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Previous Year Paper

Chemistry - 2019



Multiple Choice Questions

1. 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 relation between S and K_{sp} is correct ?

- A. $S = K_{sp}^{1/21}$
B. $S = K_{sp}^{1/29}$
C. $S = K_{sp}^{1/16}$
D. $S = K_{sp}^{1/17}$

Answer

2. The quantum number of four electrons are given below:

I. $n = 4$	$l = 2$	$m_l = -2$	$m_s = -1/2$
II. $n = 3$	$l = 2$	$m_l = 1$	$m_s = +1/2$
III. $n = 4$	$l = 1$	$m_l = 0$	$m_s = +1/2$
IV. $n = 3$	$l = 1$	$m_l = 1$	$m_s = -1/2$

The correct order of these increasing energies will be:

- A. $IV > III > II > I$
B. $I > II > III > IV$
C. $I > III > II > IV$
D. $IV > II > III > I$

Answer

3. For silver, $C_p (K^{-1} mol^{-1}) = 23 + 0.01T$. If the temperature (T) of 3 moles of silver is raised from 300 K to 1000 K at 1 atm pressure, the value of ΔH will be close to :

- A. 21 kJ
B. 62 kJ
C. 16 kJ
D. 13 kJ

Answer

4. The correct order of the spin only magnetic moment of metal ions in the following low spin complexes, $[V(CN)_6]^{4-}$, $[Fe(CN)_6]^{4-}$, $[Ru(NH_3)_6]^{3+}$ and $[Cr(NH_3)_6]^{2+}$ is

- A. $V^{2+} > Cr^{2+} > Ru^{3+} > Fe^{2+}$

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D. $\text{Cr}^{2+} > \text{Ru}^{3+} > \text{Fe}^{2+} > \text{V}^{2+}$

Answer

5. In order to oxidise a mixture of one mole of each of FeC_2O_4 , $\text{Fe}_2(\text{C}_2\text{O}_4)_3$, FeSO_4 and $\text{Fe}_2(\text{SO}_4)_3$ in acidic medium, the number of moles of KMnO_4 required is:
- 1.5
 - 3
 - 2
 - 1

Answer

6. In the following compounds, the decreasing order of basic strength will be:
- $(\text{C}_2\text{H}_5)_2\text{NH} > \text{NH}_3 > \text{C}_2\text{H}_5\text{NH}_2$
 - $(\text{C}_2\text{H}_5)_2\text{NH} > \text{C}_2\text{H}_5\text{NH}_2 > \text{NH}_3$
 - $\text{C}_2\text{H}_5\text{NH}_2 > \text{NH}_3 > (\text{C}_2\text{H}_5)_2\text{NH}$
 - $\text{NH}_3 > \text{C}_2\text{H}_5\text{NH}_2 > (\text{C}_2\text{H}_5)_2\text{NH}$

Answer

7. The vapour pressures of pure liquids A and B are 400 and 600 mm Hg, respectively at 298 K. On mixing the two liquids, the sum of their initial volumes is equal to the volume of the final mixture. The mole fraction of liquid B is 0.5 in the mixture. The vapour pressure of the final solution, the mole fractions of components A and B in vapour phase, respectively are:
- 500 mm Hg, 0.4, 0.6
 - 450 mm Hg, 0.4, 0.6
 - 500 mm Hg, 0.5, 0.5
 - 450 mm Hg, 0.5, 0.5

Answer

8. The size of the iso-electronic species Cl^- , Ar and Ca^{2+} is affected by:
- nuclear charge
 - Principal quantum number of valence shell
 - azimuthal quantum number of valence shell
 - electron-electron interaction in the outer orbitals

Answer

9. Which one of the following equations does not correctly represent the first law of thermodynamics for the given processes involving an ideal gas? (Assume non-expansion work is zero)
- Isothermal process : $q = -w$
 - Cyclic process : $q = -w$
 - Isochoric process : $\Delta U = q$

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Answer

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10. Diborane (B_2H_6) reacts independently with O_2 and H_2O to produce, respectively:

- A. B_2O_3 and H_3BO_3
- B. H_3BO_3 and B_2O_3
- C. B_2O_3 and $[BH_4]^-$
- D. HBO_2 and H_3BO_3

Answer

11. 100 mL of a water sample contains 0.81 g of calcium bicarbonate and 0.73 g of magnesium bicarbonate. The hardness of this water sample expressed in terms of equivalents of $CaCO_3$ is:

(molar mass of calcium bicarbonate is 162 g mol^{-1} and magnesium bicarbonate is 146 g mol^{-1})

- A. 1,000 ppm
- B. 100 ppm
- C. 10,000 ppm
- D. 5000 ppm

Answer

12. The correct order of hydration enthalpies of alkali metal ions is:

- A. $Li^+ > Na^+ > K^+ > Cs^+ > Rb^+$
- B. $Na^+ > Li^+ > K^+ > Rb^+ > Cs^+$
- C. $Na^+ > Li^+ > K^+ > Cs^+ > Rb^+$
- D. $Li^+ > Na^+ > K^+ > Rb^+ > Cs^+$

Answer

13. Assertion : Ozone is destroyed by CFCs in the upper stratosphere.

Reason : Ozone holes increase the amount of UV radiation reaching the earth.

- A. Assertion and reason are incorrect.
- B. Assertion is false, but the reason is correct.
- C. Assertion and reason are correct and the reason is the correct explanation for the assertion.
- D. Assertion and reason are correct, but the reason is not the explanation for the assertion.

Answer

14. Which is wrong with respect to our responsibility as a human being to protect our environment ?

- A. Avoiding the use of floodlighted facilities
- B. Setting up compost tin in gardens
- C. Restricting the use of vehicles
- D. Using plastic bags

Answer

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15. For the reaction $2A + B \rightarrow C$, the values of initial rate at different reactant concentrations are given in the table below. The rate law for the reaction is :

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[A] (mol L ⁻¹)	[B] (mol L ⁻¹)	Initial rate (mol L ⁻¹ s ⁻¹)
0.05	0.05	0.045
0.10	0.05	0.090
0.20	0.10	0.72

- A. Rate = $k[A]^2[B]^2$
 B. Rate = $k[A]^2[B]$
 C. Rate = $k[A][B]$
 D. Rate = $k[A][B]^2$

Answer

16. Given that,

$$E_{O_2/O_2^{2-}} = +1.23 \text{ V} \quad E_{S_2O_8^{2-}/SO_4^{2-}}$$

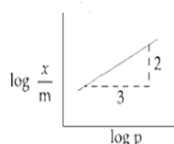
$$E_{Br_2/Br^-} = +1.09 \text{ V} \quad E_{Au^{3+}/Au} = +1.4 \text{ V}$$

The strongest oxidising agent is

- A. Br^{2+}
 B. O_2
 C. Au^{3+}
 D. $S_2O_8^{2-}$

Answer

17. Adsorption of a gas follows Freundlich adsorption isotherm. x is the mass of the gas adsorbed on mass m of the adsorbent. The plot of $\log \frac{x}{m}$ versus $\log p$ is shown in the given graph. xm is proportional to :



- A. $p^{3/2}$
 B. p^3
 C. p^2
 D. $p^{2/3}$

Answer

18. With respect to an ore, Ellingham diagram helps to predict the feasibility of its
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B. Electrolysis

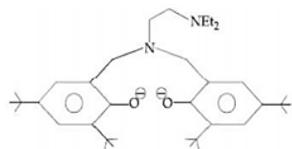
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C. Zone refining

D. Vapour phase refining

Answer

19. The following ligand is



A. tetradentate

B. bidentate

C. hexadentate

D. tridentate

Answer

20. Element 'B' forms *ccp* structure and 'A' occupies half of the octahedral voids, while oxygen atoms occupy all the tetrahedral voids. The structure of bimetallic oxide is:

A. AB_2O_4

B. A_2B_2O

C. A_2BO_4

D. A_4B_2O

Answer

21. The lanthanide ion that would show colour is :

A. Lu^{3+}

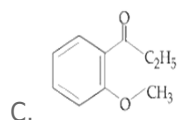
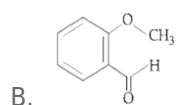
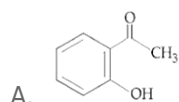
B. Sm^{3+}

C. La^{3+}

D. Gd^{3+}

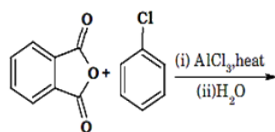
Answer

22. An organic compound neither reacts neutral ferric chloride solution nor with Fehling solution. It however, reacts with Grignard reagent and gives positive iodoform test. The compound is:



Answer

23. The major product of the following reaction is :



- A.
- B.
- C.
- D.

Answer

24. Maltose on treatment with dilute HCl gives:

- A. D - glucose and D-Fructose
- B. D - glucose
- C. D-Fructose
- D. D-Galactose

Answer

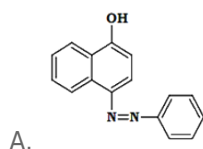
25. The IUPAC name of the following compound is:



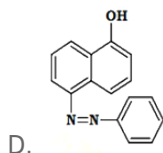
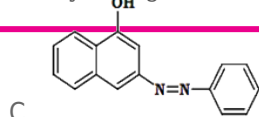
- A. 3-Hydroxy-4-methylpentanoic acid
- B. 4,4-Dimethyl-3-hydroxybutanoic acid
- C. 4-Methyl-3-hydroxypentanoic acid
- D. 2-Methyl-3-hydroxypentan-5-oic acid

Answer

26. Coupling of benzene diazonium chloride with 1-naphthol in alkaline medium will give:



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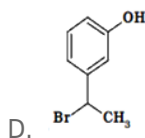
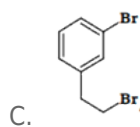
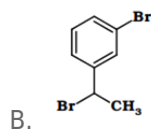
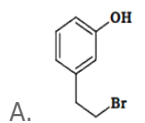
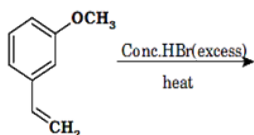
Answer

27. Which of the following amines can be prepared by Gabriel phthalimide reaction ?

- A. *n*-butylamine
- B. neo-pentylamine
- C. *t*-butylamine
- D. triethylamine

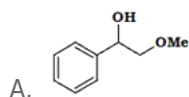
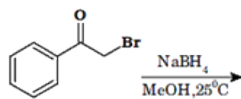
Answer

28. The major product of the following reaction is:

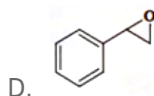
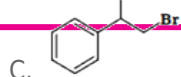


Answer

29. The major product of the following reaction is:



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Answer

30. An organic compound 'X' showing the following solubility profile is:

X	Water	→ Insoluble
	5% HCl	→ Insoluble
	10% NaOH	→ Soluble
	10% NaHCO ₃	→ Insoluble

- A. m-Cresol
- B. Benzamide
- C. Oleic acid
- D. o-Toluidine

Answer