



Previous Year Solved Question Paper
of

G.A.T.E. (XL) 2008

LIFE SCIENCES

XL: Chemistry

Examination

(Original Question Paper with Answer Key)

GRADUATE APTITUDE TEST IN ENGINEERING



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XL : LIFE SCIENCES

Duration : Three Hours

Maximum Marks :150

Read the following instructions carefully

1. This question paper contains **32** printed pages including pages for rough work. Please check all pages and report discrepancy, if any.
2. Write your registration number, your name and name of the examination centre at the specified locations on the right half of the ORS.
3. Using HB pencil, darken the appropriate bubble under each digit of your registration number and the letters corresponding to your paper code.
4. All the questions in this question paper are of objective type.
5. Questions must be answered on **Objective Response Sheet (ORS)** by darkening the appropriate bubble (marked A, B, C, D) using HB pencil against the question number on the left hand side of the ORS. **Each question has only one correct answer.** In case you wish to change an answer, erase the old answer completely. More than one answer bubbled against a question will be treated as a wrong answer.
6. This question paper contains **six** sections as listed below. Section J is compulsory. Choose **two** more sections from the remaining sections **K** through **O**.

Section	Page	Section	Page
J. Chemistry	02	M. Botany	15
K. Biochemistry	06	N. Microbiology	22
L. Biotechnology	10	O. Zoology	26

Using HB pencil, mark the sections you have chosen by darkening the appropriate bubbles on the left hand side of the **Objective Response Sheet (ORS)** provided. **Make sure you have correctly bubbled the sections you have chosen. ORS will not be evaluated if this information is NOT marked.**

7. Each of the XL sections (J through O) carry 50 marks. Questions 1 through 6 are 1-mark questions, questions 7 through 28 are 2-mark questions. Questions 23 and 24 are a set of common data questions. The question pairs (25, 26) and (27, 28) are questions with linked answers. The answer to the second question of the above pairs will depend on the answer to the first question of the pair. If the first question in the linked pair is wrongly answered or is un-attempted, then the answer to the second question in the pair will not be evaluated.
8. Un-attempted questions will carry zero marks.
9. **NEGATIVE MARKING: (Sections J through O):** For Q.1 to Q.6, **0.25** mark will be deducted for each wrong answer. For Q.7 to Q.24, **0.5** mark will be deducted for each wrong answer. For the pairs of questions with linked answers, there will be negative marks only for wrong answer to the first question, i.e. for Q.25 and Q.27, **0.5** mark will be deducted for each wrong answer. There is no negative marking for Q.26 and Q.28.
10. Calculator **without data connectivity** is allowed in the examination hall.
11. Charts, graph sheets and tables are **NOT** allowed in the examination hall.
12. Rough work can be done on the question paper itself. Additional blank pages are given at the end of the question paper for rough work.

J : CHEMISTRY (*Compulsory*)

Useful data for Section J: Chemistry

$\ln 2 = 0.693$; $\ln 10 = 2.303$; $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1} = 0.083 \text{ L bar K}^{-1} \text{ mol}^{-1}$; $K_{sp}(\text{AgCl}) = 1.8 \times 10^{-10}$;
 $K_{sp}(\text{AgI}) = 8.3 \times 10^{-17}$; Trouton's constant = 85

Q. 1 – Q. 6 carry one mark each.

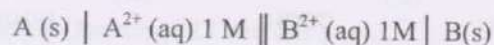
- Q.1 Which of the following will **NOT** conduct electricity?
 (A) Solid metallic Na (B) Solid NaCl (C) Aqueous NaCl (D) Fused NaCl
- Q.2 The region in which the following spectral lines are observed is
 P. Lyman series Q. Balmer series R. Paschen series
 (A) P – UV, Q – UV/Vis, R – IR (B) P – UV/Vis, Q – UV, R – IR
 (C) P – IR, Q – UV, R – Vis/IR (D) P – UV, Q – IR, R – UV/Vis
- Q.3 The pH of a 10^{-8} molar hydrochloric acid solution is
 (A) exactly 8 (B) between 7 and 8
 (C) exactly 7 (D) between 6 and 7
- Q.4 The plot of concentration of A against time is a straight line with negative slope for the reaction:

$$A \rightarrow \text{products}$$
 The order of the reaction is
 (A) –1 (B) 0 (C) 1 (D) 2
- Q.5 Among the following four amines, which one is **least basic** in aqueous solution?
 (A) CH_3NH_2 (B) $(\text{CH}_3)_2\text{NH}$ (C) $(\text{CH}_3)_3\text{N}$ (D) $\text{CH}_3\text{NHC}_6\text{H}_5$
- Q.6 Which of the following acids is used for the preparation of cyclohexene from cyclohexanol?
 (A) Conc. HNO_3 (B) 48% HBr
 (C) 85% H_3PO_4 (D) $(\text{COOH})_2$

Q. 7 to Q. 24 carry two marks each.

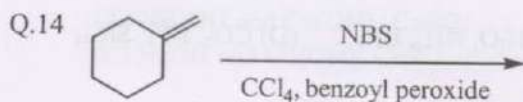
- Q.7 An aqueous mixture solution is prepared which contains 0.1 M of KCl and 0.1 M KI . To this solution, a drop of 0.01 M aqueous solution of AgNO_3 is added. Which of the following statement is correct?
 (A) A precipitate forms which is primarily AgI .
 (B) A precipitate forms which is primarily AgCl .
 (C) A precipitate forms which has equimolar amounts of AgCl and AgI .
 (D) There will be no precipitation, as there is no common ion between potassium and silver salts.
- Q.8 1 g L^{-1} solution of a protein exerts an osmotic pressure of 8.3×10^{-3} bar at 300 K. Calculate the molar mass of the protein.
 (A) 2490 g mol^{-1} (B) 3000 g mol^{-1} (C) 4578 g mol^{-1} (D) 6100 g mol^{-1}

- Q.9 An electrochemical cell of the following representation was found to be a galvanic cell, where 'A' and 'B' represent different metals.

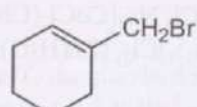
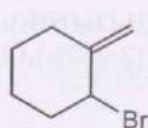
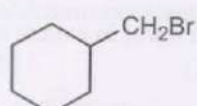
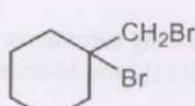


Which of the following statements with respect to the cell is correct?

- (A) The cell converts electrical energy to chemical energy spontaneously.
 (B) The cell uses electrical energy to deposit 'A' and dissolve 'B' spontaneously.
 (C) (A^{2+}/A) is a stronger reducing agent than (B^{2+}/B) .
 (D) (A^{2+}/A) is a stronger oxidizing agent than (B^{2+}/B) .
- Q.10 For a first order reaction at a particular temperature, the half-life was found to be $(100 \ln 2)$ seconds. The specific rate constant of the reaction is
 (A) $0.01\ s^{-1}$ (B) $100\ s^{-1}$ (C) $230\ s^{-1}$ (D) $693\ s^{-1}$
- Q.11 Liquid bromine boils at $59\ ^\circ\text{C}$. Assuming it to be a normal liquid, which of the following gives its standard molar enthalpy of vaporization?
 (A) $(8.314 \times 332)\ \text{J mol}^{-1}$ (B) $(85 \times 332)\ \text{J mol}^{-1}$
 (C) $(332 / 85)\ \text{J mol}^{-1}$ (D) $(332 / 8.314)\ \text{J mol}^{-1}$
- Q.12 The limiting molar conductivities of some species are given in $(\text{S cm}^2 \text{ mol}^{-1})$ units:
 $\Lambda^0(\text{HCl}) = 425.9$; $\Lambda^0(\text{NaCl}) = 126.4$; $\lambda^0(\text{H}^+) = 349.6$
 Find the limiting molar conductivity of Na^+ ion.
 (A) 50.1 (B) 76.3 (C) 299.5 (D) 476.0
- Q.13 The reactivity order for nitration of benzene, chlorobenzene, phenol and nitrobenzene is
 (A) Benzene > Chlorobenzene > Phenol > Nitrobenzene
 (B) Phenol > Benzene > Chlorobenzene > Nitrobenzene
 (C) Nitrobenzene > Phenol > Chlorobenzene > Benzene
 (D) Phenol > Chlorobenzene > Benzene > Nitrobenzene

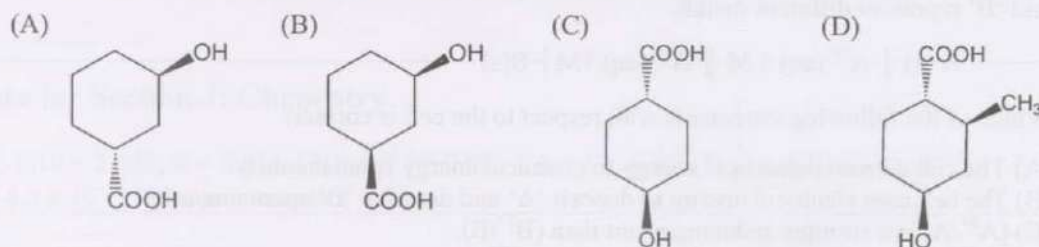


The major product in the above reaction is

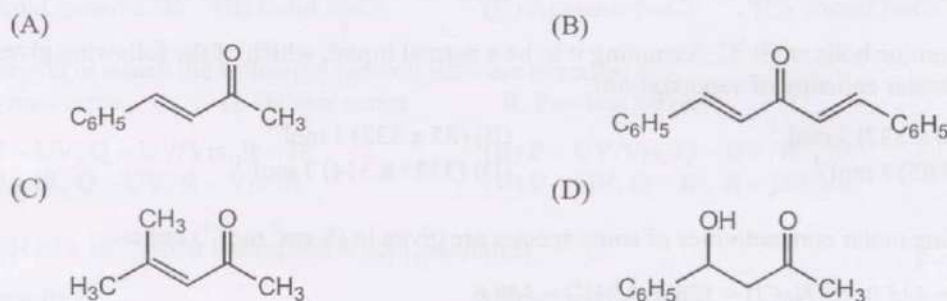
- (A)  (B) 
- (C)  (D) 

- Q.15 When a compound (M) is slowly heated with chloroform in alcoholic KOH solution, it produces an offensive smell. The compound M is
 (A) N,N-Diethylaniline (B) Diethylamine
 (C) Ethylamine (D) Triethylamine

Q.16 Which one of the following will lactonize in presence of acid?



Q.17 The major condensation product in the reaction of benzaldehyde with excess amount of acetone in presence of dilute NaOH solution is



Q.18 Ammonia gas can be dried over

- (A) conc. H_2SO_4 (B) anhydrous P_2O_5 (C) anhydrous CaO (D) anhydrous CaCl_2

Q.19 Which of the following molecules will have zero dipole moment?

H_2O , SiCl_4 , CO_2 , NH_3 , BF_3

- (A) H_2O , SiCl_4 , BF_3 (B) CO_2 , NH_3 , SiCl_4 (C) H_2O , NH_3 , BF_3 (D) CO_2 , BF_3 , SiCl_4

Q.20 Which of the following pairs of complexes will **NOT** show any ligand field $d-d$ transitions?

(A) $\text{K}_4[\text{Fe}(\text{CN})_6]$, $[\text{Ni}(\text{H}_2\text{O})_2(\text{NH}_3)_4]\text{SO}_4$

(B) $[\text{Cu}(\text{CH}_3\text{CN})_4]\text{Cl}$, $\text{Na}_3[\text{CoCl}_2(\text{CN})_4]$

(C) $[\text{Cu}(\text{CH}_3\text{CN})_4]\text{Cl}$, $[\text{Zn}(\text{NH}_3)_4]\text{Cl}_2$

(D) $[\text{Cu}(\text{H}_2\text{O})_2(\text{NH}_3)_4]\text{Cl}_2$, $[\text{Zn}(\text{H}_2\text{O})_4(\text{NH}_3)_4]\text{SO}_4$

Q.21 Which of the following substances will produce acidic oxides when burnt in excess air?
Sodium (P), Sulfur (Q) and Methane (R)

- (A) All three (B) Both Q and R (C) Only Q (D) Both P and R

Q.22 In the ring test for nitrate ion, the brown color is due to the formation of

(A) $[\text{Fe}(\text{H}_2\text{O})_5(\text{NO})]\text{SO}_4$

(B) $[\text{Fe}(\text{H}_2\text{O})_5(\text{NO}_2)]\text{SO}_4$

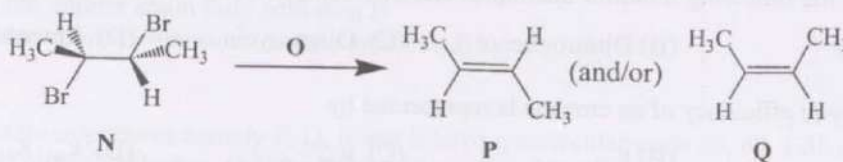
(C) $[\text{Fe}(\text{H}_2\text{O})_3(\text{NO})_3]\text{SO}_4$

(D) $[\text{Fe}(\text{H}_2\text{O})_5(\text{NO}_3)]\text{SO}_4$

Common Data Questions

Common Data for Questions 23 and 24:

The compound (N) on treatment with the reagent (O) gives an alkene.



- Q.23 The appropriate reagent (O) required for this transformation is
 (A) KOH / EtOH (B) NaOMe / MeOH
 (C) NaI / Acetone (D) NaNH₂
- Q.24 The alkene will be produced as
 (A) P exclusively since it is going through E2 mechanism
 (B) Q exclusively since it is going through E2 mechanism
 (C) Equal amount of P and Q since it is going through E1 mechanism
 (D) P as major amount since it is going through E1cB mechanism

Linked Answer Questions: Q.25 to Q.28 carry two marks each.

Statement for Linked Answer Questions 25 and 26:

CuSO₄ solution when treated with aqueous alkali (W) forms a blue precipitate (X), which dissolves on addition of excess W. Another aqueous alkali (Y) precipitates blue solid (Z) when reacted with CuSO₄, but the blue precipitate (Z) does not dissolve with excess alkali (Y).

- Q.25 Identify W and X
 (A) NH₄OH and Cu(OH)₂.CuSO₄ (B) NH₄OH and Cu(OH)₂
 (C) NaOH and Cu(OH)₂.CuSO₄ (D) NaOH and Cu(OH)₂
- Q.26 Identify Y and Z
 (A) NH₄OH and Cu(OH)₂.CuSO₄ (B) NH₄OH and Cu(OH)₂
 (C) NaOH and Cu(OH)₂.CuSO₄ (D) NaOH and Cu(OH)₂

Statement for Linked Answer Questions 27 and 28:

For a first order reversible reaction



at a temperature T, the standard molar free energy (ΔG^0) is equal to $-2.303RT$, and the rate constant of forward reaction (k_f) is $1 \times 10^{-3} \text{ s}^{-1}$.

- Q.27 The equilibrium constant of the reaction is
 (A) 23.03 (B) 19.09 (C) 10 (D) 1
- Q.28 The rate constant of the backward reaction (k_b) is
 (A) $5.26 \times 10^{-5} \text{ s}^{-1}$ (B) $1 \times 10^{-2} \text{ s}^{-1}$ (C) $4.35 \times 10^{-5} \text{ s}^{-1}$ (D) $1 \times 10^{-4} \text{ s}^{-1}$

END OF SECTION – J

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