



Previous Year Solved Question Paper
of

G.A.T.E. (XL) 2007

LIFE SCIENCES

XL: Chemistry

Examination

(Original Question Paper with Answer Key)

GRADUATE APTITUDE TEST IN ENGINEERING

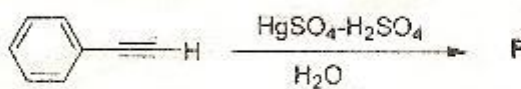


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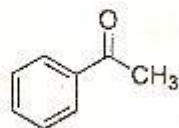
H : Chemistry (Compulsory)

Q. 1 – Q. 6 carry one mark each.

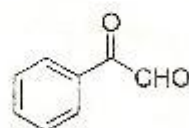
- Q.1 On the basis of VSEPR theory, the molecule which has a linear structure is
(A) SO_2 (B) N_2O (C) Cl_2O (D) NO_2
- Q.2 The geometries of $[\text{NiCl}_4]^{2-}$ and $[\text{PdCl}_4]^{2-}$ respectively are
(A) Tetrahedral and square planar
(B) Both tetrahedral
(C) Both square planar
(D) Square planar and tetrahedral
- Q.3 The ionization energy of hydrogen atom in ground state is 13.6 eV. The ionization energy of Li^{2+} in ground state would be
(A) 1.51 eV (B) 4.53 eV (C) 40.8 eV (D) 122.4 eV
- Q.4 The half-life of ^{14}C is 5730 years. An old sample of wood contains 25% of ^{14}C as would be found in a current living tree. The age of the sample of wood would be
(A) 1432 years (B) 2865 years (C) 5730 years (D) 11460 years
- Q.5 The product 'P' formed in the following reaction is



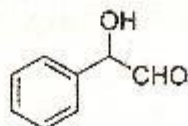
(A)



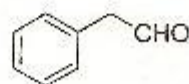
(B)



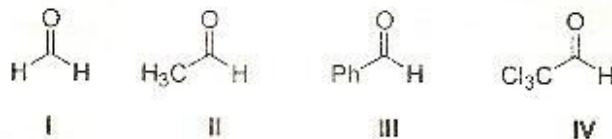
(C)



(D)



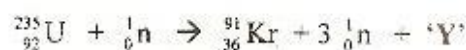
Q.6 The order of reactivity of the following aldehydes with a nucleophile is



- (A) I > II > III > IV (B) IV > I > II > III
 (C) IV > III > II > I (D) I > IV > II > III

Q. 7 – Q. 24 carry two marks each.

Q.7 In the nuclear reaction of $^{235}_{92}\text{U}$ with a neutron, two elements, Kr and 'Y', are formed along with three neutrons.



The element 'Y' is

- (A) $^{142}_{56}\text{Ba}$ (B) $^{142}_{55}\text{Cs}$ (C) $^{142}_{54}\text{Xe}$ (D) $^{142}_{53}\text{I}$

Q.8 Which of the following statements is true about diatomic species He_2 and He_2^+ ?

- (A) He_2 is stable AND He_2^+ is stable
 (B) He_2 is stable AND He_2^+ is unstable
 (C) He_2 is unstable AND He_2^+ is stable
 (D) He_2 is unstable AND He_2^+ is unstable

Q.9 For the reaction $\text{A} \rightleftharpoons \text{B}$, the activation energy for the forward reaction is 123 kJ/mol. The activation energy for the reverse reaction is 140 kJ/mol. The enthalpy change for the forward reaction is

- (A) 263 kJ/mol (B) -263 kJ/mol (C) 17 kJ/mol (D) -17 kJ/mol

Q.10 The acid dissociation constant of a weak acid HA is 10^{-5} . A 0.20 M solution of the acid HA also contains 0.10 M of salt MA. The pH of the solution is

- (A) 0.69 (B) 1.0 (C) 2.85 (D) 5.0

Q.11 The attractive part of the van der Waals interaction, $-B/r^6$, where B is a positive coefficient and r is the distance between the molecules, is governed by

- (A) dipole-dipole interaction
 (B) charge-dipole interaction
 (C) induced dipole-induced dipole interaction
 (D) dipole-induced dipole interaction

Q.12 A fuel cell is based on the idea of the reaction $\text{H}_2(\text{g}) + \frac{1}{2} \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$ generating electricity. The standard free energy change (ΔG°) for this reaction at 298 K is -237.13 kJ/mol . The standard cell potential for the system at 298 K is (1 Faraday = 96500 coulombs)

- (A) 2.457 volts (B) 1.228 volts (C) -1.228 volts (D) -2.457 volts

Q.13 The electron-deficient molecule is

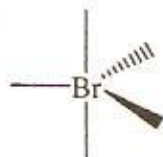
- (A) N_2H_4 (B) C_2H_6 (C) B_2H_6 (D) O_2H_2

Q.14 The complex with crystal field stabilization energy (CFSE) of $-0.4 \Delta_1$ is

- (A) $[\text{TiCl}_4]$ (B) $[\text{MnCl}_4]^{2-}$ (C) $[\text{CoCl}_4]^{2-}$ (D) $[\text{CuCl}_4]^{2-}$

Q.15 The most stable geometry of BrF_5 is

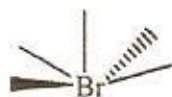
(A)



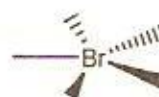
(B)



(C)



(D)



Q.16 The species having three unpaired electrons and tetrahedral geometry is

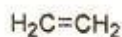
- (A) $[\text{Co}(\text{CN})_6]^{4-}$ (B) $[\text{CoCl}_4]^{2-}$ (C) $[\text{Ni}(\text{CN})_4]^{2-}$ (D) $[\text{NiCl}_4]^{2-}$

Q.17 The correct arrangement of group 13 elements in terms of increasing average M-Cl bond energy in MCl_3 compounds is

- (A) $\text{Al} > \text{Ga} > \text{In} > \text{Tl}$
 (B) $\text{Tl} > \text{In} > \text{Ga} > \text{Al}$
 (C) $\text{Al} > \text{Ga} > \text{Tl} > \text{In}$
 (D) $\text{Ga} > \text{In} > \text{Tl} > \text{Al}$

Q.18 Which of the following olefins leads to a racemic mixture of the diol product upon *cis*-dihydroxylation?

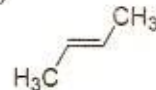
(A)



(B)



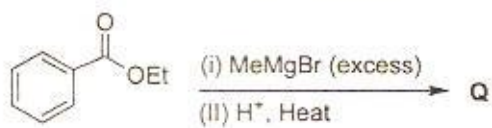
(C)

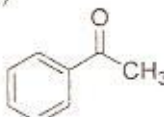
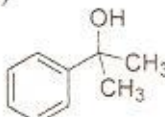
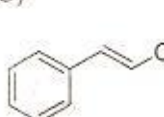
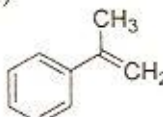


(D)

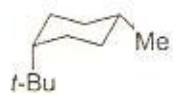
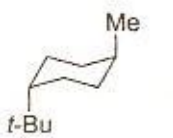




Q.19 The major product 'Q' formed in the following reaction is

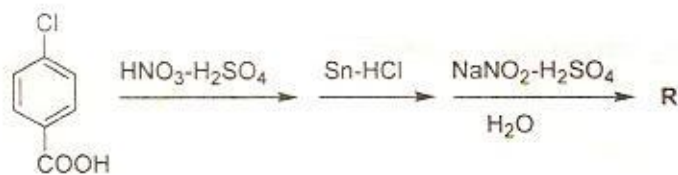


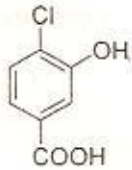
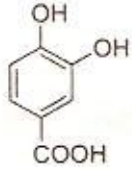
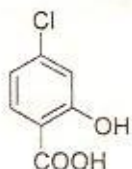
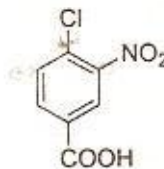
- (A)  (B)  (C)  (D) 

Q.20 The most stable conformation of *cis*-1-*tert*-butyl-4-methylcyclohexane is

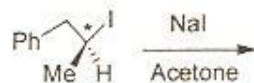
- (A)  (B) 
 (C)  (D) 

Q.21 The major product 'R' formed in the following reaction sequence is



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

- Q.22 The following optically active compound undergoes racemization upon reaction with NaI in acetone.



The pathway followed by the reaction is

- (A) $\text{S}_{\text{N}}1$ (B) $\text{S}_{\text{N}}2$ (C) E1 (D) E2

Common Data Questions

Common Data for Questions 23 & 24:

The equilibrium constant (K) for the reaction $\text{Ag}_2\text{CO}_3(\text{s}) \rightleftharpoons \text{Ag}_2\text{O}(\text{s}) + \text{CO}_2(\text{g})$ varies with temperature T as

| | | |
|---------|-----------------------|------|
| T(in K) | 400 | 500 |
| K | 1.41×10^{-2} | 1.41 |

- Q.23 The standard free energy change (ΔG^0) for the above reaction at 500 K is ($R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)
- (A) -0.62 kJ/mol (B) -1.43 kJ/mol (C) 0.62 kJ/mol (D) 1.43 kJ/mol
- Q.24 Assuming that the standard enthalpy change (ΔH^0) for the above reaction is constant in this temperature range, its value is
- (A) 33.3 kJ/mol (B) 76.6 kJ/mol (C) -33.3 kJ/mol (D) -76.6 kJ/mol

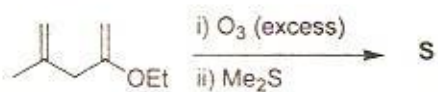
Linked Answer Questions: Q. 25 to Q. 28 carry two marks each.

Statement for Linked Answer Questions 25 & 26:

A solid compound **X** on heating produces a new solid **P** and a gas **Q**. The gas **Q** is absorbed by KOH.

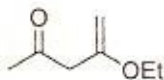
- Q.25 The gas **Q** is
- (A) CO_2 (B) O_2 (C) N_2 (D) NH_3
- Q.26 The reaction between **P** and water forms a new compound **R**. Compound **R** gives bleaching powder on reaction with Cl_2 . The compound **X** is
- (A) NH_4NO_2 (B) KClO_3 (C) CaCO_3 (D) CuFeS_2

Statement for Linked Answer Questions 27 & 28:

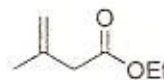


Q.27 The structure of 'S' is

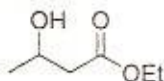
(A)



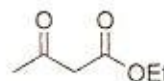
(B)



(C)



(D)



Q.28 The name reaction by which the product 'S' may be readily prepared is

(A) Aldol condensation

(B) Benzoin condensation

(C) Claisen condensation

(D) Perkin condensation

END OF THE SECTION

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