

Sample Paper 18

Class XII 2023-24

Chemistry

Time: 3 Hours

Max. Marks: 70

General Instructions:

1. There are 33 questions in this question paper with internal choice.
 2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
 3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
 4. SECTION C consists of 7 short answer questions carrying 3 marks each.
 5. SECTION D consists of 2 case-based questions carrying 4 marks each.
 6. SECTION E consists of 3 long answer questions carrying 5 marks each.
 7. All questions are compulsory.
 8. Use of log tables and calculators is not allowed.
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SECTION-A

Directions (Q. Nos. 1-16) : The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. The most durable metal plating on iron to protect against corrosion is
(a) nickel plating (b) copper plating
(c) tin plating (d) zinc plating
2. The rate of reaction between *A* and *B* increases by a factor of 100, when the concentration of *A* is increased 10 folds, the order of reaction with respect to *A* is
(a) 10 (b) 1
(c) 4 (d) 2
3. The rate of a first order reaction is $1.5 \times 10^{-2} \text{ mol L}^{-1}\text{min}^{-1}$ at 0.5 M concentration of the reactant. The half life of the reaction is
(a) 0.383 min (b) 23.1 min
(c) 8.73 min (d) 7.53 min
4. Which one of the following ionic species will impart colour to an aqueous solution?
(a) Ti^{4+} (b) Cu^{+}
(c) Zn^{2+} (d) Cr^{3+}

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5. If 96500 coulomb of electricity is passed through CuSO_4 solution, it will liberate :
- (a) 63.5 g Cu (b) 31.76 g Cu
(c) 96500 g Cu (d) 100 g Cu
6. In which of the following conversions, phosphorous pentachloride is used as the reagent?
- (a) $\text{H}_2\text{C} = \text{CH}_2 \longrightarrow \text{CH}_3\text{CH}_2\text{Cl}$ (b) $\text{CH}_3\text{CH}_2\text{OH} \longrightarrow \text{CH}_3\text{CH}_2\text{Cl}$
(c) $\text{H}_3\text{C} - \text{O} - \text{CH}_3 \longrightarrow \text{CH}_3\text{Cl}$ (d) $\text{CH} \equiv \text{CH} \longrightarrow \text{CH}_2 = \text{CHCl}$
7. Among the following, the compound that is both paramagnetic and coloured is
- (a) $\text{K}_2\text{Cr}_2\text{O}_7$ (b) $(\text{NH}_4)_2(\text{TiCl}_6)$
(c) CoSO_4 (d) $\text{K}_3[\text{Cu}(\text{CN})_4]$
8. Which of the following compounds does not react with NaNO_2 and HCl ?
- (a) $\text{C}_6\text{H}_5\text{OH}$ (b) $\text{C}_6\text{H}_5\text{NH}_2$
(c) $(\text{CH}_3)_3\text{CNO}_2$ (d) $(\text{CH}_3)_3\text{CNO}$
9. Ethylene reacts with Baeyer's reagent to give
- (a) ethane (b) ethyl alcohol
(c) ethylene glycol (d) none
10. Which one of the following esters cannot undergo Claisen self-condensation?
- (a) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{COOC}_2\text{H}_5$ (b) $\text{C}_6\text{H}_5\text{COOC}_2\text{H}_5$
(c) $\text{C}_6\text{H}_5\text{CH}_2\text{COOC}_2\text{H}_5$ (d) $\text{C}_6\text{H}_{11}\text{CH}_2\text{COOC}_2\text{H}_5$
11. The pyrimidine bases present in DNA are
- (a) cytosine and thymine (b) cytosine and uracil
(c) cytosine and adenine (d) cytosine and guanine
12. If 0.1 M solution of glucose and 0.1 M solution of urea are placed on two sides of the semi-permeable membrane to equal heights, then it will be correct to say that:
- (a) there will be no net movement across the membrane
(b) glucose will flow towards urea solution
(c) urea will flow towards glucose solution
(d) water will flow from urea solution to glucose

Directions (Q. No. 13-16) : Each of the following questions consists of two statements, one is Assertion and the other is Reason. Give answer :

- 13. Assertion :** Hydroxyketones are not directly used in Grignard reaction.
Reason : Grignard reagents react with hydroxyl group.
- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
 - (b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
 - (c) Assertion is correct but Reason is incorrect.
 - (d) Both the Assertion and Reason are incorrect.
- 14. Assertion :** An ether is more volatile than an alcohol of comparable molecular mass.
Reason : Ethers are polar in nature.
- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
 - (b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
 - (c) Assertion is correct but Reason is incorrect.
 - (d) Both the Assertion and Reason are incorrect.
- 15. Assertion :** Magnetic moment values of actinides are lesser than the theoretically predicted values.
Reason : Actinide elements are strongly paramagnetic.
- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
 - (b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
 - (c) Assertion is correct but Reason is incorrect.
 - (d) Both the Assertion and Reason are incorrect.
- 16. Assertion :** Protonation of a carbonyl group increases its electrophilic character.
Reason : Protonation of a carbonyl group involves addition of an electrophile on nucleophilic oxygen.
- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
 - (b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
 - (c) Assertion is correct but Reason is incorrect.
 - (d) Both the Assertion and Reason are incorrect.

SECTION-B

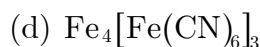
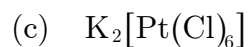
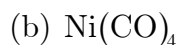
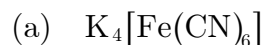
Directions (Q. Nos. 17-21) : This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

17. Arrange the following carbonyl compounds and nucleophilic addition-elimination reaction.
Ethane, Propanal, Propanone, Butanone
butanone < Propanone < Propanal < Ethanal
18. Discuss the factors responsible for rusting of iron.
19. What are the products obtained at the platinum anode and the platinum cathode respectively in the electrolysis of fused or molten NaCl ?
20. Explain hydrogenolysis reaction of an ester.

or

How is chemical reduction of esters done ? What are the products obtained ?

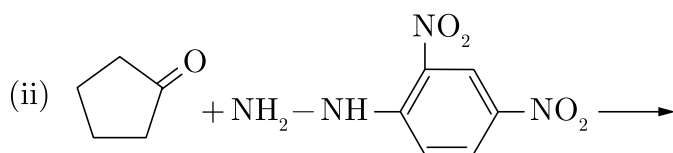
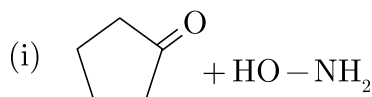
21. Write and IUPAC name of the following coordination compounds:

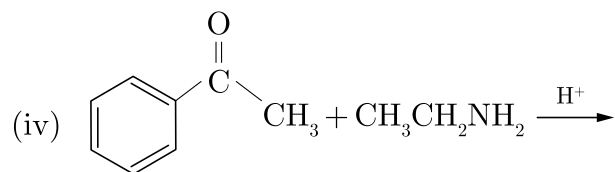
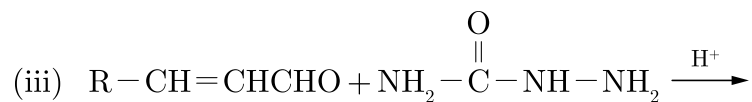


SECTION-C

Directions (Q. Nos. 22-28) : This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. Predict the products of the following reactions.





23. Which aqueous solution has higher concentration : 1 molar or 1 molal solution of the same solute. Give reason.
24. How is molar conductivity of an aqueous electrolyte solution measured experimentally?
25. Write IUPAC names of the following :
- $[Cu(NH_3)_4]Cl_2$
 - $K_4[Fe(CN)_6]$
26. Arrange each set of compounds in order of increasing boiling points.
- Bromomethane, bromoform, chloromethane, dibromomethane.
 - 1-Chloropropane, Isopropyl chloride, 1-chlorobutane.
27. Give important uses of carboxylic acids.

or

Explain how does $-OH$ group attached to a carbon of benzene ring activate it towards electrophilic substitution?

28. Write down the electronic configuration of
- Cr^{3+}
 - Cu^+
 - Co^{2+}
 - Mn^{2+}

Continue on next page.....

SECTION-D

Directions (Q. Nos. 29-30) : The following questions are case-based questions. Each question has an internal choice and carries 4 marks each. Read the passage carefully and answer the questions that follow.

- 29.** The amines are basic in nature due to the presence of a lone pair of electron on N-atom of the NH_2 group, which it can donate to electron deficient compounds. Aliphatic amines are stronger bases than NH_3 because of the $+I$ effect of the alkyl groups. Greater the number of alkyl groups attached to N-atom, higher is the electron density on it and more will be the basicity. Aniline is a weaker base compared to ammonia. This is because the lone pair of electrons on N-atom of aniline is less available for protonation due to its involvement in conjugation with the π -electrons of the benzene ring. Further the presence of electron withdrawing groups decreases the basicity while, the presence of electron donating groups activates the benzene ring and also increases the basicity.

Read the above passage and answer the following questions:

- (a) $(\text{CH}_3)_2\text{NH}$ is more basic than $(\text{CH}_3)_3\text{N}$ in an aqueous solution. Give reason
 (b) Arrange the following in increasing order of basic strength : $\text{C}_6\text{H}_5\text{NH}_2, \text{C}_6\text{H}_5\text{NHCH}_3, \text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$
 (c)
 (i) Arrange the following compounds in an increasing order of basic strength : $\text{C}_6\text{H}_5\text{NH}_2, \text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2, (\text{C}_2\text{H}_5)_2\text{NH}$ and CH_3NH_2
 (ii) Arrange the following compounds in a decreasing order of pK_b values. $\text{C}_2\text{H}_5\text{NH}_2, \text{C}_6\text{H}_5\text{NHCH}_3, (\text{C}_2\text{H}_5)_2\text{NH}$, and $\text{C}_6\text{H}_5\text{NH}_2$
or
 (d) Arrange the following in increasing order of basic strength : Aniline, *p*-nitroaniline and *p*-toluidine.

- 30.** The unique behaviour of Cu, having a positive E° , accounts for its inability to liberate H_2 from acids. Only oxidising acids (nitric and hot concentrated sulphuric) react with Cu, the acids being reduced. The high energy to transform $\text{Cu}_{(s)}$ to $\text{Cu}_{(aq)}^{2+}$ is not balanced by its hydration enthalpy. The general trend towards less negative E° values across the series is related to the general increase in the sum of the first and second ionisation enthalpies. It is interesting to note that the value of E° for Mn, Ni, and Zn are more negative than expected from the trend. The stability of the half-filled *d* sub-shell in Mn^{2+} and the completely filled d^{10} configuration in Zn are related to their E° values, whereas E° for Ni is related to the highest negative $\Delta_{hyd}H^\circ$. An examination of the $E^\circ_{(M^{3+}/M^{2+})}$ values shows the varying trends. The low value for Sc reflects the stability of Sc^{3+} which has a noble gas configuration. The highest value for Zn is due to the removal of an electron from the stable d^{10} configuration of Zn^{2+} . The comparatively high value for Mn shows that $\text{Mn}^{2+}(d^5)$ is particularly stable, whereas comparatively low value for Fe shows the extra stability of $\text{Fe}^{3+}(d^5)$. The comparatively low value for V is related to the stability of V^{2+} (half-filled t_{2g} level).

Read the above passage and answer the following question :

- (a) Cobalt (II) is very stable in aqueous solutions but gets easily oxidised in the presence of strong ligands.

- (b) Why are $E^\circ_{(M^{2+}/M)}$ values of Mn and Zn more negative than expected ?
 (c) Use the data to answer the following and also justify giving reasons :

	Cr	Mn	Fe	Co
$E^\circ_{(M^{2+}/M)}$	-0.91	-1.18	-0.44	-0.28
$E^\circ_{(M^{3+}/M^{2+})}$	-0.41	+1.57	+0.77	+1.97

- (i) Which is a stronger reducing agent in aqueous medium, Cr^{2+} or Fe^{2+} and why ?
 (ii) Which is the most stable ion in +2 oxidation state and why ?

or

(d)

	Cr	Mn	Fe	Co	Ni	Cu
$E^\circ_{(M^{2+}/M)}$	-0.91	-1.18	-0.44	-0.28	-0.25	+0.34

From the given data of E° values, answer the following questions :

- (i) Why is $E^\circ_{Mn^{2+}}$ value highly negative as compared to other elements ?
 (ii) Which is a stronger reducing agent Cr^{2+} or Fe^{2+} ? Give reason.

SECTION-E

Directions (Q. Nos. 31-33) : The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

31. (i) What is starch?
 (ii) Draw the structure of Amylose.
 (iii) Draw the structure of Amylopectin.
32. Derive the integrated rate equation for a first order reaction.

or

Define threshold energy and activation energy. How are they related ?

33. Compare the chemistry of actinoids with that of lanthanoids with special reference to
1. Electronic configuration
 2. Oxidation state
 3. Atomic and ionic size
 4. Chemical reactivity

or

What is lanthanoid contraction? What are the consequences of lanthanoid contraction?

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