

(Memory Based)

Date of Exam: 26th August 2021 Time: 9:00 a.m.-12:00 p.m. Subject: Chemistry

1. Calculate the number of 4f electrons present in Gd^{2+} (Atomic number = 64).

Ans: 8
Solution:
Electronic configuration of $Gd = [Xe]4f^75d^16s^2$
Electronic configuration of $Gd^{2+} = [Xe]4f^75d^1$
Due to orbital contraction electron of $5d$ will get transferred into $4f$ and its electronic
configuration will be $Gd^{2+} = [Xe]4f^85d^0$.
Hence, the number of 4f electrons present in $Gd^{2+} = 8$.

b) 3

d) 5

- 2. Find the number of lone pairs on central atom in interhalogen compound IX_3 .
 - a) 1
 - c) 2

Ans: (c)

Solution:

Hybridization of interhalogen compound $IX_3 = sp^3d$.

Structure: 3 bond pairs and 2 lone pairs, hence T shaped. Therefore, central atom I contains 2 lone pairs. Hence, option c) is the correct answer.

- 3. Statement I: Frenkel defect provides color in a solid. Statement II: Frenkel defect is an interstitial defect.
 - a) Statement I is correct, and statement II is correct.
 - b) Statement I is correct, and statement II is incorrect.
 - c) Statement I is incorrect, and statement II is incorrect.
 - d) Statement I is incorrect, and statement II is correct

Ans: c)

Solution

Frenkel defect is shown by ionic solids. It is a dislocation defect. It is not interstitial defect and it is not responsible to provide color in the solid. Hence, option c) is the correct answer.



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4. Formula of hydroxyapatite is:

a) (*CaPO*₄)₆. *CaF*₂ c) 3[*Ca*₃(*PO*₄)₂]. *CaF*₂ b) $3[Ca_3(PO_4)_2].Ca(OH)_2$ d) $Ca_3(PO_4)_2.Ca(OH)_2$

Ans: (b)

Solution

Correct formula of hydroxyapatite is $3[Ca_3(PO_4)_2]$. $Ca(OH)_2$. Hydroxyapatite is the main component of the phosphate rocks.

Hence, b) is the correct answer.

- 5. Which polymer is made by novolac and formaldehyde addition?
 - a) Melamine
 - c) Polyester

b) Bakelite d) None of the above

Ans: (b)

Solution

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Novolac on heating with formaldehyde undergoes cross linking to form an infusible solid mass called bakelite.
Hence, the correct option is b).
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- 6. Calculate the molarity of 3.3 *molal* solution of *KCl* whose density is 1.28 *g*/*mL*.
 - a) 3.7 *M* c) 3.4 *M*

Ans: c)

b) 5.0 *M* d) 2.5 *M*

Solution Given, Molality = 3.3 m Density = 1.28 g/ mL By using formula, Molality(m) = $\frac{M \times 1000}{1000 \times d - M \times M_{solute}}$

 $3.3 = \frac{M \times 1000}{1000 \times 1.28 - M \times 74.5}$

4224 - 245.85M = 1000M 1245.85M = 4224

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 $M = \frac{4224}{1245.85} = 3.39 \approx 3.4 \text{ M}$ Hence, the correct option is c).

7. Suitable method to deionize water is:

a) Synthetic resin

c) Permutit method

b) Calgon d)Clark's method

Ans: a)

Solution

Pure demineralised (de-ionized) water free from all soluble mineral salts is obtained by passing water successively through a cation exchange (in the H^+ form) and an anion exchange (in the OH^{-} form) resins. Hence, the correct option is a).

8. When excess of CO_2 is passed through lime water then what will be the sequence of the product? b) $CaO, Ca(HCO_3)_2$ a) $Ca(HCO_3)_2, CaO$ d) $Ca(HCO_3)_2$, CaO

c) $CaCO_3$, $Ca(HCO_3)_2$

Ans: c)

Solution

 $Ca(OH)_2(aq) + CO_2(q) \rightarrow CaCO_3(s) + H_2O(l)$ $CaCO_3(s) + H_2O(l) + CO_2(g) \rightarrow Ca(HCO_3)_2(aq)$ Hence, the correct option is c).

9. Predict the major product for the following reaction:





of movement of its molecules becomes restricted. This amounts to a decrease in the entropy of the gas after adsorption, i.e., $\Delta S < 0$ is negative.

Hence, the correct option is a).

11. Find the product.



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Solution

In water, bromine is ionized to a greater extent and hence tribromination occurred. In carbondisuphide, bromine ionizes to a very less extent.



13. Choose the ion whose aqueous solution is violet colored?

a)	$[Fe(CN)_6]^{4-}$	b)	$[Fe(SCN)_3]$
c)	$[E_{\alpha}(CN), NOS]^{4-}$	d)	$[E_{\alpha}(CN)]^{3}$

c) $[Fe(CN)_5 NOS]^{4-}$ d) $[Fe(CN)_6]^{3-}$

Ans: (c)

Solution

Violet color is given by complex ion $[Fe(CN)_5NOS]^{4-}$. It is the test for detection of sulphur.

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Statement-II: In Ellingham diagram, as we move from left to right ΔS increases.

a) Both S-I and S-II are true

b) S-I is true, but S-II is false

c) S-I is false, but S-II is false

d) Both S-I and S-II are false

Ans: b)

Solution:

S1: Ellingham diagram is used to check which metal oxide is to be reduced by which compound.

Explanation: This statement is true because graph of metal which lies below in Ellingham diagram has more affinity towards oxygen. Therefore, it can be used to predict which metal oxide can be reduced by using a particular compound.

S2: In Ellingham diagram, as we move from left to right ΔS increases.

Explanation: This statement is false because slope of Ellingham diagram is equal to $-\Delta S$ and Ellingham diagram contains straight line for which slope is constant. It gets changed only when phase is changed.

Hence, option b) is correct

- 15. Which compound will have equal freezing point as 0.1 M ethanol?
 - a) $0.1 M Na_2 SO_4$
 - c) 0.1 *M HCl*

b) $0.1 M Ba_3 (PO_4)_2$ d) $0.1 M C_6 H_{12} O_6$

Ans: d)

Solution:

$\Delta T_f = iK_f m$

For very dilute solutions, we can assume m(molality) = M(Molarity)As m is same for all solution so ΔT_f depends on vant Hoff factor (i). Greater is the i, smaller will be the freezing point. Let's compute for each option: a) *i for* 0.1 $M Na_2SO_4 = 3$

b) *i* for $0.1 M Ba_3(PO_4)_2 = 5$

c) *i* for 0.1 M HCl = 2

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d) *i* for 0.1 $M C_6 H_{12} O_6 = 1$

And i for ethanol (C_2H_5OH) = is also 1. Hence, the correct answer will be d).

16. Which of the following will dissolve in water and give color?

a)	Cu_2Cl_2	b) <i>CuCl</i> ₂
c)	AgBr	d) $ZnCl_2$

Ans: b) *CuCl*₂

Solution

*CuCl*₂ dissolves in water and gives colored solutions.

- 17. Statement I: In Bohr's model, velocity of electron increases with decrease in positive charge of nucleus as electrons are not held tightly. Statement II: Velocity decreases with an increase in principal quantum number.
 - a) Statement I is correct & Statement II is correct
 - b) Statement I is correct & Statement II is incorrect
 - c) Statement I is incorrect & Statement II is incorrect
 - d) Statement I is incorrect & Statement II is correct

Ans: (d) Solution For Statement I: According to the Bohr's model, Velocity of electron,

$$V_n = v_o \frac{z}{n}$$

Where, $v_o = 2.18 \times 10^6 m/s$ So, with decrease in *z*, V_n will also decrease Hence, Statement I is incorrect,

For Statement II:

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b) $U_{0_2} > U_{N_2} > U_{CO_2}$

d) $U_{CO_2} = U_{O_2} = U_{N_2}$

With increase in n, velocity will decrease as per the relation given above, Hence, Statement II is correct Hence, option d) is correct.

18. Correct sequence of U_{rms} of O_2 , CO_2 , N_2 at constant temperature.

- a) $U_{N_2} > U_{O_2} > U_{CO_2}$
- c) $U_{CO_2} > U_{O_2} > U_{N_2}$

Ans: a) Solution

 $U_{rms} = \sqrt{\frac{3RT}{M}}$

So, $U_{rms} \propto \frac{1}{\sqrt{M}}$ (At constant temperature) And as we know, Molar Mass: $CO_2 > O_2 > N_2$ Therefore, $U_{rms} : U_{N_2} > U_{O_2} > U_{CO_2}$ Hence, option a) is correct.

- 19. Statement-I: Titration of strong acid with weak base uses methyl orange as an indicator. Statement-II: Titration of weak acid with strong base uses phenolphthalein as an indicator.
 - a) Statement I is correct & Statement II is correct
 - b) Statement I is correct & Statement II is incorrect
 - c) Statement I is incorrect & Statement II is incorrect
 - d) Statement I is incorrect & Statement II is correct

Ans: a)

Solution

Statement I: Methyl Orange is suitable indicator for titration of strong acid and weak base is correct.

Statement II: Phenolphthalein is a suitable indicator for titration of weak acid and strong base is also correct.

Hence, option a) is correct.

20. Isobutane + $Br_2(hv/temp = 125^{\circ}C) \rightarrow ?$ JEE MAIN 26th August Shift-1 2021(Chemistry)





