JEE Main 2023 30 Jan Shift 1 Chemistry Question Paper

Time Allowed :180 minutes	**Maximum Marks :**300	**Total questions :**90

General Instructions

Read the following instructions very carefully and strictly follow them:

(A) The test is of 3 hours duration.

(B) The question paper consists of 90 questions, out of which 75 are to attempted. The maximum marks are 300.

(C) There are three parts in the question paper consisting of Physics, Chemistry and Mathematics having 30 questions in each part of equal weightage. (D) 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

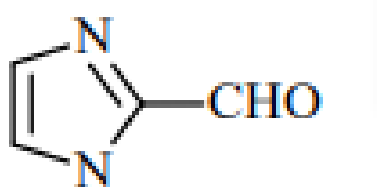
Chemistry

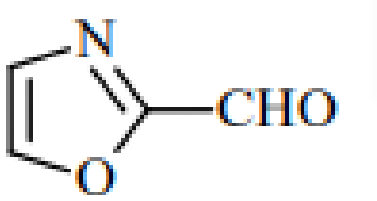
Section A

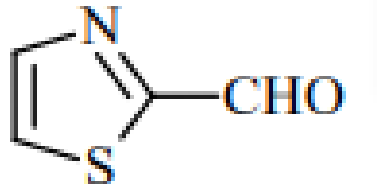
1. Which of the following compounds would give the following set of qualitative analysis?

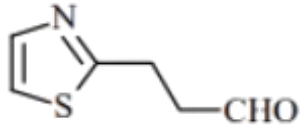
(i) Fehling's Test: Positive

(ii) Na fusion extract upon treatment with sodium nitroprusside gives a blood red colour but not

(1) 

(2) 

(3) 

(4) 

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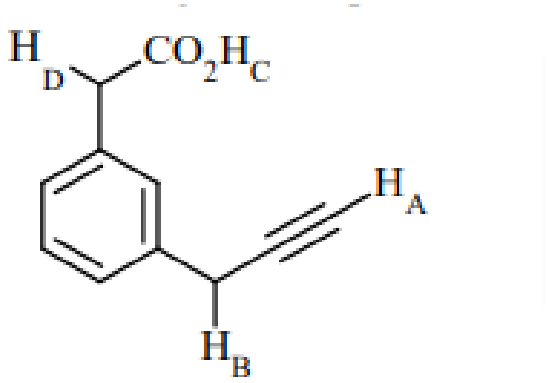
2. What is the correct order of acidity of the protons marked A-D in the given compounds?



(1) $H_C > H_D > H_B > H_A$

(2) $H_C > H_D > H_A > H_B$

(3) $H_D > H_C > H_B > H_A$

(4) $H_C > H_A > H_D > H_B$

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3. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): Ketoses give Seliwanoff's test faster than Aldoses.

Reason (R): Ketoses undergo -elimination followed by formation of furfural.

In 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)

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4. In the extraction of copper, its sulphide ore is heated in a reverberatory furnace after mixing with silica to:

(1) separate CuO as $CuSiO_3$

(2) remove calcium as $CaSiO_3$

(3) decrease the temperature needed for roasting of Cu_2S

(4) remove FeO as $FeSiO_3$

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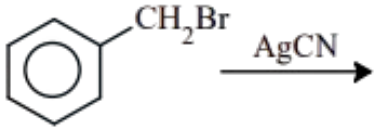
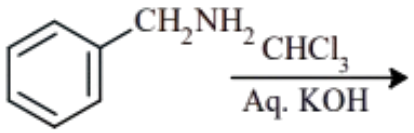
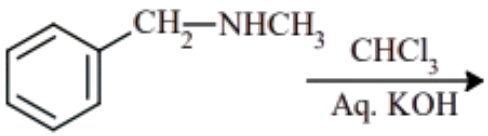
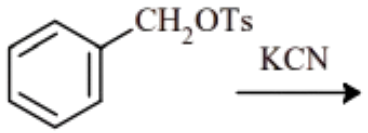
7. Benzyl isocyanide can be obtained by:

(A) 

(B) 

(C) 

(D) 

Choose the correct answer from the options given below:

(1) A and D

(2) Only B

(3) A and B

(4) B and C

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8. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): In expensive scientific instruments, silica gel is kept in watch-glasses or in semipermeable membrane bags.

Reason (R): Silica gel adsorbs moisture from air via adsorption, thus protects the instrument from water corrosion (rusting) and/or prevents malfunctioning.

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

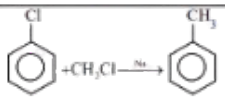
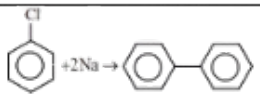
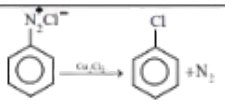
(1) A is false but (R) is true

(2) A is true but (R) is false

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

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

9. Match List I with List II:

List I		List II	
A		I	Fitting reaction
B		II	Wurtz Fitting reaction
C		III	Finkelstein reaction
D	$C_2H_5Cl + NaI \rightarrow C_2H_5I + NaCl$	IV	Sandmeyer reaction

(1) A – IV, B – I, C – III, D – II

(2) A – I, B – II, C – IV, D – III

(3) A – I, B – III, C – II, D – I

(4) A – II, B – I, C – IV, D – III

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10. Caprolactam when heated at high temperature in presence of water gives:

(1) Teflon

(2) Dacron

(3) Nylon 6, 6

(4) Nylon 6

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11. The alkaline earth metal sulphate(s) which are readily soluble in water is/are:

(A) $BeSO_4$

(B) $MgSO_4$

(C) $CaSO_4$

(D) $SrSO_4$

(E) $BaSO_4$

Choose the **correct answer** from the options given below:

(1) A only

(2) B only

(3) A and B

(4) B and C

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12. Which of the following is the correct order of ligand field strength?

(1) $CO < en < NH_3 < C_2O_4^{2-} < S^{2-}$

(2) $S^{2-} < C_2O_4^{2-} < NH_3 < en < CO$

(3) $NH_3 < en < CO < S^{2-} < C_2O_4^{2-}$

(4) $S^{2-} < NH_3 < en < CO < C_2O_4^{2-}$

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13. Formation of photochemical smog involves the following reaction in which A, B, and C are respectively.

(i) $NO_2 \xrightarrow{h\nu} A + B$

(ii) $B + O_2 \rightarrow C$

(iii) $A + C \rightarrow NO_2 + O_2$

Choose the correct answer from the options given below:

(1) O, NO, and NO_3^-

(2) N_2O and NO

(3) N, O_2, and O_3

(4) NO, O, and O_3

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14. During the qualitative analysis of SO_3^{2-} using dilute H_2SO_4, SO_2 gas is evolved which turns $K_2Cr_2O_7$ solution (acidified with dilute H_2SO_4):

(1) Black

(2) Red

(3) Green

(4) Blue

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15. To inhibit the growth of tumours, identify the compounds used from the following:

(A) EDTA

(B) Coordination Compounds of Pt

(C) D – Penicillamine

(D) Cis – Platin

Choose the correct answer from the options given below:

(1) B and D Only

(2) C and D Only

(3) A and B Only

(4) A and C Only

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16. In the wet tests for identification of various cations by precipitation, which transition element cation doesn't belong to group IV in qualitative inorganic analysis?

(1) Fe^{3+}

(2) Zn^{2+}

(3) Co^{2+}

(4) Ni^{2+}

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17. Match List I with List II

LIST–I (molecules/ions)	LIST–II (No. of lone pairs of e^- on central atom)
(*A*) IF_7	I. Three
(*B*) ICl_4^-	II. One
(*C*) XeF_6	III. Two
(*D*) XeF_2	IV. Zero

Choose the **correct answer** from the options given below:

(1) A – II, B – III, C – IV, D – I

(2) A – IV, B – III, C – II, D – I

(3) A – II, B – I, C – IV, D – III

(4) A – IV, B – I, C – II, D – III

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18. For OF_2 molecule consider the following:

(A) Number of lone pairs on oxygen is 2.

(B) F–O–F angle is less than 104.5° .

(C) Oxidation state of O is –2.

(D) Molecule is bent 'V' shaped.

(E) Molecular geometry is linear.

Correct options are:

(1) C, D, E only

(2) B, E, A only

(3) A, C, D only

(4) A, B, D only

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19. Lithium aluminium hydride can be prepared from the reaction of:

(1) LiCl and Al_2H_6

(2) LiH and Al_2Cl_6

(3) LiCl, Al and H_2

(4) LiH and $Al(OH)_3$

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20. Match List – I with List – II

LIST–I (Atomic number)	LIST–II (Block of periodic table)
(*A*) 37 (K)	I. p-block
(*B*) 78 (Pt)	II. d-block
(*C*) 52 (Te)	III. f-block
(*D*) 65 (Tb)	IV. s-block

Choose the **correct answer** from the options given below:

(1) A – II, B – IV, C – I, D – III

(2) A – I, B – III, C – IV, D – II

(3) A – IV, B – III, C – II, D – I

(4) A – IV, B – II, C – I, D – III

Section B

21. Consider the cell

$$\text{Pt(s)}|\text{H}_2\text{(g, 1 atm)}|\text{H}^+\text{(aq, 1M)}||\text{Fe}^{3+}\text{(aq)}, \text{Fe}^{2+}\text{(aq)}||\text{Pt(s)}.$$

When the potential of the cell is 0.712 V at 298 K, the ratio $\frac{[\text{Fe}^{2+}]}{[\text{Fe}^{3+}]}$ is _____. (Nearest integer)

Given:

$$\text{Fe}^{3+} + e^- \rightarrow \text{Fe}^{2+}, \quad E^\circ_{\text{Fe}^{3+}|\text{Fe}^{2+}} = 0.771\,\text{V}.$$

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

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22. A 300 mL bottle of soft drink has 0.2 M CO_2 dissolved in it. Assuming CO_2 behaves as an ideal gas, the volume of the dissolved CO_2 at STP is _____ mL. (Nearest integer)

Given: At STP, molar volume of an ideal gas is 22.7 L mol^{-1}.

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23. A solution containing 2 g of a non-volatile solute in 20 g of water boils at 373.52 K. The molecular mass of the solute is _____ g mol^{-1}. (Nearest integer)

Given: Water boils at 373 K, K_b for water = $0.52\,\text{K kg mol}^{-1}$.

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24. If compound A reacts with B following first-order kinetics with rate constant $2.011 \times 10^{-3}\,\text{s}^{-1}$, the time taken by A (in seconds) to reduce from 7 g to 2 g will be _____. (Nearest Integer)

Given:

$$\log 5 = 0.698, \quad \log 7 = 0.845, \quad \log 2 = 0.301.$$

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25. The energy of one mole of photons of radiation of frequency 2×10^{12} Hz in J mol^{-1} is _____. (Nearest integer)

Given: $h = 6.626 \times 10^{-34}\,\text{Js}$, $N_A = 6.022 \times 10^{23}\,\text{mol}^{-1}$.

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26. The number of electrons involved in the reduction of permanganate to manganese dioxide in acidic medium is _____.

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27. When 2 liters of ideal gas expands isothermally into a vacuum to a total volume of 6 liters, the change in internal energy is _____ J. (Nearest integer)

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28. 600 mL of 0.01 M HCl is mixed with 400 mL of 0.01 M H_2SO_4. The pH of the mixture is _____$\times 10^{-2}$. (Nearest integer)
Given:

$$\log 2 = 0.30, \quad \log 3 = 0.48, \quad \log 5 = 0.69, \quad \log 7 = 0.84, \quad \log 11 = 1.04.$$

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29. A trisubstituted compound 'A', $C_{10}H_{12}O_2$, gives neutral $FeCl_3$ test positive. Treatment of compound 'A' with NaOH and CH_3Br gives $C_{11}H_{14}O_2$, with hydroiodic acid gives methyl iodide and with hot conc. NaOH gives a compound 'B', $C_{10}H_{12}O_2$. Compound 'A' also decolourises alkaline $KMnO_4$. The number of π bond/s present in the compound 'A' is _____.

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30. Some amount of dichloromethane (CH_2Cl_2) is added to 671.141 mL of chloroform ($CHCl_3$) to prepare a 2.6×10^{-3} M solution of CH_2Cl_2 (DCM). The concentration of DCM is _____ ppm (by mass).
Given: Atomic mass C $= 12$, H $= 1$, Cl $= 35.5$, density of $CHCl_3 = 1.49$ g cm^{-3}.
