

EXAMINER'S MIND

CLASS XII

The questions given in this column have been prepared strictly on the basis of NCERT Chemistry for class XII. Over the last few years IIT-JEE/AIEEE/AIIMS/AIPMT has drawn its papers heavily from NCERT books.

AMINES, BIOMOLECULES, POLYMERS AND CHEMISTRY IN EVERYDAY LIFE

MCQs SINGLE OPTION CORRECT

- Hofmann's exhaustive methylation is used to decide nature of
(a) carbon in amines
(b) nitrogen atom in amines
(c) both (a) and (b) (d) neither (a) nor (b).
- Hair is composed of protein called
(a) globulin (b) mucin
(c) casein (d) keratin.
- 3-nitroaniline is subjected to the treatment of various reagents in the following sequence.
(i) NaNO_2/HCl , 280 K
(ii) KI
(iii) Cu powder
The final product will be
(a) 3,3'-diaminobiphenyl
(b) 3-iodoaniline
(c) 3-nitroiodobenzene
(d) 3,3'-dinitrobiphenyl.
- An organic compound (A) $\text{C}_9\text{H}_{13}\text{N}$ dissolves in dil. HCl and releases N_2 with HNO_2 giving an optically active alcohol. Alcohol on oxidation gives dicarboxylic acid, which on heating form anhydride. The organic compound (A) is

(a) (b)
(c) (d)
- Which of the following reactions will not give a primary amine?

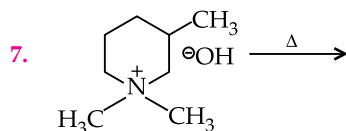
- (a) $\text{CH}_3\text{CONH}_2 \xrightarrow{\text{Br}_2/\text{KOH}}$

(b) $\text{CH}_3\text{CN} \xrightarrow{\text{LiAlH}_4}$ (c) $\text{CH}_3\text{NC} \xrightarrow{\text{LiAlH}_4}$

(d) $\text{CH}_3\text{CONH}_2 \xrightarrow{\text{LiAlH}_4}$

- Identify A in the following sequence of reactions:
$$A \xrightarrow[1 \text{ mole}]{\text{NH}_3} B \xrightarrow[\text{Alc. KOH}]{\text{CHCl}_3} C \xrightarrow{\text{Red}''} (\text{CH}_3)_2\text{CHNHCH}_3$$

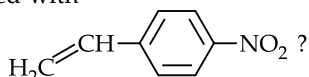
(a) Ethyl halide (b) *Iso*-propylamine
(c) *n*-Propylhalide (d) *Iso*-propylhalide.



The major product will be

-
- Which order of basicity is correct?
(a) Aniline > *m*-toluidine > *o*-toluidine
(b) Aniline > *o*-toluidine > *m*-toluidine
(c) *o*-toluidine > aniline > *m*-toluidine
(d) *o*-toluidine < aniline < *m*-toluidine.
- Propionitrile reacts with 'A' to give 'B'. The compound 'B' on addition of HCN gives 'C'. The compound 'C' on reduction gives 1-amino-2-ethyl-4-methyl-2-pentanol. Which of the following is 'A'?

- (a) $(\text{CH}_3)_3\text{CCH}_2\text{MgX}$ (b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{MgX}$
 (c) $\text{C}_2\text{H}_5\text{MgX}$ (d) $(\text{CH}_3)_2\text{CHCH}_2\text{MgX}$
10. Polymerisation of propene using Ziegler-Natta catalyst is advantageous over free radical polymerisation because
- (a) it can lead to living polymers via anionic polymerisation.
 (b) it permits step-growth polymerisation resulting in a highly cross-linked polymer.
 (c) it gives highly branched polymer with a high degree of crystallinity.
 (d) it gives linear polymer molecules permitting stereochemical control.
11. Although styrene undergoes both cationic and anionic polymerisation, one method is always preferred with substituted styrenes. Which method is preferred with



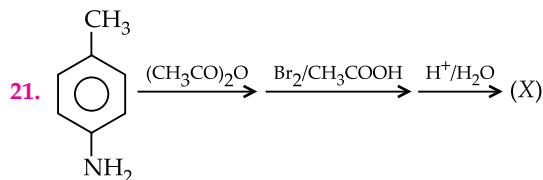
- (a) radical polymerisation
 (b) cationic polymerisation
 (c) anionic polymerisation
 (d) none of the above.
12. The given polymer is
- (a) natural rubber (b) gutta percha
 (c) neoprene (d) polypropylene.
13. Match the list I with list II and select the correct answer using the codes given below the list.

List I		List II	
A.	Iodoform	p.	Anaesthetic
B.	Methyl salicylate	q.	Antiseptic
C.	Diethyl ether	r.	Insecticide
D.	Hexachlorocyclohexane	s.	Detergent
		t.	Pain balm

Codes:

- (a) A-q; B-t; C-r; D-s (b) A-s; B-q; C-p; D-r
 (c) A-q; B-t; C-p; D-r (d) A-r; B-p; C-s; D-q
14. An antibiotic, contains nitro group attached to benzene nucleus in its structure, is
- (a) chloramphenicol (b) penicillin
 (c) tetracycline (d) streptomycin.
15. A substance which can act both as an antiseptic and disinfectant is
- (a) aspirin (b) phenol
 (c) analgin (d) sodium pentothal.

16. Arsenic drugs are mainly used in the treatment of
- (a) jaundice (b) typhoid
 (c) syphilis (d) cholera.
17. LSD(Lysergic acid diethylamide) is
- (a) sweetening agent (b) synthetic fibre
 (c) psychedelic drug (d) antibiotic.
18. The number of resonating structures of anilinium ion is
- (a) 2 (b) 3
 (c) 4 (d) 5
19. Of the following statements about enzymes, which are true?
- (i) Enzymes lack in nucleophilic groups.
 (ii) Enzymes are highly specific both in binding chiral substrates and in catalysing their reactions.
 (iii) Enzymes catalyse chemical reactions by lowering the activation energy.
 (iv) Pepsin is proteolytic enzyme.
- (a) (i) (b) (i) and (iv)
 (c) (i) and (iii) (d) (ii), (iii) and (iv).
20. A compound *A* has a molecular formula $\text{C}_7\text{H}_7\text{NO}$. On treatment with Br_2 and KOH , *A* gives an amine *B* which gives carbylamine test. *B* upon diazotisation and coupling with phenol gives an azo dye. *A* can be
- (a) $\text{C}_6\text{H}_5\text{CONHCOCH}_3$
 (b) $\text{C}_6\text{H}_5\text{CONH}_2$
 (c) $\text{C}_6\text{H}_5\text{NO}_2$
 (d) *o*-, *m*- or *p*- $\text{C}_6\text{H}_4(\text{NH}_2)\text{CHO}$.

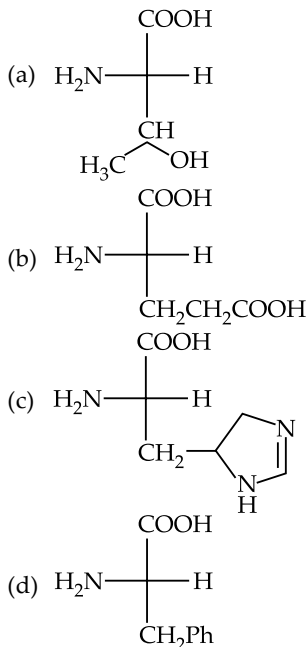


- (a) (b)
 (c) (d)

22. Aniline when acetylated, the product on nitration followed by alkaline hydrolysis gives
 (a) acetanilide (b) *o*-nitroacetanilide
 (c) *p*-nitroaniline (d) *m*-nitroaniline.
23. When phenylacetic acid is heated in presence of hydrazoic acid and conc. H_2SO_4 at $50^\circ C$ to $55^\circ C$ affords
 (a) $C_6H_5NH_2$ (b) $C_6H_5CH=NH$
 (c) $C_6H_5CH_2NH_2$ (d) none of these.
24. Reaction of cyclohexanone with dimethyl amine in the presence of catalytic amount of an acid forms a compound if water during the reaction is continuously removed. The compound formed is generally known as
 (a) a Schiff's base (b) an enamine
 (c) an imine (d) an amine
25. Hydrazine as a drug is used in the treatment of
 (a) malaria (b) typhoid
 (c) cholera (d) tuberculosis.

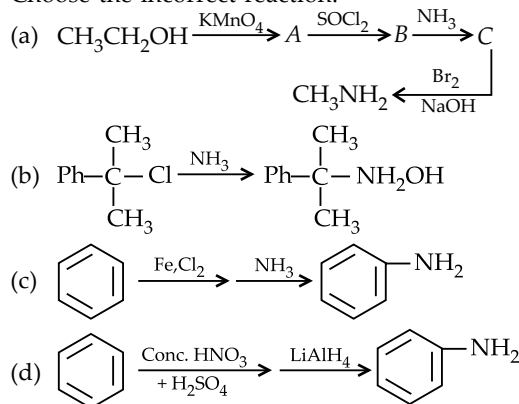
MCQs MORE THAN ONE OPTION CORRECT

26. Choose the neutral amino acids.



27. Which of the following statements is true?
 (a) Narcotic analgesics are also known as opiates.
 (b) Oral contraceptives belong to the class of natural products called steroids.
 (c) Allergies are caused due to secretion of histamine in the body.
 (d) Tranquillizers are not habit forming.

28. Choose the incorrect reaction.



29. Which of the following is a correct match?

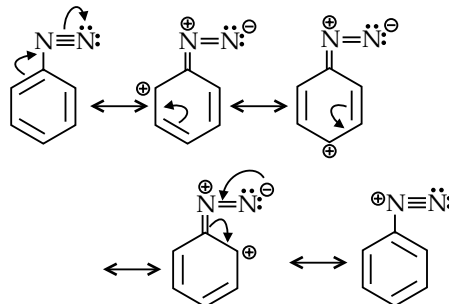
	Monomeric unit	Polymer name
(a)		Bakelite
(b)	Chloroprene	Neoprene
(c)		Dacron
(d)		Nylon 6,6

30. Which of the following are fat soluble vitamins?

- (a) Ergocalciferol (b) Phylloquinone
 (c) Riboflavin (d) Cyanocobalamin.

PASSAGE COMPREHENSION

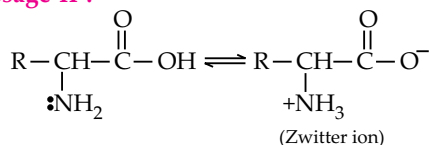
Passage I :



31. In the diazotization of aryl amines with sodium nitrite and hydrochloric acid, an excess of hydrochloric acid is used primarily to
 (a) suppress the concentration of free aniline available for coupling.
 (b) suppress hydrolysis of phenol

- (c) ensure a stoichiometric amount of nitrous acid.
 (d) neutralise the base liberated.
32. The indicator that is obtained by coupling the diazonium salt of sulphanilic acid with *N,N*-dimethylaniline is
 (a) phenanthroline (b) methyl orange
 (c) methyl red (d) phenolphthalein.
33. Aniline is reacted with bromine water and the resulting product is treated with an aqueous solution of sodium nitrite in presence of dilute HCl. The compound so formed is converted into tetrafluoroborate which is subsequently heated dry. The final product is
 (a) *p*-bromofluorobenzene
 (b) *p*-bromoaniline
 (c) 2,4,6-tribromofluorobenzene
 (d) 1,3,5-tribromobenzene.

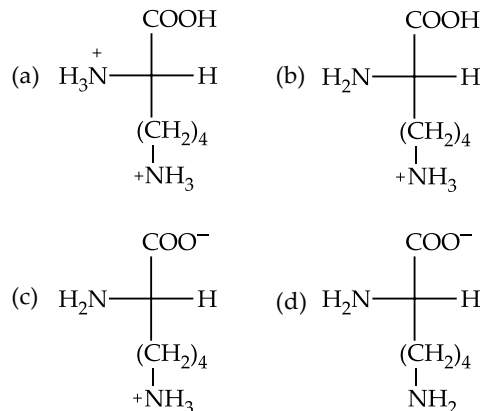
Passage II :



Amino acids behave like salts rather than simple amines or carboxylic acids. This behaviour is due to the presence of both acidic (carboxyl group) and basic (amino group) groups in the same molecule. In aqueous solution, the carboxyl group can lose a proton and amino group can accept a proton, giving rise to a dipolar ion known as Zwitter ion. This is neutral but contains both positive and negative charges. In Zwitter ionic form, amino acids show amphoteric behaviour as they react both with acids and bases.

34. In an amino acid, the carboxyl group ionises at $pK_{a_1} = 2.34$ and ammonium ion at $pK_{a_2} = 9.60$. The isoelectric point of the amino acid is at pH
 (a) 5.97 (b) 2.34
 (c) 9.60 (d) 6.97
35. What form of glutamic acid would you expect to predominate in a strongly base solution?
 (a) $\text{H}_3\text{N}^+-\text{CH}(\text{CH}_2\text{CH}_2\text{COOH})-\text{COOH}$
 (b) $\text{H}_2\text{N}-\text{CH}(\text{CH}_2\text{CH}_2\text{COO}^-)-\text{COO}^-$
 (c) $\text{H}_3\text{N}^+-\text{CH}(\text{CH}_2\text{CH}_2\text{COO}^-)-\text{COO}^-$
 (d) All of these are stable.

36. Which of the following is the major species in a solution of lysine at pH = 3.5 ?



MATRIX-MATCH

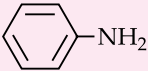
37. Match the Column-I with Column -II.

Column-I		Column-II	
A.	Cellulose	p.	Natural polymer
B.	Nylon-6,6	q.	Synthetic polymer
C.	Protein	r.	Amide linkage
D.	Sucrose	s.	Glycoside linkage

38. Match the Column-I with Column-II.

Column-I		Column-II	
A.	$\text{PhCH}_2\text{CH}_2-\underset{\text{OH}^-}{\overset{\text{CH}_2\text{Ph}}{\text{N}^+}}-\underset{\text{CH}_3}{\text{CH}_2\text{CH}_3} \xrightarrow{\text{heat}}$	p.	Give pungent smell on treatment with $\text{CHCl}_3/\text{OH}^-$
B.	$\text{CH}_3\text{CH}_2-\underset{\text{OH}}{\overset{\text{CH}_3}{\text{C}}}-\text{CH}_3 \xrightarrow{\text{AgCN, H}^+}$	q.	3° amine
C.	$\text{CH}_3\text{CH}_2\text{NO}_2 \xrightarrow{\text{Zn/NH}_4\text{Cl}}$	r.	Gives positive Tollen's test.
D.	$\text{PhCH}_2\text{CH}_2-\underset{\text{O}^-}{\overset{\text{CH}_2\text{CH}_3}{\text{N}^+}}-\text{CH}_2\text{Ph} \xrightarrow{\text{heat}}$	s.	The amine which is not prepared by Hofmann's ammonolysis process
		t.	Hydroxylamine

39. Match the Column-I with Column-II.

Column-I (Amines)	Column-II (Characteristics)
A. $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$	p. Treatment of NaNO_2 , HCl gives N-nitroso compound
B. $\text{CH}_3\text{CH}_2\text{NHCH}_3$	q. Treatment of NaNO_2 , HCl gives diazonium chloride
C. $\text{CH}_3-\text{N}(\text{CH}_3)_2$	r. Treatment of CH_3I (excess) followed by AgOH ; heat gives out alkene
D. 	s. Treatment of HCl , heat gives dealkylation

ASSERTION AND REASON

Each of the following questions contains statements of Assertion (A) and Reason (R) just below it. Of the statements, mark the correct answer.

- (a) If both assertion and reason are true and reason is the correct explanation of assertion.
 (b) If both assertion and reason are true but reason is not the correct explanation of assertion.
 (c) If assertion is true but reason is false.
 (d) If both assertion and reason are false.
 (e) If assertion is false but reason is true.

40. **Assertion** : Sucrose is dextrorotatory but on hydrolysis, the mixture of glucose and fructose obtained is laevorotatory.

Reason : Laevorotation of fructose is more than dextrorotation of glucose.

41. **Assertion** : Sodium lauryl sarcosinate is a cationic detergent.

Reason : Sodium lauryl sarcosinate is used in tooth paste, shampoos and water emulsion paints.

42. **Assertion** : Aniline on reaction with NaNO_2/HCl at 0°C followed by coupling with β -naphthol gives a dark blue coloured precipitate.

Reason : The colour of the compound formed in the reaction of aniline with NaNO_2/HCl at 0°C followed by coupling with β -naphthol is due to the extended conjugation.

43. **Assertion** : In vulcanisation of rubber, sulphur cross links are introduced.

Reason : Vulcanisation is a free radical initiated

chain reaction.

44. **Assertion** : Aniline is a weaker base than cyclohexyl amine.

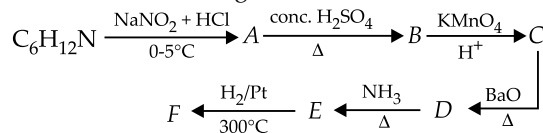
Reason : Aniline undergoes halogenation even in the absence of a catalyst.

45. **Assertion** : The specific rotation of a freshly prepared solution of α -glucose decreases from $+112^\circ$ to 52.7° while that of β -glucose increases from $+19^\circ$ to 52.7° .

Reason : The change in specific rotation of an optically active compound with time to an equilibrium value is called mutarotation.

INTEGER ANSWER TYPE

46. A cyclic 1° amine $\text{C}_6\text{H}_{12}\text{N}$ undergoes the following sequence of reactions and the end product F is an x -membered ring. The value of x is

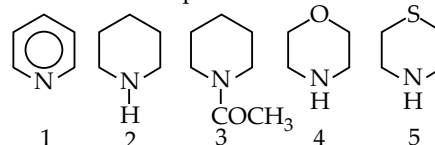


47. $\text{B} \xrightarrow{\text{H}_2\text{SO}_5} \text{K} \xrightarrow{\text{H}^+} \text{L} + \text{M}$

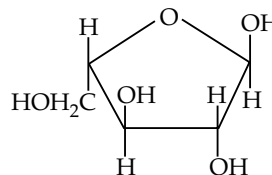
L and M are metamers.

If the starting compound B is an optically active compound and resolvable amine, the minimum number of carbon atoms in the simplest alkylamine, B will be

48. The most basic compound is

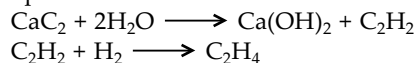


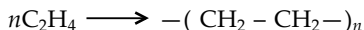
49. Among the given, the number of terms which correctly represent the below given compound is



(1) Pentose, (2) hexose, (3) aldose, (4) ketose, (5) pyranose, (6) furanose

50. Formation of polyethene from calcium carbide takes place as follows:





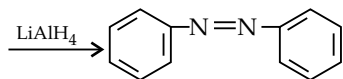
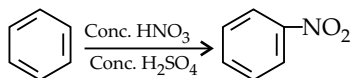
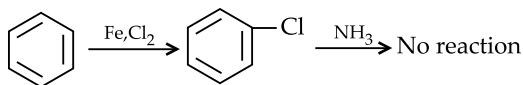
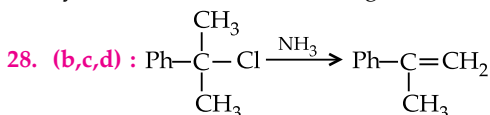
The amount of polyethene in g obtained from 16 kg of CaC_2 is

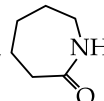
ANSWERS

1. (b) 2. (d) 3. (d) 4. (c) 5. (c) 6. (d)
 7. (b) 8. (d) 9. (d) 10. (d) 11. (c) 12. (a)
 13. (c) 14. (a) 15. (b) 16. (c) 17. (c) 18. (a)
 19. (d) 20. (b) 21. (b) 22. (c) 23. (c) 24. (b)
 25. (d)

26. (a, d) : Threonine $\left(\text{CH}_3\text{CH}(\text{OH})\text{CH} \begin{matrix} \text{NH}_2 \\ \text{COOH} \end{matrix}\right)$ is a polar neutral amino acid while phenyl alanine $\left(\text{PhCH}_2\text{CH} \begin{matrix} \text{NH}_2 \\ \text{COOH} \end{matrix}\right)$ is a non-polar neutral amino acid.

27. (a,b,c) : Tranquillizers act on central nervous system and are habit forming in nature.



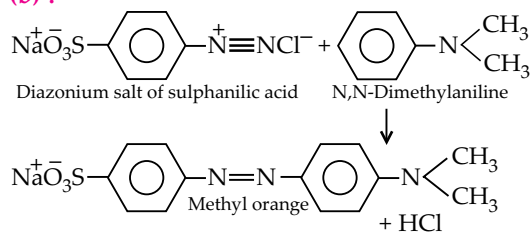
29. (a, b, c) : Caprolactam,  is a monomeric

unit of nylon 6. Hexamethylenediamine and adipic acid are monomeric units of nylon 6,6.

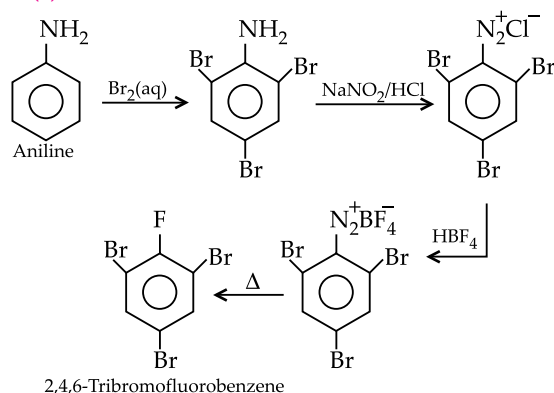
30. (a,b) : Riboflavin (vitamin B₂) & cyanocobalamin (vitamin B₁₂) are water soluble vitamins.

31. (a) : Excess of hydrochloric acid avoids the possibility of coupling reaction by leaving no free aniline for coupling reaction.

32. (b) :



33. (c) :



34. (a) : Isoelectric point, $\text{pH} = \frac{\text{p}K_{a_1} + \text{p}K_{a_2}}{2}$

$$= \frac{2.34 + 9.60}{2} = 5.97$$

35. (b) : At high pH, anionic form dominates

36. (d) : At low pH, cationic form dominates.

37. A → p,s; B → q,r; C → p,r; D → s

Cellulose is a natural polymer of monosaccharides. It consists of two units (i) amylose and (ii) amylopectin. Both are composed of α-D-glucose units linked by glycosidic linkages.

Nylon-6,6 is a condensation synthetic polymer consists of amide linkages formed by condensation of an amino group and carboxylic group with elimination of water molecule.

Protein is a natural polymer consists of peptide (amide) linkage which is formed by joining the carboxyl group of one amino acid to the α-amino group of another amino acid with the elimination of water molecule.

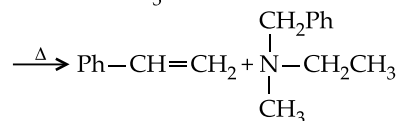
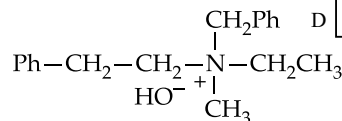
	p	q	r	s
A	p	q	r	s
B	p	q	r	s
C	p	q	r	s
D	p	q	r	s

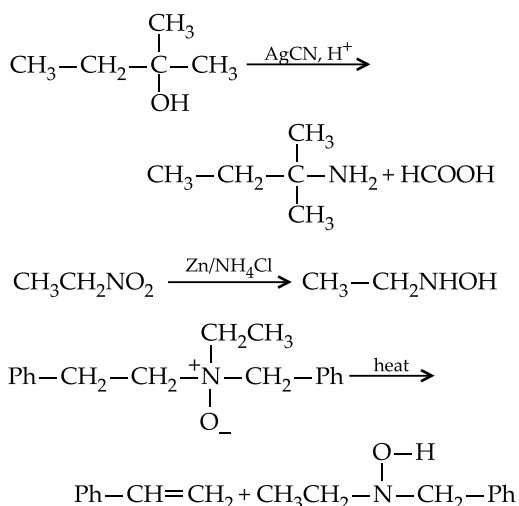
Sucrose is a natural disaccharide, where the two monosaccharides are joined together by glycosidic linkage.

38. A → q; B → p,r,s;

C → r,t; D → t

	p	q	r	s	t
A	p	q	r	s	t
B	p	q	r	s	t
C	p	q	r	s	t
D	p	q	r	s	t





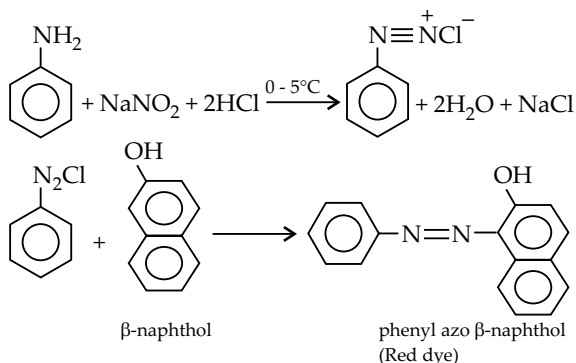
39. A → r, s; B → p, r, s; C → s; D → q

	p	q	r	s
A	(p)	(q)	(r)	(s)
B	(p)	(q)	(r)	(s)
C	(p)	(q)	(r)	(s)
D	(p)	(q)	(r)	(s)

40. (a) : Sucrose is dextrorotatory but after hydrolysis gives dextrorotatory glucose and laevorotatory fructose. Since the laevorotation of fructose (-92.4°) is more than dextrorotation of glucose ($+52.5^\circ$), the mixture is laevorotatory. Thus, hydrolysis of sucrose brings about a change in the sign of rotation, from dextro (+) to laevo(-) and the product is named as invert sugar.

41. (e) : Sodium lauryl sarcosinate is an example of amphoteric detergent or Zwitter ionic detergent.

42. (e) :



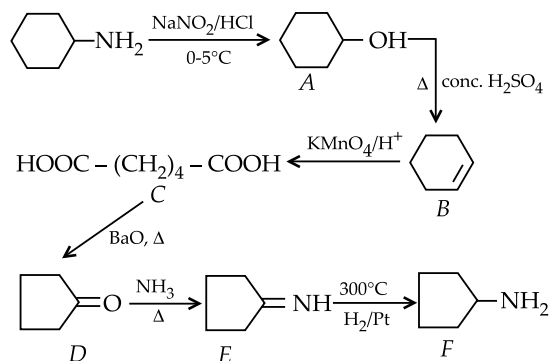
43. (b) : Vulcanisation is a process of treating natural rubber with sulphur or some compounds of sulphur under heat so as to modify its properties.

This cross-linking gives mechanical strength to the rubber.

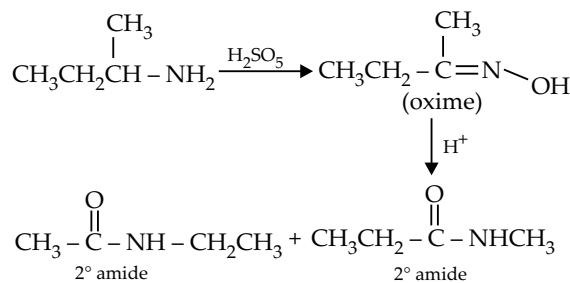
44. (b) : Aniline exists as resonance hybrid. As a result of resonance, the lone pair of electrons on nitrogen gets delocalized over the benzene ring and thus is not easily available for protonation than in case of cyclohexylamine where no such resonance takes place.

45. (b) : Glucose exists in two forms, i.e. α-D-glucose with a specific rotation of $+112^\circ$ and β-D-glucose with a specific rotation of $+19^\circ$. However, when either of these two forms is dissolved in water and allowed to stand, it gets converted into the same equilibrium mixture of both the α- and β-forms with a small amount of open chain form. As a result of this equilibrium, the specific rotation of a freshly prepared solution of α-glucose decreases from $+112^\circ$ to 52.7° while that of β-glucose increases from $+19^\circ$ to 52.7° .

46. (5) :



47. (4) : L and M are metamers



⇒ K is an oxime which can exhibit geometrical isomerism.

⇒ B is a 1° amine with an unsymmetrical 2° alkyl group.

As B is an optically active simplest alkylamine.

