you wish.

**THEORY (Questions 1-50)**

- The decomposition products of  $\text{PbCl}_4$  at room temperature are
  - $\text{Pb} + \text{Cl}_4$
  - $\text{Pb} + 2\text{Cl}_2$
  - $\text{PbCl}_2 + 2\text{Cl}^-$
  - $\text{PbCl}_2 + \text{Cl}_2$
- The CORRECT order of electrical conductivity in the elements of 3<sup>rd</sup> period is
  - $\text{Na} < \text{Mg} < \text{Al} < \text{Si}$
  - $\text{Na} > \text{Mg} > \text{Al} < \text{Si}$
  - $\text{Na} < \text{Mg} < \text{Al} > \text{Si}$
  - $\text{Na} > \text{Mg} > \text{Al} > \text{Si}$
- The complete reaction of chlorine with water in the presence of bright sunlight is written as
  - $\text{Cl}_{2(g)} + \text{H}_2\text{O}_{(l)} \rightleftharpoons \text{HCl}_{(aq)} + \text{HOCl}_{(aq)}$
  - $2\text{Cl}_{2(g)} + 2\text{H}_2\text{O}_{(l)} \rightarrow 4\text{HCl}_{(aq)} + \text{O}_{2(g)}$
  - $\text{Cl}_{2(g)} + 2\text{H}_2\text{O}_{(l)} \rightleftharpoons 2\text{HOCl}_{(aq)} + \text{H}_{2(g)}$
  - $\text{Cl}_{2(g)} + 2\text{H}_2\text{O}_{(l)} \rightarrow 2\text{HCl}_{(aq)} + \text{H}_{2(g)} + \text{O}_{2(g)}$
- A non-metal is MOST reactive when it has a
  - large atomic radius.
  - low electron affinity.
  - high electronegativity.
  - low ionisation energy.
- The systematic name of the transition metal complex  $[\text{Co}(\text{NO}_2)_3(\text{NH}_3)_3]$  is
  - trinitrotriammine cobalt(III).
  - triamminetrinitro cobalt(III).
  - trinitrotriammine cobalt(VI).
  - triamminetrinitro cobalt(VI).
- The shape of a coordination complex with coordination number 4 would be
  - linear.
  - trigonal.
  - hexagonal.
  - square planar.
- The deep purple colour of  $\text{KMnO}_4$  is due to
  - 1 charge of  $\text{MnO}_4$  ion.
  - +7 charge of Mn ion.
  - +1 charge of K ion.
  - 2 charge of O ion.

8. The description that is CORRECT about monodentate ligand is that it always
- donates a proton.
  - accepts an electron.
  - forms a dative bond.
  - consists of one atom only.
9. Which of the following amino acids is optically inactive?

$\begin{array}{c} \text{O} \\ \parallel \\ \text{H}_2\text{N}-\text{CH}-\text{C}-\text{OH} \\   \\ \text{CH}_2 \\   \\ \text{SH} \end{array}$	$\begin{array}{c} \text{O} \\ \parallel \\ \text{H}_2\text{N}-\text{CH}_2-\text{C}-\text{OH} \end{array}$
A	B
$\begin{array}{c} \text{O} \\ \parallel \\ \text{H}_2\text{N}-\text{CH}-\text{C}-\text{OH} \\   \\ \text{CH}_2 \\   \\ \text{OH} \end{array}$	$\begin{array}{c} \text{O} \\ \parallel \\ \text{H}_2\text{N}-\text{CH}-\text{C}-\text{OH} \\   \\ \text{CH}_3 \end{array}$
C	D

10. How many stereoisomers can exist for a compound with 3 chiral centres?
- 3
  - 6
  - 8
  - 9
11. Closed chain hydrocarbons that are non-benzenoid and follow the general formula of  $\text{C}_n\text{H}_{2n}$  are classified as
- acyclic.
  - alicyclic.
  - aromatic.
  - heterocyclic.
12. Which of the following organic compounds contains TWO chiral centres?
- 3-amino-3-hydroxybutanoic acid
  - 2-amino-3-hydroxybutanoic acid
  - 2-hydroxy-2-methyl butanal
  - 2-hydroxy-3-methyl butanal

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13. Which option represents functional group isomers?

A	$\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—Cl}$	$\begin{array}{c} \text{H} \\   \\ \text{H}_3\text{C—C—CH}_3 \\   \\ \text{Cl} \end{array}$
B	$\begin{array}{c} \text{O} \\    \\ \text{H}_3\text{C—C—O—CH}_3 \end{array}$	$\begin{array}{c} \text{O} \\    \\ \text{H}_3\text{C—CH}_2\text{—C—OH} \end{array}$
C	$\begin{array}{c} \text{CH}_3\text{—CH}_2\text{—CH—CH}_3 \\   \\ \text{CH}_3 \end{array}$	$\begin{array}{c} \text{CH}_3 \\   \\ \text{H}_3\text{C—C—CH}_3 \\   \\ \text{CH}_3 \end{array}$
D	$\text{CH}_3\text{—CH}_2\text{—O—CH}_2\text{—CH}_3$	$\text{CH}_3\text{—O—CH}_2\text{—CH}_2\text{—CH}_3$

14.  $\text{CH}_3\text{COOC}_3\text{H}_7$  is the structural formula of

- A. ethanoic acid.
- B. propanoic acid.
- C. ethyl ethanoate.
- D. propyl ethanoate.

15. Organic compounds **X** and **Y** have same molecular formula that is  $\text{C}_3\text{H}_6\text{O}$ .

Based on the given statement, the type of isomerism that differentiates **X** from **Y** is

- A. chain isomerism.
- B. optical isomerism.
- C. position isomerism.
- D. functional group isomerism.


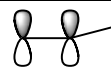
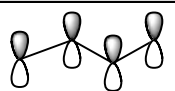
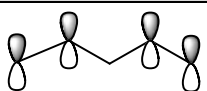
16. Iso-pentane and neo-pentane are isomers that show a difference in

- A. general formula.
- B. empirical formula.
- C. structural formula.
- D. molecular formula.

17. The product obtained by the chlorination of nitrobenzene is

- A. o-chloronitrobenzene.
- B. p-chloronitrobenzene.
- C. m-chloronitrobenzene.
- D. o,p-trichloronitrobenzene.

18. Based on the structures of molecules, which of the following p-systems is a conjugated system?

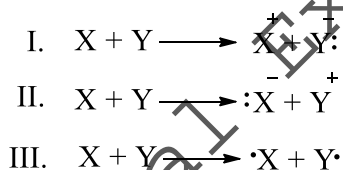
 Ethene	 Propene
A	B
 1,3-butadiene	 1,4-pentadiene
C	D

19. The CORRECT sequence of events in an electrophilic substitution reaction of benzene is

- I. elimination of a proton
- II. generation of a catalyst
- III. formation of an arenium ion
- IV. generation of an electrophile

- A. IV → III → I → II
- B. II → IV → III → I
- C. III → II → IV → I
- D. I → IV → III → II

20. Consider the given fission reactions.



The reaction(s) that represent(s) heterolytic fission is/ are

- A. I only.
- B. I and II.
- C. III only.
- D. II and III.

21. The option that CORRECTLY depicts the number of  $\pi$ -bonds and the shape of ethene molecule is

	Number of $\pi$ -Bonds	Shape of Molecule
A	2	tetrahedral
B	1	trigonal planar
C	2	angular
D	1	linear

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22. Dissolution of methane gas in water releases enough amount of energy that can overcome

- I. Van der Waals dispersion forces in methane molecules
- II. carbon-hydrogen bonding in methane molecules
- III. hydrogen bonding in water molecules

- A. I only.
- B. II only.
- C. I and III.
- D. II and III.

23. Benzene shows greater stability as compared to the corresponding alkene because of its

- A.  $\pi$ -electron cloud.
- B. non-polar behaviour.
- C. hexagonal ring structure.
- D. reactivity towards hydrogen.

24. The group that replaces a hydrogen atom in the Friedal-Crafts acylation of benzene is

(Note: X in the given structures represents Br or Cl.)

$\begin{array}{c} \text{OH} \\   \\ \text{---C---X} \\   \\ \text{H} \end{array}$	$\begin{array}{c} \text{O} \\    \\ \text{---C---X} \end{array}$	$\begin{array}{c} \text{O} \\    \\ \text{---C---OX} \end{array}$	$\begin{array}{c} \text{O} \\    \\ \text{---C---OH} \end{array}$
A	B	C	D

25. The elimination reaction is favoured over substitution reaction when there is crowding within the substrate molecule. This is because, from tertiary planar carbonium ion, the removal of

- A.  $\beta$ -hydrogen atom by base is easy.
- B.  $\alpha$ -hydrogen atom by base is easy.
- C.  $\beta$ -hydrogen atom by base is difficult.
- D.  $\alpha$ -hydrogen atom by base is difficult.

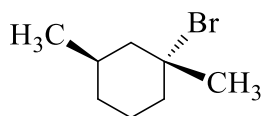
26. Which of the following carbon halide bonds is the STRONGEST?

- A. C-I
- B. C-Br
- C. C-Cl
- D. C-F

27. Grignard's reagents (RMgX) can convert

- A. alkane into water.
- B. aldehyde into ketone.
- C. ester into tertiary alcohol.
- D. carboxylic acid into carbon dioxide.

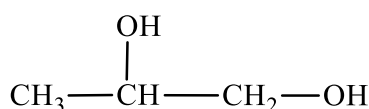
28. The given compound undergoes  $S_N1$  reaction mechanism when it is treated with  $CH_3OH$  which is a weak nucleophile and a solvent.



Based on this information, the MAJOR product expected from this reaction will be

A	B
C	D

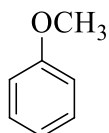
29. Boiling points of consecutive alcohols in the homologous series generally increase with the
- increasing number of branches.
  - decreasing polarity of O-H bond.
  - decreasing Van der Waals forces.
  - increasing number of carbon atoms.
30. The CORRECT order of reactivity of alcohol with reference to O-H bond cleavage is
- methyl alcohol > primary alcohol > secondary alcohol > tertiary alcohol
  - tertiary alcohol > secondary alcohol > primary alcohol > methyl alcohol
  - tertiary alcohol > secondary alcohol > methyl alcohol > primary alcohol
  - primary alcohol > methyl alcohol > secondary alcohol > tertiary alcohol
31. When Lucas reagent reacts with an alcohol,  $ZnCl_2$  acts as a
- reactant.
  - product.
  - reagent.
  - catalyst.
32. The oxidative cleavage of the given diol produces



- 2 molecules of ketone.
- 2 molecules of aldehyde.
- 1 molecule of ketone and 1 molecule of ester.
- 1 molecule of aldehyde and 1 molecule of ester.

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33. Consider the given structure of an aromatic ether.



When this ether is treated with the excess of anhydrous hydrogen iodide, the products formed will be

A	B	C	D

34. A reversible reaction occurs when propanol is treated with ethanoic acid under the following reaction conditions.

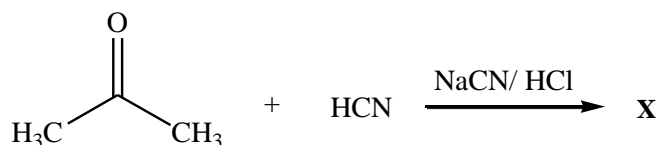
- I. Presence of concentrated sulphuric acid
- II. Reflux at 180°C

The MAJOR product of this reaction will be

- A. propyl ethanoate.
  - B. ethyl propanoate.
  - C. propoxyethane.
  - D. ethoxypropane.
35. In humans, long-term exposure to formalin can cause
- A. sore throat.
  - B. nasal cancer.
  - C. skin irritation.
  - D. eye inflammation.

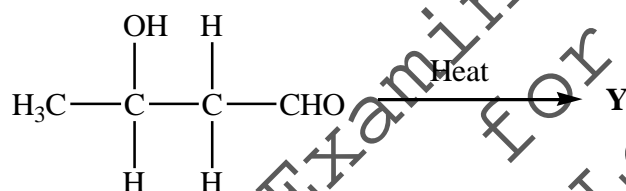


36. The product **X** formed in the given chemical reaction is



$\begin{array}{c} \text{NC} \quad \text{CN} \\ \diagdown \quad / \\ \text{C} \\ / \quad \diagdown \\ \text{H}_3\text{C} \quad \text{CH}_3 \end{array}$	$\begin{array}{c} \text{HO} \quad \text{CN} \\ \diagdown \quad / \\ \text{C} \\ / \quad \diagdown \\ \text{H}_3\text{C} \quad \text{CH}_3 \end{array}$
A	B
$\begin{array}{c} \text{H}_2\text{N} \quad \text{CN} \\ \diagdown \quad / \\ \text{C} \\ / \quad \diagdown \\ \text{H}_3\text{C} \quad \text{CH}_3 \end{array}$	$\begin{array}{c} \text{H} \quad \text{CN} \\ \diagdown \quad / \\ \text{C} \\ / \quad \diagdown \\ \text{H}_3\text{C} \quad \text{CH}_3 \end{array}$
C	D

37. When the given compound is heated in the presence of a dilute acid it forms an unsaturated carbonyl compound **Y**.

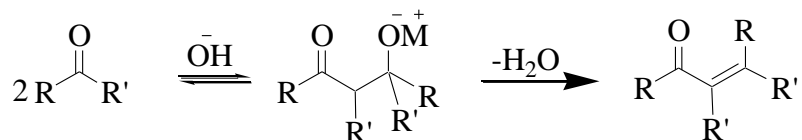


Based on the given information, the structure of compound **Y** will be

$\text{H}_3\text{C}-\text{CH}=\text{CH}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}=\overset{\text{OH}}{\text{C}}-\text{H}$
A	B
$\text{H}_3\text{C}-\text{HC}=\text{CH}-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}$	$\text{H}_2\text{C}=\text{CH}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$
C	D

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38. Consider the given general reaction of a carbonyl compound.

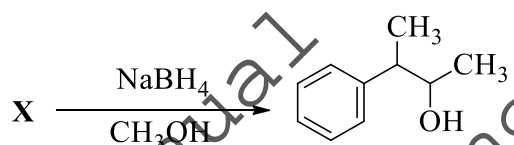


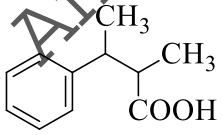
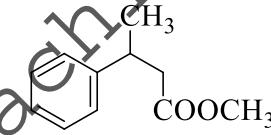
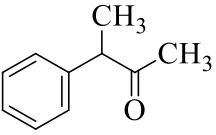
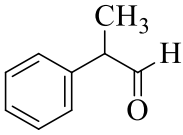
The given base catalysed reaction represents

- A. Cannizzaro's reaction.  
 B. Aldol condensation.  
 C. oxidation reaction.  
 D. haloform reaction.
39. Which class of alcohol is produced when an aldehyde or a ketone is hydrolysed after reaction with  $\text{LiAlH}_4$ ?

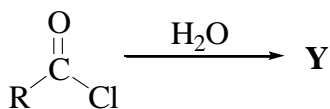
	Alcohol Produced by	
	Aldehyde	Ketone
A	1°	1°
B	1°	2°
C	2°	2°
D	2°	3°

40. In the given reaction, X is identified as



			
A	B	C	D

41. The product **Y** in the given reaction would be



$\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$	$\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OR}'$	$\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NR}_2$	$\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\overset{\text{O}}{\parallel}{\text{C}}-\text{R}$
A	B	C	D

42. The oxidising agent that can convert a primary alcohol into a carboxylic acid is

- A.  $[\text{Ag}(\text{NH}_3)_2]^+\text{OH}^-$   
 B. acidified  $\text{H}_2\text{O}$   
 C.  $\text{H}_2\text{CrO}_4$   
 D.  $\text{MnO}_2$

43. All of the following conversion reactions of carboxylic acid derivatives are possible EXCEPT

	Conversion Reaction
A	$\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH} + \text{NH}_3 \xrightarrow{\text{Heat}} \text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2 + \text{H}_2\text{O}$
B	$\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{N}(\text{CH}_3)_2 + \text{HCl} \xrightleftharpoons[\text{Temperature}]{\text{Room}} \text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{Cl} + \text{NH}(\text{CH}_3)_2$
C	$\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{Cl} + \text{HOCH}_2\text{CH}_3 \xrightarrow{\text{Pyridine}} \text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OCH}_2\text{CH}_3 + \text{HCl}$
D	$\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 + \text{HOCH}_2\text{CH}_3 \xrightarrow{\text{H}^+} \text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OCH}_2\text{CH}_3 + \text{CH}_3\text{COOH}$

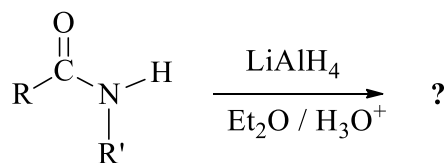
44. Formic acid and ethanol both have nearly identical molecular weights, but formic acid has the highest boiling point. This is because formic acid

- A. exists in solid state at room temperature.  
 B. exists in liquid state at room temperature.  
 C. molecules form strong and stable covalent bonds.  
 D. molecules form a dimer in both liquid and gaseous states.

45. All of the following naturally occurring carboxylic acids are used in soap making EXCEPT

- A. oleic acid.  
 B. stearic acid.  
 C. valeric acid.  
 D. palmitic acid.

46. The MAJOR product of the given reaction is



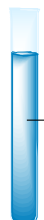
$\begin{array}{c} \text{OH} \quad \text{H} \\   \quad / \\ \text{R}-\text{C}-\text{N} \\   \quad \backslash \\ \text{H} \quad \text{R}' \end{array}$	$\begin{array}{c} \text{H} \quad \text{H} \\   \quad / \\ \text{R}-\text{C}-\text{N} \\   \quad \backslash \\ \text{H} \quad \text{R}' \end{array}$
A	B
$\begin{array}{c} \text{H} \quad \text{OH} \\   \quad / \\ \text{R}-\text{C}-\text{N} \\   \quad \backslash \\ \text{H} \quad \text{R}' \end{array}$	$\begin{array}{c} \text{H} \quad \text{H} \\   \quad / \\ \text{R}-\text{C}-\text{N} \\   \quad \backslash \\ \text{H} \quad \text{OR} \end{array}$
C	D

47. All of the following are the significances of dyes EXCEPT that they are used in
- laser scanning.
  - textile printing.
  - food processing.
  - biological staining.
48. Which of the following processes exemplifies the formation of macromolecules from small organic molecules?
- Hydrolysis of proteins
  - Cracking of petroleum
  - Reforming of petroleum
  - Condensation of proteins
49. All of the following polymers are formed by the elimination of a small molecule as a by-product EXCEPT
- nylon.
  - protein.
  - polyester.
  - polystyrene.
50. Polyvinyl chloride (PVC) is an example of
- copolymer.
  - biopolymer.
  - addition polymer.
  - condensation polymer.

**ALTERNATE TO PRACTICAL (ATP: Questions 51-65)**

Use the given information to answer Q.51, Q.52 and Q.53.

The given test tube contains following reagents.



Original salt solution +  $\text{NH}_4\text{Cl}_{(s)}$  +  $\text{NH}_4\text{OH}_{(aq)}$  +  $(\text{NH}_4)_2\text{CO}_{3(s)}$

51. The reaction indicates that the original salt is being tested for the basic radical of group
- II.
  - III.
  - IV.
  - V.
52. The basic radical that will NOT form precipitates with these reagents is
- $\text{Ca}^{2+}$
  - $\text{Mg}^{2+}$
  - $\text{Sr}^{2+}$
  - $\text{Ba}^{2+}$
53. If precipitation does NOT occur, then the next reagent that should be added to this reaction mixture is
- $\text{H}_2\text{S}_{(g)}$
  - $\text{HCl}_{(aq)}$
  - $\text{NaOH}_{(aq)}$
  - $(\text{NH}_4)_2\text{HPO}_{4(s)}$
54. A student investigated a sample of tetraamminecopper(II) sulphate by preparing its crystals in a chemistry laboratory.
- The type of bond that is present between copper and nitrogen in this prepared complex is
- ionic.
  - polar covalent.
  - non-polar covalent.
  - co-ordinate covalent.

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55. The purpose to form Lassaigne's solution before element detection in an organic compound is to convert a/ an
- solid into liquid.
  - covalent bond into a metallic bond.
  - covalent compound into ionic form.
  - soluble substance into an insoluble substance.

56. Amtul inferred the presence of chlorine in an organic compound using Lassaigne's extract.

She added 1 mL of concentrated nitric acid to a small portion of Lassaigne's extract. After that she boiled and cooled the mixture, and added silver nitrate solution followed by ammonium hydroxide in it.

Based on her inference, the desired result she must have observed is that

- white precipitates are soluble in ammonium hydroxide.
  - white precipitates are insoluble in ammonium hydroxide.
  - pale yellow precipitates are partially soluble in ammonium hydroxide.
  - pale yellow precipitates are completely soluble in ammonium hydroxide.
57. During the formation of diazonium salts, nitrous acid is formed by the action of
- sulphuric acid and nitric acid.
  - nitric acid and hydrochloric acid.
  - hydrochloric acid and aqueous solution of sodium nitrite.
  - sodium nitrite and aqueous solution of sodium hydroxide.
58. When lemon juice is applied on fish meat it eliminates its smell by turning a compound into less unpleasant salts. This happens because fish meat contains a compound with a specific functional group that has the following characteristics.
- Basic in nature
  - Smells like fish
  - Forms diazonium salts upon reaction with an acid

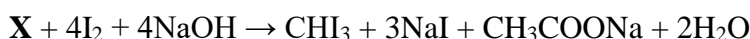
Based on the given characteristics, the compound present in fish will be

	Compounds
A	$\text{ClCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$
B	$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
C	$\text{H}_2\text{NCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$
D	$\text{HO}_2\text{CCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$

59. Asma took 1:1 ratio of a solid phenol and phthalic anhydride in a test tube. She then added a drop of concentrated  $\text{H}_2\text{SO}_4$  and heated the test tube for a few minutes. After cooling it, she added 10%  $\text{NaOH}$  in excess and observed that the solution has turned blue.

Based on this observation, she drew a conclusion that the phenol is

- A. o-cresol.  
 B. catechol.  
 C. m-cresol.  
 D. naphthol.
60. Consider the following reaction.



The given reaction will NOT occur if **X** is

- A.  $\text{CH}_3\text{CH}_2\text{OH}$   
 B.  $\text{CH}_3\text{COCH}_3$   
 C.  $\text{CH}_3\text{CHO}$   
 D.  $\text{CH}_3\text{OH}$
61. Consider the given Cannizzaro's reaction.



This reaction occurs when the R in aldehyde is

- A.  $-\text{CH}_3$   
 B.  $-\text{C}_2\text{H}_5$   
 C.  $-\text{C}_3\text{H}_7$   
 D.  $-\text{C}_6\text{H}_5$
62. When boiled with Fehling's solution, the compound that will produce copper(I) oxide is
- A.  $(\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2)_2\text{O}$   
 B.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CHO}$   
 C.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$   
 D.  $\text{CH}_3\text{COCH}(\text{CH}_3)\text{CH}_2\text{CH}_3$
63. Alishba performed Fehling's, Tollen's and Benedict's tests on the sample of a reducing sugar. She recorded her observations by using ( $\checkmark$ ) for a positive result and ( $\times$ ) for a negative one.

If the sample solution contains an aldehyde functional group, then which of the following options CORRECTLY represents the results of these tests?

	Fehling's Test	Tollen's Test	Benedict's Test
A	$\checkmark$	$\checkmark$	$\times$
B	$\times$	$\checkmark$	$\checkmark$
C	$\times$	$\times$	$\checkmark$
D	$\checkmark$	$\checkmark$	$\checkmark$

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64. Upon esterification of an unknown sample of carboxylic acid, a smell of wintergreen oil is observed. This smell indicates the presence of
- A. acetic acid.
  - B. formic acid.
  - C. benzoic acid.
  - D. salicylic acid.
65. A sample of carboxylic acid was provided to Asad for qualitative analysis. Upon addition of an alkaline solution of  $\text{KMnO}_4$ , he observed the decolourisation of the solution.
- Asad inferred that the decolourisation of the solution indicates the
- A. existence of heteroatom.
  - B. concentration of hydrogen ions.
  - C. change in oxidation state of carbon.
  - D. presence of unsaturation in carboxylic acid.

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