AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XII

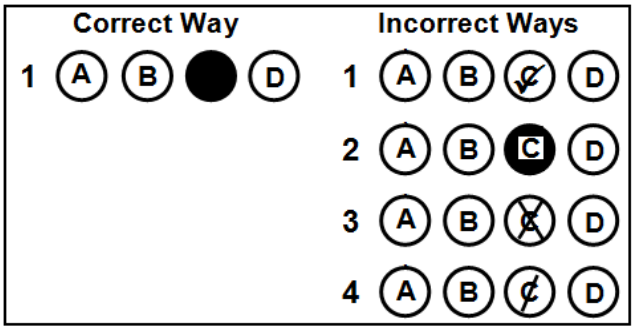
MODEL EXAMINATION PAPER 2023 AND ONWARDS

Chemistry Paper I

Time: 1 hour 30 minutes Marks: 50

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 50 only.
4. 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.



Candidate's Signature

5. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
6. DO NOT write anything in the answer grid. The computer only records what is in the circles.
7. You may use a scientific calculator if you wish.

1. The given electronic configuration indicates that the element belongs to group

   $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{10}, 4p^6, 5s^2, 4d^{10}, 5p^6, 6s^2, 4f^{14}, 5d^{10}, 6p^2$

   A. IIA.
   B. IVA.
   C. VA.
   D. VIA.

2. In group VIIA of the periodic table, the melting point of elements from top to bottom

   A. increases with the increase in atomic size.
   B. decreases with the increase in atomic number.
   C. decreases with the increase in shielding effect.
   D. increases with the increase in electronegativity.

3. Beryllium differs from other elements of group IIA due to its

   A. characteristic taste and low melting point.
   B. large atomic size and low ionisation energy.
   C. small atomic size and high electronegativity value.
   D. high ionisation energy and low electronegativity value.

4. Thermodynamically, the MOST stable oxidation state of carbon is

   A. + 4
   B. + 2
   C. – 2
   D. – 4

5. An element ‘indium’ belongs to group IIIA and period 5 of the modern periodic table.

   The electronic configuration for the given element is

   A. $1s^2 2s^2 2p^6 3s^2 3p^3$
   B. $1s^2 2s^2 2p^6 3s^2 3p^5$
   C. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6\ 5s^2 4d^{10} 5p^1$
   D. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6\ 5s^2 4d^{10} 5p^3$

6. Ethylenediamine is a ligand that comprises of **X** donor atom(s) having **Y** electrons for bonding.

   The CORRECT interpretation of **X** and **Y** for the given ligand is

	X	**Y**
A	1	2
B	2	2
C	2	4
D	4	6

7. Consider the given reaction of potassium permanganate ($KMnO_4$) with iron sulphate ($FeSO_4$).

$$2KMnO_4 + 10FeSO_4 + 8H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 5Fe_2(SO_4)_3 + 8H_2O$$

The element which is reduced in the given reaction is

A. iron (Fe).
B. sulphur (S).
C. potassium (K).
D. manganese (Mn).

8. Which of the following electronic configurations represents the ion of a transition element?

A. $Y^{1-} = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^0$
B. $X^{1+} = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^0$
C. $Y^{2-} = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^1, 4s^0$
D. $X^{2+} = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^1, 4s^0$

9. When dissolved in water, which salt will form a coloured solution?

A. KI
B. NaBr
C. $CoCl_2$
D. $MgSO_4$

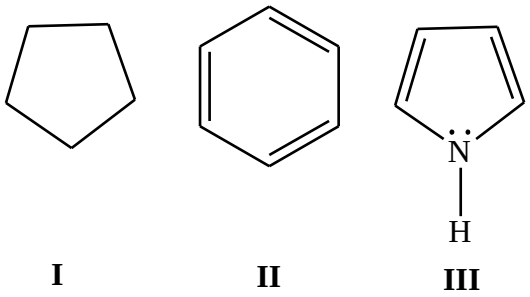
10. The functional group present in H_3CCONH_2 is

A. $>CO$
B. $-NH_2$
C. $-CONH_2$
D. $-COCH_3$

11. The chiral centre is ABSENT in

A. $(C_6H_5)CH(OH)_2$
B. $H_3CCH(OH)C_2H_5$
C. $(C_6H_5)CH(OH)CHO$
D. $(C_6H_5)CH(OH)COCH_3$

12. The compound(s) with carbocyclic nature is/ are



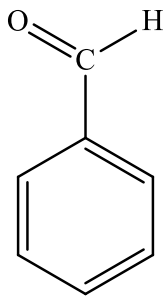
I **II** **III**

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

13. In the nitration of benzene, the first step involves the reaction of sulphuric acid with nitric acid. This reaction generates

A. NO
B. SO_3
C. NO_2^-
D. NO_2^+

14. The name of the given aromatic compound is

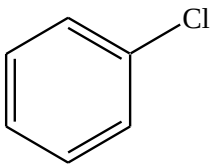
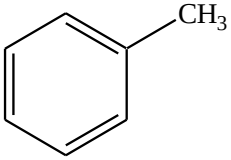
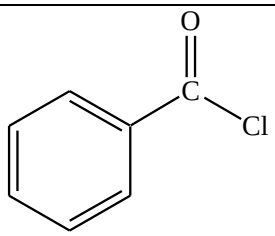
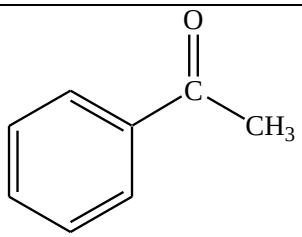


A. benzoic acid.
B. benzaldehyde.
C. 1-phenylethan-1-one.
D. 2-phenylacetaldehyde.

15. Terminal alkynes are acidic in nature because of the overlapping of

A. sp – s orbitals.
B. sp – sp orbitals.
C. $sp^2 – sp^2$ orbitals.
D. $sp^3 – sp^3$ orbitals.

16. When benzene reacts with acetyl chloride (CH_3COCl) in the presence of aluminium chloride ($AlCl_3$), it gives

			
A	B	C	D

17. The causative agent(s) of 'reducing smog' is/ are

    A. ultraviolet radiations.
    B. nitrogen oxides.
    C. sulphur dioxide.
    D. ozone.

18. During water purification coagulation helps to remove

    A. volatile organic compounds.
    B. foul-smelling dissolved gases.
    C. disease causing microorganisms.
    D. large amounts of suspended solids.

19. Urban smog results in the formation of peroxyacetyl nitrate which causes damage to

    A. plant life.
    B. rubber tyres.
    C. kidney tissues.
    D. the nervous system.

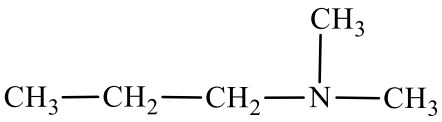
20. The total dissolved solids (TDS) is a parameter which indicates the

    A. presence of acids or bases in water.
    B. amount of mineral contents in water.
    C. quantity of dissolved oxygen in water.
    D. concentration of oxidisable material in water.

21. When tertiary butyl iodide is forced to undergo dehydrohalogenation, the MAJOR resulting product is

    A. 1-butene.
    B. 2-butene.
    C. 2-methyl propene.
    D. 1,1-dimethyl ethene.

22. The International Union of Pure and Applied Chemistry (IUPAC) name of the given amine is



A. methyl amino butane.
B. dimethyl amino propane.
C. 2-methyl-2-amino butane.
D. 2-methyl propyl amino ethane.

23. The MOST stable diazonium salt is

A. $C_6H_5 - N_2^+$
B. $CH_3 - CH_2 - N_2^+$
C. $C_6H_5 - CH_2 - N_2^+$
D. $CH_3 - CH_2 - CH_2 - N_2^+$

24. A nucleophilic substitution reaction is summarised in the form of its rate equation as follows.

$$\text{Rate} = k[R - X][OH^-]$$

Which of the following statements is FALSE for the given reaction?

A. OH^- attacks R^+ in the final step.
B. The overall reaction is 2nd order.
C. The rate determining step is bimolecular.
D. OH^- attacks R–X before R–X bond is broken.

25. When carboxylic acids are decomposed into carbonates and bicarbonates, the gas that evolves is

A. oxygen.
B. ammonia.
C. carbon dioxide.
D. carbon monoxide.

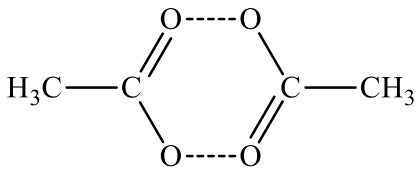
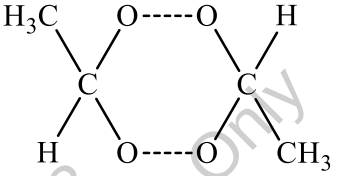
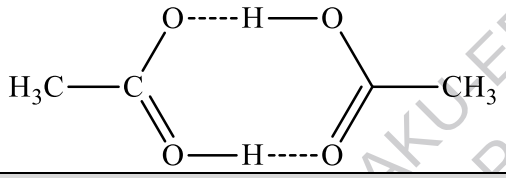
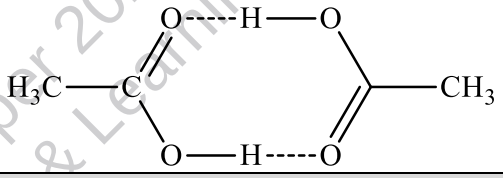
26. The compound that yields ethanoic acid when hydrolysed with hydrochloric acid is

A. CH_3MgBr
B. $CH_3C \equiv N$
C. CH_3CH_2OH
D. $CH_3CH = CHCH_3$

27. Which of the following compounds is LEAST soluble in water?

A. CH_3COOH
B. CH_3CH_2COOH
C. $CH_3(CH_2)_2COOH$
D. $CH_3(CH_2)_4COOH$

28. The structure that represents the dimer of carboxylic acid is

	
A	B
	
C	D

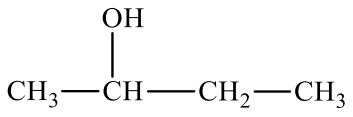
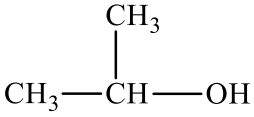
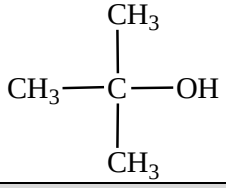
29. The MOST acidic among the given substituted phenols is

A. p-nitrophenol.
B. p-aminophenol.
C. p-chlorophenol.
D. p-methoxyphenol.

30. Which of the following statements is TRUE about Lucas test?

A. The test distinguishes among primary, secondary and tertiary amines.
B. The test result confirms that 1° carbocations are more stable than 2° and 3°.
C. The test reagent is a saturated solution of anhydrous $ZnCl_2$ in concentrated HCl.
D. The test uses an aqueous solution of sodium hydroxide and benzenesulfonyl chloride.

31. In Lucas test, the alcohol that forms an oily layer upon heating is

	
A	B
	
C	D

32. The test that can distinguish phenols from alcohols is the

A. Biuret test.
B. Litmus test.
C. Tollen's test.
D. Baeyer's test.

33. The alcohol which can undergo oxidative cleavage to form two carbonyl compounds is

A. 1,3-diol.
B. 1,4-diol.
C. vicinal diol.
D. geminal diol.

34. Formalin should always be used with adequate ventilation preferably under a fume hood because it has a tendency to

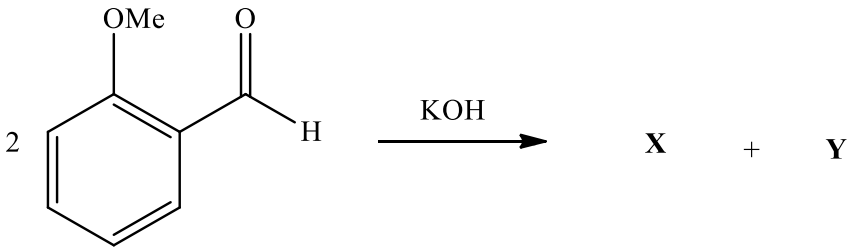
A. coagulate easily.
B. decolourise readily.
C. cause allergic reactions.
D. corrode reaction vessels.

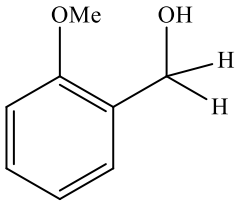
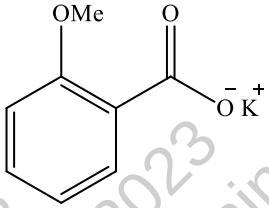
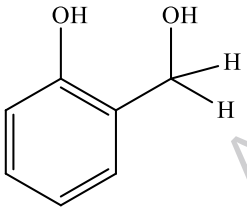
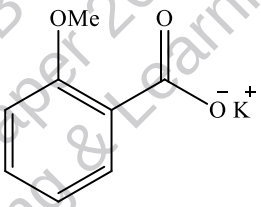
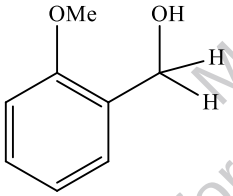
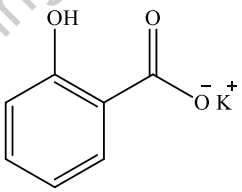
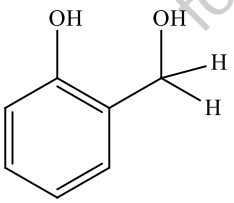
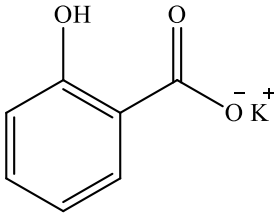
35. Which of the following statements is/ are TRUE for a molecule of glucose?

I. It is an aldohexose that can easily be oxidised.
II. It consists of ketone and hydroxyl functional groups.
III. It forms brick red precipitate with Benedict's solution.

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

36. The products **X** and **Y** in the given reaction are

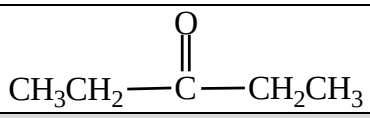
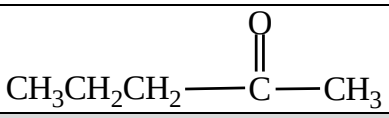
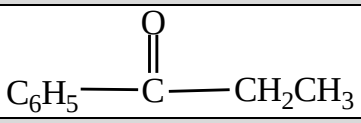
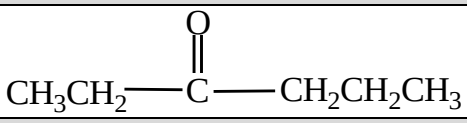


	X	Y
A		
B		
C		
D		

37. Which of the following common names of organic compounds is INCORRECTLY paired up with its IUPAC name?

	Common Name	IUPAC Name
A	Propionaldehyde	Propanal
B	Diphenyl ketone	Acetophenone
C	Ethyl methyl ketone	Butanone
D	Dimethyl ketone	Acetone

38. Which of the following compounds gives a positive iodoform test?

	
A	B
	
C	D

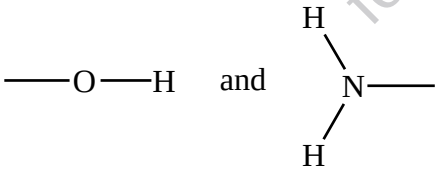
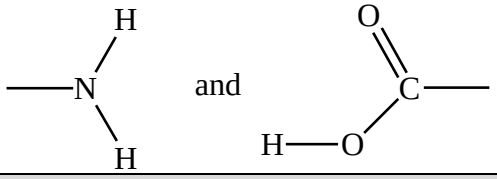
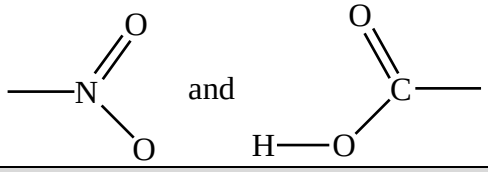
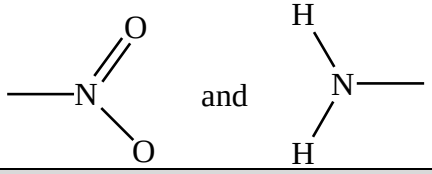
39. Up on hydrolysis, a molecule of sucrose yields

A. two molecules of glucose.
B. two molecules of fructose.
C. one molecule each of glucose and fructose.
D. one molecule each of glucose and galactose.

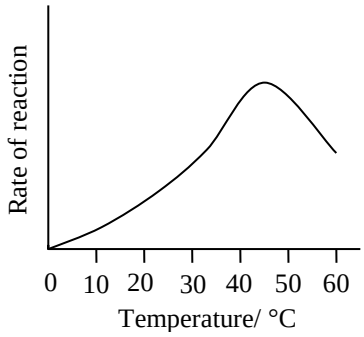
40. At isoelectric point of approximately 4.6, the casein protein will have

A. minimum solubility.
B. maximum solubility.
C. a net positive charge.
D. a net negative charge.

41. If reacted, which of the following functional groups will give rise to an amide (peptide) linkage?

	
A	B
	
C	D

42. The given graph shows the action of lactase enzyme on lactose at different temperatures.



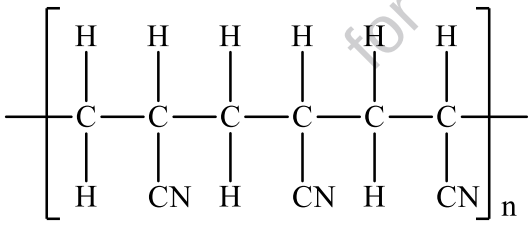
The reaction rate falls after 45°C because the

A. enzyme has lost its active sites.
B. activation energy has decreased.
C. reaction has attained equilibrium.
D. entire enzyme has been consumed.

43. The process of breaking higher hydrocarbons (large molecules) into a variety of lower hydrocarbons (small molecules) is known as

A. cracking.
B. catenation.
C. fractional distillation.
D. destructive distillation.

44. The given structure shows a part of a polyacrylonitrile molecule.



The structure of the monomer forming the given polymer is

A. $HC \equiv C - CN$
B. $H_2C = CH - CN$
C. $H_3C - CH_2 - CN$
D. $H_3C - CH = CH - CN$

45. Which of the following statements is FALSE about fractional distillation?

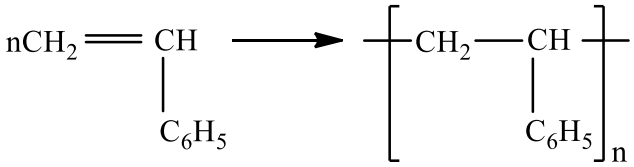
A. The fractionating column provides a large surface area for condensation.
B. Heavy fractions are runny with lower boiling points than light fractions.
C. Fractions of short chain hydrocarbons are collected at the top of the column.
D. Fractions of long chain hydrocarbons are collected at the bottom of the column.

46. Soon after completing his education, Aliyan joins a chemical industry to start a career.

Which of the following is a precautionary measure that he should always keep in mind while at work?

A. Check glassware and equipment prior to each use.
B. Work with hazardous chemicals in a packed room.
C. Return excess unused chemicals back into the stock bottles.
D. Pour water into concentrated acids/ bases to prepare diluted solutions.

47. The given equation shows a petrochemical and its derivative.



Which of the following pairs of monomers and polymers is shown in the given polymerisation process?

	Monomer	**Polymer**
A	Vinyl chloride	Polyvinyl chloride
B	Styrene	Polystyrene
C	Ethylene	Polyethylene
D	Butadiene	Polybutadiene

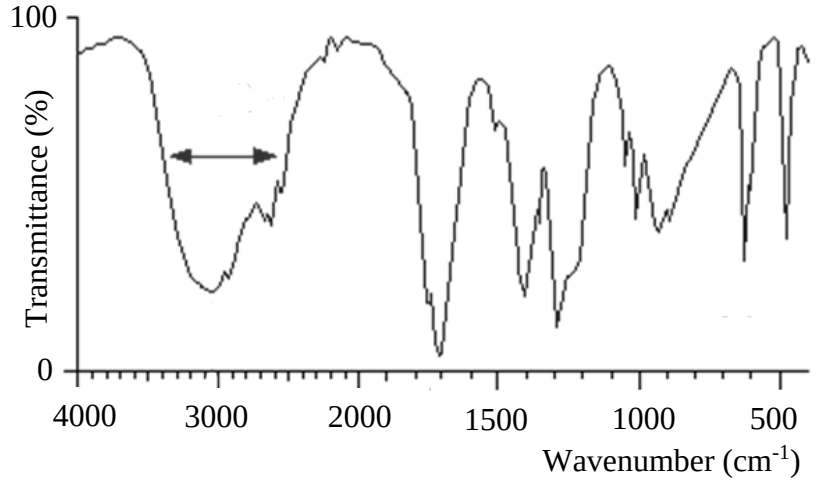
48. The BEST description of atomic absorption spectrum is that it

A. occurs when light is passed through a hot solid.
B. contains bright lines against a dark background.
C. contains dark lines against a bright background.
D. occurs when a gas is subjected to high pressure.

49. In mass spectroscopy, the electron which is MOST easily removed from a target atom/ molecule is

A. non-bonded.
B. sigma bonded.
C. isolated π bonded.
D. delocalised π bonded.

50. Given is the infrared (IR) spectrum of acetic acid.



The double headed arrow shows the broad band of absorption which is caused by

A. C = O
B. O – H
C. C – O
D. C – H

END OF PAPER

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