JEE Advanced

CHEMISTRY PRACTICE PROBLEMS

SECTION-1 (MAXIMUM MARKS : 40)

This section contains 10 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which one or more than one answer is correct. For each question you will be awarded 4 marks if you have darkened only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. No negative marking in this section.

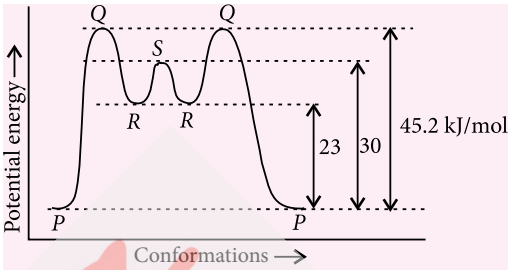
1. Which of the following statements regarding a peptide linkage in a protein molecule is/are correct?
(a) It is an amide linkage.
(b) It has partial double bond character.
(c) It is hydrophilic in nature.
(d) It connects protein molecules through H-bonds.

2. Under Wolff–Kishner reduction conditions, the conversions which may be brought about are
(a) benzophenone into diphenylmethane
(b) benzaldehyde into benzyl alcohol
(c) cyclohexanone into cyclohexane
(d) cyclohexanone into cyclohexanol.

3. Metallurgies of which of the following metals involve(s) leaching?
(a) Au (b) Ag (c) Al (d) Fe

4. Find the correct statement(s).
(a) Schottky defect is also called dislocation defect.
(b) Unit cell having crystal parameters, $a = b \neq c$, $\alpha = \beta = 90°$, $\gamma = 120°$ is hexagonal.
(c) In ionic compounds having Frenkel defect, the ratio r^+/r^- is high.
(d) The coordination number of Na^+ ion in NaCl is 8.

5. For cyclohexane, four types of conformations have been found. These are chair, half chair, twist boat and boat form. Energy diagram of different conformers of cyclohexane is given. Choose the correct option(s).

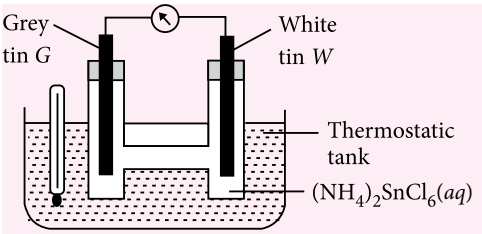


(a) Point *R* corresponds to chair form.
(b) Point *S* corresponds to chair form.
(c) Point *Q* corresponds to boat form.
(d) None of these.

6. During one of his adventures Chacha Chaudhary got trapped in an underground cave which was sealed two hundred years back. The air inside was poisonous and contains CO in addition to O_2 and N_2. Sabu, being huge, could not enter cave. In order to save Chacha Chaudhary he started sucking the poisonous air out of the cave by mouth. In each cycle he used to fill his lungs with cave air and exhale it out in the surroundings. In the mean time fresh air (N_2 + O_2) from the surrounding effused into cave till the pressure was 1 atmosphere. Each time Sabu sucked air, the pressure in the cave dropped to 1/2 atm. An initial sample of air taken from the cave measured 11.2 mL at STP and give 7 J on complete combustion at constant pressure.
(i) If the safe level of CO required in cave for life is less than 0.001% by volume, how many times does Sabu need to suck out air in order to save Chacha Chaudhary.
(ii) Sabu should rescue Chacha Chaudhary within 10 minutes else he will die. Precious 80 s was wasted in thinking of a way to rescue him. At maximum how much time should each cycle of inhaling and exhaling take?
[Given : $\Delta H_{comb}CO = -280$ kJ mol^{-1}. Neglect Graham's law effect during operations.]

(a) 8 times (b) 13 times
(c) 40 s (d) 20 s

7. The diagram shows an apparatus to find the transition temperature (18 °C) at which white tin and grey tin are in equilibrium. Below 18 °C, white tin dissolves from *W* and is deposited on *G* as grey tin.



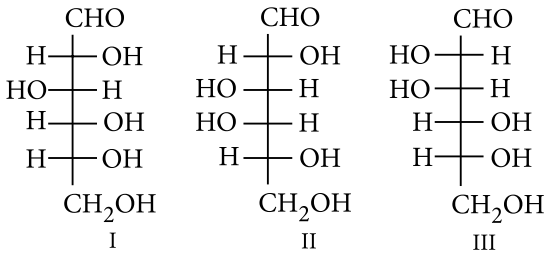
Which of the following statements are correct?
(a) The stable form of tin at 25 °C is grey.
(b) Below 18°C, electrons flow through the external circuit from *W* to *G*.
(c) At 18 °C, no current flows.
(d) At 25 °C, current flows from *W* to *G*.

8. The gas phase decomposition of dimethyl ether follows first order kinetics,

$CH_3—O—CH_{3(g)} \longrightarrow CH_{4(g)} + H_{2(g)} + CO_{(g)}$

The reaction is carried out in a constant volume container at 500 °C and has a half life of 0.116 hours. Initially only dimethyl ether is present at a pressure of 10 atm. (Assume ideal gas behaviour.)
(a) The total pressure of the system after 23.03 min is 9 atm.
(b) The total pressure of the system after 23.03 min is 28 atm.
(c) The partial pressure of dimethyl ether after 23.03 min is 1 atm.
(d) The partial pressure of methane after 23.03 min is 9 atm.

9. Which of the statements regarding following structures is true?



(a) I and II are epimers.
(b) I and III are epimers.
(c) I and II are enantiomers.
(d) I and III are enantiomers.

10. Choose the correct characteristic test(s) of anions.
(a) Sulphide : With dilute H_2SO_4, H_2S is evolved which turns lead acetate paper black and with sodium nitroprusside, sulphide gives purple colour.

$Pb(CH_3COO)_2 + H_2S \rightarrow \underset{\text{(black)}}{PbS} + 2CH_3COOH$

$Na_2[Fe(CN)_5NO] + Na_2S \rightarrow \underset{\text{(purple)}}{Na_4[Fe(CN)_5NOS]}$

(b) Sulphite : With dilute H_2SO_4, SO_2 is released which turns potassium dichromate paper green.

$Cr_2O_7^{2-} + 2H^+ + 3SO_2 \rightarrow \underset{\text{(green)}}{2Cr^{3+}} + 3SO_4^{2-} + H_2O$

(c) Nitrite : With dilute H_2SO_4, nitric oxide is released which combines with atmospheric oxygen to give reddish-brown fumes. The nitric oxide turns ferrous sulphate solution brownish-black ($FeSO_4 \cdot NO$).
(d) Chlorides : With concentrated H_2SO_4, HCl gas is released which gives white fumes with ammonia. Silver nitrate solution gives white precipitate with Cl^- which is soluble in ammonia.

$Cl^- + Ag^+ \rightarrow AgCl\downarrow$

$AgCl + 2NH_4OH \rightarrow [Ag(NH_3)_2]Cl + 2H_2O$

The characteristic test of Cl^- is chromyl chloride test :

$K_2Cr_2O_7 + 4Cl^- + 6H_2SO_4 \rightarrow \underset{\text{(red vapours)}}{2CrO_2Cl_2} + 2KHSO_4 + 4HSO_4^- + 3H_2O$

$CrO_2Cl_2 + 4NaOH \rightarrow \underset{\text{(Yellow soln.)}}{Na_2CrO_4} + 2NaCl + 2H_2O$

$Na_2CrO_4 + (CH_3COO)_2Pb \rightarrow \underset{\text{(Yellow ppt.)}}{PbCrO_4} + 2CH_3COONa$

SECTION-2 (MAXIMUM MARKS : 40)

This section contains 10 integer type questions. Answers are to be given in between 0 to 9 in the form of nearest integer. Each question carries 4 marks if you darken the correct answer and no negative mark will be awarded for an incorrectly bubbled answer.

11. When C_2H_5COONa is electrolysed, the main organic compound formed is $C_pH_qO_r$. Then integer value of '*r*' is

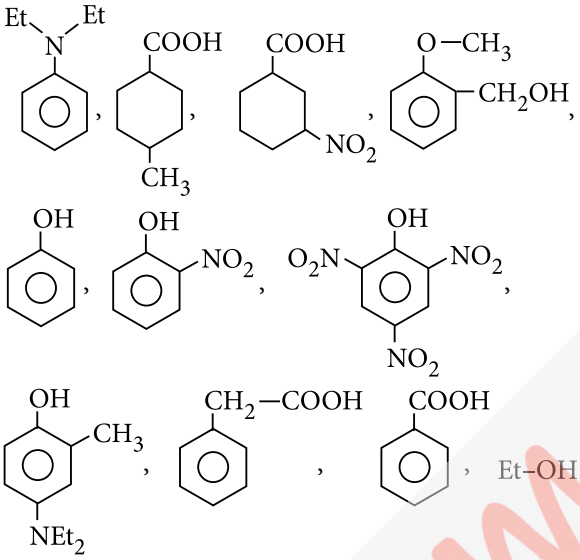
12. How many of the following sulphides salts are black in colour?
CdS, ZnS, NiS, PbS, CuS, Bi_2S_3

13. A certain gas diffuses from two different vessels *P* and *Q*. The vessel *P* has a circular orifice while vessel *Q* has square orifice of length equal to the radius

of the orifice of vessel *P*. The rates of diffusion of the gas from vessel *P* to vessel *Q* under similar temperature and pressure condition is

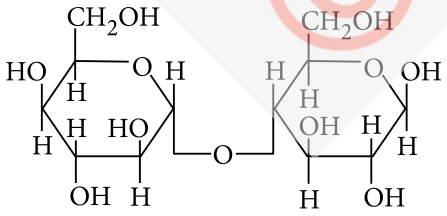
14. 1 g sample of pure organic compound containing chlorine is fused with Na_2O_2 to convert chlorine to NaCl. The sample is then dissolved in water and the chloride precipitated with $AgNO_3$, giving 1.96 g of AgCl. If the molecular weight of organic compound is 147, how many chlorine atoms does each molecule contain?

15. Amongst the following, the total number of compounds which are soluble in aqueous NaOH is



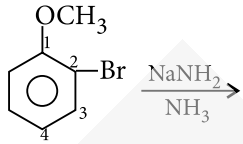
16. Read the following statements from 0 to 9 and choose the incorrect statement.

0. Both glucose and fructose give positive test with Tollens' reagent.

1. 

gives positive test with Tollens' reagent.

2. Thermosetting polymers are the polymers which undergo permanent change on heating.
3. A polymer formed by the condensation of two or more than two monomers with the elimination of simple molecules like water, ammonia, hydrogen chloride, alcohol, etc. is called condensation polymer.
4. Buna-S is obtained by polymerization of 1,3-butadiene and styrene in the ratio of 3 : 1 in presence of sodium.
5. Natural rubber is a polymer of chloroprene.
6. Glycine gives purple colour with ninhydrin while acetamide does not.
7. Raffinose is a trisaccharide and on hydrolysis it gives three molecules of monosaccharide units one each of glucose, fructose and galactose.
8. According to Maxwell distribution law, at high temperatures a greater fraction of the molecules can be expected to have high speed than at low temperatures.
9. The entropy of a perfectly ordered crystalline substance at 0 K is zero.

17. 

In the substitution product, $-NH_2$ group is present at C–___ position.

18. The vapour pressure of pure liquid *A* is 0.80 atm. When a non-volatile liquid *B* is added to *A* its vapour pressure drops to 0.60 atm. The mole fraction of *B* in the solution is $1/x$. Find the value of *x*.

19. In antifluorite structure coordination number of anion is ___.

20. 3 moles of acetone when heated with dry HCl gives phoron. How many sp^2 hybridised carbon atoms are present in phoron?

ANSWER KEY

1.	(a,b,c,d)	**2.**	(a,c)	**3.**	(a,b,c)	**4.**	(b)
5.	(d)	**6.**	(b,c)	**7.**	(b,c,d)		
8.	(b,c,d)	**9.**	(a,b)	**10.**	(a,b,c,d)	**11.**	(0)
12.	(4)	**13.**	(3)	**14.**	(2)	**15.**	(7)
16.	(5)	**17.**	(3)	**18.**	(4)	**19.**	(8)
20.	(5)						