

CHEMISTRY

BOOKS - UNITED BOOK HOUSE

TECHNO INDIA GROUP ACADEMIA, SOUTH
KOLKATA QUESTION PAPER

Exercise

1. The correct set of quantum numbers for the 19th electron of ${}_{24}\text{Cr}$ atom is:

A. , . 2, 0, + 1/2

B. 4, 1, - 1, + 1/2

C. 3, 1, - 1, $\pm 1/2$

D. 4, 0, 0, $\pm 1/2$

Answer:



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2. The number and type of bonds between two carbon atoms in CaC_2 are :

A. one sigma (σ) and one pi (π) bonds

B. one sigma (σ) and two pi (π) bonds

C. one sigma (σ) and one and a half (π) bonds

D. one sigma (σ) bond.

Answer:



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3. The ONO angle is maximum in :



Answer:





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4. Select the correct answer :A bottle of dry NH_3 and a bottle of dry HCL connected through a long tube are opened simultaneously at both ends, the white ring of NH_4Cl first formed will be:

- A. at the centre of the tube
- B. near the HCl bottle
- C. near the NH_3 bottle
- D. throughout the length of the tube

Answer:



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5. Which of the following is true for a reaction

$H_2O(l) \rightarrow H_2O(g)$ at $100^\circ C$ 1 atm Pressure :

A. $\Delta H = \Delta U$

B. $\Delta U = 0$

C. $\Delta H = 0$

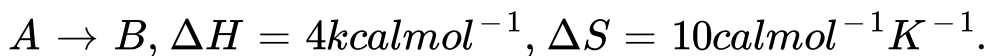
D. $\Delta H = T\Delta S$

Answer:



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6.



Reaction is spontaneous when temperature is :

A. 400k

B. 300k

C. 500k

D. none

Answer:



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7. The salt hydrolysis of the salt of strong acid and weak base is called:

- A. Anionic hydrolysis
- B. Cationic hydrolysis
- C. Amphoteric hydrolysis
- D. none

Answer:



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8. The raw materials used in the manufacture of Na_2CO_3 by Solvay process are:

A. NH_3 and CO_2

B. $NaCl$ and CO_2

C. $NaCl$ limestone and CO_2

D. NH_3 brine and CO_2

Answer:



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9. Which of the following hydroxides is weakest base?

A. $Mg(OH)_2$

B. $Ca(OH)_2$

C. $NaOH$

D. KOH

Answer:



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10. Homolytic fission of C — C bond in ethane gives an intermediate in which carbon is :

A. sp^3 hybridised

B. sp^2 hybridised

C. sp hybridised

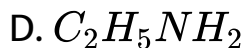
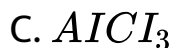
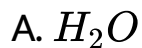
D. sp^3d hybridised

Answer:



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11. Which of the following is an electrophile?



Answer:



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12. Electrolytic decarboxylation of sodium propionate produces:

A. propane

B. ethane

C. methane

D. butane

Answer:



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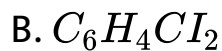
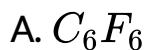
13. Most common reactions of benzene and its derivatives are:

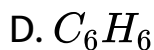
- A. electrophilic addition reactions
- B. Electrophilic substitution reactions
- C. Nucleophilic addition reactions
- D. Nucleophilic substitution reactions

Answer:

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14. Ozone in the stratosphere is depleted by :





Answer:

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15. Calculate the molarity of water if its density, is $1000\text{kg}/\text{m}^3$.

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16. Na^+ and Ne have the same number of electrons but the ionization potential of Na is 47.3 eV and that of Ne only 21.6 eV. Why?

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17. Write the general outer electronic configuration of f block elements.

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18. The enthalpy of fusion of a compound is 5.6 kJ mol^{-1} . Suggest the type of solid and nature of forces between its particles.

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19. How are ΔH and ΔU are related? What is the difference between ΔH and ΔU in a fusion process?

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20. What is the product obtained when hydrogen Bromide reacts with propene in presence of benzoyl peroxide?

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21. A bride presents a 10 carat diamond ring to her groom during engagement. Calculate how many carbon

atoms actually she gifted? [1 carat = 200mg]

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22. When solutions containing 2.00 g Na_2SO_4 and 3.00 gm $BaCl_2$ are mixed, what mass of $BaSO_4$ is produced? [Formula mass

$Na_2SO_4 = 142$ & $BaCl_2 = 208$]

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23. ${}_{26}Fe^{3+}$ is more stable than Fe^{2+} . Explain why?

Which is more paramagnetic?

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24. Does the electron remain static while it is in a stationary orbit? Explain. What is the difference in the angular momentum of an electron present in 2p and that present in 5 p. orbital?



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25. Explain why atomic radius of Ga is less than that of Al? $AlCl_3$ forms dimer but BCl_3 does not - Explain? What is corundum?



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26. What is Zeolites and write one use of it.

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27. Write the IUPAC name of the following organic molecules: $CH_3CH(OH)CH_2CHO$.

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28. Write the IUPAC name of the following organic molecules: $CH_3CH = CHCHCl_2$.

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29. Define BOD and COD? How are these determined?

Mention their units.

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30. What is meant by the statement that an electron has dual character?

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31. What will be the maximum number of electrons of same spin present in an atom having $n + 1 = 4$?

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32. How many orbitals do you expect to be present in the 5th shell?

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33. Give the difference between orbit and orbital.

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34. Write the electronic configuration of the following ions. ${}_{16}\text{S}^{2-}$ and ${}_{20}\text{Ca}^{2+}$.

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35. Why the radius of an anion is greater than that of an atom of the element?

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36. Which Carbocation has highest stability —

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37. Although ethanoic acid and ethanol are covalent compounds they are soluble in polar solvent water. Why?

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38. Indicate the nature of bonds in the compound NH_4Cl .

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39. Give example of a molecule in which central atom contains more than octet.

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40. Which one is more polar NF_3 or NH_3 ? Explain

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41. Oxygen gas is present, in a 1.0 L flask at a pressure of $7.6 \times 10^{-10} \text{ mm Hg}$ at 27°C . Calculate the number of oxygen atoms in the flask

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42. How compressibility factor help in understanding the deviation of real gas from ideal behaviour?

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43. Deduce the relationship between partial pressure, mole fraction and total pressure for the mixture of ideal

gases.



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44. Write the Vander Walls equation for n'mole of the real gas.



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45. Assuming the reactant and product gases of chemical reaction as ideal, show that for a gaseous reaction $\Delta H = \Delta U + \Delta nRT$ where ΔH and ΔU indicate the changes of enthalpy and internal energy, in the reaction.

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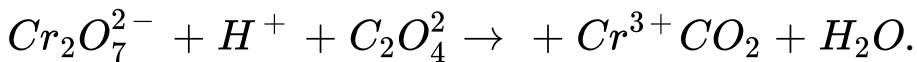
46. Give example of a reaction where $\Delta H = \Delta U$.

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47. Calculate the resonance energy of N_2O from the following data $\Delta_f H^0$ of $N_2O = 82 \text{ kJ mol}^{-1}$ for the reaction $N_2(g) + \frac{1}{2}O_2(g) \rightarrow N_2O(g)$ Bond energy of $N = N$, $N = N$, $O = O$ and $N = O$ bonds are $946, 418, 498$ and 607 kJ mol^{-1} respectively.

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48. Balance the following equation by ion electron method :



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49. KMnO_4 oxidises oxalic acid in acid medium.

Calculate the number of CO_2 molecules produced as per the balanced equation.

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50. Explain why Hydrated barium peroxide is used in the preparation of hydrogen peroxide by barium peroxide

and sulphuric, acid? What does mean by 20 volume hydrogen peroxide.

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51. Why is Li_2CO_3 decomposed at a lower temperature whereas, Na_2CO_3 at higher temperature?

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52. Why are lithium salts are commonly hydrated and those of the other alkali ions are usually anhydrous?

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53. Why aqueous solution of Na_2CO_3 is alkaline.

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54. Write the balance equations for reactions between water and potassium superoxide.

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55. How would you explain BaO is soluble but $BaSO_4$ is insoluble in water.

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56. Give chemical identity of plaster of paris.

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57. What are electrophiles, nucleophiles and free radicals? Explain with examples.

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58. Express the equilibrium constant of the reaction in the forms of K_p and K_c for the reaction,
$$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g).$$

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60. When 1 mole of ethyl alcohol and 1 mole of acetic acid are heated in a closed vessel even for a long time 1 mole of ester and 1 mole of water are never produced. Explain why?

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61. The solubility of magnesium hydroxide in water is $8.35 \times 10^{-3} \text{ gm} / \text{L}$ at 298 K. Calculate its solubility product at this temperature. (Molar mass of Mg is 24 gm)

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62. Deduce the expression for the degree of ionization of a dilute aqueous acetic acid solution at a given temperature. Discuss the effect of addition sodium acetate solution separately to this solution.

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63. Write the resonance structure of CO_3^{2-} ion.

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64. Explain what happens when boric acid (H_3BO_3) is heated?

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65. What is carbogen and what its use?

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66. Draw the structure of inorganic Benzene.



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67. Explain why 1-butyne produces white precipitate with ammoniacal $AgNO_3$ solution but 2-butyne does not respond to this reaction.



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68. Ozonolysis of an alkene A yields two moles of methanol and one mole of ethane-1, 2-diol. Give the structure of A and IUPAC name.



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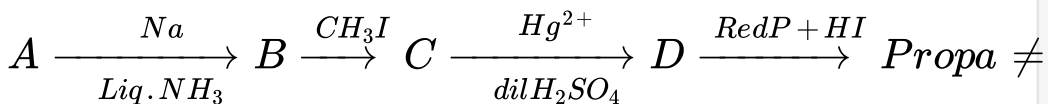
69. Write the geometrical isomer of but-2-ene and which have greater dipole moment value.

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70. Write the chemical reaction occurred at anode in Kolbe's electrolytic preparation of alkane.

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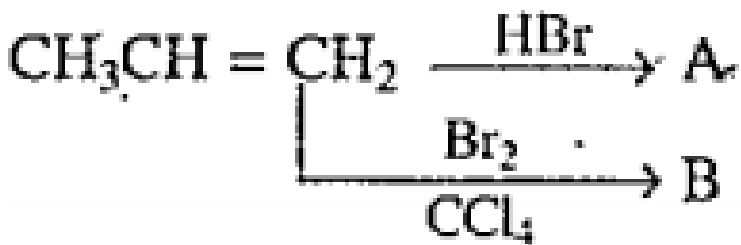
71. Identify the compounds A, B, C and D in the following transformation :





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72. Write structural formulas of A and B in the following two reactions.



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73. Convert 'benzene → ethyl benzene'.



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