RAMAKRISHNA MISSION VIDYAMANDIRA

Belur Math, Howrah – 711 202

ADMISSION TEST – 2023

INDUSTRIAL CHEMISTRY (Honours)

Date : 14-07-2023 **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 **OMR 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 not allowed**.*

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1. The number of moles of $KMnO_4$ that will be needed to react with one mole of sulphite ion in acidic solution is

   a) $\frac{2}{5}$ b) $\frac{3}{5}$ c) $\frac{4}{5}$ d) 1

2. The oxidation number of phosphorus in $Ba(H_2PO_2)_2$ is

   a) +3 b) +2 c) +1 d) -1

3. Which of the following is the energy of a possible excited state of hydrogen?

   a) +13.6 eV
   b) -6.8 eV
   c) -3.4 eV
   d) +6.8 eV

4. The correct order of radii is

   a) N < Be < B
   b) $F^- < O^{2-} < N^{3-}$
   c) Na < Li < K
   d) $Fe^{3+} < Fe^{2+} < Fe^{4+}$

5. Molecular shape of SF_4, CF_4 and XeF_4 are

   a) the same with 2,0 and 1 lone pair of electrons respectively
   b) the same with 1,1 and 1 lone pair of electrons respectively
   c) the different with 0,1 and 2 lone pair of electrons respectively
   d) the different with 1,0 and 2 lone pair of electrons respectively

6. The compressibility factor for an ideal gas is

   a) 1.5 b) 1.0 c) 2.0 d) ∞

7. The pK_a of acetyl salicylic acid (aspirin) is 3.5. The pH of gastric juice in human stomach is about 2-3 and the pH in the small intestine is about 8. Aspirin will be

   a) unionized in the small intestine and in the stomach
   b) completely ionized in the small intestine and in the stomach
   c) ionized in the stomach and almost unionized in the small intestine
   d) ionized in the small intestine and almost unionized in the stomach

8. Which of the following statement is false?

a) Work is a state function
b) Temperature is a state function
c) Change in the state is completely defined when the initial and final states are specified
d) Work appears at the boundary of the system.

9. The succeeding operations that enable this transformation of states are

a) heating, cooling, heating, cooling
b) cooling, heating, cooling, heating
c) heating, cooling, cooling, heating
d) cooling, heating, heating, cooling

10. CsCl crystallises in body centred cubic lattice. If 'a' its edge length, then which of the following expressions is correct?

a) $r_{Cs+} + r_{Cl-} = 3a$
b) $r_{Cs+} + r_{Cl-} = \frac{3a}{2}$
c) $r_{Cs+} + r_{Cl-} = \frac{\sqrt{3}}{2}a$
d) $r_{Cs+} + r_{Cl-} = \sqrt{3}a$

11. During depression of freezing point in a solution the following are in equilibrium

a) liquid solvent, solid solvent
b) liquid solvent, solid solute
c) liquid solute, solid solute
d) liquid solute, solid solvent

12. The correct order of equivalent conductance at infinite dilution of LiCl, NaCl and KCl is

a) LiCl > NaCl > KCl
b) KCl > NaCl > LiCl
c) NaCl > NaCl > LiCl
d) LiCl > KCl > NaCl

13. The specific rate constant of a first order reaction depends on the

a) concentration of the reactant
b) concentration of the product
c) time
d) temperature

14. In which of the following reactions H_2O_2 acts as a reducing agent ?

I. $H_2O_2 + 2H^+ + 2e^- \longrightarrow 2H_2O$
II. $H_2O_2 - 2e^- \longrightarrow O_2 + 2H^+$
III. $H_2O_2 + 2e^- \longrightarrow 2OH^-$
V. $H_2O_2 + 2OH^- - 2e^- \longrightarrow O_2 + 2H_2O$

a) I and II
b) III and IV
c) I and III
d) II and IV

15. In compounds of type ECl_3 where E = B, P, As or Bi the angles Cl – E – Cl for different E are in the order

a) B > P = As = Bi
b) B > P > As > Bi
c) B < P = As = Bi
d) B < P < As < Bi

16. The colour of light absorbed by an aqueous solution of $CuSO_4$ is -

a) orange-red
b) blue-green
c) yellow
d) violet

17. Amongst $Ni(CO)_4$, $[Ni(CN)_4]^{2-}$ and $NiCl_4^{2-}$

a) $Ni(CO)_4$ and $NiCl_4^{2-}$ are diamagnetic and $[Ni(CN)_4]^{2-}$ is paramagnetic
b) $NiCl_4^{2-}$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $Ni(CO)_4$ is paramagnetic
c) $Ni(CO)_4$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $NiCl_4^{2-}$ is paramagnetic
d) $Ni(CO)_4$ is diamagnetic and $NiCl_4^{2-}$ and $[Ni(CN)_4]^{2-}$ is paramagnetic

18. Hyperconjugation involves overlap of the following orbitals —

a) $\sigma - \sigma$ b) $\sigma - p$ c) $p - p$ d) $\pi - \pi$

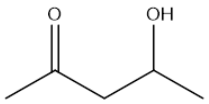
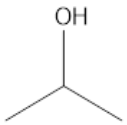
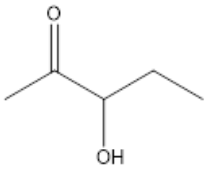
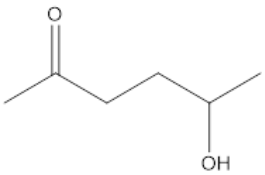
19. Which of the following compounds does not dissolve in conc. H_2SO_4 even on warming ?

a) Ethylene b) Benzene c) Hexane d) Aniline

20. Identify a reagent from the following list which can easily distinguish between 1-butyne and 2-butyne.

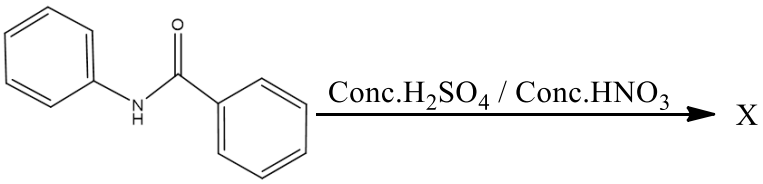
a) bromine, CCl_4
b) H_2, Lindlar catalyst
c) dilute H_2SO_4, $HgSO_4$
d) ammoniacal $CuCl_2$ solution

21. Which one of the following will most readily be dehydrated in acidic condition ?

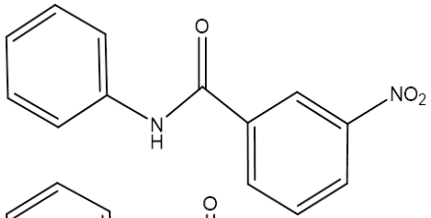
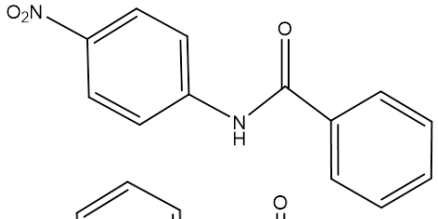
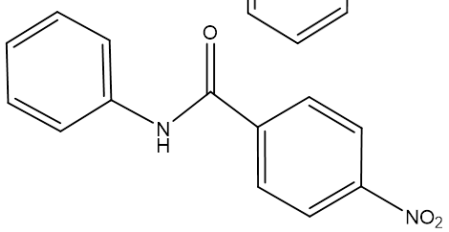
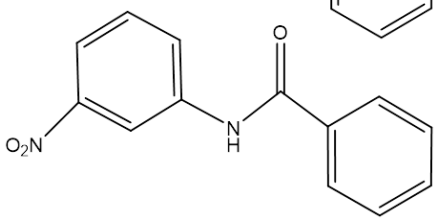
a) 
b) 
c) 
d) 

22. Carbylamine test is performed in alc. KOH by heating a mixture of —

a) chloroform and silver powder
b) trihalogenated methane and primary amine
c) an alkyl halide and a primary amine
d) an alkyl cyanide and a primary amine

23. 

Here X is —

a) 
b) 
c) 
d) 

24. Low density polythene (LDP) is used in the insulation of electricity carrying wires and manufacture of flexible pipes and squeeze bottles because —

a) It is tough, hard and rigid
b) It is chemically inert, tough, flexible and poor conductor of electricity
c) It is very tough, good conductor of electricity and flexible
d) It is chemically inert, very soft, water absorbent and poor conductor of heat

25. The main difference between bathing and washing soap is —

a) bathing soaps are potassium salts of fatty acids while washing soaps are sodium salts of fatty acids
b) bathing soaps are sodium salts of fatty acids while washing soaps are potassium salts of fatty acids
c) bathing soaps are cationic in nature while washing soaps are anionic
d) bathing soaps are calcium salts of fatty acids while washing soaps are magnesium salts of fatty acids

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