

IIT-JEE-Chemistry-Screening-2003

SCREENING

1. Among the following the molecule with the highest dipole moment is :

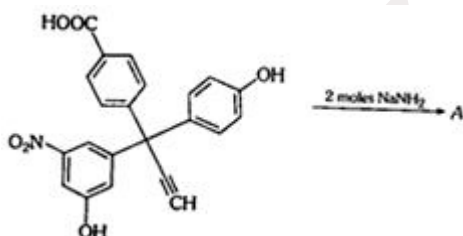
- (a) CH_3Cl
- (b) CH_2Cl_2
- (c) CHCl_3
- (d) CCl_4

2. Which of the following are isoelectronic and isostructural?

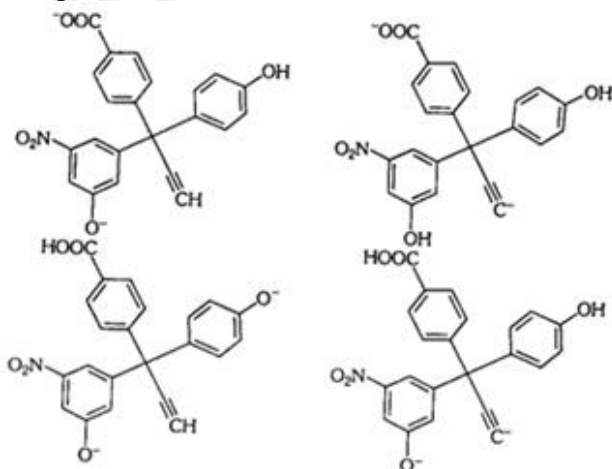
NO_3^- , CO_3^{2-} , ClO_3^- , SO_3

- (a) NO_3^- , CO_3^{2-}
- (b) SO_3 , NO_3^-
- (c) ClO_3^- , CO_3^{2-}
- (d) CO_3^{2-} , SO_3

3.

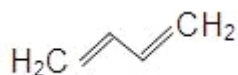


The product A will be

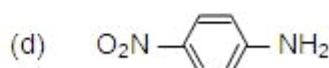
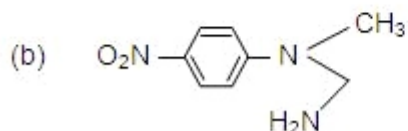
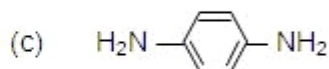
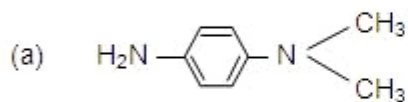
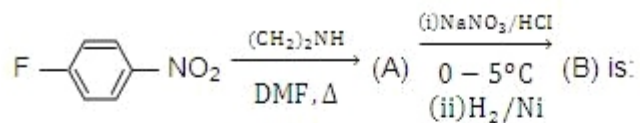


GRAVITY CLASSES

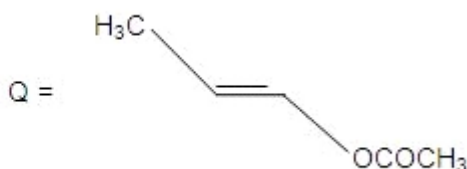
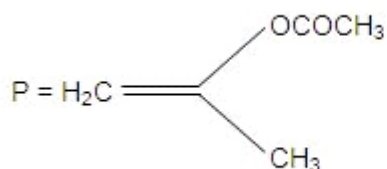
4. [X] + H₂SO₄ ? [Y] a colourless gas with irritating smell
[Y] + K₂CrO₇ + H₂SO₄ ® green solution
[X] and [Y] is:
(a) S O₃²⁻, SO₂
(b) Cl⁻, HCl
(c) S²⁻, H₂S
(d) C O₃⁻, CO₂
5. For H₃PO₃ and H₃PO₄ the correct choice is:
(a) H₃PO₃ is dibasic and reducing
(b) H₃PO₃ is dibasic and non-reducing
(c) H₃PO₄ is tribasic and reducing
(d) H₃PO₃ is tribasic and non-reducing
6. When MnO₂ is fused with KOH, a coloured compound is formed, the product and its colour is :
(a) K₂MnO₄, purple green
(b) KMnO₄, purple
(c) Mn₂O₃, brown
(d) Mn₃O₄ black
7. Rate of physisorption increases with :
(a) decrease in temperature
(b) increase in temperature
(c) decrease in pressure
(d) decrease in surface area
8. Which of the following represent the given mode of hybridization sp² - sp² - sp - sp from left to right?
(a) H₂C = CH - C ? N
(b) HC ? C - C ? CH
(c) H₂C = C = C = CH₂
(d)



9.

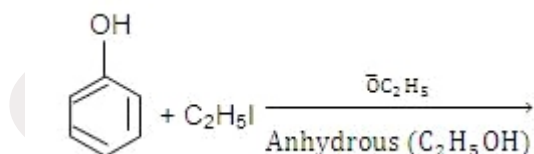


10. The product of acid hydrolysis of P and Q can be distinguished by :



- (a) Lucas Reagent
 (b) 2, 4-DNP
 (c) Fehling's solution
 (d) NaHSO₃

11.



- (a) C₆H₅OC₂H₅
 (b) C₂H₅OC₂H₅
 (c) C₆H₅OC₆H₅
 (d) C₆H₅I

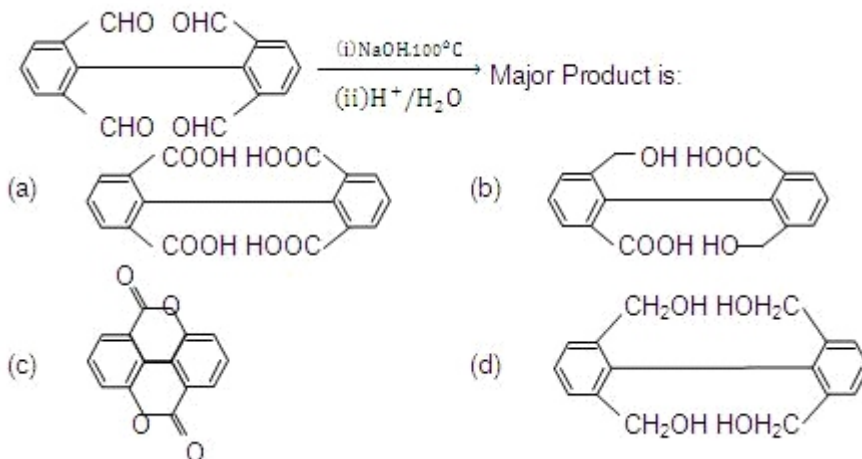
12. Which has maximum number of atoms?

- (a) 24g of C (12)

GRAVITY CLASSES

- (c) 27g of Al (27)
 (d) 108 g of Ag (108)

13.



14. In the electrolytic cell, flow of electrons is from :

- (a) cathode to anode in solution
 (b) cathode to anode through external supply
 (c) cathode to anode through internal supply
 (d) anode to cathode through internal supply

15. In a first order reaction the concentration of reactant decreases from 800 mol/dm^3 to 50 mol/dm^3 in $2 \times 10^4 \text{ sec}$. The rate constant of reaction in sec^{-1} is :

- (a) 2×10^4
 (b) 3.45×10^{-5}
 (c) 1.386×10^{-5}
 (d) 2×10^{-4}

16. During depression of freezing point in a solution the following are in equilibrium :

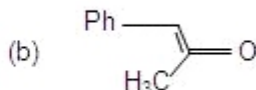
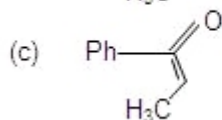
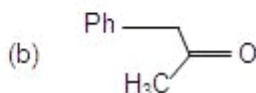
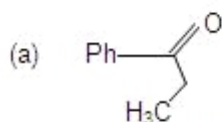
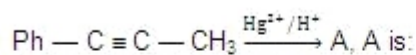
- (a) liquid solvent, solid solvent
 (b) liquid solvent, solid solute
 (c) liquid solute, solid solute
 (d) liquid solute solid solvent

17. H_3BO_3 is :

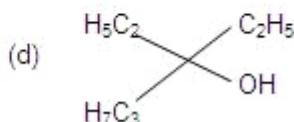
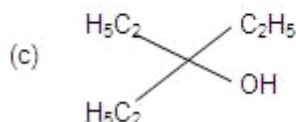
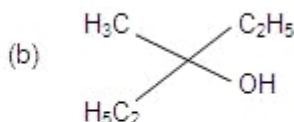
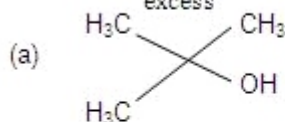
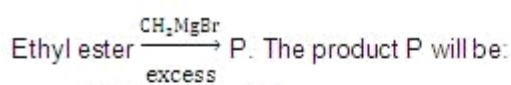
- (a) Monobasic and weak Lewis acid
 (b) Monobasic and weak Bronsted acid
 (c) Monobasic and strong Lewis acid

GRAVITY CLASSES

18.



19.



20. Mixture X = 0.02 mol of $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$ and 0.02 mol of $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$ was prepared in 2 litre of solution.

1 litre of mixture X + excess AgNO_3 ? Y

1 litre of mixture X + excess BaCl_2 ? Z

Number of moles of Y and Z are :

- (a) 0.01, 0.01
 (b) 0.02, 0.01
 (c) 0.01, 0.02
 (d) 0.02, 0.02

21. Which of the reaction defines ΔH_f^0 :

- (a) $\text{C}_{\text{diamond}} + \text{O}_{2(\text{g})} \rightarrow \text{CO}_{2(\text{g})}$
 (b) $1/2 \text{H}_{2(\text{g})} + 1/2 \text{F}_{2(\text{g})} \rightarrow \text{HF}_{(\text{g})}$
 (c) $\text{N}_{2(\text{s})} + 3\text{H}_{2(\text{g})} \rightarrow 2\text{NH}_{3(\text{g})}$
 (d) $\text{CO}_{(\text{g})} + 1/2 \text{O}_{2(\text{g})} \rightarrow \text{CO}_{2(\text{g})}$

22. ^{23}Na is the more stable isotope of Na. Find out the process by which $^{24}\text{Na}_{11}$ can undergo radioactive decay:

GRAVITY CLASSES

- (a) b^- emission
- (b) a emission
- (c) b^+ emission
- (d) K electron capture

23. $(\text{Me})_2\text{SiCl}_2$ on hydrolysis will produce :

- (a) $(\text{Me})_2\text{Si}(\text{OH})_2$
- (b) $(\text{Me})_2\text{Si} = \text{O}$
- (c) $-\text{[O}-(\text{Me})_2\text{Si-O}]_n-$
- (d) $\text{Me}_2\text{SiCl}(\text{OH})$

24. A solution which is 10^{-3} M each in Mn^{2+} , Fe^{2+} , Zn^{2+} and Hg^{2+} is treated with 10^{-16} M sulphide ion. If K_{sp} of MnS , FeS , ZnS and HgS are 10^{-15} , 10^{-23} , 10^{-20} and 10^{-54} respectively, which one will precipitate first?

- (a) FeS
- (b) MgS
- (c) HgS
- (d) ZnS

25. In the process of extraction of gold,
 Roasted gold ore + $\text{CN}^- + \text{H}_2\text{O} ? \text{O}_2 ? [\text{X}] + \text{OH}^-$
 $[\text{X}] + \text{Zn} ? [\text{Y}] + \text{Au}$

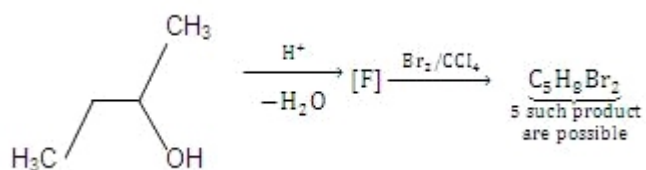
Identify the complexes $[\text{X}]$ and $[\text{Y}]$:

- (a) $\text{X} = [\text{Au}(\text{CN})_2]^-$, $\text{Y} = [\text{Zn}(\text{CN})_4]^{2-}$
- (b) $\text{X} = [\text{Au}(\text{CN})_4]^{3-}$, $\text{Y} = [\text{Zn}(\text{CN})_4]^{2-}$
- (c) $\text{X} = [\text{Au}(\text{CN})_2]^-$, $\text{Y} = [\text{Zn}(\text{CN})_6]^{4-}$
- (d) $\text{X} = [\text{Au}(\text{CN})_4]^-$, $\text{Y} = [\text{Zn}(\text{CN})_4]^{2-}$

26. Positive deviation from ideal behaviour takes place because of :

- (a) Molecular interaction between atom and $\text{PV}/n\text{RT} > 1$.
- (b) Molecular interaction between atom and $\text{PV}/n\text{RT} < 1$.
- (c) Finite size of atom and $\text{PV}/n\text{RT} > 1$
- (d) Finite size of atoms and $\text{PV}/n\text{RT} < 1$

27.



- (a) 2
- (b) 5
- (c) 6
- (d) 3

28. An enantiomerically pure acid is treated with racemic mixture of an alcohol having one chiral carbon. The ester formed will be:

- (a) Optically active mixture
- (b) Pure enantiomer
- (c) Meso Compound
- (d) Racemic mixture

IIT-JEE-Chemistry-Mains-2003

Mains

Note : Question number 1 to 10 carries 2 marks each and 11 to 20 carries 4 marks each.

1. Calculate the molarity of water if its density is 1000 kg/m^3 .
2. The average velocity of gas molecules is 400 m/sec . Calculate its rms velocity at the same temperature.
3. Write down the heterogeneous catalyst involved in the polymerization of ethylene.
4. Which one is more soluble in diethyl ether anhydrous AlCl_3 or hydrous AlCl_3 ? Explain in terms of bonding.
5. Using VSEPR theory, draw the shape of PCl_5 and BrF_5 .
6. A racemic mixture of (+) 2-phenyl propanoic acid on esterification with (+) 2-butanol gives two esters. Mention the stereochemistry of the two esters produced.
7. Wavelengths of high energy transition of H-atoms is 91.2 nm . Calculate the

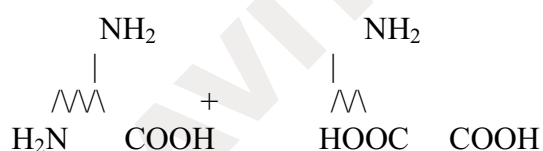
GRAVITY CLASSES

8. Match the K_a values

	K_a
(a) Benzoic acid	3.3×10^{-5}
(b) $\text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{COOH}$	6.3×10^{-5}
(c) $\text{Cl}-\text{C}_6\text{H}_4-\text{COOH}$	30.6×10^{-5}
(d) $\text{H}_3\text{CO}-\text{C}_6\text{H}_4-\text{COOH}$	6.4×10^{-5}
(e) $\text{H}_3\text{C}-\text{C}_6\text{H}_4-\text{COOH}$	4.2×10^{-5}

9. Write down reactions involved in the extraction of Pb. What is the oxidation number of lead in litharge?

10. Following two aminoacids lysine and glutamine form dipeptide linkage. What are two possible dipeptides?



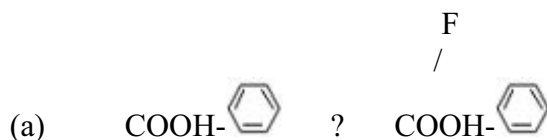
11. (a) You are given marbles of diameter 10 mm. They are to be placed such that their centres are lying in a square bound by four lines each of length 40 mm. What will be the arrangements of marbles in a plane so that maximum number of marbles can be placed inside the area? Sketch the diagram and derive expression for the number of molecules per unit area.

(b) 1 gm of charcoal adsorbs 100 ml 0.5 M CH_3COOH to form a monolayer, and thereby the molarity of CH_3COOH reduces to 0.49. Calculate the surface area of the charcoal adsorbed by each molecule of acetic acid. Surface area of charcoal = $3.01 \times 10^2 \text{ m}^2/\text{gm}$.

GRAVITY CLASSES

12. (a) Will the pH of water be same at 4°C and 25°C? Explain.
 (b) Two students use same stock solution of ZnSO₄ and a solution of CuSO₄. The emf of one cell is 0.03 V higher than the other. The conc. of CuSO₄ in the cell with higher emf value is 0.5 M. Find out the conc. of CuSO₄ in the other cell (2.203 RT/F = 0.06).

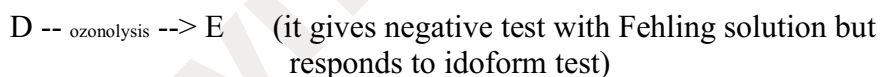
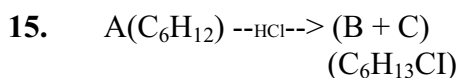
13. Convert



(in not more than 3 steps)

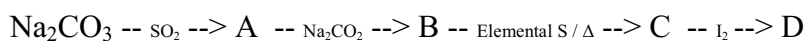


14. There is a solution of p-hydroxy benzoic acid and p-amino benzoic acid. Discuss one method by which we can separate them and also write down the confirmatory tests of the functional groups present.



Identify to A to G.

16. Identify the following :



Also mention the oxidation state of S in all the compounds.

GRAVITY CLASSES

17. Write the IUPAC nomenclature of the given complex along with its hybridization and structure. $K_2[Cr(NO)(NH_3)(CN)_4]$, $m = 1.73$ BM.

18. A mixture consists A (yellow solid) and B (colourless solid) which gives lilac colour in flame :

(a) Mixture gives black precipitate C on passing $H_2S(g)$.

(b) C is soluble in aqua-regia and on evaporation of aqua-regia and adding $SnCl_2$ gives grayish black precipitate D.

The salt solution with NH_4OH gives a brown precipitate.

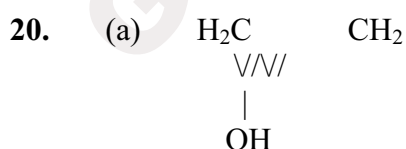
(i) The sodium extract of the salt with $CCl_4/FeCl_3$ gives a violet layer.

(ii) The sodium extract gives yellow precipitate with $AgNO_3$ solution which is insoluble in NH_3 . Identify A and B, and the precipitates C and D.

19. (a) Match the following if the molecular weights of X, Y and Z are same

	Boiling Point	Kb
X	100	0.68
Y	27	0.53
Z	253	0.98

(b) C_u value of He is always $3R/2$ but C_u value for H_2 is $3R/2$ at low temperature and $5R/2$ at moderate temperature and more than $5R/2$ at higher temperature explain in two to three lines.



Write resonance structure of the given compound.

(b) Compound A of molecular formula $C_9H_7O_2Cl$ exists in ketoform and predominantly in enolic form 'B'. On oxidation with $KMnO_4$, 'A' gives m-chlorobenzoic acid. Identify 'A' and 'B'.