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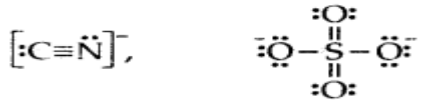
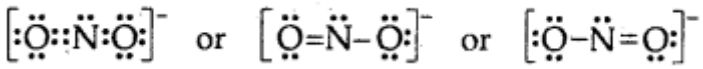
CLASS: XI (HALF YEARLY EAXAMINATION)
SUBJECT: CHEMISTRY THEORY (043)
DURATION: 3 Hrs **MAXIMUM MARKS: 70**

MARKING SCHEME
SET-1

QUESTION	ANSWER	MARKS
1	c	1
2	c	1
3	d	1
4	d or a	1
5	a or c	1
6	c	1
7	a	1
8	c or b	1
9	d	1
10	a	1
11	d or b	1
12	c	1
13	d Or c	1
14	c	1
15	c	1
16	c	1
17	C or b	1
18	a	1
19	(i) 6.023×10^{23} molecules of NaCl weighs = 58.5 g One molecule of NaCI weighs = 58.56.023×1023 = 9.71×10^{-23} g. (ii) % of Ca = 40×100/(40+12+3×16) = 40.0%	1 1
20	The balance chemical equation representing the reaction is $3\,Fe(s) + 4\,H_2O(g) \longrightarrow Fe_3O_4(s) + 4H_2(g)$ $3 \times 56 \quad 4 \times 18$ $= 168\ g \quad = 72\ g$ Now 72 g of steam [$H_2O(g)$] react with 168 g of Iron ∴ 18 g of steam will ‘reacts with = 168/72 × 18 = 42.0 g of iron Thus, the weight of iron required = 42.0 g	1 1
21	(i)According to the Aufbau principle, the given orbitals will be filled in the order: 2s, 2p, 3s, 3p, 4s, 3d. (ii)Electronic configuration of atom is: $1s^2$, $2s^2p^6$, $3s^2$, $3p^1_x$, $3p^1_y$, $3p^1_z$. It has three unpaired electrons. OR	1 1 1 1

	(i)Electronic configuration of riNa = $1s^2$, $2s^2 2p^6$ $3s^1$ The electron with the highest energy is $3s^1$ for which n = 3 , l = 0, m = 0, s = +1/2 (ii)This is because the energies of the orbits in which the electrons revolve are fixed.	
22	((i)$Mg^{2+} < Na^{+} < F^{-} < O^{2-} < N^{3-}$ (ii)Unbinillium and its symbol is Ubn.	1 ½,1/2
23	 (i) (ii) CO_2, CH_4, NH_3, H_2O	½, ½ 1
24	(i)This is because the OH group present in ethyl alcohol forms H-bonds with water. ii)This is due to resonance in benzene. OR: (i)  (ii)In Cl_2 both atoms have the same electronegativity. Hence the shared pair of electrons is attracted equally by both and remains exactly in the center. No end acquires a negative or positive charge. In HCl, chlorine is more electronegative than H. Hence shared pair of electrons is more attracted towards chlorine, which, therefore acquires a negative charge while H acquires a positive charge	1 1 1 1
25	(i)Intensive properties: Viscosity, refractive index, Extensive properties: Mass, volume, heat capacity, etc. (ii)q + w is equal to ΔU, which is a state function. OR (i) Both are equal. (ii) ΔH is positive as $\Delta H = H_p - H_r$ and $H_r < H_p$.	1 1 1 1
26	Calculation of the empirical formula of the compound	

Element	%	Atomic Mass	%/At. Mass	Simplest atomic ratio	Simple whole no. ratio
Carbon (C)	40.687	12	$\frac{40.687}{12} = 3.390$	$\frac{3.390}{3.389} = 1$	2
Hydrogen (H)	5.085	1	$\frac{5.085}{1} = 5.085$	$\frac{5.085}{3.389} = 1.5$	3
Oxygen (O)	54.228	16	$\frac{54.228}{16} = 3.389$	$\frac{3.389}{3.389} = 1$	2

½ ½ ½ ½

∴ The empirical formula of the compound is C2H3O2
Molecular mass of compound = 118
n = Molecular Mass/ Empirical formula mass
= 118/ (2×12+3×1+2×16) =118/59 = 2
∴ Molecular formula of the compound = n × empirical formula = 2 × $C_2H_3O_2$
= $C_4H_6O_4$.

½ ½

	OR The equation representing the chemical change is $2KMnO_4 + 3\ H_2SO_4 + 5H_2C_2O_4 \rightarrow K_2SO_4 + 2\ MnSO_4 + 8\ H_2O + 10\ CO_2$ Step I. To calculate the no. of moles of KMn04 required to completely oxidize 2.70 g of'$H_2C_2O_4$ in acidic medium: Molar mass of $H_2C_2O_4 = 2 \times 1 + 2 \times 12 + 4 \times 16$ $= 90.0\ g\ mol^{-1}$ ∴ No. of moles of $H_2C_2O_4$ contained in 2.70 g of it = 2.70/90.0 = 0.03 5 Moles of $H_2C_2O_4$ are oxidized by 2 moles of $KMnO_4$ ∴ 0.03 moles of it oxidized by = 25 × 0.03 = 0.012 mole of $KMnO_4$	1 1 1
27	(i) Correct explanation (ii) Correct explanation (iii) Correct explanation	1 1 1
28	(i) Correct explanation (ii) Correct explanation (iii) sp^3, bent shape	1 1 ½, ½
29	(i) The internal energy of the system will decrease. (ii) Heat and work. (iii) $\Delta G = \Delta H - T\ \Delta S$, = -891 – 350x -1.1 = -1276 KJ negative value of Gibbs energy shows reaction is spontaneous	1 1 1
30	Correct definition, correct example and correct application	1,1,1
31	(i) b (ii) c (iii)a (iv)b or c	1 1 1 1
32	(i) Correct explanation (ii) Correct explanation (c) Correct explanation (d) H_2, CO_2, HCl, H_2O	1 1 1 1
33	(i)Given m = 0.40kg, v = 40 m/s, $\Delta p = 1x10^{-6}mv$, h = 6.626 x 10^{-34} Js , Δx =? $\Delta p = 1x10^{-6}mv = 1x10^{-6}$ x 0.40 x 40 =1.6 x 10^{-5} we know that, **$(\Delta p)(\Delta x) = h/4\pi$ or $(\Delta x) = h/4\pi\ (\Delta p)$,** **$(\Delta x) = 6.626 \times 10^{-34} / 4x3.14x1.6 \times 10^{-5}$** = **$3.3 \times 10^{-30}$** (ii) Given p = 1.5x$10^{-27}$ kg m/s, h = 6.626 x 10^{-34} Js, **$\lambda = h/p$** **$\lambda = 6.626 \times 10^{-34} / 1.5x10^{-27}$** **$\lambda = 4.42 \times 10^{-7}$ m**	 1 1 1 1 1
34	**(i)** Correct definition **(ii)**bond order of $N_2 = (N_b-N_a)/2 = (10-4)/2 = 3$ bond order of $O_2 = (N_b-N_a)/2 = (10-6)/2 = 2$ bond order of $O_2^+ = (N_b-N_a)/2 = (10-5)/2 = 2.5$ bond order of $O_2^- = (N_b-N_a)/2 = (10-6)/2 = 1.5$ **OR** (i)correct resonating structure (ii)(a)PCl_3 - hybridization -sp^3 shape - Trigonal pyramidal (b) CH_4 - hybridization -sp^3 shape – Tetrahedral (c) BCl_3 - hybridization -sp^2 shape - Trigonal planar	1 1 1 1 1 1 2 1 1 1

34	(i) Correct definition. (ii) Correct definition (iii) Correct definition (iv) Correct definition (v) Correct definition OR (i) Correct statement and correct mathematical expression. (ii) Given (*i*) $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$; $\Delta H = -890.2$ KJ mol^{-1} (*ii*) $C + O_2 \longrightarrow CO_2$; $\Delta H = -393.4$ kJ mol^{-1} (*iii*) $H_2 + \frac{1}{2}O_2 \longrightarrow H_2O$; $\Delta H = -285.7$ kJ mol^{-1} Multiply equation (iii) by 2, add it to equation (ii) and subtract equation (i) from their sum $C + 2H_2 \rightarrow CH_4$. $\Delta H = -393.4 + 2(-285.7) - (-890.2)$ $= -74.6$ kJ mol^{-1} Hence the heat of formation of methane (CH_4) is $\Delta_f H = -74.6$ kJ mol^{-1}.	1 1 1 1 1 1+1 1 1 1