



Total No. of Questions: 3

Total No. of Pages: 04

FIRST YEAR (B.Sc. Blended)
24BLCH12101: Inorganic and Physical Chemistry
(Semester II)

Program: B.Sc. Blended

Program Specific: B.Sc. Blended (Chemistry)

Course Type: DSC

Paper: I

Credits: 2

Time: 2 Hours

Max. Marks: 30

SET: A

Instructions to the candidate:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw a well labelled diagram wherever necessary.
- 4) Check annexure for data values

Q1) Attempt ANY SIX of the following.

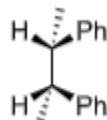
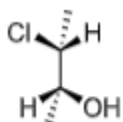
[6 X 2 = 12]

- a) Define stereoisomer.
- b) What are enzymes?
- c) What is chiral carbon? Give two examples.
- d) Which are the two possible geometries for coordination number four ?
- e) What are the rules for the IUPAC nomenclature of coordination compounds ?
- f) Explain why KNO_3 or KCl is preferred to make salt bridges ?
- g) Explain Pauli exclusion principle.
- h) Draw schematic diagram of Pfund series of hydrogen atom spectrum.

Q2) Attempt ANY THREE of the following.

[3 X 4 = 12]

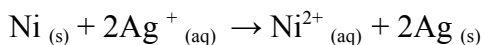
- a) What are inner sphere and outer sphere complexes? Explain with suitable examples.
- b) Distinguish between catabolism and anabolism.
- c) Explain the structures and number of atoms per unit cell in simple cubic, BCC and FCC.
Comment on their packing efficiency.
- d) Explain the hybridisation of central metal for coordination number six with a suitable example.
- e) Assign R or S configuration of the following molecules. Justify your answer.
 - i)
 - ii)



Q3) Attempt ANY TWO of the following.

[2 X 3 = 06]

- a) Calculate the uncertainty in the position of a particle having mass 2.7×10^{-28} g moving with a velocity of 2.1×10^9 cm/s. Given: Plank's constant(h) = 6.626×10^{-27} erg.s ; $\pi = 3.14$
- b) Compare the properties of d and p block elements with respect to following,
i) oxidation states
ii) electronegativity
iii) atomic radii
- c) Explain the structure of haemoglobin and its role in respiration.
- d) Calculate the emf of the cell in which the following reaction takes place:



Comment on its spontaneous/ non spontaneous behavior.

Given: Refer annexure for the standard reduction potential values.

$[\text{Ag}^+] = 0.002\text{M}$, $[\text{Ni}^{2+}] = 0.140\text{M}$,

at 298 K, $RT/F = 0.0591$

Annexure

Electrochemical series

Electrode	Electrode reaction (Oxidized form + ne ⁻ → Reduced form)	E ⁰ (V)
F ₂ F ⁻	F ₂ (g) + 2e ⁻ → 2F ⁻ (aq)	2.87
Co ³⁺ Co ²⁺	Co ³⁺ + e ⁻ → Co ²⁺	1.81
H ₂ O ₂ H ₂ O	H ₂ O ₂ + 2H ⁺ + 2e ⁻ → 2H ₂ O	1.78
MnO ₂ , H ⁺ Mn ²⁺	MnO ₂ (s) + 4H ⁺ + 2e ⁻ → Mn ²⁺ + 2H ₂ O	1.61
Au ³⁺ Au	Au ³⁺ + 3e ⁻ → Au (s)	1.50
MnO ₄ ⁻ Mn ²⁺	MnO ₄ ⁻ + 8H ⁺ + 5e ⁻ → Mn ²⁺ + 4H ₂ O	1.49
Cl ₂ Cl ⁻	Cl ₂ (g) + 2e ⁻ → 2Cl ⁻	1.36
Cr ₂ O ₇ ²⁻ , H ⁺ Cr ³⁺	Cr ₂ O ₇ ²⁻ + 4H ⁺ + 6e ⁻ → 2Cr ³⁺ + 7H ₂ O	1.33
O ₂ , H ⁺ H ₂ O	O ₂ + 4H ⁺ + 4e ⁻ → 2H ₂ O	1.23
Br ₂ Br ⁻	Br ₂ (l) + 2e ⁻ → 2Br ⁻	1.09
NO ₃ ⁻ , H ⁺ NO	NO ₃ ⁻ + 4H ⁺ + 3e ⁻ → NO (g) + 2H ₂ O	0.97
Hg ₂ ²⁺ Hg ₂ ²⁺	2Hg ₂ ²⁺ + 2e ⁻ → Hg ₂ ²⁺	0.92
ClO ⁻ Cl ⁻	ClO ⁻ + H ₂ O + 2e ⁻ → Cl ⁻ + 2OH ⁻	0.89
Hg ₂ ²⁺ Hg	Hg ₂ ²⁺ + 2e ⁻ → Hg	0.85
Ag ⁺ Ag	Ag ⁺ + e ⁻ → Ag	0.80
Hg ₂ ²⁺ Hg	Hg ₂ ²⁺ + e ⁻ → 2Hg	0.79
Fe ³⁺ Fe ²⁺	Fe ³⁺ + e ⁻ → Fe ²⁺	0.78
MnO ₄ ⁻ MnO ₄ ²⁻	MnO ₄ ⁻ + e ⁻ → MnO ₄ ²⁻	0.56
I ₂ I ⁻	I ₂ + 2e ⁻ → 2I ⁻	0.54
Cu ⁺ Cu	Cu ⁺ + e ⁻ → Cu	0.52
Cu ²⁺ Cu	Cu ²⁺ + 2e ⁻ → Cu	0.34
AgCl Ag	AgCl + e ⁻ → Ag + Cl ⁻	0.22
Cu ²⁺ Cu ⁺	Cu ²⁺ + e ⁻ → Cu ⁺	0.15
AgBr Ag	AgBr + e ⁻ → Ag + Br ⁻	0.10
H ⁺ H ₂	2H ⁺ + 2e ⁻ → H ₂	0.00
Fe ³⁺ Fe	Fe ³⁺ + 3e ⁻ → Fe	- 0.04
Pb ²⁺ Pb	Pb ²⁺ + 2e ⁻ → Pb	- 0.13
Sn ²⁺ Sn	Sn ²⁺ + 2e ⁻ → Sn	- 0.16
Ni ²⁺ Ni	Ni ²⁺ + 2e ⁻ → Ni	- 0.25
Co ²⁺ Co	Co ²⁺ + 2e ⁻ → Co	- 0.28
Cd ²⁺ Cd	Cd ²⁺ + 2e ⁻ → Cd	- 0.40
Fe ²⁺ Fe	Fe ²⁺ + 2e ⁻ → Fe	- 0.44
Cr ³⁺ Cr	Cr ³⁺ + 3e ⁻ → Cr	- 0.74
Zn ²⁺ Zn	Zn ²⁺ + 2e ⁻ → Zn	- 0.76
Mn ²⁺ Mn	Mn ²⁺ + 2e ⁻ → Mn	- 1.18
Al ³⁺ Al	Al ³⁺ + 3e ⁻ → Al	- 1.66
Mg ²⁺ Mg	Mg ²⁺ + 2e ⁻ → Mg	- 2.36
Ce ³⁺ Ce	Ce ³⁺ + 3e ⁻ → Ce	- 2.48
Na ⁺ Na	Na ⁺ + e ⁻ → Na	- 2.71
Ca ²⁺ Ca	Ca ²⁺ + 2e ⁻ → Ca	- 2.87
Ba ²⁺ Ba	Ba ²⁺ + 2e ⁻ → Ba	- 2.91
Cs ⁺ Cs	Cs ⁺ + e ⁻ → Cs	- 2.92
K ⁺ K	K ⁺ + e ⁻ → K	- 2.93
Li ⁺ Li	Li ⁺ + e ⁻ → Li	- 3.05

Periodic Table of the Elements

1 H Hydrogen 1.008	2 He Helium 4.003																	18 VIIIA 8A																
3 Li Lithium 6.941	4 Be Beryllium 9.012																	2 IIA 2A																
11 Na Sodium 22.990	12 Mg Magnesium 24.305	13 Al Aluminum 10.811	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.065	17 Cl Chlorine 35.453	18 Ar Argon 39.948																	10 VIIIA 8A										
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.88	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.61	33 As Arsenic 74.922	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80																	8 VIIIA 8A
37 Rb Rubidium 84.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.94	43 Tc Technetium 98.907	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.71	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.904	54 Xe Xenon 131.29																	7 VIIIA 8A
55 Cs Cesium 132.905	56 Ba Barium 137.327	57-71 Lanthanide Series	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.85	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.967	80 Hg Mercury 200.59	81 Tl Thallium 204.383	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium [208.982]	85 At Astatine 209.987	86 Rn Radon 222.018																	6 VIIIA 8A
87 Fr Francium 223.020	88 Ra Radium 226.025	89-103 Actinide Series	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [263]	107 Bh Bohrium [264]	108 Hs Hassium [265]	109 Mt Meitnerium [266]	110 Ds Darmstadtium [269]	111 Rg Roentgenium [272]	112 Cn Copernicium [277]	113 Nh Nihonium [284]	114 Fl Flerovium [289]	115 Uup Ununpentium [294]	116 Lv Livermorium [293]	117 Uus Ununseptium [294]	118 Uuo Ununoctium [294]																	5 VIIIA 8A
57 La Lanthanum 138.905	58 Ce Cerium 140.115	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.24	61 Pm Promethium [144.913]	62 Sm Samarium 150.35	63 Eu Europium 151.965	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.50	67 Ho Holmium 164.930	68 Er Erbium 167.26	69 Tm Thulium 168.934	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967																	4 VIIIA 8A			
89 Ac Actinium 227.028	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	94 Pu Plutonium 244.064	95 Am Americium 243.061	96 Cm Curium 247.070	97 Bk Berkelium 247.070	98 Cf Californium 251.080	99 Es Einsteinium [254]	100 Fm Fermium [257.085]	101 Md Mendelevium [258.1]	102 No Nobelium [259.101]	103 Lr Lawrencium [262]																	3 VIIIA 8A			

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