

JEE Main 2023 April 15 Shift 1 Question Paper

Time Allowed :3 Hours	Maximum Marks :300	Total Questions :90
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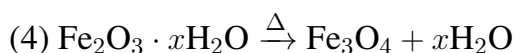
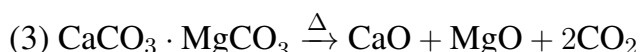
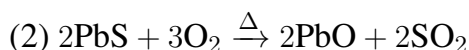
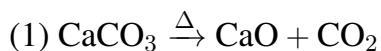
General Instructions

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, 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

1. Which one of the following is not an example of calcination?

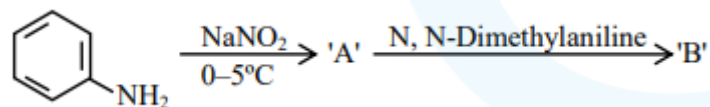


2. During water-gas shift reaction

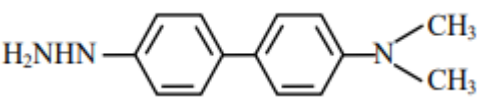
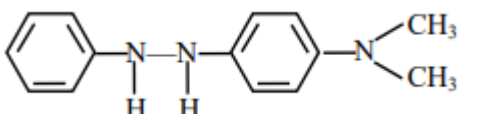
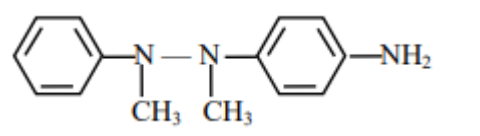
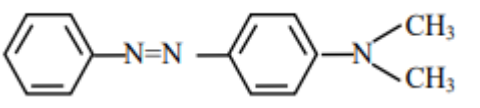
- (1) Water is evaporated in presence of catalyst.

- (2) Carbon monoxide is oxidized to carbon dioxide.
 (3) Carbon is oxidized to carbon monoxide.
 (4) Carbon dioxide is reduced to carbon monoxide.
-

3. Consider the following sequence of reaction:



The product B is:

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

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

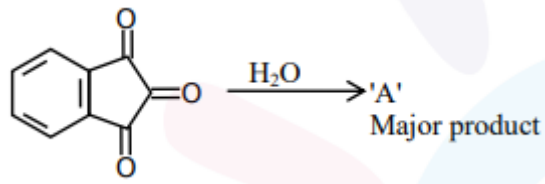
Assertion (A): BeCl_2 and MgCl_2 Produce characteristic flame

Reason (R): The excitation energy is high in BeCl_2 and MgCl_2

In the light of the above statement, 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) Both (A) and (R) are true but (R) is NOT the correct explanation of (A)
 (4) (A) is true but (R) is false
-

5. 'A' formed in the above reaction is:



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

6. For a good quality cement, the ratio of silica to alumina is found to be

- (1) 2
(2) 3
(3) 4.5
(4) 1.5

7. Which of the following expressions is correct in case of a CaCl unit cell (edge length 'a')?

- (1) $r_{cs} + r_{cr} = \frac{a}{\sqrt{2}}$
(2) $r_{cs} + r_{cr} = a$
(3) $r_{cs} + r_{cr} = \frac{\sqrt{3}}{2}a$
(4) $r_{cs} + r_{cr} = \frac{a}{2}$

8. Given below are two statements:

Statement I: According to Bohr's model of hydrogen atom, the angular momentum of an electron in a given stationary state is quantised.

Statement II: The concept of electron in Bohr's orbit violates the Heisenberg uncertainty principle.

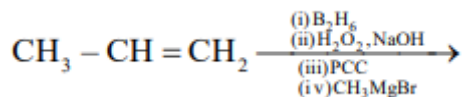
In the light of the above statements, choose the most appropriate answer from the options given below:

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

9. In the above conversion the correct sequence of reagents to be added is:

- (1) Br₂/Fe, (ii) Fe/H⁺, (iii) KMnO₄, (iv) Cl₂
 - (2) (i) Br₂/Fe, (ii) Fe/H⁺, (iii) HONO, (iv) CuCl, (v) KMnO₄
 - (3) (i) Fe/H⁺, (ii) HONO, (iii) CuCl, (iv) KMnO₄, (v) Br₂
 - (4) (i) KMnO₄, (ii) Br₂/Fe, (iii) Fe/H⁺, (iv) Cl₂
-

10. The product formed in the following multistep reaction is:



- (1) $\begin{array}{c} \text{OH} \\ | \\ \text{CH}_3 - \text{CH}_2 - \text{CH} - \text{CH}_3 \end{array}$
 - (2) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{OH}$
 - (3) $\begin{array}{c} \text{O} \\ || \\ \text{CH}_3 - \text{CH}_2 - \text{C} - \text{OCH}_3 \end{array}$
 - (4) $\begin{array}{c} \text{OH} \\ | \\ \text{CH}_3 - \text{C} - \text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$
-

11. The possibility of photochemical smog formation will be minimum at:

- (1) Srinagar, Jammu and Kashmir in January

- (2) New Delhi in August (Summer)
 - (3) Kolkata in October
 - (4) Mumbai in May
-

12. Consider the following statements:

- (A) NF_3 molecule has a trigonal planar structure.
- (B) Bond length of N_2 is shorter than O_2 .
- (C) Isoelectronic molecules or ions have identical bond order.
- (D) Dipole moment of HS is higher than that of water molecule.

Choose the correct answer from the options given below:

- (1) (A) and (B) are correct
 - (2) (C) and (D) are correct
 - (3) (B) and (C) are correct
 - (4) (A) and (D) are correct
-

13. The number of P–O–P bonds in $\text{H}_4\text{P}_2\text{O}_7$, $(\text{HPO}_3)_3$, and P_4O_{10} are respectively:

- (1) 1, 3, 6
 - (2) 0, 3, 6
 - (3) 0, 3, 4
 - (4) 1, 2, 4
-

14. Which is not true for arginine?

- (1) It has high solubility in benzene
 - (2) It is associated with more than one pK_a values.
 - (3) It is a crystalline solid.
 - (4) It has a fairly high melting point.
-

15. The complex with highest magnitude of crystal field splitting energy (Δ_o) is

- (1) $[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$
- (2) $[\text{Fe}(\text{OH}_2)_6]^{3+}$
- (3) $[\text{Cr}(\text{OH}_2)_6]^{3+}$



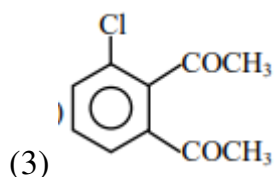
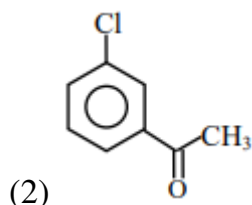
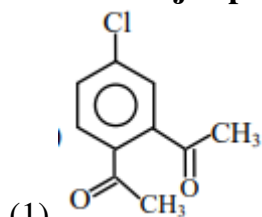
16. Which of the following statement is correct for paper chromatography?

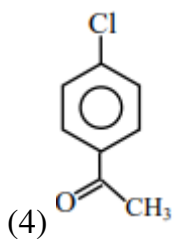
- (1) Water present in the pores of the paper forms the stationary phase.
 - (2) Water present in the mobile phase gets absorbed by the paper which then forms the stationary phase.
 - (3) Paper sheet forms the stationary phase.
 - (4) Paper and water present in its pores together form the stationary phase.
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17. Which of the following statement(s) is/are correct?

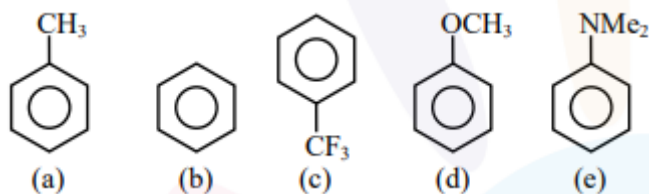
- (A) The pH of 1×10^{-8} M HCl solution is 8
 - (B) The conjugate base of H_2PO_4^+ is HPO_4^{2-}
 - (C) K_w increases with increase in temperature.
 - (D) When a solution of a weak monoprotic acid is titrated against a strong base at half neutralisation point, $\text{pH} = \frac{1}{2} \text{pK}_a$.
- (1) (A), (B), (C)
 - (2) (A), (D)
 - (3) (B), (C)
 - (4) (B), (C), (D)
-

18. The major product in the Friedel-Craft acylation of chlorobenzene is:





19. Decreasing order of reactivity towards electrophilic substitution for the following compounds is:



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

20. Match List-I with List-II :

Monomer (List-I)	Polymer (List-II)
(A) Tetrafluoroethene	(I) Orlon
(B) Acrylonitrile	(II) Natural rubber
(C) Caprolactam	(III) Teflon
(D) Isoprene	(IV) Nylon-6

Choose the correct answer from the options given below:

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

Section - B

21. The homoleptic and octahedral complex of Co^{2+} and H_2O has ---- unpaired electron(s) in the t_{2g} set of orbitals.

22. 30.4 kJ of heat is required to melt one mole of sodium chloride and the entropy change at the melting point is $28.4 \text{ J K}^{-1} \text{ mol}^{-1}$ at 1 atm. The melting point of sodium chloride is ____ K. (Nearest Integer)

23. The total number of isoelectronic species from the given set is ____.

24. For a reversible reaction $A \rightleftharpoons B$, the $\Delta H_{\text{forward}} = 20 \text{ kJ/mol}$. The activation energy of the uncatalysed forward reaction is 300 kJ/mol. When the reaction is catalysed keeping the reactant concentration same, the rate of the catalysed forward reaction at 27°C is found to be same as that of the uncatalysed reaction at 327°C . The activation energy of the catalysed backward reaction is ____ kJ/mol.

25. The vapour pressure of 30% (w/v) aqueous solution of glucose is ____ mm Hg at 25°C . [Given: The density of 30% (w/v), aqueous solutions of glucose is 1.2 g cm^{-3} and vapour pressure of pure water is 24 mm Hg. (Molar mass of glucose is 180 g mol^{-1})]

26. In Chromyl chloride, the oxidation state of chromium is (+) ____.

27. The volume (in mL) of 0.1 M AgNO_3 required for complete precipitation of chloride ions present in 20 mL of 0.01 M solution of $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_2$ as silver chloride is ____.

28. 20 mL of 0.5 M NaCl is required to coagulate 200 mL of As_2S_3 solution in 2 hours. The coagulating value of NaCl is ____.

29. The total change in the oxidation state of manganese involved in the reaction of KMnO_4 and potassium iodide in the acidic medium is ____.

30. The number of correct statements from the following is ____.

- (A) Conductivity always decreases with decrease in concentration for both strong and weak electrolysis.
- (B) The number of ions per unit volume that carry current in a solution increases on dilution.
- (C) Molar conductivity increases with decrease in concentration.
- (D) The variation in molar conductivity is different for strong and weak electrolysis.
- (E) For weak electrolysis, the change in molar conductivity with dilution is due to the decrease in degree of dissociation.
-