

JEE Main 2023 Jan 30 Shift 2 Chemistry Question Paper

Time Allowed :3 Hours

Maximum Marks :300

Total Questions :90

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours duration.
2. The question paper consists of 90 questions, out of which 75 are to attempted.
The maximum marks are 300.
3. There are three parts in the question paper consisting of Physics, Chemistry and Mathematics having 30 questions in each part of equal weightage.
4. Each part (subject) has two sections.
 - (i) Section-A: This section contains 20 multiple choice questions which have only one correct answer. Each question carries 4 marks for correct answer and –1 mark for wrong answer.
 - (ii) Section-B: This section contains 10 questions. In Section-B, attempt any five questions out of 10. The answer to each of the questions is a numerical value. Each question carries 4 marks for correct answer and –1 mark for wrong answer. For Section-B, the answer should be rounded off to the nearest integer

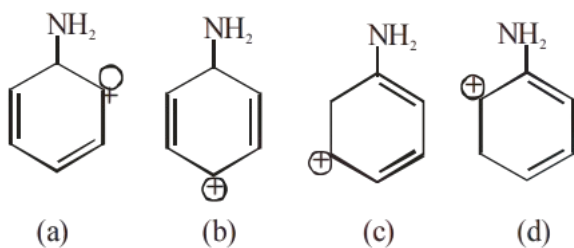
Chemistry

Section-A

31. Which of the following reactions is correct?

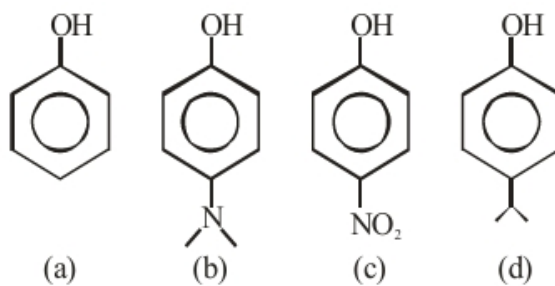
- (1) $2\text{LiNO}_3 \xrightarrow{\Delta} 2\text{LiNO}_2 + \text{O}_2$
(2) $4\text{LiNO}_3 \xrightarrow{\Delta} 2\text{Li}_2\text{O} + 2\text{N}_2\text{O}_4 + \text{O}_2$
(3) $4\text{LiNO}_3 \xrightarrow{\Delta} 2\text{Li}_2\text{O} + 4\text{NO}_2 + \text{O}_2$
(4) $2\text{LiNO}_3 \xrightarrow{\Delta} 2\text{Li} + 2\text{NO}_2 + \text{O}_2$
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32. The most stable carbocation for the following is:



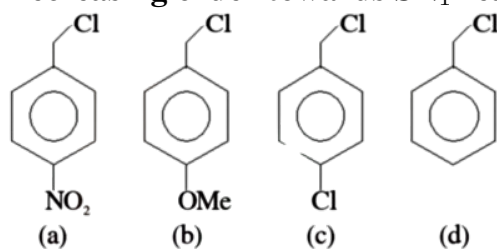
- (1) c
(2) d
(3) b
(4) a
-

33. The correct order of pK_a values for the following compounds is:



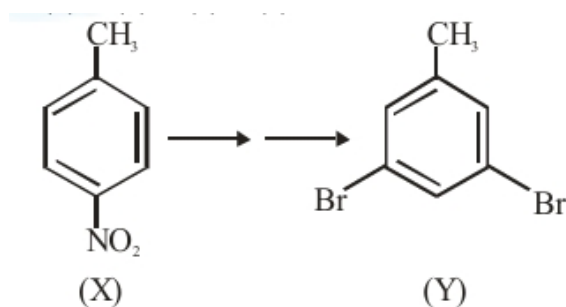
- (1) $c > a > d > b$
(2) $b > d > a > c$
(3) $b > a > d > c$
(4) $a > b > c > d$

34. Decreasing order towards $\text{S}_{\text{N}}1$ reaction for the following compounds is:



- (1) $a > c > d > b$
(2) $a > b > c > d$
(3) $b > d > c > a$
(4) $d > b > c > a$

35. In the above conversion of compound (X) to product (Y), the sequence of reagents to be used will be:



- (1) (i) Br_2 , Fe (ii) H^+ (iii) LiAlH_4
(2) (i) Br_2 , Fe (ii) LiAlH_4 (iii) H_3O^+
(3) (i) Fe, H^+ (ii) Br_2 (iii) HNO_2 , CuBr
(4) (i) Fe, H^+ (ii) Br_2 (iii) HNO_2 , H_3PO_2

36. Maximum number of electrons that can be accommodated in shell with $n = 4$ are:

- (1) 16
(2) 32
(3) 50
(4) 72

37. Match List I with List II:

	List I (Complexes)		List II (Hybridisation)
(A)	$[\text{Ni}(\text{CO})_4]$	I	sp^3
(B)	$[\text{Cu}(\text{NH}_3)_4]^{2+}$	II	dsp^2
(C)	$[\text{Fe}(\text{NH}_3)_6]^{2+}$	III	sp^3d^2
(D)	$[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$	IV	d^2sp^3

(1) A - II, B - I, C - III, D - IV

(2) A - I, B - II, C - III, D - IV

(3) A - II, B - I, C - IV, D - III

(4) A - I, B - II, C - IV, D - III

38. The Cl - Co - Cl bond angle values in a fac – $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$ complex is/are:

(1) 90° & 180°

(2) 90°

(3) 180°

(4) 90° & 120°

39. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: CH_3COOH can be easily reduced using Zn-Hg/HCl to $\text{CH}_3\text{CH}_2\text{OH}$.

Reason R: Zn-Hg/HCl is used to reduce carbonyl group to $-\text{CH}_2-$ group.

In the light of the above statements, choose the correct answer from the options given below:

(1) A is false but R is true

(2) A is true but R is false

(3) Both A and R are true but R is not the correct explanation of A

(4) Both A and R are true and R is the correct explanation of A

40. Chlorides of which metal are soluble in organic solvents:

(1) Ca

- (2) Mg
 - (3) K
 - (4) Be
-

41. Given below are two statements: One is labelled as Assertion A and the other labelled as Reason R.

Assertion A: Antihistamines do not affect the secretion of acid in stomach. Reason R: Antiallergic and antacid drugs work on different receptors.

In the light of the above statements, choose the correct answer from the options given below:

- (1) A is false but R is true
 - (2) Both A and R are true and R is the correct explanation of A
 - (3) A is true but R is false
 - (4) Both A and R are true but R is not the correct explanation of A
-

42. The wave function (Ψ) of 2s is given by

$$\Psi_{2s} = \frac{1}{2\sqrt{2\pi}} \left(\frac{1}{a_0} \right)^{1/2} \left(2 - \frac{r}{a_0} \right) e^{-r/2a_0}$$

At $r = r_0$, a radial node is formed. Thus, r_0 in terms of a_0 is:

- (1) $r_0 = a_0$
 - (2) $r_0 = 4a_0$
 - (3) $r_0 = \frac{a_0}{2}$
 - (4) $r_0 = 2a_0$
-

43. KMnO_4 oxidises I^- in acidic and neutral/faintly alkaline solution, respectively to:

- (1) I_2 & IO_3^-
 - (2) IO_3^- & I_2
 - (3) IO_3^- & IO_3^-
 - (4) I_2 & I_2
-

44. Bond dissociation energy of E–H bond of the “H₂E” hydrides of group 16 elements (given below), follows order.

- (A) O
 - (B) S
 - (C) Se
 - (D) Te
 - (1) $A > B > C > D$
 - (2) $A > B > C > D$
 - (3) $B > A > C > D$
 - (4) $D > C > B > A$
-

45. The water quality of a pond was analysed and its BOD was found to be 4. The pond has:

- (1) Highly polluted water
 - (2) Water has high amount of fluoride compounds
 - (3) Very clean water
 - (4) Slightly polluted water
-

46. Match List I with List II:

	List I (Mixture)		List II (Separation Technique)
(A)	$\text{CHCl}_3 + \text{C}_6\text{H}_5\text{NH}_2$	I	Steam distillation
(B)	$\text{C}_6\text{H}_{14} + \text{C}_5\text{H}_{12}$	II	Differential extraction
(C)	$\text{C}_6\text{H}_5\text{NH}_2 + \text{H}_2\text{O}$	III	Distillation
(D)	Organic compound in H_2O	IV	Fractional distillation

- (1) A-I, B-II, C-III, D-IV
- (2) A-II, B-III, C-IV, D-I
- (3) A-II, B-I, C-III, D-IV

(4) A-III, B-I, C-IV, D-II

47. Boric acid in solid, whereas BF_3 is gas at room temperature because of:

- (1) Strong ionic bond in Boric acid
 - (2) Strong van der Waal's interaction in Boric acid
 - (3) Strong hydrogen bond in Boric acid
 - (4) Strong covalent bond in BF_3
-

48. Given below are two statements:

Statement I: During Electrolytic refining, the pure metal is made to act as anode and its impure metallic form is used as cathode.

Statement II: During the Hall-Heroult electrolysis process, purified Al_2O_3 is mixed with Na_3AlF_6 to lower the melting point of the mixture.

- (1) Statement I is incorrect but Statement II is correct
 - (2) Both Statement I and Statement II are incorrect
 - (3) Statement I is correct but Statement II is incorrect
 - (4) Both Statement I and Statement II are correct
-

49. Formulae for Nessler's reagent is:

- (1) KHgI_2
 - (2) KHgI_3
 - (3) K_2HgI_4
 - (4) HgI_2
-

50. 1 L, 0.02 M solution of $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$ is mixed with 1 L, 0.02 M solution of $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$. The resulting solution is divided into two equal parts (X) and treated with excess AgNO_3 solution and BaCl_2 solution respectively as shown below:

1 L Solution (X) + AgNO_3 solution (excess) $\rightarrow$ Y

1 L Solution (X) + BaCl_2 solution (excess) $\rightarrow$ Z The number of moles of Y and Z respectively are:

- (1) 0.02, 0.02
 - (2) 0.01, 0.01
 - (3) 0.02, 0.01
 - (4) 0.01, 0.02
-

SECTION-B

51. 1 mole of ideal gas is allowed to expand reversibly and adiabatically from a temperature of 27°C. The work done is 3 kJ mol⁻¹. The final temperature of the gas is K (Nearest integer). Given $C_v = 20 \text{ J mol}^{-1} \text{ K}^{-1}$.

52. Iron oxide FeO, crystallises in a cubic lattice with a unit cell edge length of 5.0 Å. If density of the FeO in the crystal is 4.0 g cm⁻³, then the number of FeO units present per unit cell is (Nearest integer)

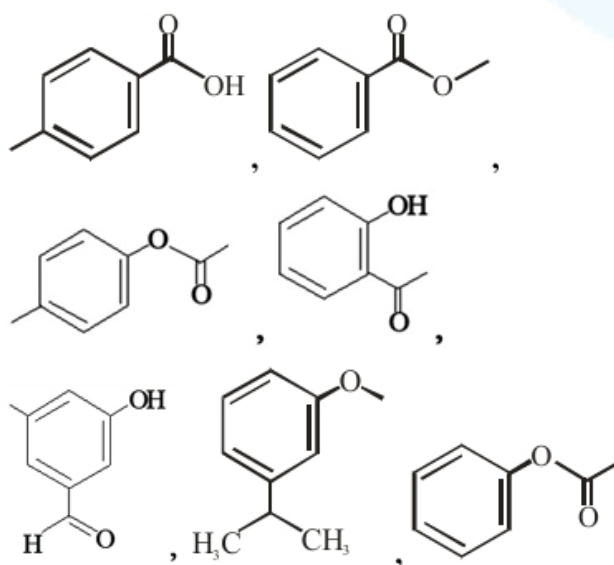
53. An organic compound undergoes first order decomposition. If the time taken for the 60% decomposition is 540 s, then the time required for 90% decomposition will be s. (Nearest integer).

54. Lead storage battery contains 38% by weight solution of H₂SO₄. The van't Hoff factor is 2.67 at this concentration. The temperature in Kelvin at which the solution in the battery will freeze is (Nearest integer).

55. Consider the following equation: $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$, $\Delta H = -190 \text{ kJ}$ The number of factors which will increase the yield of SO₃ at equilibrium from the following is

56. The graph of $\log \frac{x}{m}$ vs $\log p$ for an adsorption process is a straight line inclined at an angle of 45° with intercept equal to 0.6020. The mass of gas adsorbed per unit mass of adsorbent at the pressure of 0.4 atm is $\times 10^{-1}$ (Nearest integer).

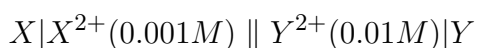
57. Number of compounds from the following which will not dissolve in cold NaHCO_3 and NaOH solutions but will dissolve in hot NaOH solution is



58. A short peptide on complete hydrolysis produces 3 moles of glycine (G), two moles of leucine (L) and two moles of valine (V) per mole of peptide. The number of peptide linkages in it are

59. The strength of 50 volume solution of hydrogen peroxide is g/L (Nearest integer). Given: Molar mass of H_2O_2 is 34 g mol^{-1} Molar volume of gas at STP = 22.7 L

60. The electrode potential of the following half cell at 298 K.



is $\times 10^{-2}\text{V}$ (Nearest integer).

Given: $E_{\text{X}^{2+}|\text{X}}^0 = -2.36 \text{ V}$ $E_{\text{Y}^{2+}|\text{Y}}^0 = +0.36 \text{ V}$

$$\frac{2.303RT}{F} = 0.06 \text{ V}$$