RAMAKRISHNA MISSION VIDYAMANDIRA

Belur Math, Howrah – 711 202

ADMISSION TEST – 2022

INDUSTRIAL CHEMISTRY (Honours)

Date : 29-06-2022 **Full Marks : 50** Time: 01·00 p.m. – 2·00 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**. 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. Which compound is likely to have an incomplete octet?

   a) P_2O_5 b) BCl_3 c) PH_3 d) HF

2. Select the pair of the substances which is not a conjugate acid-base pair?

   a) H_2O & H_3O^+ b) HSO_4^- & H_2SO_4 c) NH_2^- & NH_3 d) H_2S & S^{2-}

3. Na^+, Mg^{2+}, Al^{3+} and Si^{4+} are isoelectronic. The order of their ionic size is

   a) $Na^+ > Mg^{2+} < Al^{3+} < Si^{4+}$ b) $Na^+ < Mg^{2+} > Al^{3+} > Si^{4+}$

   c) $Na^+ > Mg^{2+} > Al^{3+} > Si^{4+}$ d) $Na^+ < Mg^{2+} > Al^{3+} < Si^{4+}$

4. The correct order of the O-O bond length in O_2, H_2O_2 and O_3 is

   a) $O_2 > H_2O_2 > O_3$ b) $H_2O_2 > O_3 > O_2$

   c) $O_2 > O_3 > H_2O_2$ d) $O_3 > H_2O_2 > O_2$

5. At what temperature, the rate of effusion of N_2 would be 1.625 times than the rate of SO_2 at 500°C?

   a) 373°C b) 620°C c) 110°C d) 173°C

6. In the reactions: $S + 3/2\ O_2 \rightarrow SO_3 + 2x$ kcal and $SO_2 + 1/2\ O_2 \rightarrow SO_3 + y$ kcal, the heat of formation of SO_2 is

   a) $(2x + y)$ b) $(x - y)$ c) $(x + y)$ d) $(2x - y)$

7. 0.1 M solution of which one of these substances will act basic?

   a) Sodium borate b) Ammonium chloride c) Calcium Nitrate d) Sodium sulphate

8. Molecular bonding between two sp^2 hybridized carbons utilizes

   a) a sigma bond and a pi bond b) two sigma bonds

   c) two pi bonds d) None of these

9. Structure of a mixed oxide is cubic close packed (ccp). The cubic unit cell of mixed oxide is composed of oxide ions. One fourth of the tetrahedral voids are occupied by divalent metal A and the octahedral voids are occupied by a monovalent metal B. The formula of the oxide is

a) ABO_2 b) A_2BO_2 c) $A_2B_3O_4$ d) AB_2O_2

10. Which of the following amines can form hydrogen bonds with water?

a) 2° and 3° b) 1° and 2° c) 1°, 2° and 3° d) 1° and 3°

11. 4.5 g of aluminium (at. Mass 27 amu) is deposited at cathode from Al^{3+} solution by a certain quantity of electric charge. The volume of hydrogen produced at STP from H^+ ions in solution by the same quantity of electric charge will be

a) 44.8 L b) 22.4 L c) 11.2 L d) 5.6 L

12. The given reaction, $2FeCl_3 + SnCl_2 \rightarrow 2FeCl_2 + SnCl_4$ is an example of

a) third order reaction b) first order reaction c) second order reaction d) none of these

13. When a biochemical reaction is carried out in laboratory, outside the human body in absence of enzyme, then rate of reaction obtained is 10^{-6} times, the activation energy of reaction in the presence of enzyme is

a) 6/RT b) P is required

c) different from E_a obtained in laboratory d) Can't say anything

14. It is possible to obtain oxygen from air by fractional distillation because

a) oxygen is in a different group of the periodic table from nitrogen

b) oxygen is more reactive than nitrogen

c) oxygen has higher boiling point than nitrogen

d) oxygen has a lower density than nitrogen.

15. Each of the following is true for white and red phosphorus except that they

a) are both soluble in CS_2 b) can be oxidized by heating in air

c) consist of the same kind of atoms d) can converted into one another.

16. The most convenient method to protect the bottom of ship made of iron is

a) coating it with red lead oxide b) white tin plating

c) connecting it with Mg block d) connecting it with Pb block

17. The number of geometrical isomers of the complex $[Co(NO_2)_3(NH_3)_3]$ is

a) 4 b) 0 c) 2 d) 3

18. Benzene reacts with n-propyl chloride in the presence of anhydrous $AlCl_3$ to give

a) 3-propyl-1-chlorobenzene b) n-propylbenzene

c) no reaction d) isopropylbenzene

19. Phenol is heated with $CHCl_3$ and aqueous KOH when salicylaldehyde is produced. This reaction is known as

a) Rosenmund's reaction
b) Reimer-Tiemann reaction
c) Friedel-Crafts reaction
d) Sommelet reaction

20. The relative reactivities of acyl compounds towards nucleophilic substitution are in the order of

a) acid anhydride > amide > ester > acyl chloride

b) acyl chloride > ester > acid anhydride > amide

c) acyl chloride > acid anhydride > ester > amide

d) ester > acyl chloride > amide > acid anhydride

21. Clemmensen reduction of a ketone is carried out in the presence of which of the following?

a) Glycol with KOH b) Zn-Hg with HCl c) $LiAlH_4$ d) H_2 and Pt as catalyst

22. Method by which aniline cannot be prepared is

a) degradation of benzamide with bromine in alkaline solution

b) reduction of nitrobenzene with H_2/Pd in ethanol

c) potassium salt of phthalimide treated with chlorobenzene followed by hydrolysis with aqueous NaOH solution

d) hydrolysis of phenylisocyanide with acidic solution.

23. Aniline is reacted with bromine water and the resulting product is treated with an aqueous solution of sodium nitrite in presence of dilute hydrochloric acid. The compound so formed is converted into a tetrafluoroborate which is subsequently heated to dry. The final product is

a) p-bromoaniline
b) p-bromofluorobenzene
c) 1, 3, 5 - tribromobenzene
d) 2, 4, 6- tribromofluorobenzene

24. Which one of the following statements is not true?

a) Buna-S is a copolymer of butadiene and styrene.

b) Natural rubber is a 1,4-polymer of isoprene.

c) In vulcanization, the formation of Sulphur bridges between different chains make rubber harder and stronger.

d) Natural rubber has the trans-configuration at every double bond.

25. Aspirin is an acetylation product of

a) m-Hydroxybenzoic acid
b) o-Dihydroxybenzene
c) o-Hydroxybenzoic acid
d) m-Dihydroxybenzene

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