Solution

CHEMISTRY

JEE main - Chemistry

CHEMISTRY (Section-A)

1.

(c) 32

Explanation:

The number of electrons in the orbitals of sub-shell of n = 4 are 4s (2), 4p (6), 4d (10), 4f (14), total 32 electrons.

2.

(b) $1s^2\ 2s^2\ 2p^6\ 3s^1$

Explanation:

Ionization enthalpy represents the energy required to remove an electron from an isolated gaseous atom in its ground state. The larger the atomic size, the smaller will be the value of ionization enthalpy of an element.

Hence, the atom with the electronic configuration $1s^2\ 2s^2\ 2p^6\ 3s^1$ will have the lowest ionization enthalpy.

3.

(d) $K_p = K_c$

Explanation:

$\Delta n = (a + b) - (a + b) = 0$

4.

(b) $-\gamma\frac{\Delta V}{V}$

Explanation:

For adiabatic process: PV^γ = constant

Taking derivative

$dPV^\gamma + \gamma PV^{\gamma-1}\ dV = 0$

$dPV^\gamma = -\gamma PV^{\gamma-1}\ dV$

$\frac{dP}{P} = -\gamma\frac{V^{\gamma-1}}{V^\gamma}\ dV$

$\frac{\Delta P}{P} = -\gamma\frac{\Delta V}{V}$

5. **(a)** $NH_4Cl + NaOH \rightarrow H_2O + NH_3 + NaCl$

Explanation:

Ammonium salts with alkali given NH_3. Rest all are redox reactions taking place in the backward direction.

6.

(b) iv and i

Explanation:

Neither there is an oxidant nor reductant or none of the species shows the change in oxidation no.

7.

(c) Acetic acid

Explanation:

Organic acids dissolve lead in presence of oxygen

$Pb + 2CH_3COOH + \frac{1}{2}O_2 \rightarrow Pb(CH_3COO)_2 + H_2O$

8. **(a)** O-H

Explanation:

NOTE: Heterolytic fission occurs when the two atoms differ considerably in their electronegativities.
O - H bond undergoes cleavage most readily because O and H differ markedly in their electronegativity and further oxygen being highly electronegative can accommodate the negative charge more effectively developed after the cleavage.

9. **(a)** II and IV
Explanation:

4n + 2 = 6
n = 1
Aromatic

4n + 2 = 6
n = 1
Aromatic

10. **(b)** 269.07 K
Explanation:
For cane sugar ? T_f =273.15 -271.0 =2.15 K
Thus K_f = (? T_f x M_B X W_A)/(W_B X1000)
=2.15 X 342 X100/(5 X1000)
=14.71 K Kg mol-1
For glucose solution
? T_f =K_f xW_B X1000/(M_B XW_A)
= 14.71 X1000 X 5 /(100 X180)
=4.085
Therefore freezing point of y 5% glucose solution is =273.15 -4.085=269.07K

11. **(a)**

Solution of sucrose (w/w)	Molality (mol kg-1)	B.P. (^oC)
10%	0.32	100.167
20%	0.73	100.380

Explanation:
10 % (w/w) solution contains 10 g sucrose and 90 g water
$\frac{10\ g C_{12}H_{22}O_{11}}{342\ g/mol}$ = 0.029 mol
90 g H_2O = 0.09 kg H_2O
Molality = m = $\frac{0.029}{0.09}$ = 0.322 mol kg^{-1}
Elevation in b.p. (ΔT_b) = 0.52 $\times$ 0.322
= 0.167 K or 0.167^oC
Boiling point = 100 + 0.167 = 100.167^oC
Similarly, for 20% (w/w) solution,
Molality = 0.73 mol kg^{-1}
Boiling point = 100.380^oC

12.

(b) 9 : 1

Explanation:

9 : 1

13.

(c) all of these

Explanation:

These are characteristics of the first-order reaction.

When the rate of the reaction depends on the first power of the reactant concentration in the rate equation, then the reaction is said to follow first-order kinetics. The change in the concentration of only one reactant will affect the rate of the reaction. The unit of the rate constant for the first-order reaction is s^{-1}. This implies that the rate constant does not depend on the concentration of the reactant. The time taken for half the reactant to get reacted, the half lifetime of the first-order reaction is independent of the concentration. This means that the half-life period of the first-order reaction is constant.

14.

(c) basic copper carbonate and sulphate

Explanation:

Architectural structures built with copper corrode to give green verdigris (copper carbonate). It can be a mixture of carbonate and sulfate compounds in various amounts, depending upon environmental conditions such as sulfur-containing acid rain.

15.

(c) $[I_3]^-$

Explanation:

I_3^-, XeF_4,SF_4, and ClO_3^- have 3, 2, 1, 1 lone pair of electrons respectively.

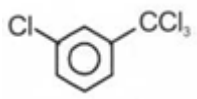
16.

(b) All of these

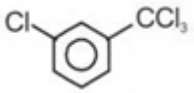
Explanation:

All of these

17.

(b) 

Explanation:



CCl_3 is an electron-withdrawing group so meta product is a major product.

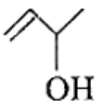
18.

(c) i - d, ii - e, iii - c, iv - a

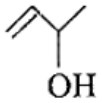
Explanation:

i - d, ii - e, iii - c, iv - a

19. **(a)**

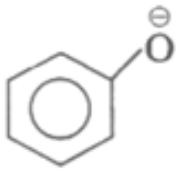


Explanation:



does not contain carbonyl so, no reaction with 2, 4-DNP.

20.

(c) 

Explanation:

$\overset{\ominus}{O}$ is better donar than -NH_2 and -OCH_3.

CHEMISTRY (Section-B)

21. 64

Explanation:

In pure water, s = 8×10^{-4}

$K_{sp} = s^2 = (8 \times 10^{-4})^2 = 64 \times 10^{-8}$

In 0.01 M H_2SO_4,

$H_2SO_4 \longrightarrow \underset{0.02}{2H^+} + \underset{0.01}{SO_4^{2-}}$

$CdSO_4 \longrightarrow \underset{s}{Cd^{2+}} + \underset{s}{SO_4^{2-}}$

Total conc. of SO_4^{2-} = 0.01 + s

K_{sp} = s(s + 0.01)

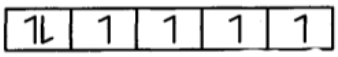
K_{sp} = s.(0.01) (neglecting s^2)

s = $\frac{64 \times 10^{-8}}{0.01}$ = 64×10^{-6}

22. 49.0

Explanation:

Fe (Z = 26) $\Rightarrow$ [Ar] $3d^6\ 4s^2$



Number of unpaired electrons = 4

$\because \mu = \sqrt{n\ (n\ +\ 2)}$ BM

$\therefore \mu = \sqrt{4\ (4\ +\ 2)} = \sqrt{24}$ BM = 4.89 $\approx 49 \times 10^{-1}$ BM

23. 200

Explanation:

Let M is the molar mass of the compound (g/mol) mass of compound = $0.01 \times M_{comp}$

where $M_{comp.}$ = molar mass of compound mass of carbon in the compound $= 0.01 \times M_{comp.} \times \frac{60}{100}$

moles of carbon $= \frac{0.01 M_{comp.}}{12} \times \frac{60}{100}$

moles of CO_2 from combustion $= \frac{4.4}{44}$

It should be equal to the moles of carbon in the compound.

$\Rightarrow \frac{0.01 M_{comp.}}{12} \times \frac{60}{100} = \frac{4.4}{44}$

$M_{comp.} = \frac{4.4}{44} \times \frac{100}{60} \times \frac{12}{0.01} = 200\ g/mol$

24. 5

Explanation:

5

25. 925

Explanation:

Let, Volume of C_2H_4 is x litre

	$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$		
Initial	x	–	
Final	–	2x	

	$CH_4 +$	$2O_2 \rightarrow CO_2 + 2H_2O$	
Initial	$(16.8 - x)$	–	
Final	–		$(16.8 - x)$

Total volume of CO_2 = 2x + 16.8 - x

$\Rightarrow$ 28 = 16.8 + x

x = 11.2 L

Volume of C_2H_4 = 4.2 L, Volume of CH_4

= (16.8 - 11.2) L = 5.6 L

${}^{n}CH_4 = \frac{5.6}{22.4} = 0.25$ mol; ${}^{n}C_2H_4 = \frac{11.2}{22.4} = 0.5$ mol

$\therefore$ Heat evolved = 0.25 $\times$ (-900) + 0.5 (-1400) = -925 kJ