

IIT JEE 2012 PAPER – 1

PART II: CHEMISTRY

SECTION 1 : SINGLE CORRECT ANSWER TYPE

This section contains 10 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE is correct

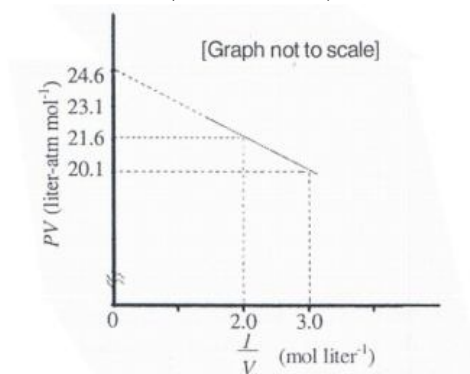
21. In allene (C_3H_4), the type(s) of hybridization of the carbon atoms is (are)
 A. sp and sp^3 B. sp and sp^2 C. only sp^2 D. sp^2 and sp^3

21. B

Allene

\Rightarrow hybridization $C_1 = sp^2$, $C_2 = sp$, $C_3 = sp^2$

22. For one mole of a van der Waals gas when $b = 0$ and $T = 300$ K, the PV vs. $1/V$ plot is shown below. The value of the van der Waals constant a ($\text{at.liter}^2 \text{mol}^{-2}$) is



- A. 1.0 B. 4.5 C. 1.5 D. 3.0
22. C

$b = 0$

$n = 1$

$$\left(P + \frac{a}{V^2}\right)(V) = nRT$$

$$\Rightarrow PV + \frac{a}{V} = RT$$

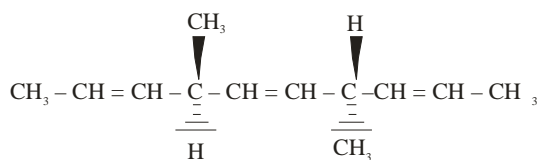
$$\Rightarrow PV + \frac{a}{V} = \text{constant}$$

$$\Rightarrow (PV)_1 + \frac{a}{V_1} = (PV)_2 + \frac{a}{V_2}$$

$$\Rightarrow 21.6 + 2a = 20.1 + 3a$$

$$\Rightarrow a = 1.5$$

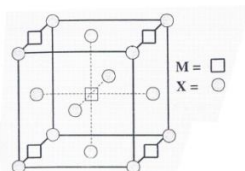
23. The number of optically active products obtained from the complete ozonolysis of the given compound is



23. A. 0 B. 1 C. 2 D. 4

After ozonolysis
 \Rightarrow no optically active product

24. A compound M_pX_q has cubic close packing (ccp) arrangement of X. Its unit cell structure is shown. The empirical formula of the compound is



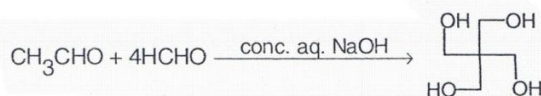
- A. MX B. MX_2 C. M_2X D. M_5X_{14}
24. B

$$\text{contribution of M} = 1 + 4 \times \frac{1}{4} = 2$$

$$\text{contribution of X} = 8 \times \frac{1}{4} + 4 \times \frac{1}{2} = 4$$

\Rightarrow empirical formula is $\text{M}_2\text{X}_4 = \text{MX}_2$

25. The number of aldol reaction(s) that occurs in the given transformation is



- A. 1 B. 2 C. 3 D. 4
25. C

In the compound CH_3CHO there are only three α -hydrogens, so only 3 aldol reactions are possible.

26. The colour of light absorbed by an aqueous solution of CuSO_4 is
A. orange-red B. Blue-green C. yellow D. violet

26. A
Since blue colour is reflected back, orange red is absorbed.

27. The carboxyl functional group ($-\text{COOH}$) is present in
A. picric acid B. barbituric acid C. ascorbic acid D. aspirin

27. D
Aspirin is

28. The kinetic energy of an electron in the second Bohr orbit of a hydrogen atom is [a_0 is Bohr radius]

A. $\frac{h^2}{4\pi^2 ma_0^2}$ B. $\frac{h^2}{16\pi^2 ma_0^2}$ C. $\frac{h^2}{32\pi^2 ma_0^2}$ D. $\frac{h^2}{64\pi^2 ma_0^2}$

29. B
 $\text{HNO}_3 \rightarrow 5$, $\text{NO} \rightarrow 2$, $\text{NH}_4\text{Cl} \rightarrow -3$, $\text{N}_2 \rightarrow 0$
 $\Rightarrow \text{HNO}_3, \text{NO}, \text{N}_2, \text{NH}_4\text{Cl}$ decreasing order

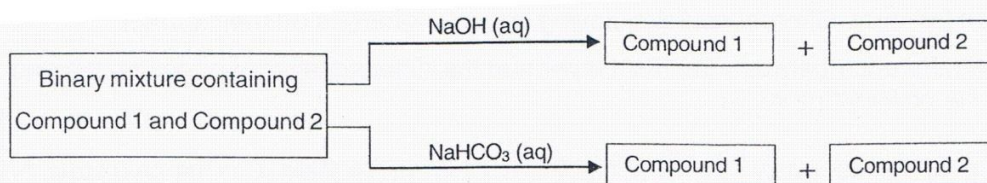
29. Which ordering of compounds is according to the decreasing order of the oxidation state of nitrogen?
A. $\text{HNO}_3, \text{NO}, \text{NH}_4\text{Cl}, \text{N}_2$ B. $\text{HNO}_3, \text{NO}, \text{N}_2, \text{NH}_4\text{Cl}$
C. $\text{HNO}_3, \text{NH}_4\text{Cl}, \text{NO}, \text{N}_2$ D. $\text{NO}, \text{HNO}_3, \text{NH}_4\text{Cl}, \text{N}_2$

30. As per IUPAC nomenclature, the name of the complex $[\text{Co}(\text{H}_2\text{O})_4(\text{NH}_3)_2] \text{Cl}_3$ is
- A. Tetraaquadiammincobalt (III) chloride B. Tetraaquadiammincobalt (III) chloride
 C. Diaminetetraaquacobalt (III) chloride D. Diamminetetraaquacobalt (III) chloride
30. D
 The name amine is used for NH_2 group whereas the amine is used for NH_3 group in the coordination compounds

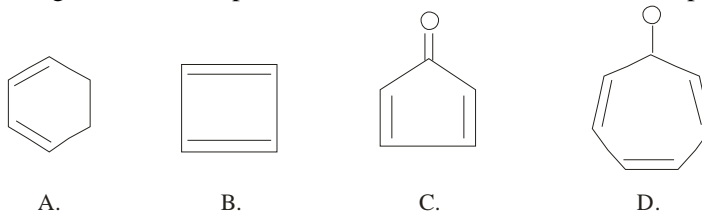
SECTION II : Multiple Correct Answer(s) Type

This section contains 5 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE or MORE are correct.

31. Identify the binary mixture(s) that can be separated into individual compounds, by differential extraction, as shown in the given scheme.

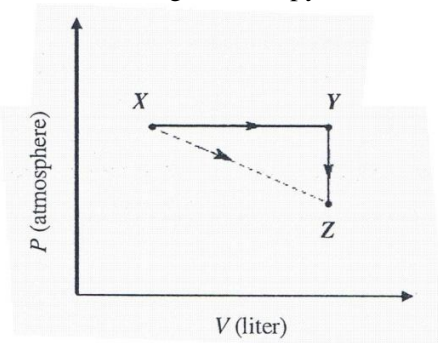


- A. $\text{C}_6\text{H}_5\text{OH}$ and $\text{C}_6\text{H}_5\text{COOH}$ B. $\text{C}_6\text{H}_5\text{COOH}$ and $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$
 C. $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ and $\text{C}_6\text{H}_5\text{OH}$ D. $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ and $\text{C}_6\text{H}_5\text{CH}_2\text{COOH}$
32. Choose the correct reason(s) for the stability of the lyophobic colloidal particles.
- A. Preferential adsorption of ions on their surface from the solution
 B. Preferential adsorption of solvent on their surface from the solution
 C. Attraction between different particles having opposite charges on their surface
 D. Potential difference between the fixed layer and the diffused layer of opposite charges around the colloidal particles
33. Which of the following molecules, in pure form, is (are) unstable at room temperature?



34. Which of the following hydrogen halides react(s) with $\text{AgNO}_3(\text{aq})$ to give a precipitate that dissolves in $\text{Na}_2\text{S}_2\text{O}_3(\text{aq})$?
- A. HCl B. HF C. HBr D. HI

35. For an ideal gas, consider only P.V work in going from an initial state X to the final state Z. The final state Z can be reached by either of the two paths shown in the figure. Which of the following choice(s) is (are) correct? [Take ΔS as change in entropy and w as work done]

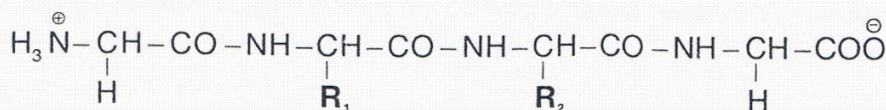


- A. $\Delta S_{x \rightarrow z} = \Delta S_{x \rightarrow y} + \Delta S_{y \rightarrow z}$ B. $w_{x \rightarrow z} = w_{x \rightarrow y} + w_{y \rightarrow z}$
 C. $w_{x \rightarrow y \rightarrow z} = w_{x \rightarrow y}$ D. $\Delta S_{x \rightarrow y \rightarrow z} = \Delta S_{x \rightarrow y}$

SECTION III : INTEGER ANSWER TYPE

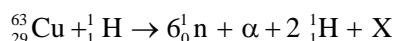
This contains 5 Questions. The answer to each question is a single digit integer, ranging from 0 to 9 (both inclusive).

36. The he substituent R_1 and R_2 for nine peptides are listed in the table given below. How many of these peptides are positively charged at pH = 7.0?

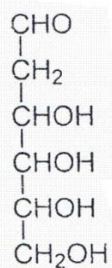


Peptide	R_1	R_2
I	H	H
II	H	CH_3
III	CH_2COOH	H
IV	CH_2CONH_2	$(\text{CH}_2)_4\text{NH}_2$
V	CH_2CONH_2	CH_2CONH_2
VI	$(\text{CH}_2)_4\text{NH}_2$	$(\text{CH}_2)_4\text{NH}_2$
VII	CH_2COOH	CH_2CONH_2
VIII	CH_2OH	$(\text{CH}_2)_4\text{NH}_2$
IX	$(\text{CH}_2)_4\text{NH}_2$	CH_3

37. The periodic table consists of 18 groups. An isotope of copper, on bombardment with protons, undergoes a nuclear reaction yielding element X as shown below. To which group, element X belongs in the periodic table ?



38. When the following aldohexose exists in its D-configuration, the total number of stereo isomers in its pyranose form is



39. 29.2% (w/w) HCl stock solution has a density of 1.25 g mL^{-1} . The molecular weight of HCl is 36.5 g mol^{-1} . The volume (mL) of stock solution required to prepare a 200 mL solution of 0.4 M HCl is
40. An organic compound undergoes first-order decomposition. The time taken for its decomposition to $1/8$ and $1/10$ of its initial concentration are $t_{1/8}$ and $t_{1/10}$ respectively. What is the value of $\frac{[t_{1/8}]}{[t_{1/10}]} \times 10$? (take $\log_{10} 2 = 0.3$).