

**AskIITians IIT JEE Chemistry Test****Code – AC207****Time - One hour**

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

**A. General :**

- This booklet is your Question paper containing 69 questions.
- Blank papers, clipboard, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed to be carried inside the examination hall.
- The answer sheet, a machine-readable Objective Response Sheet (ORS), is provided separately.

**B. Filling the ORS :**

- On the lower part of the ORS, write in ink, your name, your Registration No. Do not write these anywhere else.
- Make sure the CODE on the ORS is the same as that on this booklet and put your signature on the ORS affirming that you have verified.
- Write your Registration No. in ink, provided in the lower part of the ORS and darken the appropriate bubble UNDER each digit of your Registration No. with a good quality HB pencil.

**C. Question paper format.**

- The question paper consists of 3 parts (Physics, Chemistry and Mathematics). Each part has 4 sections.
- Section I contains 6 multiple choice question. Each question has four choices (A), (B), (C) and (D), out of which only one is correct.
- Section II contains 4 questions. Each question has four choices (A), (B), (C) and (D), out of which one or more choices is correct.
- Section III contains 4 questions. Each question contains Statement -1 (Assertion) and Statement -2 (Reason).  
Bubble (A) if both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1.  
Bubble (B) if both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-2.  
Bubble (C) if STATEMENT-1 is TRUE and STATEMENT-2 is FALSE.  
Bubble (D) if STATEMENT-1 is FALSE and STATEMENT-2 is TRUE.
- Section IV contains 3 paragraphs. Based upon each paragraph. Three multiple choice questions have to be answered. Each question has four choices (A) (B) (C) (D) out of which only one is correct.

**D. Marking Scheme.**

- For each question in Section I, you will be awarded 3 marks if you have darkened only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, minus one (–1) mark will be awarded.
- For each question in Section II, you will be awarded 4 marks, if you darken only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, (–1) mark will be awarded.
- For each question in Section III, you will be awarded 3 marks, if you darken only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, (–1) mark will be awarded.
- For each question in Section IV, you will be awarded 3 marks, if you darken only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, (–1) will be awarded.

**Useful Data**

<b>Gas Constant</b>	R	= 8.314 J K <sup>-1</sup> mol <sup>-1</sup>	<b>1 Faraday</b>	= 96500 Coulomb
		= 0.0821 Lit atm K <sup>-1</sup> mol <sup>-1</sup>	<b>1 calorie</b>	= 4.2 Joule
		= 1.987 ≈ 2 Cal K <sup>-1</sup> mol <sup>-1</sup>	<b>1 Ev</b>	= 1.6 × 10 <sup>-19</sup> J
<b>Avogadro's Number</b>	N <sub>A</sub>	= 6.023 × 10 <sup>23</sup>		
<b>Planck's constant</b>	h	= 6.625 × 10 <sup>-34</sup> J . s		

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**Atomic No:** H = 1, D = 1, Li = 3, Na = 11, K = 19, Rb = 37, Cs = 55, F = 9, Ca = 20, He = 2, O = 8, Au = 79, Ni = 28, Zn = 30, Cu = 29, Cl = 17, Br = 35, Cr = 24, Mn = 25, Fe = 26, S = 16, P = 15, C = 6, N = 7, Ag = 47.

**Atomic Masses:** He = 4, Mg = 24, C = 12, O = 16, N = 14, P = 31, Br = 80, Cu = 63.5, Fe = 56, Mn = 55, Pb = 207, Au = 197, Ag = 108, F = 19, H = 1, Cl = 35.5, Sn = 118.6, Na = 23, D = 2, Cr = 52, K = 39, Ca = 40, Li = 7, Be = 4, Al = 27, S = 32.

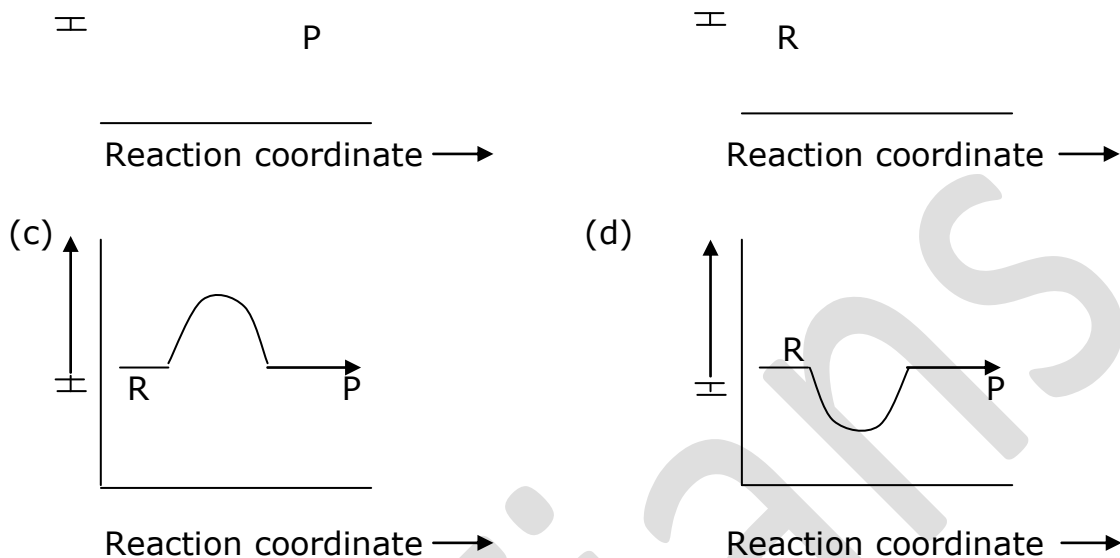
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## SECTION – I

1. Equivalent conductance of  $\text{BaSO}_4$  solution is  $400 \text{ ohm}^{-1} \text{ cm}^2 \text{ eq}^{-1}$  and its specific conductance is  $8 \times 10^{-5} \text{ ohm}^{-1} \text{ cm}^{-1}$ . Hence, the solubility of  $\text{BaSO}_4$  in  $\text{mol}^2 \text{ L}^{-2}$  is
- (a)  $4 \times 10^{-8}$  (b)  $1 \times 10^{-8}$   
(c)  $2 \times 10^{-4}$  (d)  $1 \times 10^{-4}$
2. At a given temperature  $P(x) = 3P(y)$  and  $M(y) = 2M(x)$  where P and M are the density and molar mass of gases x and y. The ratio of their pressures would be
- (a)  $1/4$  (b) 4  
(c) 6 (d)  $1/6$
3. Three litre of  $\text{NH}_3$  at  $27^\circ\text{C}$  and  $0.20 \text{ atm}$  is neutralized by  $134 \text{ ml}$  of a solution of  $\text{H}_2\text{SO}_4$ . The normality of  $\text{H}_2\text{SO}_4$  is
- (a) 0.02 (b) 0.024  
(c) 0.1 (d) 0.18
4. Equivalent conductance of  $\text{BaSO}_4$  solution is  $400 \text{ ohm}^{-1} \text{ cm}^2 \text{ eq}^{-1}$  and its specific conductance is  $8 \times 10^{-5} \text{ ohm}^{-1} \text{ cm}^{-1}$ . Hence, the solubility of  $\text{BaSO}_4$  in  $\text{mol}^2 \text{ L}^{-2}$  is
- (a)  $4 \times 10^{-8}$  (b)  $1 \times 10^{-8}$   
(c)  $2 \times 10^{-4}$  (d)  $1 \times 10^{-4}$
5. An aqueous solution of a non-volatile solute boils at  $100.17^\circ\text{C}$ . At what temperature will this solution freeze? ( $K_B$  for water =  $0.512^\circ\text{C}$  and  $K_f$  for water =  $1.86^\circ\text{C}/\text{molality}$ ).
- (a)  $-0.62^\circ\text{C}$  (b)  $0.62^\circ\text{C}$   
(c)  $6.2^\circ\text{C}$  (d)  $-6.2^\circ\text{C}$
6. For the reaction,  
$$4\text{NH}_3 + 5\text{O}_2 \rightarrow 4\text{NO} + 6\text{H}_2\text{O}$$
The rates of consumption of  $\text{O}_2$  and  $\text{NH}_3$  are in the ratio





## SECTION - II

1. **Assertion :** When hydration of alkene takes place in the presence of mercury diacetate, the corresponding alcohols is formed without involving rearrangement.

**Reason :** The reaction involved carbocation intermediate.

2. **Assertion :** Products of reaction between  $C_6H_5 - CH_2 - O - C_6H_5$  and HI are phenol and benzyl iodide

**Reason :** Both products are resonance stabilized.

3. **Assertion :** In electrolysis, the quantity of electricity needed for depositing 1 mole of silver is different from that required for 1 mole of copper.

**Reason :** The molecular weights of silver and copper are different.

**4. Assertion :** A mixture of sodium acetate and sodium propionate forms a buffer solution.

**Reason :** A buffer solution reacts with small quantities of hydrogen or hydroxyl ions and keeps the pH almost same.

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### SECTION – III

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Read the paragraph and answers the questions that follow –

#### Paragraph

Nucleic acids are the prosthetic groups of nucleoproteins. These are natural bio polymers made of nucleotide units, i.e., polynucleotides. They are present in all living cells and direct protein synthesis. They are responsible for transfer of genetic information. Nucleic acids are of two types DNA and RNA. Nucleic acids are made up of the three units namely nitrogenous bases, sugars and phosphate.

Q.1 In DNA, thymine is held by two hydrogen bonds with the base

- |             |              |
|-------------|--------------|
| (a) adenine | (b) cytosine |
| (c) thymine | (d) guanine  |

Q.2 Adenosine is an example of

- |                 |                     |
|-----------------|---------------------|
| (a) nucleotide  | (b) nucleoside      |
| (c) purine base | (d) pyrimidine base |

Q.3 Which is not a pyrimidine base?

- |             |              |
|-------------|--------------|
| (a) Thymine | (b) Uracil   |
| (c) Guanine | (d) Cytosine |

#### Paragraph

15<sup>th</sup> group elements form tri and pentahalides. The trihalides are  $sp^3$  hybridised and similar to  $NH_3$  in structure. Their chemical reactivity, basicity

and bond angles depend upon various factors including their electronegativity, size and availability of vacant d-orbitals.

Q.1 The halides of 15<sup>th</sup> group elements that are not hydrolysed among the following are

- |     |                        |                          |                          |                         |                         |
|-----|------------------------|--------------------------|--------------------------|-------------------------|-------------------------|
|     | NF <sub>3</sub><br>(i) | NCl <sub>3</sub><br>(ii) | PF <sub>3</sub><br>(iii) | PF <sub>5</sub><br>(iv) | NBr <sub>3</sub><br>(v) |
| (a) | (i)                    |                          |                          | (b)                     | (i), (iii), (v)         |
| (c) | (i), (iii)             |                          |                          | (d)                     | (i), (iii), (iv)        |

Q.2 The strongest Lewis basic trihalide of nitrogen is

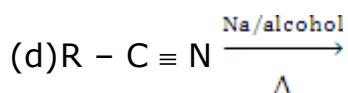
- |     |                  |     |                  |
|-----|------------------|-----|------------------|
| (a) | NCl <sub>3</sub> | (b) | NBr <sub>3</sub> |
| (c) | NF <sub>3</sub>  | (d) | NI <sub>3</sub>  |

Q.3 The least ionic to most ionic trihalide of 15<sup>th</sup> group elements are in the order

- |     |                                                                            |
|-----|----------------------------------------------------------------------------|
| (a) | PCl <sub>3</sub> < AsCl <sub>3</sub> < BiCl <sub>3</sub> < NF <sub>3</sub> |
| (b) | NF <sub>3</sub> < PCl <sub>3</sub> < AsCl <sub>3</sub> < BiCl <sub>3</sub> |
| (c) | BiCl <sub>3</sub> < AsCl <sub>3</sub> < PCl <sub>3</sub> < NF <sub>3</sub> |
| (d) | NF <sub>3</sub> < BiCl <sub>3</sub> < AsCl <sub>3</sub> < PCl <sub>3</sub> |

#### SECTION – IV

- |                                                                        |                           |
|------------------------------------------------------------------------|---------------------------|
| 1. (a) $R - COCl + Na_3N \xrightarrow[\text{Heat}]{H_2O^+}$            | (p) stephen's reaction    |
| (b) $R - COOH + NH_3 \xrightarrow[\text{Heat}]{\text{conc. } H_2SO_4}$ | (q) Mendius Reaction      |
| (c) $R - C \equiv N \xrightarrow[(2) H_3O^+]{(1) SnCl_2 - HCl}$        | (p) Curtius rearrangement |



(p) Schmidt reaction

2.

Column I		Column II	
(a)	Polonium	(q)	Diamagnetic, non-metallic
(b)	Selenium	(q)	Semiconductor
(c)	Sulphur	(r)	Conductor, metallic
(d)	Tellurium	(s)	Photoelectric Cell

3.

Column I		Column II		
(a)	$[\text{Fe}(\text{CN})_6]^{3-}$	(q)	$d^2sp^3$ , 3 electrons	3 unpaired
(b)	$[\text{Cr}(\text{NH}_3)_6]^{3+}$	(q)	$d^2sp^3$ , 2 electrons	2 unpaired
(c)	$[\text{CeF}_6]^{3-}$	(r)	$d^2sp^3$ , 1 electrons	1 unpaired
(d)	$[\text{V}(\text{H}_2\text{O})_6]^{3+}$	(s)	$sp^3d^2$ , 4 electrons	4 unpaired