

IIT-JEE-2012

PAPER-1

CHEMISTRY

[Time allowed: 3 hours] [Maximum Marks: 210]

GENERAL INSTRUCTIONS

A. General:

1. This booklet is your Question paper. Do not break the seals of this booklet before being instructed to do so by the invigilators.
2. The question paper CODE is printed on the right hand top corner of this page and on the back page of this booklet.
3. Blank spaces and blank pages are provided in this booklet for your rough work. No additional sheets will be provided for rough work.
4. Blank papers, clipboards, log tables, slide rules, calculators, cameras, cellular phones, pagers, and electronic gadgets are NOT allowed inside the examination hall.
5. Answers to the questions and personal details are to be filled on a two-part carbon-less paper, which is provided separately. You should not separate these parts. The invigilator will separate them at the end of examination. The upper sheet is machine-gradable Objective Response Sheet (ORS) which will be taken back by the invigilator.
6. **Using a black ball point pen, darken the bubbles on the upper original sheet.** Apply sufficient pressure so that the impression is created on the bottom sheet.
7. DO NOT TAMPER WITH /MUTILATE THE ORS OR THE BOOKLET.
8. On breaking the seals of the booklet check that it contains 28 pages and all 60 questions and corresponding answer choices are legible. Read carefully the instructions printed at the beginning of each section.

B. Filling the Right Part of the ORS:

9. The ORS also has a **CODES** printed on its left and right parts.

10. Check that the same CODE is printed on the ORS and on this booklet. **IF IT IS NOT THEN ASK FOR A CHANGE OF THE BOOKLET.** Sign at the place provided on the ORS affirming that you have verified that all the code are same.
11. Write your Name, Registration Number and the name of examination centre and sign with pen in the boxes provided on the right part of the ORS. **Do not write any of this information anywhere else.** Darken the appropriate bubble UNDER each digit of your Registration Number in such a way that the impression is created on the bottom sheet. Also darken the paper CODE given on the right side of **ORS(R₄)**.

C. Question paper format and Marking scheme:

12. **Section I** contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.
13. **Section II** contains **5 multiple choice questions**. Each question has four choice (A), (B), (C) and (D) out of which **ONE or MORE** are correct.
14. **Section III** contains **5 questions**. The answer to each question is a **single digit integer**, ranging from 0 to 9 (both inclusive).

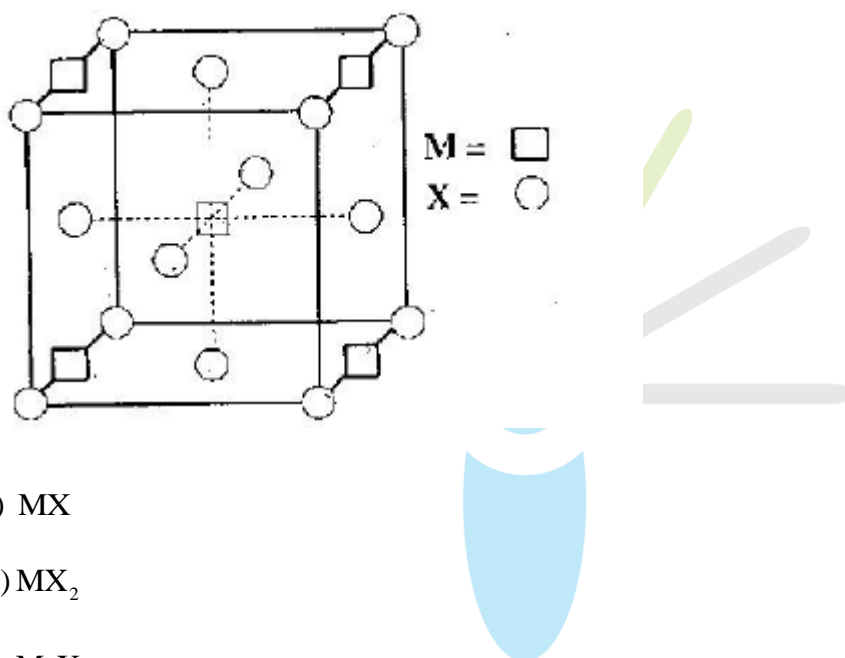
Write your Name, Registration Number and sign in the space provided on the back page of this booklet.

SECTION – I: 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. A compound M_pX_q has cubic close packing (*ccp*) arrangement of X . Its unit cell structure is shown below.

The empirical formula of the compound is



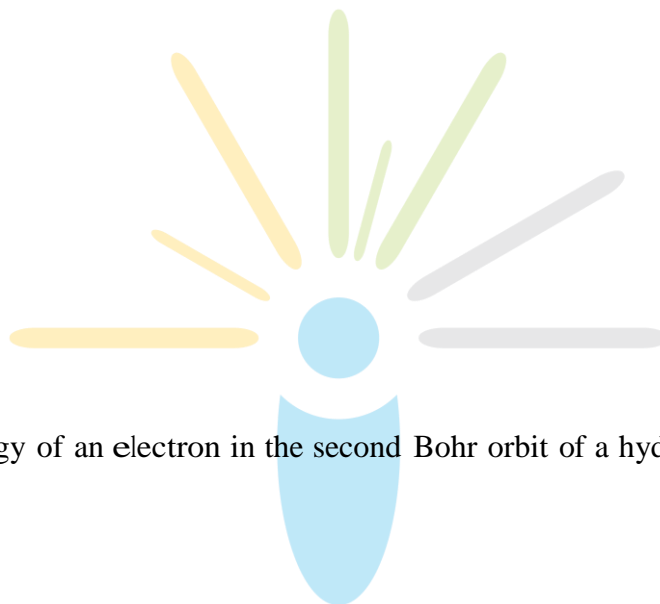
- (A) MX
 - (B) MX_2
 - (C) M_2X
 - (D) M_5X_{14}
22. The carboxyl functional group ($-\text{COOH}$) is present in
- (A) picric acid
 - (B) barbituric acid
 - (C) ascorbic acid
 - (D) aspirin

23. 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) Tetraaquadiaminecobalt (III) chloride
- (B) Tetraaquadiammincobalt (III) chloride
- (C) Diaminetetraaquacobalt (III) chloride
- (D) Diamminetetraaquacobalt (III) chloride

24. 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



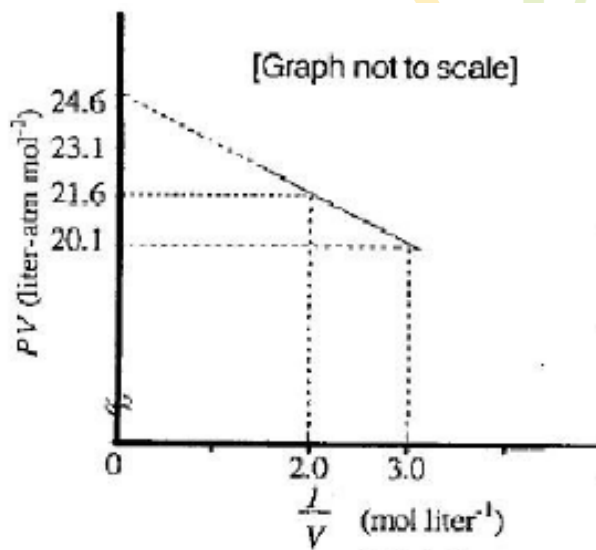
25. The kinetic energy of an electron in the second Bohr orbit of a hydrogen atom is [a_0 is Bohr radius]

- (A) $\frac{h^2}{4\pi^2 m a_0^2}$
- (B) $\frac{h^2}{16\pi^2 m a_0^2}$
- (C) $\frac{h^2}{32\pi^2 m a_0^2}$
- (D) $\frac{h^2}{64\pi^2 m a_0^2}$

26. Which ordering of compounds is according to the decreasing order of the oxidation state of nitrogen?

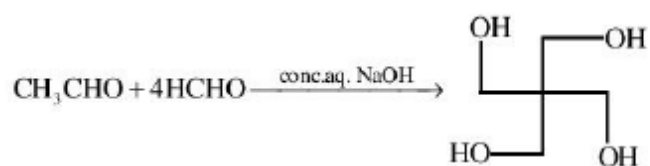
- (A) $\text{HNO}_3, \text{NO}, \text{NH}_4\text{Cl}, \text{N}_2$
- (B) $\text{HNO}_3, \text{NO}, \text{N}_2, \text{NH}_4\text{Cl}$
- (C) $\text{HNO}_3, \text{NH}_4\text{Cl}, \text{NO}, \text{N}_2$
- (D) $\text{NO}, \text{HNO}_3, \text{NH}_4\text{Cl}, \text{N}_2$

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



- (A) 1.0
- (B) 4.5
- (C) 1.5
- (D) 3.0

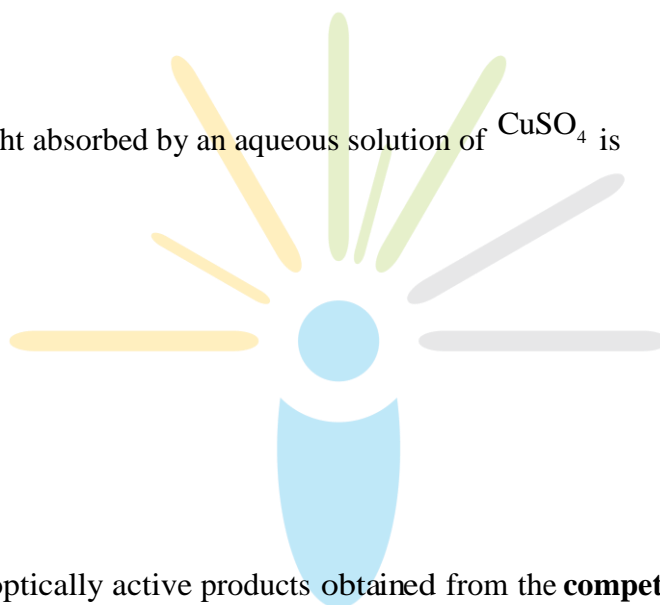
28. The number of aldol reaction(s) that occurs in the given transformation is



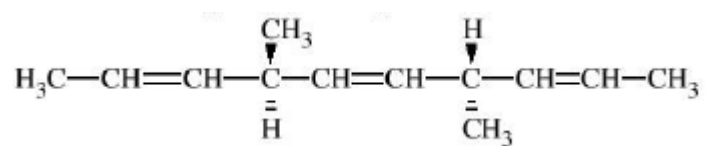
- (A) 1
- (B) 2
- (C) 3
- (D) 4

29. The colour of light absorbed by an aqueous solution of CuSO_4 is

- (A) orange- red
- (B) blue-green
- (C) yellow
- (D) violet



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

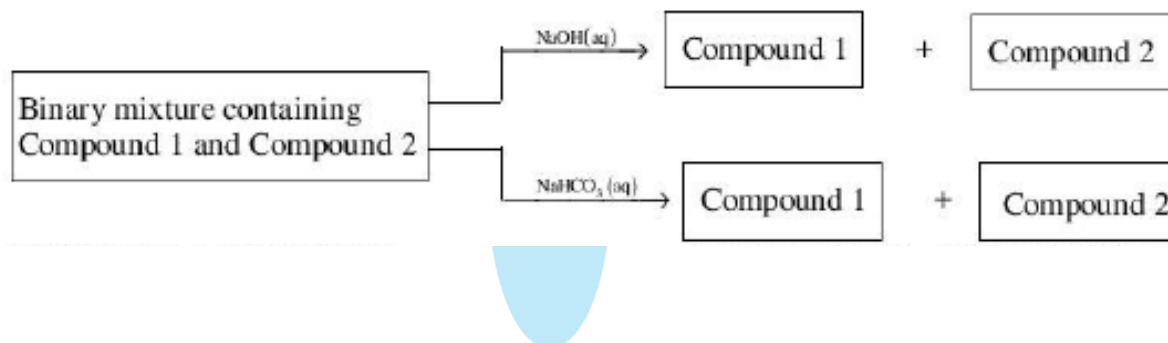


- (A) 0
- (B) 1
- (C) 2
- (D) 4

31. Which or the following hydrogen halides react(s) with $\text{AgNO}_3(\text{aq})$ to give a precipitate that dissolves in $\text{Na}_2\text{S}_2\text{O}_3(\text{aq})$?

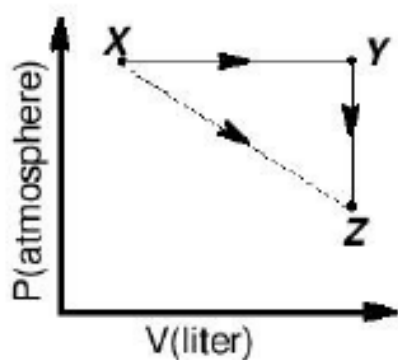
- (A) HCl
- (B) HF
- (C) HBr
- (D) HI

32. 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 $\text{C}_6\text{H}_5\text{CH}_2\text{COOH}$

33. 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]



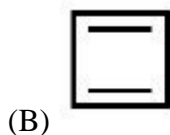
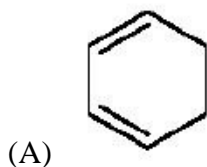
(A) $\Delta S_{x \rightarrow z} = \Delta S_{x \rightarrow y} + \Delta S_{y \rightarrow z}$

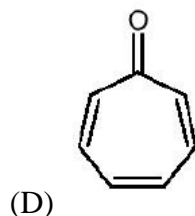
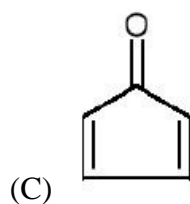
(B) $w_{x \rightarrow z} = w_{x \rightarrow y} + w_{y \rightarrow z}$

(C) $w_{x \rightarrow y \rightarrow z} = w_{x \rightarrow y}$

(D) $\Delta S_{x \rightarrow y \rightarrow z} = \Delta S_{x \rightarrow y}$

34. Which of the following molecules, in pure form, is (are) **unstable** at room temperature?



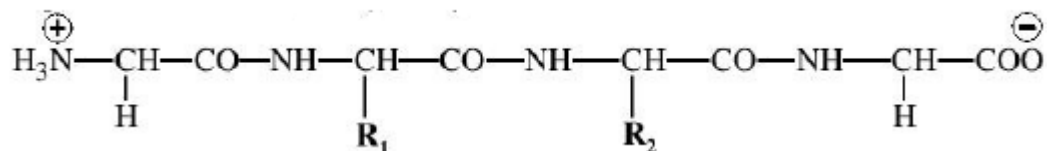


35. Choose the correct reason(s) for the stability of the lyophobic colloidal particles.

- (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

36. 29.2% (*w/w*) HCl stock solution has 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 0.4M HCl is

37. The substituents R_1 and R_2 for nine peptides are listed in the table below. How many of these peptides are positively charged at $pH = 7.0$?

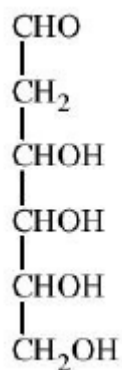


Peptide	R_1	R_2
I	H	H
II	H	CH_3
III	CH_2COOH	H
IV	CH_2CONH_2	$(\text{CH}_2)_4\text{NH}_2$
V	CH_2CONH_2	CH_2CONH_2
VI	$(\text{CH}_2)_4\text{NH}_2$	$(\text{CH}_2)_4\text{NH}_2$
VII	CH_2COOH	CH_2CONH_2
VIII	CH_2OH	$(\text{CH}_2)_4\text{NH}_2$
IX	$(\text{CH}_2)_4\text{NH}_2$	CH_3

38. 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 $\log_{10} 2 = 0.3$)

39. When the following aldohexose exists in its *D*- configuration, the total number of stereoisomers in its pyranose form is



Hence *total number of stereoisomers in pyranose form of D-configuration* = $2^3 = 8$

40. 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?

