

JEE ADVANCED-2016

CHEMISTRY

General Instructions:

1. This sealed booklet is your Question Paper. Do not break the seal till you are instructed to do so.
2. The question paper CODE is printed on the left hand top corner of this sheet and the right hand top corner of the back cover of this booklet.
3. Use the Optical Response Sheet (ORS) provided separately for answering the questions.
4. The paper CODE is printed on its left part as well as the right part of the ORS. Ensure that both these codes are identical and same as that on the question paper booklet. If not, contact the invigilator.
5. Blank spaces are provided within this booklet for rough work.
6. Write your name and roll number in the space provided on the back cover of this booklet.
7. After breaking the seal of the booklet at 2:00 pm, verify that the booklet contains 36 pages and that all the 54 questions along with the options are legible. If not, contact the invigilator for replacement of the booklet.
8. You are allowed to take away the Question Paper at the end of the examination.

Optical Response Sheet

9. The ORS (top sheet) will be provided with an attached Candidate's Sheet (bottom sheet). The Candidate's Sheet is a carbon – less copy of the ORS.
10. Darken the appropriate bubbles on the ORS by applying sufficient pressure. This will leave an impression at the corresponding place on the Candidate's Sheet.
11. The ORS will be collected by the invigilator at the end of the examination.
12. You will be allowed to take away the Candidate's Sheet at the end of the examination.
13. Do not tamper with or mutilate the ORS. Do not use the ORS for rough work.

14. Write your name, roll number and code of the examination center, and sign with pen in the space provided for this purpose on the ORS. Do not write any of these details anywhere else on the ORS. Darken the appropriate bubble under each digit of your roll number.

Darken the Bubbles on the ORS

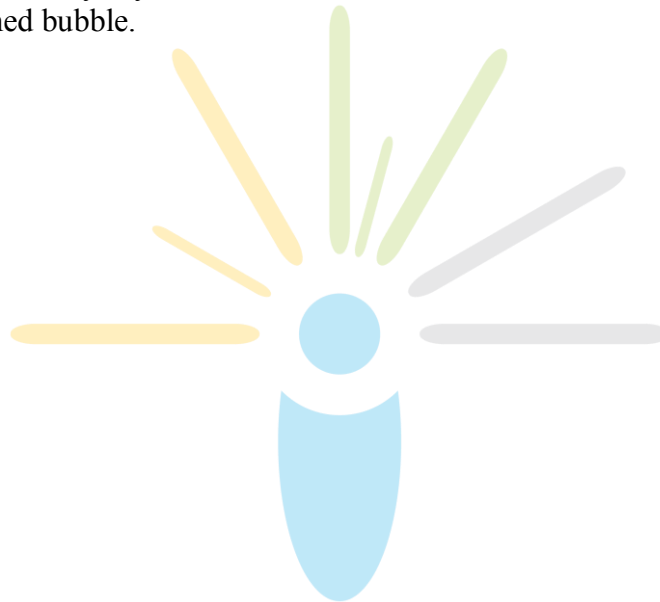
15. Use a Black Ball Point Pen to darken the bubbles on the ORS.

16. Darken the bubble  completely.

17. The correct way of darkening a bubble is as: 

18. The ORS is machine – gradable. Ensure that the bubbles are darkened in the correct way.

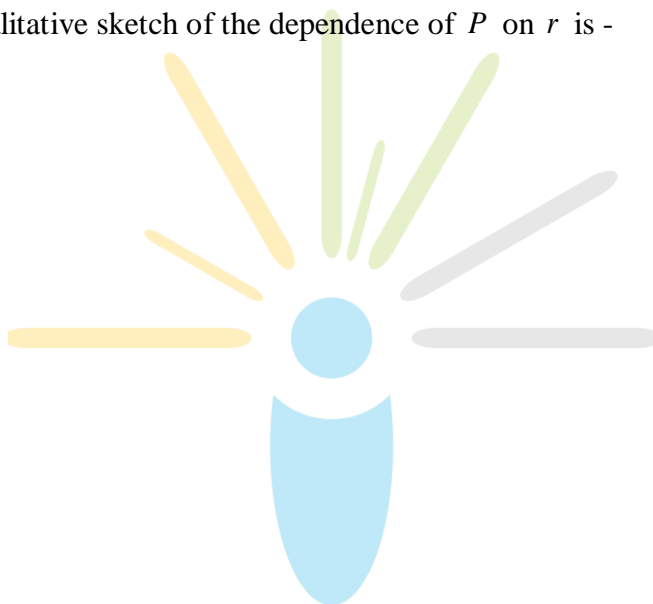
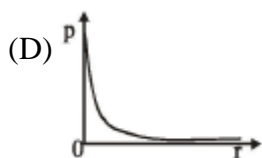
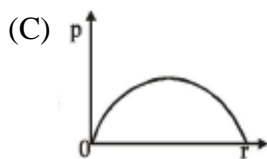
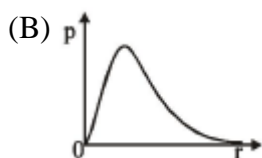
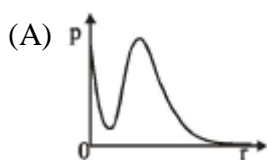
19. Darken the bubbles only if you are sure of the answer. There is no way to erase or “un-darken” a darkened bubble.



SECTION-1 (Maximum Mark : 24)

- This section contains **FIVE** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct
- For each question, darken the bubble corresponding to the correct option in the **ORS**
- For each question, marks will be awarded in one of the following categories :
 Full Marks : +3 If only the bubble corresponding to the correct option is darkened.
 Zero Marks : 0 If none of the bubbles is darkened.
 Negative Marks : -1 In all other cases.

19. P is the probability of finding the $1s$ electron of hydrogen atom in a spherical shell of infinitesimal thickness, dr , at a distance r from the nucleus. The volume of this shell is $4\pi r^2 dr$. The qualitative sketch of the dependence of P on r is -



20. One mole of an ideal gas at 300 K in thermal contact with surroundings expands isothermally from 1.0L to 2.0L against a constant pressure of 3.0atm . In this process, the change in entropy of surroundings (ΔS_{surr}) in $J K^{-1}$ is-

(1Latm = 101.3J)

- (A) 5.763
- (B) 1.013
- (C) -1.013
- (D) -5.763

21. The increasing order of atomic radii of the following group 13 elements is

- (A) Al < Ga < In < Tl
- (B) Ga < Al < In < Tl
- (C) Al < In < Ga < Tl
- (D) Al < Ga < Tl < In

22. On complete hydrogenation, natural rubber produces

- (A) ethylene-propylene copolymer
- (B) vulcanised rubber
- (C) polypropylene
- (D) polybutylene

23. Among $[\text{Ni}(\text{CO})_4]$, $[\text{NiCl}_4]^{2-}$, $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$, $\text{Na}_3[\text{CoF}_6]$, Na_2O_2 and CsO_2 , the total number of paramagnetic compounds is –

- (A) 2
- (B) 3
- (C) 4
- (D) 5

SECTION-2 (Maximum Mark : 32)

- This section contains **EIGHT** questions.
- Each question has **FOUR options** for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS
- For each question, marks will be awarded in one of the following categories :

Full Marks	: +4 If only the bubble(s) corresponding to the correct option(s) is (are) darkened.
Partial Marks	: +1 For darkening a bubble corresponding to each correct option , Provided NO incorrect option is darkened.
Zero Marks	: 0 If none of the bubbles is darkened.
Negative Marks	: -2 In all other cases
- for example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will result in +4 marks; darkening only (A) and (D) will result in +2 marks; and darkening (A) and (B) will result in -2 marks, as a wrong option is also darkened

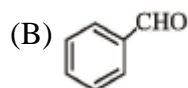
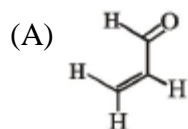
24. A plot of the number of neutrons (N) against the number of protons (P) of stable nuclei exhibits upwards deviation from linearity for atomic number, $Z > 20$. For an unstable nucleus having N/P ratio less than 1, the possible mode(s) of decay is(are) -

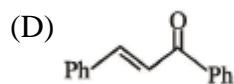
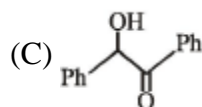
- (A) β^- decay (β emission)
- (B) orbital or K -electron capture
- (C) Neutron emission
- (D) β^- decay (positron emission)

25. The correct statements(s) about of the following reaction sequence is(are)

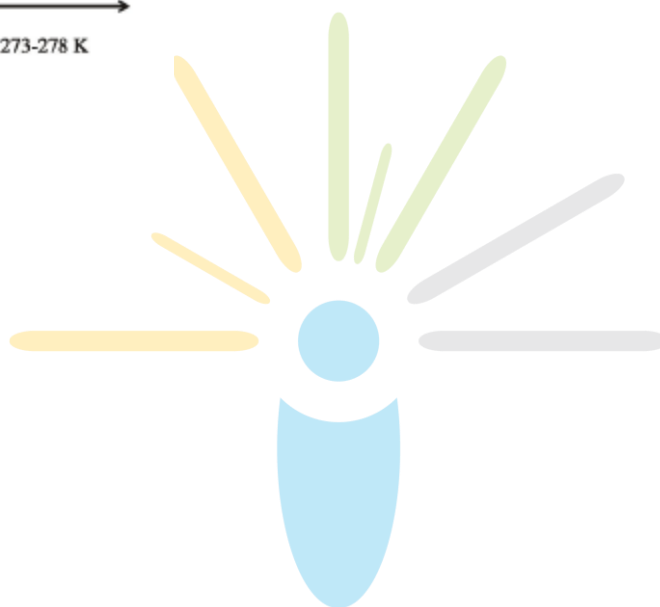
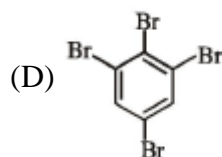
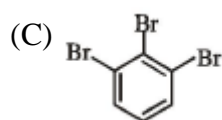
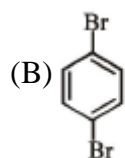
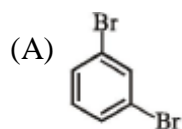
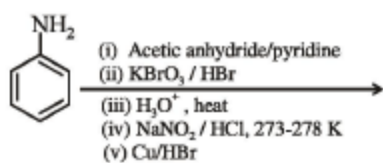
- (A) R is steam volatile
- (B) Q gives dark violet coloration with 1% aqueous FeCl_3 solution
- (C) S gives yellow precipitate with 2, 4, -dinitrophenylhydrazine
- (D) S gives dark violet coloration with 1% aqueous FeCl_3 solution

26. Positive Tollen's test is observed for





27. The product(s) of the following reaction sequence is(are)



28. The compound(s) with TWO lone pairs of electrons on the central atom is(are)

- (A) BrF_5
- (B) ClF_3
- (C) XeF_4
- (D) SF_4

29. The crystalline form of borax has

- (A) Tetranuclear $[\text{B}_4\text{O}_5(\text{OH})_4]^{2-}$ unit
- (B) All boron atoms in the same plane
- (C) Equal number of sp^2 and sp^3 hybridized boron atoms
- (D) One terminal hydroxide per boron atom

30. The reagent(s) that can selectively precipitate S^{2-} from a mixture of S^{2-} and SO_4^{2-} in aqueous solution is(are):

- (A) CuCl_2
- (B) BaCl_2
- (C) $\text{Pb}(\text{OOCCH}_3)_2$
- (D) $\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}]$

31. According to the Arrhenius equation,

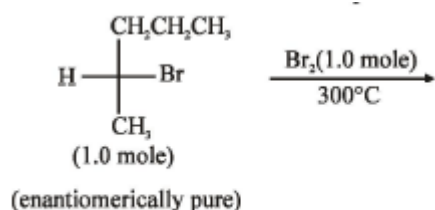
- (A) A high activation energy usually implies a fast reaction
- (B) Rate constant increase with increase in temperature. This is due to a greater number of collisions whose energy exceeds the activation energy
- (C) Higher the magnitude of activation energy, stronger is the temperature dependence of the rate constant
- (D) The pre-exponential factor is a measure of the rate at which collisions occur, irrespective of their energy.

SECTION-3 (Maximum Mark : 15)

- This section contains **FIVE** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- For each question, marks will be awarded in one of the following categories :
Full Marks : +3 If only the bubble corresponding to the correct option is darkened.
Zero Marks : 0 In all other cases.

32. The mole fraction of a solute in a solution is 0.1. At 298 K, molarity of this solution is the same as its molality. Density of this solution at 298 K is 2.0g cm^{-3} . The ratio of the molecular weights of the solute and solvent, $\left(\frac{MW_{\text{solute}}}{MW_{\text{solvent}}}\right)$, is

33. In the following monobromination reaction, the number of possible chiral products is



34. The diffusion coefficient of an ideal gas is proportional to its mean free path and mean speed. The absolute temperature of an ideal gas is increased 4 times and its pressure is increased 2 times. As a result, the diffusion coefficient of this gas increases x times. The value of x is

35. The number of geometric isomers possible for the complex $[\text{CoL}_2\text{Cl}_2]^-$ ($\text{L} = \text{H}_2\text{NCH}_2\text{CH}_2\text{O}^-$) is

36. In neutral or faintly alkaline solution, 8 moles permanganate anion quantitatively oxidize thiosulphate anions to produce X moles of a sulphur containing product, the magnitude of X is