JEE Main 29 January 2024 Shift 1 Question Paper

Chemistry

1. Assume $K_{net} = (K_1 * K_2)/K_3$

   When $Ea_1 = 40$ kJ/mol, $Ea_2 = 50$ kJ/mol and $Ea_3 = 60$ kJ/mol, calculate the value of $(Ea)_{net}$ in kJ/mol.

2. Calculate the Molarity of a solution having a density of 1.5 g/ml, percentage of (w/w) of solute as 36%, and molecular weight of solute 36 g/mol.

3. Determine products A and B when toluene reacts with Cl2 in the presence of sunlight (Product A) and in the presence of CCl4 (Product B).

4. Determine the major product for a given reaction.

5. For Rb (37), which of the following set of quantum numbers is correct for the valence electron?

   i. 5, 0, 0, +1/2

   ii. 5, 0, 1, -1/2

   iii. 5, 0, 1, +1/2

   iv. 5, 1, 1, +1/2

6. How many of the following compounds have one lone pair of electrons in the central atom?

   CIF_3, XeO_3, BrF_5, XeF_4, O_3, NH_3

7. How many of the following species have bond order 1 and are paramagnetic as well?

   He_2^{2+}, O_2^{2-}, Ne_2^{2+}, F_2, B_2, H_2, O_2^{2+}

8. Hydrolysis of protein gives which type of amino acids?

   i. α - Amino acids

   ii. β - Amino acids

   iii. γ - Amino acids

   iv. δ - Amino acids

9. If alkaline KMnO4 is oxidised iodide to give a particular product (A), then determine the oxidation state of iodine in the compound (A).

10. K_p for the following reaction is 36×10^{-2} atm^{-1}

    $2NO_2 (g) \rightleftharpoons N2O4 (g)$

    Find out Kc (M^{-1}). Take R = 0.0821 l atm/(mol K) and T = 300 K.

11. Match the following:

    Column I: i. Fluorspar, ii. Cryolite, iii. Bauxite, iv. Dolomite

    Column II: i. $Al_2O_3.H_2O$, ii. CaF_2, iii. $MgCO_3.CaCO_3$, iv. $Na_3[AlF_6]$

12. Match the following:

    Column I: i. Vitamin B12, ii. Wilkinson's Catalyst, iii. Ziegler-Natta Catalyst, iv. Haemoglobin

    Column II: i. Ti, ii. Co, iii. Fe, iv. Rh

13. Statement 1: Electronegativity of group 14 elements decreases from Si to Pb.

    Statement 2: Group 14 has metals, metalloids and non-metals.

    i. Both statements 1 and 2 are correct.

    ii. Both statements 1 and 2 are incorrect.

    iii. Statement 1 is correct and statement 2 is incorrect.

    iv. Statement 1 is incorrect and statement 2 is correct.

14. Statement 1: Ionization energy decreases along a period.

    Statement 2: In a period, Z dominates over the screening effect.

    i. Both statements 1 and 2 are correct.

    ii. Both statements 1 and 2 are incorrect.

    iii. Statement 1 is correct and statement 2 is incorrect.

    iv. Statement 1 is incorrect and statement 2 is correct.

15. The presence of which element(s) is confirmed by the appearance of blood red color with $FeCl_3$ in Lassaigne's Test?

16. What is the effect that occurs between a lone pair and a pi bond?

    i. Inductive effect

    ii. Electrometric effect

    iii. Resonance effect

    iv. Hyperconjugation

17. What is the energy difference between the actual structure and its most stable resonating structure having the least energy is called as?

18. Which of the following compounds yield a positive Fehling solution test?

19. Which of the following coordination compounds has a bridging carbonyl ligand?

    i. $[Mn_2(CO)_{10}]$

    ii. $[CO_2(CO)_8]$

    iii. $[Cr(CO)_6]$

    iv. $[Fe(CO)_5]$

20. Which of the following pairs will be formed by the decomposition of $KMnO_4$?

    i. MnO_4^-, MnO_2

    ii. K_2MnO_4, MnO_2

    iii. $KMnO_4$, MnO_2

    iv. MnO_2, H_2O

21. Which of the following statements is incorrect?

    i. $\Delta G = 0$ for reversible reaction

    ii. $\Delta G < 0$ for spontaneous process

    iii. $\Delta G > 0$ for spontaneous process

    iv. $\Delta G < 0$ for non-spontaneous process

22. $x\ Cl_2 + y\ OH^- \rightarrow z\ Cl^- + p\ ClO^-$

    Balance the equation and find the values of x, y, z, and p.