AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XII

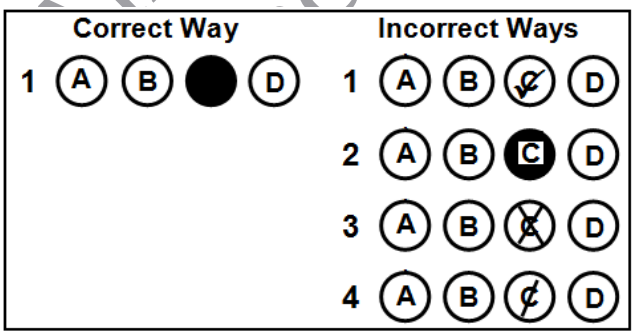
ANNUAL EXAMINATIONS (THEORY) 2023

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 halogen that CANNOT oxidise other halide ions is

   A. I_2
   B. Br_2
   C. Cl_2
   D. F_2

2. Based on the presence of vacant d-orbital in chlorine atom, it shows all of the following oxidation states EXCEPT

   A. +5
   B. +3
   C. –1
   D. –6

3. An atom of caesium loses an electron more readily than an atom of lithium although they both belong to group IA. This is because caesium possesses

	Ionisation Energy	**Shielding Effect**
A	lower	lower
B	lower	higher
C	higher	higher
D	higher	no

4. The oxide of an element **X** has a giant structure while its chloride can readily be hydrolysed.

   Based on the given information, the element **X** is

   A. silicon.
   B. carbon.
   C. barium.
   D. phosphorus.

5. Which of the following chlorides of period 3 elements is an ionic compound?

   A. NaCl
   B. SCl_2
   C. PCl_3
   D. $SiCl_4$

6. The d-block element that shows the HIGHEST value of oxidation number in forming complex compounds is

   A. $^{52}_{24}Cr$
   B. $^{55}_{25}Mn$
   C. $^{56}_{26}Fe$
   D. $^{63.5}_{29}Cu$

7. A compound of platinum has coordination number 6 and contains one cation and two chloride ions. This compound is formed as result of a combination of platinum(IV) chloride with ammonia.

   Based on this information, the formula of this compound is

   A. $Pt(NH_3)_3Cl_4$
   B. $Pt(NH_3)_4Cl_4$
   C. $Pt(NH_3)_5Cl_4$
   D. $Pt(NH_3)_6Cl_4$

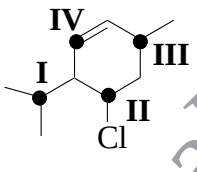
8. All of the following are characteristics of an alloy EXCEPT that it

   A. is corrosive.
   B. is strong and flexible.
   C. has high melting point.
   D. has relatively less cost than metals.

9. In transition metal complex, the electromagnetic region that corresponds to the energy of d-d transition of electrons is

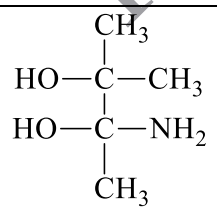
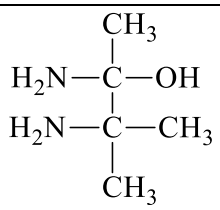
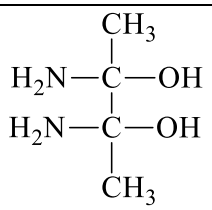
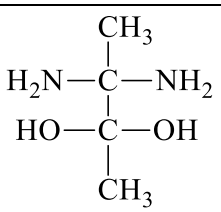
   A. ultraviolet region.
   B. infrared region.
   C. visible region.
   D. X-ray region.

10. In the given structure, the carbon which makes this compound optically active is labelled as

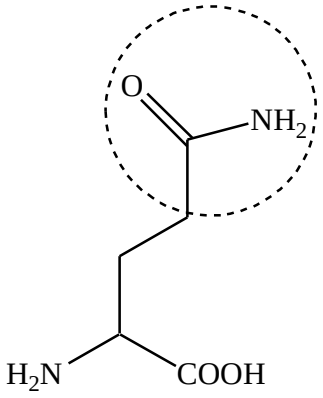


   A. I.
   B. II.
   C. III.
   D. IV.

11. The compound that contains more than one chiral centre is

A	B	C	D
			

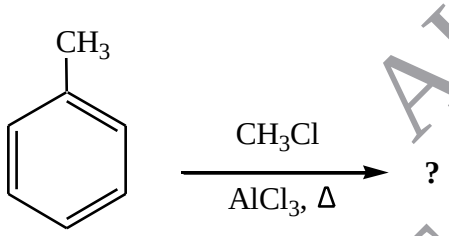
12. In the given structure of glutamine amino acid, the encircled functional group is



A. ester.
B. amine.
C. amide.
D. hydroxyl.

Use the given information to answer Q.13 and Q.14.

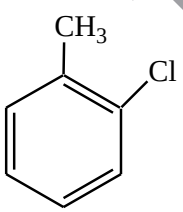
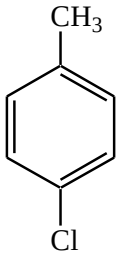
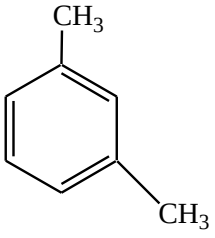
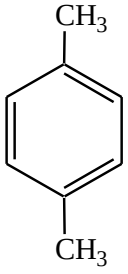
Consider the following electrophilic substitution reaction of methylbenzene.



13. In the given reaction aluminium chloride acts as a/ an

A. solvent.
B. catalyst.
C. electrophile.
D. electron rich molecule.

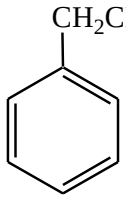
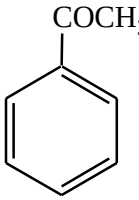
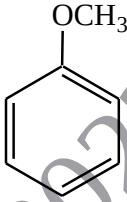
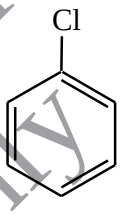
14. Which of the following is the MOST stable and MAJOR product of this reaction?

			
A	B	C	D

15. The total number of sigma bonds in a benzene molecule is

A. 3
B. 6
C. 12
D. 15

16. Which of the following substituents on benzene ring will make it LEAST reactive in electrophilic substitution reactions?

A	B	C	D
			

17. Which of the following steps in water purification removes H_2S gas and volatile organic compounds?

A. Aeration
B. Coagulation
C. Chlorination
D. Precipitation

18. Volatile organic compounds enter the atmosphere through

A. evaporation of varnishes.
B. photolysis of nitrogen dioxide.
C. respiration of living organisms.
D. microbial conversion of nitrogen.

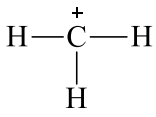
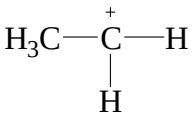
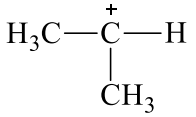
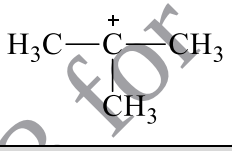
19. If the atmosphere contains excessive quantity of CO_2, then its impact on greenhouse effect and Earth's temperature would be

	Greenhouse Effect	**Earth's Temperature**
A	decreased	decreased
B	increased	decreased
C	increased	increased
D	decreased	increased

20. The acid that has the LEAST harmful effect on animals and plants is

A. HCl
B. HNO_3
C. H_2CO_3
D. H_2SO_4

21. Which of the following carbocation is the MOST stable in polar solvents?

			
A	B	C	D

22. The CORRECT decreasing order of reactivity of alkyl halides is

A. R–I > R–Br > R–Cl > R–F
B. R–F > R–Cl > R–Br > R–I
C. R–Cl > R–Br > R–I > R–F
D. R–Br > R–Cl > R–F > R–I

23. Which reagent is involved in preparing 2-methylpropanenitrile from 2-iodopropane?

A. NH_3
B. KCN
C. $CH_3CH_2NH_2$
D. $(CH_3CH_2)_3N$

24. When an amide reacts with lithium tetrahydridoaluminate ($LiAlH_4$) in dry ether ($C_2H_5OC_2H_5$) at room temperature, it forms an amine.

In comparison to the amide used, the prepared amine will have

A. one less C-atom.
B. one more C-atom.
C. two more C-atoms.
D. equal number of C-atoms.

25. Which of the following options is FALSE with reference to the presence of carboxylic acids in different natural products?

	Type of Carboxylic Acids	**Natural Product**
A	Acetic acid	Milk
B	Tartaric acid	Grapes
C	Amino acid	Meat
D	Citric acid	Lemon

26. If phenyl or vinyl group is attached to a carboxylic acid, it changes its inductive effect and acidity.

The option that shows this change in inductive effect and acidity due to the presence of these groups is

	Inductive Effect	Acidity
A	positive	increases
B	negative	decreases
C	positive	decreases
D	negative	increases

Use the given information to answer Q.27 and Q.28.

A compound **X** with molecular formula C_2H_6O is produced by fermentation process. This compound **X** yields

I. **Y** upon complete oxidation.
II. **Z** and water when it reacts with ***Y***.

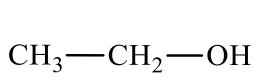
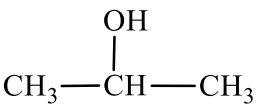
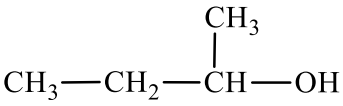
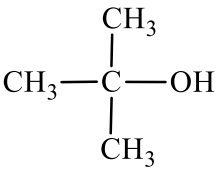
27. The compounds **X**, **Y** and **Z** are

	X	Y	Z
A	ethanoic acid	ethanol	ethyl ethanoate
B	ethanol	ethanoic acid	ethyl ethanoate
C	ethanoic acid	ethyl ethanoate	ethanol
D	ethanol	ethyl ethanoate	ethanoic acid

28. The reaction between **X** and **Y** is catalysed by

A. dilute hydrochloric acid.
B. concentrated sulphuric acid.
C. aqueous potassium hydroxide.
D. alkaline potassium permanganate solution.

29. An alcohol that reacts with concentrated HCl in anhydrous $ZnCl_2$ and forms an oily layer immediately is

	
A	B
	
C	D

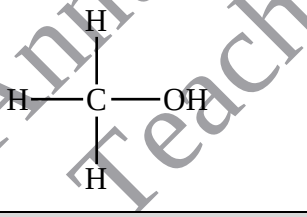
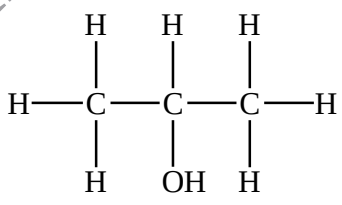
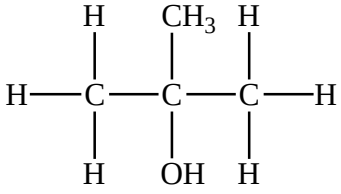
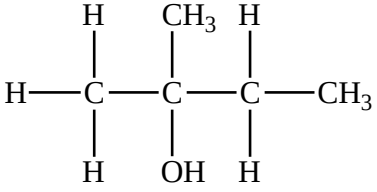
30. In cold state, $H_3C - H_2C - O - CH_2 - CH_3$ does not react with sodium metal because of the absence of all of the following EXCEPT

A. a hydroxyl group.
B. an acidic hydrogen.
C. an ionic functional group.
D. the sp^3 hybridised oxygen atom.

31. The physical characteristic that is INCORRECT for ethanol is that it

A. is a highly volatile liquid.
B. can readily dissolve in water.
C. turns red litmus paper into blue.
D. is miscible with organic solvents.

32. Which of the following alcohols will be LEAST soluble in water?

	
A	B
	
C	D

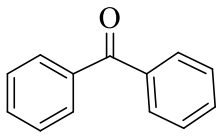
33. A positive result is obtained when the haloform test is carried out on

A. HCHO
B. CH_3OH
C. CH_3CH_2OH
D. $CH_3CH_2CH_2OH$

34. If C_6H_5CHO reacts with $KMnO_4$, then the product of this reaction would be

A. C_6H_6
B. C_6H_5OH
C. C_6H_5COOH
D. $C_6H_5COCH_3$

35. The name given to this ketone by the International Union of Applied and Pure Chemistry (IUPAC) is



A. benzophenone.
B. diphenyl ketone.
C. diphenylmethanone.
D. benzyl methyl ketone.

36. Oxime is formed when propanone reacts with

A. hydrogen cyanide.
B. hydroxylamine.
C. ammonia.
D. water.

37. Sonia has to prepare a 1° alcohol from a carboxylic acid by using hydride reagents via aldehyde formation.

Which of the following reducing agent would be her BEST choice to perform the given reaction?

A. $NaBH_4$
B. $LiAlH_4$
C. NaH
D. BH_3

38. In the given equation, the resultant **Z** would be

$$(CH_3)_2CHOH + [O] \xrightarrow{Na_2Cr_2O_7/H_2SO_4} \mathbf{Z}$$

A. propane.
B. propanal.
C. propanone.
D. propanoic acid.

39. Which of the following nitrogenous bases is absent in ribonucleic acid (RNA)?

A. Cytosine
B. Adenine
C. Thymine
D. Uracil

40. Compounds that are formed by combining glycerol with three molecules of fatty acids are called

A. lipids.
B. proteins.
C. nucleic acids.
D. carbohydrates.

41. The spiral coiling of polypeptide chains in a protein molecule represent its

A. tertiary structure.
B. primary structure.
C. secondary structure.
D. quaternary structure.

42. Enzymes mediate biochemical reactions inside the cells by

A. altering their rate.
B. increasing their pH.
C. altering their equilibrium state.
D. increasing their activation energy.

43. The characteristic(s) of thermoplastic synthetic adhesives is/ are

I. durability
II. heat resistance
III. modification without degradation

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

44. Cracking is described as a process in which

A. heavy molecules are broken up into lighter molecules.
B. larger molecules are synthesised from smaller molecules.
C. open-chain molecules are transformed into cyclic molecules.
D. molecules of different densities are separated by spinning at a high speed.

45. Nylon-6,6 is a polymer which is formed by the combination of

I. adipic acid
II. vinyl chloride
III. hexamethylene diammine

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

46. A home garden can be protected from aphids, ants, beetles and other pests in an eco-friendly, low cost and organic way.

All of the following aerosols can be used for the given purpose EXCEPT

A. olive oil.
B. clove oil.
C. onion extract.
D. garlic extract.

47. All of the following are examples of synthetic polymers EXCEPT

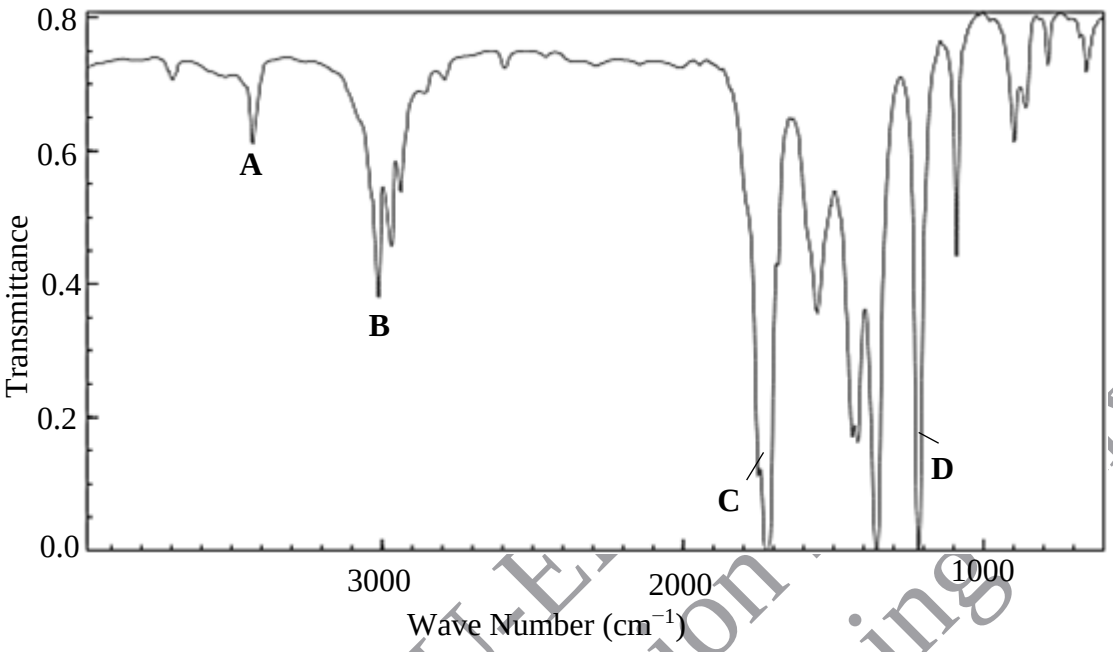
A. nylon.
B. cellulose.
C. epoxy resin.
D. polyvinyl chloride.

48. In atomic absorption spectroscopy, the type(s) of transition involved is/ are

I. electronic
II. vibrational
III. rotational

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

49. The band that infers the C=O stretching vibrations in the given IR spectrum of acetone is



50. A scientist burns an organic compound through combustion analysis to determine the percentage of carbon, hydrogen and oxygen present in it.

The products he/ she will obtain during combustion analysis are

A. O_2 and H_2O
B. O_2 and CH_4
C. CH_4 and CO_2
D. CO_2 and H_2O

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