

RAMAKRISHNA MISSION VIDYAMANDIRA

Belur Math, Howrah – 711 202

UG ADMISSION TEST – 2024

INDUSTRIAL CHEMISTRY

Date : 18-06-2024

Full Marks : 50

Time: 3:00 p.m. – 4:00 p.m.

Instructions for the candidate

Answer all the questions given below. Each question carries 2 marks for correct answer and –1 mark for wrong answer. Tick (✓) the correct option on the **ANSWER SHEET** provided along with this question. The tick must be very clear — if it is smudgy or not clear, no marks will be awarded. Unanswered questions will not be awarded. Multiple answers will be considered as wrong answer. **Calculator is allowed.**

- Experimentally it was found that a metal oxide has formula $M_{0.98}O$. Metal M, present as M^{2+} and M^{3+} in its oxide. % of metal which exists as M^{3+} would be
(a) 7.01% (b) 4.08% (c) 6.05% (d) 5.08%
- Electrolysis of dilute aqueous NaCl solution was carried out by passing 10 mA current. The time required to liberate 0.01 mole of H_2 gas at the cathode is ($1 F = 96500 C mol^{-1}$)
(a) $9.65 \times 10^4 s$ (b) $19.3 \times 10^4 s$ (c) $28.95 \times 10^4 s$ (d) $38.6 \times 10^4 s$
- Addition of 0.643 g of a compound to 50 ml of benzene (density: 0.879 g/ml) lowers the freezing point from $5.51^\circ C$ to $5.03^\circ C$. If K_f for benzene is 5.12, the molecular weight of the compound would be
(a) 156 g/mol (b) 160 g/mol (c) 165 g/mol (d) 150 g/mol
- The equivalent conductance of NaCl at concentration C and at infinite dilution is λ_c and λ_∞ , respectively. The correct relationship between λ_c and λ_∞ is given as (where, the constant B is positive)
(a) $\lambda_c = \lambda_\infty + B C$
(b) $\lambda_c = \lambda_\infty - B C$
(c) $\lambda_c = \lambda_\infty + B \sqrt{C}$
(d) $\lambda_c = \lambda_\infty - B \sqrt{C}$
- For a first order reaction, $A \rightarrow P$, the temperature (T) dependent rate constant (k) was found to follow the equation: $\log k = \frac{2000}{T} = 6.0$, the pre-exponential factor A and the activation energy E_a , respectively, are
(a) $10^6 s^{-1}$ and $9.2 kJ mol^{-1}$
(b) $6 s^{-1}$ and $16.6 kJ mol^{-1}$
(c) $10^6 s^{-1}$ and $16.6 kJ mol^{-1}$
(d) $10^6 s^{-1}$ and $38.3 kJ mol^{-1}$

6. Consider a reaction, $aG + bH \rightarrow \text{products}$. When concentration of both the reactants G and H is double, the rate increases by eight times. However, when concentration of G is double keeping the concentration of H fixed, the rate is double. The overall order of the reaction is
 (a) 0 (b) 1 (c) 2 (d) 3
7. ${}^{27}_{13}\text{Al}$ is a stable isotope. ${}^{29}_{13}\text{Al}$ is expected to decay by
 (a) α -emission (b) β -emission (c) positron emission (d) proton emission
8. Methylene blue, from its aqueous solution, is adsorbed on activated charcoal at 25 °C. For this process, the correct statements is
 (a) The adsorption requires activation at 25 °C
 (b) The adsorption is accompanied by a decreases in enthalpy
 (c) The adsorption increases with increase of temperature
 (d) The adsorption is irreversible
9. Hydrogen peroxide in its reaction with KIO_4 and NH_2OH respectively, is acting as a
 (a) Reducing agent, oxidizing agent (b) Reducing agent, reducing agent
 (c) Oxidizing agent, oxidizing agent (d) Oxidizing agent, reducing agent
10. MeSiCl_2 on hydrolysis will produce
 (a) $(\text{Me})_2\text{Si}(\text{OH})_2$ (b) $(\text{Me})_2\text{Si}=\text{O}$ (c) $[-\text{O}-(\text{Me})_2\text{Si}-\text{O}-]_n$ (d) $(\text{Me})_2\text{SiCl}(\text{OH})$
11. Which of the following is incorrect statement?
 (a) NO is heavier than O_2
 (b) The formula of heavy water is D_2O
 (c) N_2 diffuses faster than O_2 through an orifice
 (d) NH_3 can be used as a refrigerant
12. On heating ammonium dichromate, the gas evolved is
 (a) O_2 (b) NH_3 (c) NO (d) N_2
13. Spin only magnetic moment of the compound $\text{Hg}[\text{Co}(\text{SCN})_4]$ is
 (a) $\sqrt{3}$ (b) $\sqrt{15}$ (c) $\sqrt{24}$ (d) $\sqrt{8}$
14. The chemical composition of 'slag' formed during the smelting process in the extraction of copper is
 (a) $\text{Cu}_2\text{O} + \text{FeS}$ (b) FeSiO_3 (c) CuFeS_2 (d) $\text{Cu}_2\text{S} + \text{FeO}$

15. In Carius method of estimation of halogens 250 mg of an organic compound gave 141 mg of AgBr. The % of Br in the compound is (atomic mass, Ag = 108, Br = 80)
- (a) 24 (b) 36 (c) 48 (d) 60
16. In nitroprusside ion the iron and NO exist as Fe (II) and NO^+ rather than Fe(III) and NO. These forms can be differentiated by
- (a) Estimated the concentration of iron
(b) Measuring the concentration of CN
(c) Measuring the solid state magnetic moment
(d) Thermally decomposing the component
17. Which of the following compound will exhibit geometrical isomerism?
- (a) 1-phenyl-2-butene
(b) 3-phenyl-1-butene
(c) 2-phenyl-1-butene
(d) 1,1-diphenyl-2-propene
18. A gaseous hydrocarbon gives upon combustion 0.72 g of water and 3.08 g of CO_2 . The empirical formula of the hydrocarbon is
- (a) C_2H_4 (b) C_3H_4 (c) C_6H_5 (d) C_7H_8
19. The hyper-conjugative stabilities of tert-butyl cation and 2-butene, respectively, are due to
- (a) $\sigma \rightarrow \text{p}$ (empty) and $\sigma \rightarrow \pi^*$ electron delocalisations
(b) $\sigma \rightarrow \sigma^*$ and $\sigma \rightarrow \pi$ electron delocalisations
(c) $\sigma \rightarrow \text{p}$ (filled) and $\sigma \rightarrow \pi$ electron delocalisations
(d) p (filled) $\rightarrow \sigma^*$ and $\sigma \rightarrow \pi^*$ electrons delocalisations
20. Which one of the following has the smallest heat of hydrogenation per mole?
- (a) 1-butene (b) trans-2-butene (c) cis-2-butene (d) 1,3-butadiene
21. The reaction of propene with HOCl proceeds via the addition of
- (a) H^+ in the first step
(b) Cl^+ in the first step
(c) OH^- in the first step
(d) Cl^+ and OH^- single step

22. The order of reactivities of the following alkyl halides for a S_N2 reaction is

- (a) $RF > RCl > RBr > RI$ (b) $RF > RBr > RCl > RI$
(c) $RCl > RBr > RF > RI$ (d) $RI > RBr > RCl > RF$

23. In reaction, $CH_3COOH \xrightarrow{LiAlH_4} A \xrightarrow{PCl_5} B \xrightarrow{Alc. KOH} C$, the product C is

- (a) Acetaldehyde (b) acetylene (c) ethylene (d) acetyl chloride

24. A decapeptide (molecular weight: 796) on complete hydrolysis gives glycine (molecular weight 75), alanine and phenylalanine. Glycine contributes 47.0% to the total weight of the hydrolysed products. The number of glycine units present in the decapeptide is

- (a) 4 (b) 5 (c) 3 (d) 6

25. Identify the type of polymer

(i) $-A-A-A-A-A-A-A-A$

(ii) $-A-B-B-A-A-A-B-A$

- (a) (i) homopolymer, (ii) copolymer
(b) (i) natural polymer, (ii) synthetic polymer
(c) (i) linear polymer, (ii) branched polymer
(d) (i) fibre, (ii) elastomer

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