

JEE Main 2024 April 6 Shift 1 Chemistry Question Paper

Time Allowed :1 Hour	Maximum Marks :100	Total Questions :30
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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. 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.

Q1. Functional group present in sulphonic acid is:

- (1) SO_3H
- (2) SO_3H
- (3) $-\text{S}-\text{OH}$
- (4) $-\text{SO}_2$

Q2. Match List I with List II:

List I (Molecule / Species)	List II (Property / Shape)
A. SO_2Cl_2	I. Paramagnetic
B. NO	II. Diamagnetic
C. NO_2^-	III. Tetrahedral
D. I_3^-	IV. Linear

Choose the correct answer from the options given below:

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

Q3. Given below are two statements:

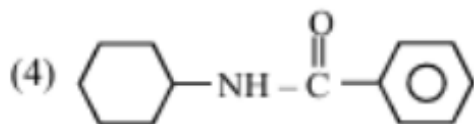
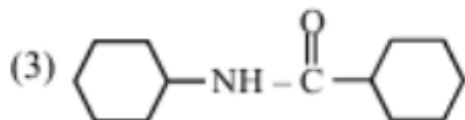
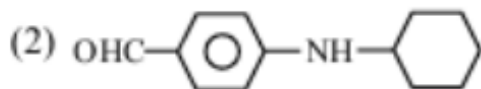
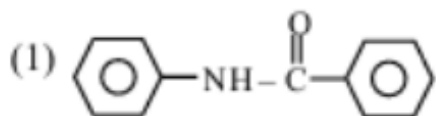
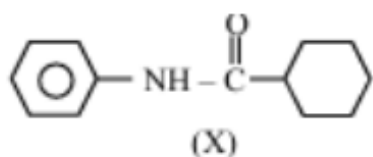
Statement I: Picric acid is 2, 4, 6-trinitrotoluene.

Statement II: Phenol-2, 4-disulphuric acid is treated with conc. HNO_3 to get picric acid.

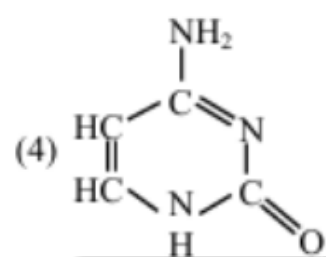
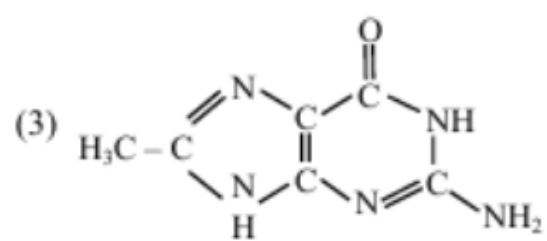
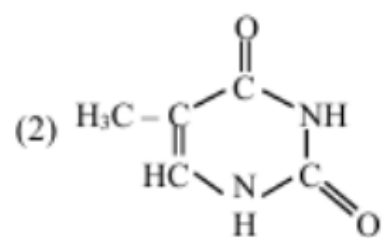
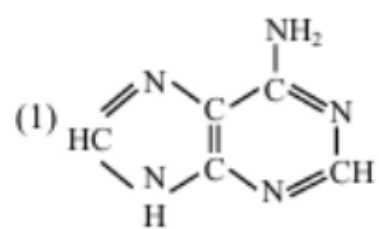
In the light of the above statement, choose the most appropriate answer from the options given below:

- (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.
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Q4. Which of the following is a metamer of the given compound (X)?



5. DNA molecule contains 4 bases whose structure are shown below. One of the structures is not correct. Identify the incorrect base structure.



6. Match List I with List II :

List I (Hybridization)	List II (Orientation in Space)
A. sp^3	III. Tetrahedral
B. dsp^2	IV. Square planar
C. sp^3d	I. Trigonal bipyramidal
D. sp^3d^2	II. Octahedral

Options:

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

7. Given below are two statements:

Statement I: Gallium is used in the manufacturing of thermometers.

Statement II: A thermometer containing gallium is useful for measuring the freezing point (256 K) of brine solution.

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

- (1) Both Statement I and Statement II are false.
- (2) Statement I is false but Statement II is true.
- (3) Both Statement I and Statement II are true.
- (4) Statement I is true but Statement II is false.

8. Which of the following statements are correct?

- A. Glycerol is purified by vacuum distillation because it decomposes at its normal boiling point.
- B. Aniline can be purified by steam distillation as aniline is miscible in water.
- C. Ethanol can be separated from ethanol-water mixture by azeotropic distillation because it forms azeotrope.
- D. An organic compound is pure if mixed melting point remains the same.

Choose the most appropriate answer from the options given below:

- (1) A, B, C only
- (2) A, C, D only

(3) B, C, D only

(4) A, B, D only

9. Match List I with List II:

List I (Compound/Species)	List II (Shape/Geometry)
A. SF_4	I. Tetrahedral
B. BrF_3	II. Pyramidal
C. BrO_3^-	III. See Saw
D. NH_4^+	IV. Bent T-shape

Choose the correct answer from the options given below:

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

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

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

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

10. In Reimer-Tiemann reaction, phenol is converted into salicylaldehyde through an intermediate. The structure of intermediate is:

Q.11. Which of the following material is not a semiconductor?

(1) Germanium

(2) Graphite

(3) Silicon

(4) Copper oxide

Q.12. Consider the following complexes:

(A) $[\text{CoCl}(\text{NH}_3)_5]^{2+}$,

(B) $[\text{Co}(\text{CN})_6]^{3-}$

(C) $[\text{Co}(\text{NH}_3)_5(\text{H}_2\text{O})]^{3+}$,

(D) $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$

The correct order of A, B, C, and D in terms of wavenumber of light absorbed is:

(1) $C < D < A < B$

(2) $D < A < C < B$

(3) $A < C < B < D$

(4) $B < C < A < D$

Q.13. Match List I with List II:

List I (Precipitating reagent and conditions)	List II (Cation)
A. $\text{NH}_4\text{Cl} + \text{NH}_4\text{OH}$	I. Mn^{2+}
B. $\text{NH}_4\text{OH} + \text{Na}_2\text{CO}_3$	II. Pb^{2+}
C. $\text{NH}_4\text{OH} + \text{NH}_4\text{Cl} + \text{H}_2\text{S}$ gas	III. Al^{3+}
D. Dilute HCl	IV. Sr^{2+}

Choose the correct answer from the options given below:

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

Q.14. The electron affinity values are negative for:

- A. $\text{Be} \rightarrow \text{Be}^-$
- B. $\text{N} \rightarrow \text{N}^-$
- C. $\text{O} \rightarrow \text{O}^-$
- D. $\text{Na} \rightarrow \text{Na}^-$
- E. $\text{Al} \rightarrow \text{Al}^-$

Choose the most appropriate answer from the options given below:

- (1) D and E only
- (2) A, B, D and E only
- (3) A and D only
- (4) A, B and C only

Q.15. The number of elements from the following that do not belong to lanthanoids is:

Eu, Cm, Er, Tb, Yb and Lu

- (1) 3
- (2) 4
- (3) 1
- (4) 5

Q.16. The density of 'x' M solution ('x' molar) of NaOH is 1.12 g mL^{-1} , while in molality, the concentration of the solution is 3 m (3 molal). Then x is

- (1) 3.5
- (2) 3.0
- (3) 3.8

(4) 2.8

Q.17. Which among the following aldehydes is most reactive towards nucleophilic addition reactions?

- (1) HCHO
- (2) C₂H₅CHO
- (3) CH₃CHO
- (4) C₃H₇CHO

Q.18. At -20°C and 1 atm pressure, a cylinder is filled with an equal number of H₂, I₂, and HI molecules for the reaction:



Options:

- (1) 2
- (2) 1
- (3) 10
- (4) 0.01

Q.19 Match **List I** with **List II**:

List I (Compound)	List II (Uses)
A. Iodoform	I. Fire extinguisher
B. Carbon tetrachloride	II. Insecticide
C. CFC	III. Antiseptic
D. DDT	IV. Refrigerants

Choose the correct answer from the options given below:

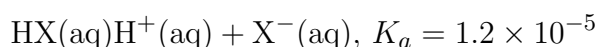
- 1. A-I, B-II, C-III, D-IV
- 2. A-III, B-II, C-IV, D-I
- 3. A-III, B-I, C-IV, D-II
- 4. A-II, B-IV, C-I, D-III

Q.20 A conductivity cell with two electrodes (dark side) are half filled with infinitely dilute aqueous solution of a weak electrolyte. If volume is doubled by adding more water at constant temperature, the molar conductivity of the cell will:

- 1. increase sharply
- 2. remain same or can not be measured accurately
- 3. decrease sharply

4. depend upon type of electrolyte

21. Consider the dissociation of the weak acid HX as given below:



[K_a : dissociation constant]

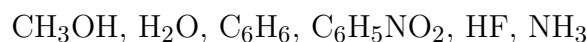
The osmotic pressure of 0.03 M aqueous solution of HX at 300 K is $___ \times 10^{-2}$ bar (nearest integer).

$$\text{Given: } R = 0.083 \text{ L bar mol}^{-1} \text{K}^{-1}$$

22. The difference in the 'spin-only' magnetic moment values of KMnO_4 and the manganese product formed during titration of KMnO_4 against oxalic acid in acidic medium is $___ \text{ BM}$ (nearest integer).

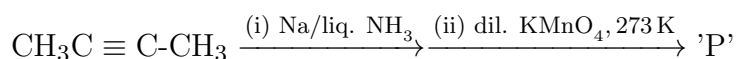
23. Time required for 99.9% completion of a first-order reaction is $___$ times the time required for completion of 90% reaction (nearest integer).

24. Number of molecules from the following which can exhibit hydrogen bonding is $___$ (nearest integer).



25. 9.3 g of pure aniline upon diazotisation followed by coupling with phenol gives an orange dye. The mass of orange dye produced (assume 100% yield/conversion) is $______ \text{ g}$. (nearest integer).

26. The major product of the following reaction is P.

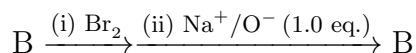
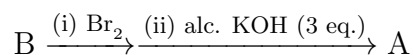


Number of oxygen atoms present in product 'P' is $______$ (nearest integer).

27. Frequency of the de-Broglie wave of an electron in Bohr's first orbit of the hydrogen atom is $___ \times 10^{13} \text{ Hz}$ (nearest integer).

$$\text{Given: } R_H \text{ (Rydberg constant)} = 2.18 \times 10^{-18} \text{ J}, h \text{ (Planck's constant)} = 6.6 \times 10^{-34} \text{ J}\cdot\text{s}.$$

28. The major products from the following reaction sequence are product A and product B.



The total sum of π electrons in product A and product B are ____ (nearest integer).

29. Among CrO, Cr₂O₃, and CrO₃, the sum of spin-only magnetic moment values of basic and amphoteric oxides is ____ $\times 10^{-2}$ BM (nearest integer).

(Given atomic number of Cr is 24)

30. An ideal gas, $C_V = \frac{5}{2}R$, is expanded adiabatically against a constant pressure of 1 atm until it doubles in volume. If the initial temperature and pressure is 298 K and 5 atm, respectively, then the final temperature is ____ K (nearest integer).

(C_V is the molar heat capacity at constant volume.)
