CHEMISTRY

BOOKS - EDUCART PUBLICATION

SAMPLE PAPER 01

Section A

1. Which of the following statements is true :

    A. Melting point of Phosphorous is less than that of Nitrogen

    B. N_2 is highly reactive while P_4 is inert

    C. Nitrogen shows higher tendency of catenation than P

    D. N-N is weaker than P-P

Answer: D

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2. Which of the following is a non-stoichiometric defect ?

A. Frenkel defect

B. Schottky defect

C. metal deficiency defect

D. interstitial defect

Answer: C

3. Identify the law which is stated as:

For any solution, the partial vapour pressure of each volatile component

in the solution is directly proportional to its mole fraction.

A. Henry's law

B. Raoult's law

C. Dalton's law

D. Gay-Lussac's Law

Answer: B

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4. Pink colour of LiCl crystals is due to:

A. Schottky defect

B. Frenkel defect

C. Metal excess defect

D. Metal deficiency defect

Answer: C

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5. Which of the following isomer has the highest melting point:

A. 1, 2-dichlorobenzene

B. 1, 3-dichlorobenzene

C. 1, 4-dichlorobenzene

D. all isomers have same melting points

Answer: C

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6. Which one of the following reactions is not explained by the open chain Structure of glucose:

A. Formation of pentaacetate of glucose with acetic anhydride

B. Formation of addition product with 2, 4 DNP reagent

C. Silver mirror formation with Tollen's reagent

D. Existence of alpha and beta forms of glucose.

Answer: D

7. Williamson's synthesis of preparing dimethyl ether is an :

   A. S_N1 reaction

   B. Elimination reaction

   C. S_N2 reaction

   D. Nucleophilic addition reaction

Answer: C

8. Chlorine water loses its yellow colour on standing because :

   A. HCl gas is produced, due to the action of sunlight.

B. a mixture of HOCl and HCl is produced in the presence of light.

C. HOCl and hydrogen gas is produced

D. a mixture of HCl and ClO_3 is produced, due to the action of sunlight

Answer: B

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9. During the dehydration of alcohols to alkenes by heating with conc. H_2SO_4, the initiating step is :

A. protonation of alcohol molecule

B. formation of carbocation

C. elimination of water

D. formation of an ester

Answer: A

10. Amorphous solids are :

A. isotropic

B. anisotropic

C. isotopic

D. isomeric

Answer: A

11. Which of the following reactions is used to prepare salicylaldehyde?

A. Kolbe's reaction

B. Etard reaction

C. Reimer - Tiemann reaction

D. Stephen's reduction

Answer: C

12. Which of the following is an example of a solid solution?

A. sea water

B. sugar solution

C. smoke

D. 22 carat gold

Answer: D

13. The boiling points of alcohols are higher than those of hydrocarbons of comparable masses due to:

A. Hydrogen bonding

B. Ion - dipole interaction

C. Dipole - dipole interaction

D. Van der Waal's forces

Answer: A

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14. Which of the following has the lowest boiling point:

A. H_2O

B. H_2S

C. H_2Se

D. H_2Te

Answer: B

15. Which of the following statement is correct :

A. Fibrous proteins are generally soluble in water

B. Albumin is an example of fibrous proteins

C. In fibrous proteins, the structure is stabilised by hydroben bonds

and disulphide bonds

D. pH does not affect the primary structure of protein

Answer: D

16. Major product obtained on reaction of 3-Phenyl propene with HBr in

presence of organic peroxide

A. 3-Phenyl-1-bromopropane

B. 1-Phenyl-3-bromopropane

C. 1-Phenyl-2-bromopropane

D. 3-Phenyl-2-bromopropane

Answer: B

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17. Which of the following is a correct statement for C_2H_5Br ?

A. It reacts with metallic Na to give ethane

B. It gives nitroethane on heating with aqueous solution of $AgNO_2$

C. It gives C_2H_5OH on boiling with alcoholic potash

D. It forms diethlthioether on heating with alcoholic KSH

Answer: B

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18. Covalency of nitrogen is restricted to:

A. 2

B. 3

C. 4

D. 5

Answer: C

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19. Solubility of gases in liquids decreases with rise in temperature because dissolution is an:

A. endothermic and reversible process

B. exothermic and reversible process

C. endothermic and irreversible process

D. exothermic and irreversible process

Answer: B

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20. All elements of Group 15 show allotropy except:

A. Nitrogen

B. Arsenic

C. Antimony

D. Bismuth

Answer: A

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21. Which of the following is a polysaccharide?

A. glucose

B. maltose

C. glycogen

D. lactose

Answer: C

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22. Substance having the lowest boiling point:

A. Hydrogen

B. Oxygen

C. Nitrogen

D. Helium

Answer: D

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23. Lower molecular mass alcohols are:

A. miscible in limited amount of water

B. miscible in excess of water

C. miscible in water in all proportions

D. immiscible in water

Answer: C

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24. Maximum oxidation state exhibited by Chlorine is:

A. $+1$

B. $+3$

C. $+5$

D. $+7$

Answer: D

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25. In which of the following cases blood cells will shrink :

A. when placed in water containing more than 0.9% (mass/volume) NaCl solution.

B. when placed in water containing less than 0.9% (mass/volume) NaCl solution.

C. when placed in water containing 0.9% (mass/volume) NaCl solution.

D. when placed in distilled water.

Answer: A

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1. How much ethyl alcohol must be added to 1 litre of water so that the solution will freeze at $-14°C$? (Kf for water = $1.86°C$/mol)

    A. 7.5 mol

    B. 8.5 mol

    C. 9.5 mol

    D. 10.5 mol

Answer: A

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2. Which reagents are required for one step conversion of chlorobenzene to toluene?

    A. $CH_3Cl \, / \, AlCl_3$

B. CH_3Cl, Na, Dry ether

C. CH_3Cl / Fe dark

D. $NaNO_2 / HCl / 0 - 5°C$

Answer: B

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3. On partial hydrolysis, XeF_6 gives:

A. $XeO_3 + 4HF$

B. $XeO_2F + HF$

C. $XeOF_4 + H_2$

D. $XeO_2F_2 + 4HF$

Answer: D

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4. Which one of the following statement is correct about sucrose :

A. It can reduce tollen's reagent however cannot reduce fehling's

   reagent

B. It undergoes mutarotation like glucose and fructose

C. It undergoes inversion in the configuration on hydrolysis

D. It is laevorotatory in nature

Answer: C

5. Phenol does not undergo nucleophilic substitution reaction easily due

to:

A. acidic nature of phenol

B. partial double bond character of C-OH bond

C. partial double bond character of C-C bond

D. instability of phenoxide ion

Answer: B

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6. Which of the following has highest ionisation enthalpy ?

A. Nitrogen

B. Phosphorus

C. Oxygen

D. Sulphur

Answer: A

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7. Metal M ions form a ccp structure. Oxide ions occupy $1/2$ octahedral and $1/2$ tetrahedral voids. What is the formula of the oxide?

A. MO

B. MO_2

C. MO_3

D. M_2O_3

Answer: D

8. The reaction of toluene with Cl_2 in presence of $FeCl_3$ gives 'X' while the of toluene with Cl_2 in presence of light gives 'Y'. Thus 'X' and 'Y'are:

A. X = benzyl chloride Y = o and p - chlorotoluene

B. X = m - chlorotoluene Y = p - chlorotoluene

C. X = o and p-chlorotoluene Y = trichloromethylbenzene

D. X = benzyl chloride, Y = m - chlorotoluene

Answer: C

9. Ozone is a/ an _____ molecule and the two O-O bond lengths in ozone are (i)_____-and (ii) _____

A. linear, 110 pm , 148 pm

B. angular, 110 pm , 148 pm

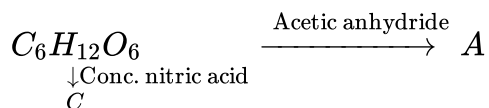C. linear, 128 pm , 128 pm

D. angular, 128 pm , 128 pm

Answer: D

10. Water retention or puffiness due to high salt intake occurs due to:

A. diffusion

B. vapour pressure difference

C. osmosis

D. reverse osmosis

Answer: C

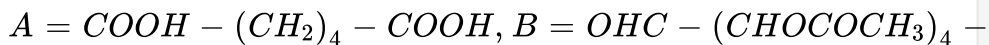▶ **Watch Video Solution**
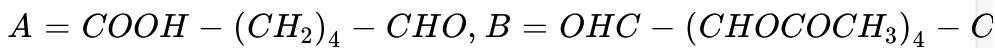
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11. In the following reaction, identify A and B :

$$C_6H_{12}O_6 \xrightarrow{\text{Acetic anhydride}} A$$
$$\downarrow\text{Conc. nitric acid}$$
$$C$$

A.

$$A = COOH - (CH_2)_4 - COOH, B = OHC - (CHOCOCH_3)_4 -$$

B.

$$A = COOH - (CH_2)_4 - CHO, B = OHC - (CHOCOCH_3)_4 - C$$

C.

$$A = OHC - (CHOCOCH_3)_3 - CH_2OCOCH_3, B = COOH - (C$$
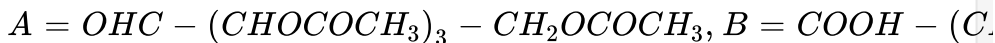
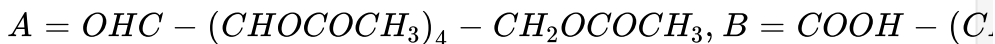D.

$$A = OHC - (CHOCOCH_3)_4 - CH_2OCOCH_3, B = COOH - (C$$

Answer: D

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12. In lake test for Al^{3+} ions, there is the formation of coloured 'floating

lake'. It is due to :

A. Absorption of litmus by $\left[Al(OH)_4\right]^-$

B. Absorption of litmus by $Al(OH)_3$

C. Adsorption of litmus by $\left[Al(OH)_4\right]^-$

D. Adsorption of litmus by $Al(OH)_3$

Answer: D

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13. A unit cell of NaCl has 4 formula units. Its edge length is 0.50 nm. Calculate the density if molar mass of NaCl = 58.5 g/mol.

A. $1 \, g/cm^3$

B. $2 \, g/cm^3$

C. $3 \, g/cm^3$

D. $4 \, g/cm^3$

Answer: C

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14. Which one of the following are correctly arranged on the basis of the property indicated:

A. $I_2 < Br_2 < F_2 < Cl_2$ [increasing bond dissociation enthalpy]

B. $H_2O > H_2S < H_2Te < H_2Se$ [increasing acidic strength]

C. $NH_3 < N_2O < NH_2OH < N_2O_s$ [increasing oxidation state]

D. $BiH_3 < SbH_3 < AsH_3 < PH_3 < NH_3$ [increasing bond angle]

Answer: A::B::C::D

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15. What would be the reactant and reagent used to obtain 2,4 - dimethylpentan-3-ol ?

A. Propanal and propyl magnesium bromide

B. 3-methylbutanal and 2-methyl magnesium iodide

C. 2-dimethylpropanone and methyl magnesium iodide

D. 2-methylpropanal and ispropyl magnesium iodide

Answer: D

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16. o-hydroxy benzyl alcohol when reacted with PCl_3 gives the product as

(IUPAC name)

A. o-hydroxy benzyl chloride

B. 2-chloromethylphenol

C. o-chloromethylchlorobenzene

D. 4-hydroxymethylphenol

Answer: B

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17. Which of the following statements is true :

A. Ammonia is the weakest reducing agent and the strongest base among Group 15 hydrides.

B. Ammonia is the strongest reducing agent as well as the strongest base among Group 15 hydrides.

C. Ammonia is the weakest reducing agent as well as the weakest base among Group 15 hydrides.

D. Ammonia is the strongest reducing agent and the weakest base among Group 15 hydrides.

Answer: A

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18. Identify the secondary alcohols from the following set :

(I) $CH_3CH_2CH(OH)CH_3$

(II) $(C2H_5)_3COH$

(III)

    A. (I) and (IV)

    B. (I) and (III)

    C. (I) and (II)

    D. (I), (III) and (IV)

Answer: A

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19. Alkenes decolourise bromine water in presence of CCl_4 due to formation of:

    A. allyl bromide

    B. vinyl bromide

    C. bromoform

D. vicinal dibromide

Answer: D

20. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): Electron gain enthalpy of oxygen is less than that of Flourine but greater than Nitrogen.

Reason (R): Ionisation enthalpies of the elements follow the order Nitrogen $>$ Oxygen $>$ Fluorine

Select the most appropriate answer from the options given below:

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Answer: C

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21. Given below are two statements labelled as Assertion (A) and Reason (R) Assertion

(A): Alkyl halides are insoluble in water.

Reason (R): Alkyl halides have halogen attached to sp^3 hybrid carbon.

Select the most appropriate answer from the options given below:

    A. Both A and R are true and R is the correct explanation of A

    B. Both A and R are true but R is not the correct explanation of A.

    C. A is true but R is false.

    D. A is false but R is true.

Answer: B

22. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion(A): Molarity of a solution changes with temperature.

Reason (R): Molarity is a colligative property.

Select the most appropriate answer from the options given below:

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Answer: C

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23. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion(A): SO_2 is reducing while TeO_2 is an oxidising agent.

Reason(R):Reducing property of dioxide decreases from SO_2 to TeO_2.

Select the most appropriate answer from the options given below:

   A. Both A and R are true and R is the correct explanation of A

   B. Both A and R are true but R is not the correct explanation of A.

   C. A is true but R is false.

   D. A is false but R is true.

Answer: A

24. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A):Cryoscopic constant depends on nature of solvent.

Reason(R):Cryoscopic constant is a universal constant. Select the most appropriate answer from the options given below:

   A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Answer: C

25. Match the following :

I		II	
(i)	Amino acids	(A)	protein
(ii)	Thymine	(B)	Nucleic acid
(iii)	Insulin	(C)	DNA
(iv)	posphodiester linkage	(D)	Zwitter ion
(v)	Uracil		

Which of the following is the best matched options ?

A. (i) - (A), (v) - (D), (iii) - (C), (iv) - (B)

B. (i) - (D), (ii) - (C), (iii) - (A), (iv) - (B)

C. (i) - (D), (v) - (D), (iii) - (A), (iv) - (B)

D. (i) - (A), (ii) - (C), (iii) - (D), (iv) - (B)

Answer: B

Section C

1. Which of the following analogies is correct:

A. Nitrogen : $1s^2 2s^2 2p^3$: Argon : $1s^2 2s^2 2p^6$

B. Carbon : maximum compounds : : Xenon : no compounds

C. XeF_2 : Linear : : ClF_3 : Trigonal planar

D. Helium : meteorological observations : : Argon : metallurgical processes

Answer: D

2. Complete the following analogy:

Same molecular formula but different structures: A:: Non superimposable

mirror images: B

A. A : Isomers B : Enantiomer

B. A : Enantiomers B : Racemic mixture

C. A : Sterioisomers B : Retention

D. A : Isomers B : Sterioisomers

Answer: A

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3. Early crystallographers had trouble solving the structures of inorganic

solids using X-ray diffraction because some of the mathematical tools for

analyzing the data had not yet been developed. Once a trial structure was

proposed, it was relatively easy to calculate the diffraction pattern, but it

was difficult to go the other way (from the diffraction pattern to the structure) if nothing was known a priori about the arrangement of atoms in the unit cell. It was important to develop some guidelines for guessing the coordination numbers and bonding geometries of atoms in crystals. The first such rules were proposed by Linus Pauling, who considered how one might pack together oppositely charged spheres of different radii.

Pauling proposed from geometric considerations that the quality of the "fit" depended on the radius ratio of the anion and the cation.

If the anion is considered as the packing atom in the crystal, then the smaller catin fills interstitial sites ("holes"). Cations will find arrangements in which they can contact the largest number of anions. If the cation can touch all of its nearest neighbour anions then the fit is good. If the cation is too small for a given site, that coordination number will be unstable and it will prefer a lower coordination structure. The table below gives the ranges of cation/anion radius ratios that give the best fit for a given coordination geometry.

Coordiantion number	Geometry	$\rho = \frac{r_{cation}}{r_{amion}}$
2	linear	$0 - 0.155$
3	triangular	$0.155 - 0.225$
4	tetrahedral	$0.225 - 0.414$
4	square planar	$0.414 - 0.732$
6	octahedral	$0.414 - 0.732$
8	cubic	$0.732 - 1.0$
12	cuboctahedral	1.0

(Source : Ionic Radii and Radius Ratios. (2021, June 8). Retrieved June 29, 2021, from https://chem.ibretexts.org/@go/page/183346)

The radius of Ag^+ ion is 126 pm and of I^- ion is 216 pm. The coordination number of Ag^+ ion is :

A. 2

B. 3

C. 6

D. 8

Answer: C

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12	cuboctahedral	1.0

(Source : Ionic Radii and Radius Ratios. (2021, June 8). Retrieved June 29,

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A solid AB has square planar structure. If the radius of cation A^+ is 120

pm, calculate the maximum possible value of anion B^-.

A. 240 pm

B. 270 pm

C. 280 pm

D. 290 pm

Answer: D

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A "good fit" is considered to be one where the cation can touch :

A. all of its nearest neighbour anions.

B. most of its nearest neighbour anions.

C. some of its nearest neighbour anions.

D. none of its nearest neighbour anions.

Answer: A

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