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**Undergraduate Admission Test 2023:** Chemistry Honours

**Full Marks : 75**   **Time : 1 hour**

1. In a f.c.c. crystal, A atoms are at the corners and B atoms are present at the centre of each face. If one atom is detached from one corner of the unit cell, the general formula of the compound will be

   (a) A_7B_3 (b) AB_3 (c) A_7B_{24} (d) $A_{7/8}B_5$

2. A 2.0L container at 25^oC contains 1.25 mol of oxygen and 3.3 mol of carbon. If oxygen reacts completely to form CO, what will be the final pressure?

   (a) 30.6 atm   (b) 20.6 atm   (c) 03.6 atm   (d) 13.6 atm

3. The density of the water at room temperature is 1g/mL. How many molecules are there in a drop of water if its volume is 0.05mL?

   (a) 1.68×10^{21} molecules   (b) 1.28×10^{21} molecules

   (c) 1.68×10^{11} molecules   (d) 6.18×10^{21} molecules

4. If solubility product of $Zr_3(PO_4)_4$ is denoted by K_{sp} and its molar solubility is denoted by S, then which of the following is correct?

   (a) $S = \left(\dfrac{K_{sp}}{144} \right)^{1/6}$ (b) $S = \left(\dfrac{K_{sp}}{216} \right)^{1/7}$ (c) $S = \left(\dfrac{K_{sp}}{929} \right)^{1/9}$ (d) $S = \left(\dfrac{K_{sp}}{6912} \right)^{1/7}$

5. Equal weights of ethane and hydrogen are mixed in an empty container at 25^oC. The fraction of total pressure exerted by hydrogen is

   (a)   1:2   (b)   1:1   (c)   1:16   (d)   15:16

6. Find the unit of the rate constant of a reaction represented with rate equation, rate = $k[A]^{1/2}[B]^{1/2}$

   (a) $mol^{-1}Ls^{-1}$ (b) s^{-1} (c) $mol^-L^{-1}s^{-1}$ (d) $mol^{-2}L^2s^{-1}$

7. The plot of concentration of a reactant versus time for a reaction is a straight line with a negative slope. This reaction follows

(a) zero order reaction

(b) 1st order reaction

(c) 2nd order reaction

(d) 3rd order reaction

8. The entropy change in the fusion of one mole of a solid melting at 27^oC (latent heat of fusion is 2930 $Jmol^{-1}$) is

(a) 9.77 $JK^{-1}mol^{-1}$

(b) 10.73 $JK^{-1}mol^{-1}$

(c) 2930 $JK^{-1}mol^{-1}$

(d) 108.5$JK^{-1}mol^{-1}$

9. A metal crystallizes into two cubic phases, *fcc* and *bcc* whose unit cell lengths are 3.5A^o and 3.0A^o respectively. Calculate the ratio of densities of *fcc* and *bcc*.

(a) 1.259   (b) 2.599   (c) 1.599   (d) 5.009

10. Reagent for the following reaction is-
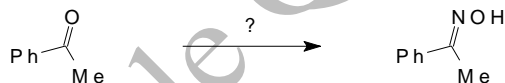
(a) $NH_2OH.HCl, MeCO_2Na$ (b) 2,4-DNP   (c) $PhNHNH_2. HCl, NaOCOCH_3$ (d) None of these

11. Products of the following reaction are-
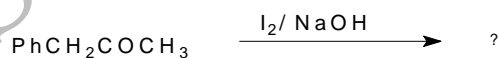
(a) $PhCO_2Na, CHI_3$ (b) $PhCH_2CO_2Na, CHI_3$ (c) $PhCHO, CHI_3$ (d) $PhCOCO_2Na, CHI_3$

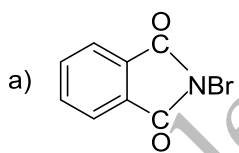**12.** Which product do you expect from the following reaction?

$$CH_3CH_2CHO \xrightarrow{\quad H^{\oplus} \quad} ?$$

(a)
$$CH_3CH_2CH=\underset{\underset{CH_3}{|}}{C}-CHO$$

(b)
$$CH_3CH_2\underset{\underset{CH_3}{|}}{C}=CH-CHO$$

(c)
$$CH_3CH_2\underset{\underset{CH_3}{|}}{CH}\overset{\overset{OH}{|}}{CH}-CHO$$

(d) None of these
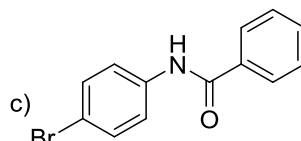
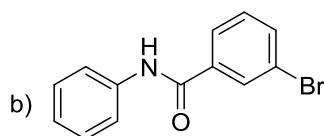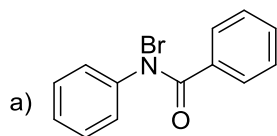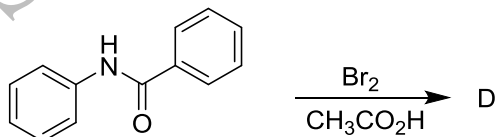**13.** Correct IUPAC name of the following compound is:
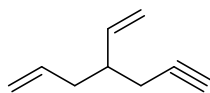
(a) 4-ethenylhept-1-en-6-yne

(b) 4-vinylhept-6-en-1-yne

(c) 4-ethenylhept-6-en-1-yne
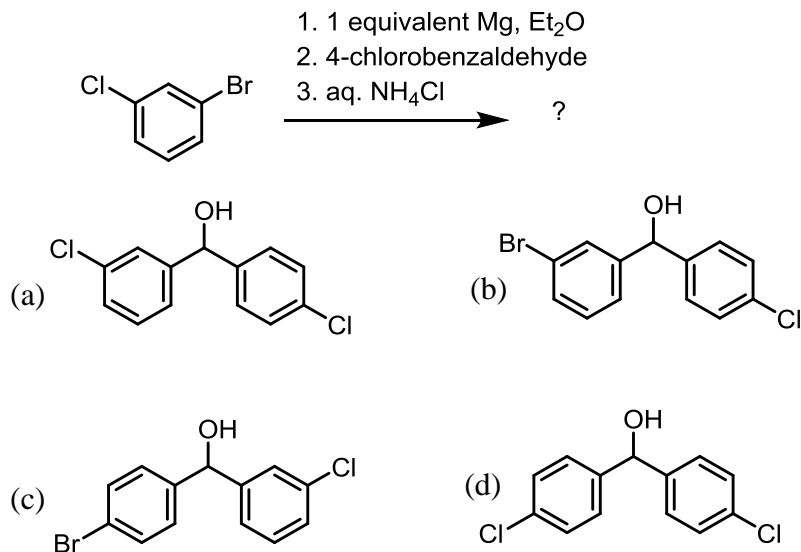
(d) 4(3-propenyl)hex-5-ene-1-yne

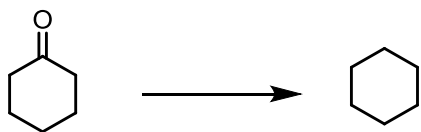**14.** Identify 'C' in the following sequence of reaction:
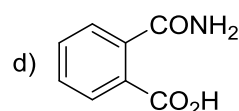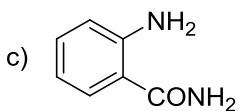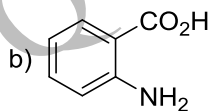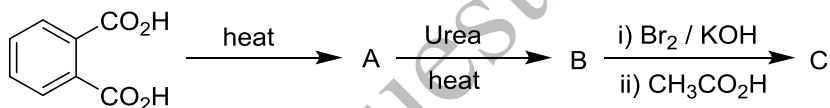
15. Identify the major mono-brominated product 'D' in the reaction below:
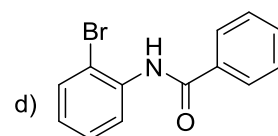
16. The product of following reaction is:

1. 1 equivalent Mg, Et$_2$O
2. 4-chlorobenzaldehyde
3. aq. NH$_4$Cl

?

(a)

(b)

(c)

(d)

17. The following conversion can be carried out by:

(a) Zn-Hg/HCl (b) i. NH$_2$NH$_2$ ii. NaCl in ethylene glycol, heat (c) HSCH$_2$CH$_2$SH/H$^+$

(d) Bromine-water.

18. What is the third largest constituent of Earth's atmosphere?

(a) Oxygen (b) Nitrogen (c) Argon (d) Krypton.

19. $^{238}U_{92}$ disintegrates to give an end product $^{206}Pb_{82}$.Total number of particles emitted are

(a) 8α, 6β (b) 6α, 8β   (c) 6α, 10β   (d) 10α, 10β.

20. What is the oxidation state of Ga in GaCl$_2$?

(a) 2   (b) 3   (c) 4   (d) 1 and 3

21. What is the coordination number of Te in Telluric acid?

(a) 2   (b) 4   (c) 6   (d) 8

22. If 50 mL 0.02(M) H_2SO_4 solution is mixed with 50 mL 0.02(M) NaOH solution, then what will be the pH of the resultant solution?

(a) 1.397   (b) 1.698   (c) 2   (d) 7

23. The correct order of second ionization energy of K, Ca, and Ba is-

(a) K >Ca> Ba   (b) Ca> Ba > K   (c) Ba > K >Ca   (d) K > Ba >Ca

24. 1 mol of an octahedral metal complex with formula $MCl_3.2\textbf{L}$ on reaction with excess of $AgNO_3$ gives 1 mol of AgCl precipitate. Then **L** is a -

(a) monodentate ligand (b) bidentate ligand (c) tridentate ligand (d) tetradentate ligand

25. A greenish yellow gas (B) is obtained when a mixture of a black solid powder (A), NaCl and conc. H_2SO_4 is heated. When gas (B) is allowed to come in contact with a filter paper soaked in (KI + starch) solution, the colour of the paper turns blue-violet. A and B is -

(a) $MnSO_4$ and Cl_2 respectively (b) MnO_2 and SO_2 respectively (c) $MnSO_4$ and SO_2 respectively (d) MnO_2 and Cl_2 respectively.