Chemistry

TARGET : JEE 2013

SCORE

JEE (Advanced)

Home Assignment # 04

ALLEN CAREER INSTITUTE
KOTA (RAJASTHAN)
Path to Success

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PHYSICAL CHEMISTRY

HOME ASSIGNMENT # 04

Topic : Electrochemistry & Solid State

Only one correct ::

1. Some standard potential are given at 25°C

$E^{\circ}_{A^+/A} = -1.50\,V$; $E^{\circ}_{B^{2+}/B} = -0.50\,V$

$E^{\circ}_{C/C^-} = +0.20\,V$; $E^{\circ}_{D^{-2}/D} = -0.70\,V$

Which of the following is best oxidising agent under standard condition? (Assuming that element exist in only given oxidation states)

(A) A^+ (B) B^{2+} (C) C^- (D) D

2. The change in reduction potential of hydrogen half cell at 25°C by increasing pressure of H_2 gas from 1 atm to 100 atm keeping H^+ concentration constant at 2M is that it :

(A) increases by 0.59 V (B) decreases by 0.59 V

(C) increases by 0.059 V (D) decreases by 0.059 V

3. The resistance of 0.1M solution of a salt is found to be 2.5×10^3 ohms. The equivalent conductance of the solution is (Cell constant = 1.15 cm^{-1})

(A) 4.6 (B) 5.6 (C) 6.6 (D) 7.6

4. The cell $Pt|H_2(g)\ (1atm)|H^+$; pH = x|| Normal calomal electrode has EMF of 0.64 volt at 25°C. The standard reduction potential of normal calomal electrode is 0.28 V. What is the pH of solution in anodic compartment. take $\frac{2.303RT}{F} = 0.06$ at 298 K.

(A) 4 (B) 5 (C) 6 (D) 7

5. Element X crystallizes in a 12 coordination FCC lattice. On applying high temperature it changes to 8 coordination BCC lattice. Find the ratio of the density of the crystal lattice before and after applying high temperature ?

(A) 1 : 1 (B) 3 : 2 (C) $\sqrt{2} : \sqrt{3}$ (D) $2\left(\sqrt{2}\right)^3 : \left(\sqrt{3}\right)^3$

6. In the solid compound Cu_2HgI_4, cations occupy tetrahedral holes in a close packed anion lattice. What fraction of tetrahedral holes are filled ?

(A) $\frac{1}{4}$ (B) $\frac{3}{8}$ (C) $\frac{3}{4}$ (D) $\frac{1}{2}$

7. Cesium iodide consists of a simple cubic lattice of I^- ions with Cs^+ ions in the cubic holes. If the cell edge length is 0.445 nm, what is the Cs–I interatomic distance ?

(A) 0.193 nm (B) 0.314 nm (C) 0.385 nm (D) 0.629 nm

8. Thallium cyanide, $Ti(CN)_x$, crystallizes as a simple cubic array of CN^- ions with thallium ions in all of the cubic holes. What is the oxidation state of thallium in this compound ?

(A) –1 (B) 0 (C) +1 (D) +2

9. Scandium oxide, Sc_2O_3, crystallizes with the oxide ions in a closest packed array with the scandium ions in octahedral holes. What fraction of the octahedral holes are filled ?

(A) All (B) 2/3 (C) 1/2 (D) 1/3

10. A chemist found the standard reduction potential $E^\circ_{Zn^{2+}/Zn} = -0.76$ V. In which of the following cell $\mathbf{E^\circ_{cell} \neq E_{cell}}$.

(A) $Zn|Zn^{2+}(1M)||H^+(1M)|H_2(1\ atm)|Pt$ (B) $Zn|Zn^{2+}(4M)||H^+(2M)|H_2(1\ atm)|Pt$

(C) $Zn|Zn^{2+}(10M)||H^+(10M)|H_2(1\ atm)|Pt$ (D) $Zn|Zn^{2+}(2M)||H^+(2M)|H_2(2\ atm)|Pt$

11. Find $\wedge_m^\infty$ (in $\Omega^{-1}\ cm^2\ mol^{-1}$) for strong electrolyte AB_2 in water at 25° from the following data.

Conc.C(mole/L)	0.25	1
$\wedge_m(\Omega^{-1}cm^2/mol)$	160	150

(A) 170 (B) 180 (C) 200 (D) 220

12 Consider the reaction of extraction of gold from its ore

$$Au + 2CN^-\ (aq.) + \frac{1}{4}O_2\ (g) + \frac{1}{2}H_2O \longrightarrow Au(CN)_2^- + OH^-$$

Use the following data to calculate ΔG° for the reaction

$K_f\{Au(CN)_2^-\} = X$

$O_2 + 2H_2O + 4e^- \longrightarrow 4OH^-$; $E^\circ = +0.41$ volt

$Au^{3+} + 3e^- \longrightarrow Au$; $E^\circ = +1.5$ volt

$Au^{3+} + 2e^- \longrightarrow Au^+$; $E^\circ = +1.4$ volt

(A) $-RT\ ln\ X + 1.29\ F$ (B) $-RT\ ln\ X - 2.11\ F$

(C) $-RT\ ln\ \frac{1}{X} + 2.11\ F$ (D) $-RT\ ln\ X - 1.29\ F$

13 A hydrogen electrode X was placed in a buffer solution of sodium acetate and acetic acid in the ratio a : b and another hydrogen electrode Y was placed in a buffer solution of sodium acetate and acetic acid in the ratio b : a. If reduction potential values for two cells are found to be E_1 and E_2 respectively w.r.t. standard hydrogen electrode, the pK_a value of the acid can be given as

(A) $\frac{E_1 + E_2}{0.118}$ (B) $\frac{E_2 - E_1}{0.118}$ (C) $-\frac{E_1 + E_2}{0.118}$ (D) $\frac{E_1 - E_2}{0.118}$

14. Diamond structure can be considered as ZnS (Zinc blend) structure in which each Zn^{2+} in alternate tetrahedral void and S^{2-} in cubic close pack arrangement is replaced by one carbon atom. If C – C covalent bond length in diamond is 1.5 Å, what is the edge length of diamond unit cell (z = 8) :

(A) 3.46 Å (B) 6.92 Å (C) 1.73 Å (D) 3 Å

15. In a non stoichiometric sample of ferrous oxide with NaCl structure, the ratio of Fe^{+3} to Fe^{2+} was found to be 0.15. The fraction of octahedral sites occupied by vacancies is :

(A) 0.0843 (B) 0.0923 (C) 0.0613 (D) 0.0232

16 A saturated solution in AgA ($K_{sp} = 3\times10^{-14}$) and AgB ($K_{sp} = 1\times10^{-14}$) has conductivity of 375×10^{-10} Scm^{-1} and limiting molar conductivity of Ag^+ and A^- are 60 $Scm^2\ mol^{-1}$ and 80 $Scm^2\ mol^{-1}$ respectively then what will be the limiting molar conductivity of B^- (in $Scm^2\ mol^{-1}$)

(A) 150 (B) 180 (C) 190 (D) 270

17. Specific conductance of 10^{-4} M n-Butyric acid aqueous solution is 1.9×10^{-9} S m^{-1}. If molar conductance of n-Butyric acid at infinite dilution is 380×10^{-4} S $m^2\ mol^{-1}$, then K_a for n-Butyric acid is :

(A) 2.5×10^{-5} (B) 2.5×10^{-4} (C) 5×10^{-5} (D) 5×10^{-4}

18 $Zn \mid Zn^{2+}\ (a = 0.1M) \parallel Fe^{2+}\ (a = 0.01M) \mid Fe$. The emf of the above cell is 0.2905 V. Equilibrium constant for the cell reaction is

(A) $10^{0.32/0.0591}$ (B) $10^{0.32/0.0295}$

(C) $10^{0.26/0.0295}$ (D) $e^{0.32/0.295}$

19 Molar conductances of $BaCl_2$, H_2SO_4 and HCl are x_1, x_2 and x_3 $Scm^2\ mol^{-1}$ at infinite dilution. If specific conductance of saturated $BaSO_4$ solution is of y Scm^{-1}, then k_{sp} of $BaSO_4$ is

(A) $\dfrac{10^3 y}{2(x_1 + x_2 - 2x_3)}$ (B) $\dfrac{10^6 y^2}{(x_1 + x_2 - 2x_3)^2}$ (C) $\dfrac{10^6 y^2}{4(x_1 + x_2 - 2x_3)^2}$ (D) $\dfrac{x_1 + x_2 - 2x_3}{10^6 y^2}$

20 What is the electrode potential of Fe^{3+}/Fe electrode in which concentration of Fe^{3+} ions is 0.1M ?

Given $E^{\circ}_{Fe^{3+}/Fe} = +0.77V$

(A) + 0.79 V (B) + 0.75 V (C) 1.50 V (D) +1.0 V

21 Given :

$2Br^- \rightarrow Br_2 + 2e^-$ $E^o = -1.09$ V ;

$I_2 + 2e^- \rightarrow 2I^-$ $E^o = 0.54$ V

$Fe^{2+} + 2e \rightarrow Fe$ $E^o = -0.44$ V

Which of the following reactions will not be spontaneous

(A) $Fe + Br_2 \rightarrow FeBr_2$

(B) $Fe + I_2 \rightarrow FeI_2$

(C) $I_2 + 2Br^- \rightarrow 2I^- + Br_2$

(D) $Br_2 + 2I^- \rightarrow 2Br^- + I_2$

22 Following are some standard reduction potential values for the given half cell

(i) $A^{++} + 2e^- \rightleftharpoons A$ $E^o = 1.27$ V

(ii) $B^+ + e^- \rightleftharpoons B$ $E^o = -0.7$ V

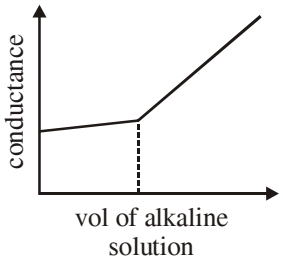
(iii) $C^{++}\ 2e^- \rightleftharpoons C$ $E^o = -0.54$ V

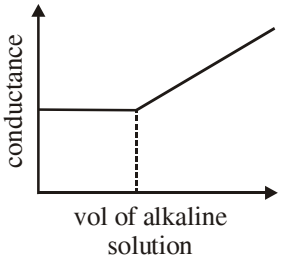
(iv) $D^+ + e^- \rightleftharpoons A$ $E^o = 1.05$ V

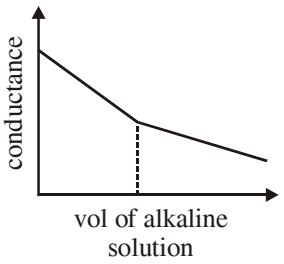
The combination of which two half cells will give galvanic cell having maximum possible emf

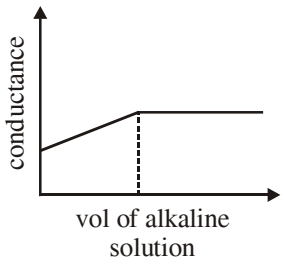
(A) (i) and (ii) (B) (i) and (iv) (C) (ii) and (iii) (D) (iii) and (iv)

23 Which of the following plots will obtained for a conducmetric titration of stong acid against a weak base-

(A) 

(B) 

(C) 

(D) 

One or more than may be correct ::

24 The standard redox potential E° of the following systems are -

$MnO_4^-(aq) + 8H^+(aq) + 5e^- \longrightarrow Mn^{2+}(aq) + 4H_2O(l)$; $E^\circ = 1.51$ V

$Cr_2O_7^{2-}(aq) + 14\ H^+(aq) + 6e^- \longrightarrow 2Cr^{3+}(aq) + 7H_2O(l)$; $E^\circ = 1.38$ V

$Sn^{2+} \longrightarrow Sn^{4+} + 2e^-$; $E^\circ = -0.15$ V

$Ce^{3+} \longrightarrow Ce^{4+} + e^-$; $E^\circ = -1.61$ V

The oxidising power of the various species are related as.

(A) $Cr_2O_7^{2-} > MnO_4^-$ (B) $Ce^{4+} > Sn^{4+}$

(C) $Ce^{4+} > MnO_4^-$ (D) $MnO_4^- > Sn^{4+}$

25. The standard emf for the cell reaction,

$Zn + Cu^{2+} \longrightarrow Cu + Zn^{2+}$, is 1.1 V at 25°C. If 0.1 M Cu^{2+} and 0.1 M Zn^{2+} solutions are used then :-

(A) the emf of cell = 1.15 V (B) emf of cell = 1.1 V

(C) reaction will be spontaneous (D) reaction will be non-spontaneous

26. Which of the following statements are true regarding tetrahedral voids in fcc lattice ?

(A) Tetrahedral voids formed by one corner spheres and three face centred spheres

(B) Two tetrahedral voids can exist on one diagonal body line in fcc cubic

(C) Tetrahedral voids are equal to number of spheres involved in crystal

(D) Volume of tetrahedral voids are half of the octahedral voids

27. An ionic crystalline solid AB having cubic unit cell, may have following arrangement(s) -
(A) B^- in FCC and A^{2+} occupies all tetrahedral voids.
(B) B^- in CCP and A^{2+} in alternate tetrahedral voids.
(C) B^- at each corner and each face center and A^{2+} in half octahedral voids.
(D) B^- at each corner and A^{2+} at each edge center.

28 Indicate the correct statements -
(A) Conductivity cells have cell constant values independent of solution filled into the cell
(B) DC (direct current) is not used for measuring the resistance of a solution
(C) Kohlrausch law is valid both for strong and weak electrolytes
(D) The k decreases but λ_M and λ_E increase on dilution

29. Consider the cell $Zn \mid Zn^{2+}(aq) \mid\mid Cl^-(aq) \mid Cl_2(g) \mid Pt(s)$

Given: $[Zn^{2+}] = 4$ M; $[Cl^-] = 0.5$ M; $[P_{Cl_2}] = 0.1$ bar ;

$E^o_{Zn/Zn^{2+}} = 0.76V$; $E^o_{Cl_2/Cl^-} = 1.32$ V ; $\frac{2.303RT}{F} = 0.06$

(A) $E_{cell} = 2.05$ V (B) $E^o_{cell} = 0.56$ V
(C) Cell is spontaneous at given condition (D) Cell is non spontaneous at standard state

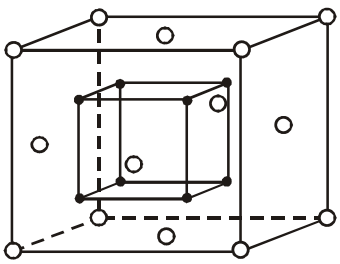
30. The hcp and ccp structure of a given element. (Given radius of element is same in both structures)
(A) have same density
(B) have same distance between two consecutive layers (A & B)
(C) have same co-ordination number
(D) have same fraction of unoccupied space.

31. Select the correct statement (s) :
(A) Schottky defect is shown by CsCl
(B) Frenkel defect is shown by ZnS
(C) hcp and ccp structures have the same coordination number 12
(D) On increasing pressure, coordination number of CsCl decreases to that of NaCl

Paragraph ::

Paragraph for Question 32 to 34

The diagram represent a unit cell of $SrCl_2$. The open circles, representing Sr^{2+} ions, are at the corners and at the intersections of the face diagonal, of the big cube. The black circles, representing Cl^- ions, are on the body diagonals of the big cube, lying at the corners of the small cube shown by the dotted lines.



32. Which of the following statements is true of the structure of strontium chloride :
(A) the strontium ions are in a body-centred cubic arrangement
(B) the strontium ions are in a face-centred cubic arrangement
(C) each chloride ion is at the centre of a cube of 8 strontium ions
(D) each strontium ion is at the centre of a tetrahedron of 4 chloride ions

33. The co-ordination numbers of Sr^{2+} and Cl^- ions respectively are :
(A) 4 : 8 (B) 8 : 4 (C) 8 : 8 (D) 8 : 12

34. If the volume of 1 mole of $SrCl_2$ is V cm^3 and the volume of a unit cell is ν cm^3, the Avogadro constant, L is given by :

(A) $\frac{V}{\nu}\times\frac{1}{4}$ (B) $\frac{V}{\nu}\times\frac{1}{2}$ (C) $\frac{V}{\nu}\times 4$ (D) $\frac{V}{\nu}\times 12$

Paragraph for Question Nos. 35 to 37

Spinal is an important class of oxide having two types of metal ions. A type of spinal have CCP arrangement of O^{2-} ions in which Fe^{2+} cation occupy 1/8 of tetrahedral voids and Fe^{3+} cation occupies 1/2 of the octahedral voids. If **'a'** be the edge of unit cell then :

35. What is the formula of spinal ?
(A) Fe_2O_3 (B) Fe_3O_4 (C) FeO (D) None of the above

36. What is the coordination number of Fe^{2+} and Fe^{3+} ion :-
(A) 4 and 6 (B) 6 and 8 (C) 6 and 12 (D) None of the above

37. What is the inter nuclear distance between Fe^{2+} ion and Fe^{3+} ion :-

(A) $\frac{\sqrt{3}}{4}a$ (B) $\frac{a}{2}$ (C) $\frac{a}{\sqrt{2}}$ (D) a

Paragraph for Question 38 to 40

The magnitude (but not the sign) of the standard reduction potentials of two metals X and Y are :

$Y^{2+} + 2e^- \longrightarrow Y$ $\quad |E_1^\circ| = 0.34$ V

$X^{2+} + 2e^- \longrightarrow X$ $\quad |E_2^\circ| = 0.25$ V

When the two half-cells of X and Y are connected to construct a cell, electrons flow from X to Y. When X is connected to a standard hydrogen electrode (SHE), electrons flow from X to SHE.
$\left[\text{Use}\frac{2.303RT}{nF} = 0.06\right]$

38. If a half-cell X/X^{2+} (0.1 M) is connected to another half-cell Y/Y^{2+} (1.0 M) by means of a salt bridge and an external circuit at 25°C, the cell voltage would be :
(A) 0.06 V (B) 0.12 V (C) 0.62 V (D) 0.72 V

39. If standard emf (E°) of a half-cell Y^{2+}/Y^+ is 0.15 V, the standard emf of the half-cell Y^+/Y will be?
(A) 0.19 V (B) 0.53 V (C) 0.49 V (D) 0.64 V

40. Given the following half-cell :

$YI + e^- \longrightarrow Y + I^-$ $\quad E^\circ = -0.37$ V

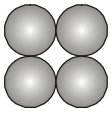
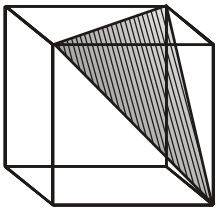
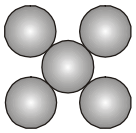
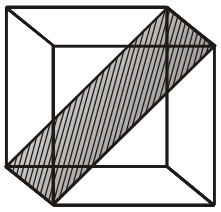
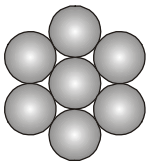
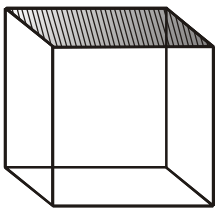
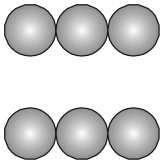
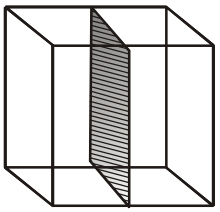
Solubility product of the iodide salt YI is :
(A) 2×10^{-3} (B) 2×10^{-12} (C) 10^{-15} (D) 6.8×10^{-16}

Match the column ::

41. Match the following Column–I and Column–II :

	Column–I	**Column–II**
(A)	Metal–metal ion half cell	(p) Cl^- / AgCl / Ag
(B)	Gas–gas ion half cell	(q) Pt / Cr^{2+} (C_1M) / Cr^{3+} (C_2M)
(C)	Redox half cell	(r) Pt / O_2 / OH^-
(D)	Metal insoluble metal salt-anion half cell	(s) Sn^{2+} / Sn
		(t) Sn^{4+} / Sn^{2+}

42. Match the following :

Column–I (Arrangement of the atoms/ions)		**Column–II (Planes in FCC lattice)**	
(A)		(p)	
(B)		(q)	
(C)		(r)	
(D)		(s)	

Integer ::

43. For an element 'X' the process of oxidation is :

$X_2O_4^{-2} \longrightarrow$ New compound

If 965 A current when passed for 100 seconds discharged 0.1 mol of $X_2O_4^{-2}$ find oxidation state of X in new compound ?

44. Consider a Galvenic cell,

$Zn(s)|Zn^{2+}(0.1\ M)||Cu^{2+}(0.1\ M)|Cu(s)$

by what factor, the electrolyte in anodic half cell should be diluted to increase the emf by 9 milli volt at 298 K.

45. AgCl has the same structure as that of NaCl. The edge length of unit cell of AgCl is found to be 555 pm and the density of AgCl is 5.561 g cm^{-3}. Find the percentage of sites that are unoccupied.

46. Potassium crystallizes in a body-centered cubic lattice with edge length, a = 5.2 Å.

(a) What is the distance between nearest neighbours?

(b) What is the distance between next-nearest neighbours?

(c) How many nearest neighbours does each K atom have?

(d) How many next-nearest neighbours does each K atom have?

(e) What is the calculated density of crystalline potassium?

47. If NaCl is dopped with 10^{-3} mol % $SrCl_2$, what is the numbers of cation vacancies per mole of NaCl?

48. Equivalent conductance of 0.2 M aqueous solution of a weak monobasic acid (HA) is 10 S cm^2 $equiv^{-1}$ and that at infinite dilution is 200 S cm^2 $equiv^{-1}$. Hence, pH of this solution is

49. How many effective Na^+ ions are present in a unit cell of NaCl. If ions along one axis joining opposite face centres are removed ?

50. A current strength of 96.5 A is passed for 10 s through 1L of solution of 0.1 M aqueous solution of $CuSO_4$. What is the pH of the solution ?

51. The emf of a cell corresponding to the reaction -

$Zn + 2H^+(aq) \rightarrow Zn^{2+}(0.1M) + H_2(g)\ (1\ atm)$

is 0.26 volt at 25ºC. Calculate the the pH of the solution at the hydrogen electrode.

Given : $E^{\circ}_{Zn/Zn^{2+}} = 0.77$ volt.

52 Calculate the potential of an indicator electrode versus the standard hydrogen electrode, which originally contained 0.1M MnO_4^- and 0.8M H^+ and which was treated with 90% of the Fe^{2+} necessary to reduce all the MnO_4^- to Mn^{+2}.

$MnO_4^- + 8H^+ + 5e \rightarrow Mn^{2+} + 4H_2O,\ E^0 = 1.51V$

53 The emf of the cell $Ag|AgI|KI(0.05M) \parallel AgNO_3(0.05M)|Ag$ is 0.788V. Calculate the solubility product of AgI.

54. The electrolysis of cold sodium chloride solution produces NaOH and Cl_2. The Cl_2 produced disproportionates in NaOH solution to give sodium hypochlorite (NaClO) and sodium chloride. How long will a cell operate to produce 1.00×10^3 L of 7.45 % (w/w) solution of NaClO if the cell current is 9.65 ampere? Assume that the density of solution is 1.00 gm/ml.

[Fill your answer by multiplying it with 10^{-5}]

55. For any sparingly soluble salt $[M(NH_3)_4Br_2]\ H_2PO_2$

Given : $\lambda^0_{M(NH_3)_4Br_2^+} = 400$ S-m^2–mol^{-1}, $\lambda^0_{H_2PO_2^-} = 100$ S-m^2–mol^{-1}

Specific resistance of saturated $[M(NH_3)_4Br_2]H_2PO_2$ solution is 200 Ω-m

If solubility product constant of the above salt is 10^{-x}. What will be the value of x.

HOME ASSIGNMENT # 04

ANSWERS KEY-PHYSICAL CHEMISTRY

1.	(D)	2.	(D)	3.	(A)	4.	(C)
5.	(D)	6.	(B)	7.	(C)	8.	(C)
9.	(B)	10.	(C)	11.	(A)	12	(A)
13	(C)	14.	(A)	15.	(C)	16	(D)
17.	(C)	18	(B)	19	(B)	20	(B)
21	(C)	22	(A)	23	(C)	24	(B,C,D)
25.	(B,C)	26.	(A, B)	27.	(C)	28	(A,B,C,D)
29.	(A, C)	30.	(A, B, C, D)	31.	(A,B,C)	32.	(B)
33.	(B)	34.	(C)	35.	(B)	36.	(A)
37.	(A)	38.	(C)	39.	(B)	40.	(C)

41. (A)–(s) ; (B)–(r) ; (C)–(q) (t) ; (D)–(p)

42. (A)–(s) ; (B)– (r) ; (C)– (p) ; (D)–(q)

43. (8) 44. (2) 45. 0.24%

46. (a) 4.5 Å, (b) 5.2 Å, (c) 8, (d) 6, (e) 0.92 g/cm^3 47. 6.02×10^{18} mol^{-1}

48.	(2)	49.	(3)	50.	(2)	51.	(9)
52	1.39V	53	$K_{sp} = 1.1 \times 10^{-16}$				
54.	0200	55.	16				

INORGANIC CHEMISTRY
HOME ASSIGNMENT # 04
d-block, p-block

Only one correct ::

1. Which of the following metal is present in haemoglobin -
(A) Fe (B) Mg (C) Ca (D) Na

2. The number of moles of $KMnO_4$ required for the oxidation of one mole of oxalate ion -
(A) 5/2 (B) 2/5 (C) 5 (D) 2

3. The number of moles of $K_2Cr_2O_7$ required to convert one mole Cl^- into Cl_2
(A) 1/3 (B) 3 (C) 2/3 (D) 3/2

4. The most thermally stable allotrophic form of phosphorous is -
(A) Red P (B) Black P (C) White P (D) None of these

5. Which of the following molecule/metal can be used as catalyst in contact process -
(A) V_2O_5 (B) $CuCl_2$ (C) Mo (D) Pt

6. In Haber process for the industrial preparation of ammonia ; Mo can be used as -
(A) Catalyst (B) Promotor (C) Activator (D) Auto catalyst

7. Which of the following compound is responsible for catching fire spontaneously in Holme's signal.
(A) P_2H_4 (B) PH_3 (C) C_2H_4 (D) All of these

8. The general formula for double chain silicate is-
(A) $(Si_2O_5)_n^{2n-}$ (B) $(Si_2O_7)_n^{2n-}$ (C) $(Si_2O_{5.5})_x^{3x-}$ (D) None

9. There is no hybridisation of the central atom in PH_3 because :-
(A) P is of 2^{nd} period element
(B) The energy gap between 2s and 2p orbital is large enough
(C) The energy gap between 3s and 2p orbital is sufficiently less
(D) The energy gap between 3s and 3p orbital is large enough

10. Find the (bond pair : lone pair) ratio in the SF_6 molecule :-
(A) 3 (B) 2 (C) 4 (D) 8

11. The structure of γ–SO_3 is-
(A) Linear (B) crossed linked (C) cyclic (D) none of these

12. White phosphorus produces the following products on reaction with conc. NaOH
(A) $NaH_2PO_2 + PH_3$ (B) $NaH_2PO_4 + PH_3$ (C) $Na_2HPO_3 + PH_3$ (D) None of these

13. Which of the following can form cyclic silicone on hydrolysis.
(A) R_2SiCl_2 (B) $RSiCl_3$ (C) R_3SiCl (D) $SiCl_4$

14. Select **incorrect** reaction which is related to prepration of $Cl_2(g)$ -
(A) $NaCl + MnO_2 \xrightarrow[conc.H_2SO_4]{\Delta with}$
(B) $2HCl + O_2 \xrightarrow[CuCl_2\ ;\ 250°C]{\Delta with}$
(C) $KClO_3(s) \xrightarrow[MnO_2]{\Delta with}$
(D) $2KCl + 2H_2O \xrightarrow{Electrolysis}$

15. Choose the incorrect statement :-

(A) In alkaline medium, the hydrolysis of $BeCl_2$ produces clear solution consisting of $[Be(OH)_4]^{2-}$ and HCl.

(B) In the clear solution of $BiCl_3$, when large quantity of water is added, the white turbidity of BiOCl is obtained.

(C) SiF_4 undergoes partial hydrolysis.

(D) The final products of PCl_3 and $POCl_3$ are not identical.

16. PH_3 (Phosphine) when passed in aqueous solution of $CuSO_4$ it produce -

(A) Blue precipitate of $Cu(OH)_2$ (B) dark blue solution of $[Cu(PH_3)_4]SO_4$

(C) Black precipitate of Cu_3P_2 (D) Colorless solution of $[Cu(H_2O)_4]^+$

17. $Ca + C_2 \longrightarrow CaC_2 \xrightarrow{N_2} A$

Compound (A) is used as a/an

(A) fertilizer (B) dessicant

(C) oxidising agent (D) reducing agent

18. When PbO_2 reacts with conc. HNO_3, the gas evolved may be :

(A) NO_2 (B) O_2 (C) N_2 (D) N_2O

19. Identify the incorrect statement among the following

(A) Ozone reacts with SO_2 to give SO_3

(B) Silicon reacts with NaOH(aq.) in the presence of air to give Na_2SiO_3 and H_2O

(C) Cl_2 reacts with excess of NH_3 to give N_2 and NH_4Cl

(D) Cl_2 reacts with hot and strong NaOH solution to given NaCl, $NaClO_4$ and H_2O

20. What would happen when a solution of potassium chromate is treated with an excess of dilute nitric acid -

(A) Cr^{3+} and $Cr_2O_7^{2-}$ are formed

(B) $Cr_2O_7^{2-}$ and H_2O are formed

(C) $Cr_2O_7^{2-}$ is reduced to +3 state of Cr

(D) $Cr_2O_7^{2-}$ is oxidised to +7 state of Cr

21. Excess of KI reacts with $CuSO_4$ solution and then $Na_2S_2O_3$ solution is added to it. Which of the statements is incorrect for this reaction :

(A) Evolved I_2 is reduced (B) CuI_2 is formed

(C) $Na_2S_2O_3$ is oxidised (D) Cu_2I_2 is formed

22. Graphite is good conductor of current but diamond is non-conductor because :

(A) Diamond is hard and graphite is soft

(B) graphite and diamond have different atomic configuration

(C) Graphite is composed of positively charged carbon ions

(D) Graphite has hexagonal layer structure with mobile π-electrons while diamond has continuous tetrahedral covalent structure with no free electrons

23. The reaction of P_4 with **X** leads selectively to P_4O_6. The **X** is :

(A) Dry O_2 (B) A mixture of O_2 and N_2

(C) Moist O_2 (D) O_2 in the presence of aqueous NaOH

24. A metal X on heating in nitrogen gas gives Y. Y on treatment with H_2O gives a colourless gas which when passed through $CuSO_4$ solution gives a blue colour. Y is
(A) $Mg(NO_3)_2$ (B) Mg_3N_2 (C) NH_3 (D) MgO

25. Which acts both an oxidising as well as reducing agent
(A) HNO_3 (B) HNO_2 (C) H_2SO_4 (D) HCl

26. The correct order of the thermal stability of hydrogen halide (H-X) is :
(A) HI > HBr > HCl > HF (B) HF > HCl > HBr > HI
(C) HCl < HF > HBr < HI (D) HI > HCl < HF > HBr

27. Which one of the following statements regarding helium is incorrect
(A) It is used to produce and sustain powerful superconducting material
(B) It is used as a cryogenic agent for carrying out experiments at low temperatures
(C) It is used in airships instead of hydrogen it is non-inflammable
(D) It is used in gas-cooled nuclear reactors

28. White phosphorus on reaction with NaOH gives PH_3 as one of the products. This is a
(A) dimerization reaction
(B) disproportionation reaction
(C) condensation reaction
(D) precipitation reaction

29. $CuSO_4$ solution reacts with excess KCN to give
(A) $Cu(CN)_2$ (B) CuCN
(C) $K_2[Cu(CN)_2]$ (D) $K_3[Cu(CN)_4]$

30. When acidified $KMnO_4$ is added to hot oxalic acid solution, the decolourization is slow in the beginning, but becomes very rapid after some time. This is because:
(A) Mn^{2+} acts as autocatalyst (B) CO_2 is formed as the product
(C) Reaction is exothermic (D) MnO_4^- catalyses the reaction

31. Bleaching powder on standing forms mixture of :-
(A) CaO + Cl (B) HOCl + Cl_2
(C) $CaCl_2$ + $Ca(ClO_3)_2$ (D) CaO + $CaCl_2$

32. Which of the following statements is not correct when a mixture of NaCl and $K_2Cr_2O_7$ is gently warmed with conc. H_2SO_4 :
(A) A deep red vapour is evolved
(B) The vapour when passed into NaOH solution gives a yellow solution of Na_2CrO_4
(C) Chlorine gas is evolved
(D) Chromyl chloride is formed

33. The F–F bond is weak because :
(A) The repulsion between the nonbonding pairs of electrons of two fluorine atoms is large
(B) The ionization energy of the fluorine atom is very low
(C) The length of the F-F bond much larger than the bond lengths in other halogen molecules
(D) The F-F bond distance is small and hence the internuclear repulsion between the two F atoms is very low

34. When steam is passed over red hot coke, the outgoing gas contains
(A) Producer gas (B) Water gas
(C) Coal gas (D) None of the above

One or more than may be correct ::

35. Select **CORRECT** statement (s) -
(A) White phosphorus produce PH_3 with NaOH conc. as one of the products.
(B) CN^- is a pseudohalide ion
(C) White phosphorous is poisnous in nature
(D) FeI_3 does not exist

36. Which of the following product is not formed when bromine reacts with Cold & dil. NaOH
(A) NaBr (B) NaBrO (C) $NaBrO_3$ (D) $HBrO_3$

37. Which of the following metal(s) becomes passive with 80 % conc.HNO_3
(A) Al (B) Fe (C) Ag (D) Cr

38. Which of the following product (s) is/are formed when Boron reacts with conc. H_2SO_4
(A) H_3BO_3 (B) SO_2 (C) H_2O (D) None of these

39. Which of the following product (s) is/are formed when Zn reacts with conc. H_2 SO_4
(A) $ZnSO_4$ (B) H_2 (C) SO_3 (D) None of these

40. Which of the following product (s) is/are formed when O_3 reacts with Hg
(A) Hg_2O (B) O_2 (C) HgO (D) H_2O

41. Which of the following product (s) is/are formed when H_2O_2 reacts with ozone
(A) H_2O (B) O_2 (C) OH^- (D) H_2

42. Which of the following product (s) is/are formed when Pb_3O_4 reacts with HNO_3
(A) $Pb(NO_3)_2$ (B) PbO_2 (C) Pb (D) NO_2

43. The correct order of boiling point is/are-
(A) $H_2O > H_2S$ (B) $CCl_4 > SiCl_4$ (C) HF > HCl (D) Xe > Ne > Ar

44. Which of the following products are formed when AgCl fused with Na_2CO_3
(A) Ag (B) Ag_2O (C) CO_2 (D) Ag_2CO_3

45. Which of the following molecule does not exist -
(A) PbI_4 (B) $PbBr_5$ (C) $PbCl_4$ (D) PbO_2

46. Select correct about "Hypophosphorous" acid .
(A) Monobasic acid in water (B) OH^- acceptor in water
(C) Reducing in nature (D) Three H attached to P

47. Which of the following is consisting of OCl^- ion.
(A) KOCl (B) BiOCl
(C) SbOCl (D) $CaOCl_2$ (bleaching powder)

48. In which of the molecule on hydrolysis proton donor oxyacid is formed from their central atom-
(A) NCl_3 (B) PCl_3 (C) SF_4 (D) P_4O_{10}

49. Choose the incorrect order of the given properties from the following option :-
(A) $SF_6 > SeF_6 > TeF_6$: Rate of hydrolysis
(B) HF < HCl : Acidic strength
(C) $H_2O > OCl_2$: Bond angle
(D) $BF_3 < BCl_3$: Lewis acidic strength

50. Which of following statement is correct regarding the B_2H_6 molecule.
(A) It has two 3c–2e bond (B) It has four 2c-2e bond
(C) The hybridisation of all B-atoms is sp^3 (D) Act as electron deficient species.

Match the column ::

Match the column :

51.

Column-I		**Column-II**	
(A)	S + conc. $HNO_3 \rightarrow$	(P)	NO is formed
(B)	Cu + dil. $HNO_3 \rightarrow$	(Q)	NO_2 is formed
(C)	Cu + conc. $HNO_3 \rightarrow$	(R)	N_2O is formed
(D)	Zn + dil. $HNO_3 \rightarrow$	(S)	$Cu(NO_3)_2$ is formed
		(T)	Redox reaction

Integer ::

52. Find the number of species which is/are non planar.
(a) 2D-silicate ion (b) 3D-silicate ion
(c) Phosphate ion (d) Inorganic benzene
(e) Diamond (f) Oleum

53. Find the number of molecule(s) which on heating gives N_2.
$(NH_4)_2Cr_2O_7$, NH_4NO_3, Na_3N, NH_4Cl, NH_4NO_2

54. Find total number of conditions in which oxidation of Fe^{+2} (aq) ions to iron(III) takes place
(i) On exposure to air (ii) On addition of conc. HNO_3
(iii) On reaction with $SnCl_2$ (iv) On reaction with H_2O_2
(v) On reaction with MnO_4^-/ H^+ (vi) On reaction with KI
(vii) On reaction with $Cr_2O_7^{2-}/ H^+$

55. One mole of calcium phosphide on reaction with excess of water gives how many moles of phosphine.

56. Total number of hydrogen bond(s) associated with per molecule of H_3BO_3 in layer like structure of H_3BO_3(s).

HOME ASSIGNMENT # 04

ANSWERS KEY-INORGANIC CHEMISTRY

1.	(A)	2.	(B)	3.	(A)	4.	(B)
5.	(A)	6.	(B)	7.	(A)	8.	(A)
9.	(D)	10.	(A)	11.	(C)	12.	(A)
13.	(A)	14.	(C)	15.	(A)	16.	(C)
17.	(A)	18.	(B)	19.	(D)	20.	(B)
21.	(B)	22.	(D)	23.	(B)	24.	(B)
25.	(B)	26.	(B)	27.	(D)	28.	(B)
29.	(D)	30.	(A)	31.	(C)	32.	(C)
33.	(A)	34.	(B)	35.	(A,B,C,D)	36.	(C, D)
37.	(A, B, D)	38.	(A, B)	39.	(A, C)	40.	(A, B)
41.	(A,B)	42.	(A, B)	43.	(B, C)	44.	(A, C)
45.	(A)	46.	(A, C)	47.	(A,D)	48.	(B,C,D)
49.	(A, B)	50.	(A, B, C, D)				
51.	(A) - Q,T ; (B) - P, S,T ; (C) - Q, S, T; (D) - R,T						
52.	(5)	53.	(2)	54.	(5)	55.	(2)
56.	(006)						

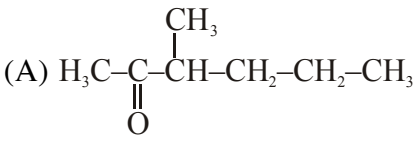
ORGANIC CHEMISTRY

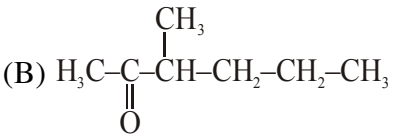
HOME ASSIGNMENT # 04

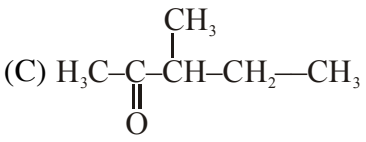
Topic : Biomolecule, Carbonyl compound, Hydrocarbon

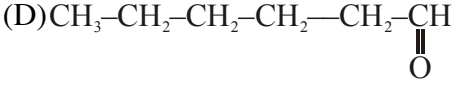
Only one correct ::

1. An optically active compound $C_6H_{12}O$ gives the positive test with 2,4-D.N.P and negative tollens test. The compound is -

(A) 

(B) 

(C) 

(D) 

2. To get $H_2N–CH_2–CH_2–OH$ from ethyne the correct sequence of reagents added will be -

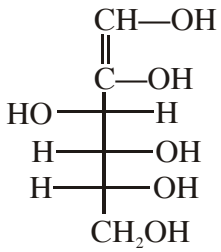
(A) $H_2/(Pd/BaSO_4)$, CH_3CO_3H ; NH_3 (B) H_2/Ni excess, H_2O, NH_3

(C) $H_2/(Pd/BaSO_4)$ NH_3, CH_3CO_2H (D) $H_2/(Pd/BaSO_4)$, CH_3CO_3H, $NH_2–OH$

3. Sucrose is dextrorotatory compound. Its specific rotation is is +66.5°. On hydrolysis with dilute acids the resulting solution becomes.

(A) Dextrorotatory (B) Laevorotatory (C) Optically inactive (D) Can't be said

4.

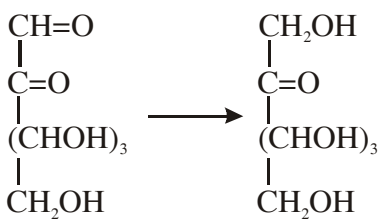


(X)

X is enol form of which of the following compound

(A) D-Glucose (B) D-mannose (C) D-fructose (D) All of these

5.



The reagents used for this conversion is -

(A) $LiAlH_4$ (B) $N_2H_4 + OEt^-$ (C) $Zn + CH_3CO_2H$ (D) Red P + HI

6. Aldohexose $\rightarrow$ n-hexane the reagents used for this conversion -

(A) H_2(Pd) (B) Zn + HCl (C) Red P + HI (D) Na-Hg + H_2SO_4

7. Glucose & fructose both when reacts with HCN & NH_2OH give -

(A) cyanohydrin & oxime

(B) Oxime & cyanohydrin

(C) Glucose only gives cyanohydrin & oxime but fructose can not

(D) Fructose only gives cyanohydrin & oxime but glucose can not

8. Glucose reacts with acetic anhydride to give two isomeric pentacetyl derivative neither of which reduce fehling solution or tollens reagents. It suggests -

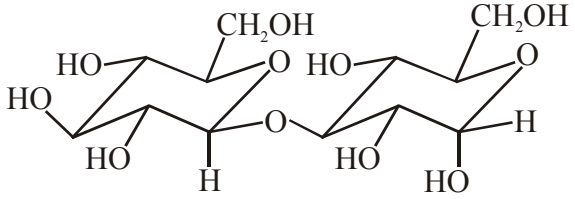
(A) Acylation of D-glucose does give open chain aldehyde

(B) The products are cyclic & only α–form exist.

(C) The products are cyclic and it exist in two forms i.e. α , β

(D) None

9.



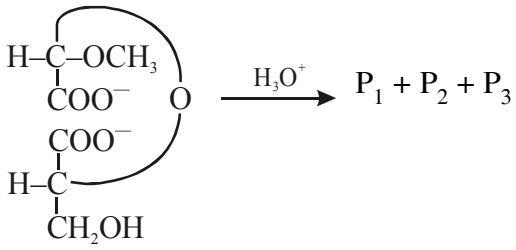
(P)

P has-

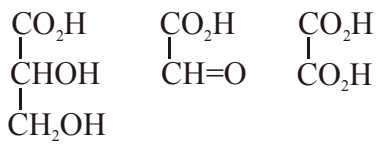
(A) α , α -glycosidic linkage (B) β, β - glycosidic linkage

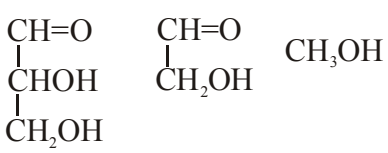
(C) α, β-glycosidic linkage (D) No glycosidic linkage

10.

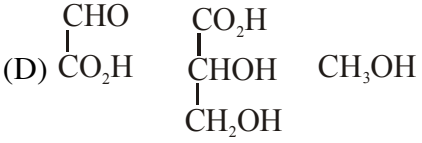


P_1, P_2 , P_3 are respectively -

(A) 

(B) 

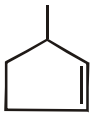
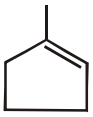
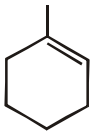
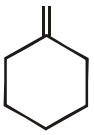
(C) 

(D) 

11. Mellitic acid $C_6(CO_2H)_6 \xrightarrow[P_4O_{10}/\text{Strong heating}]{} $ Product (P) is -

(A) Cyclic triester (B) Cyclic diester (C) Cyclic ester (D) Cyclic trianhydride

12. Adipic acid $\xrightarrow[(3)H^+]{(1)\Delta\ (2)CH_3MgX} Y \xrightarrow[\Delta]{H_3PO_4} Z$, Z is -

(A)  (B)  (C)  (D) 

13. Terylene (dacron) is a condensation polymer of

(A) Formaldehyde and urea

(B) Ethylene glycol and ethylene diisocyanate

(C) Ethylene glycol and dimethyl terephthalic acid

(D) Maleic anhydride and methylene glycol

14. Glucose molecule reacts with X number of molecules of phenylhydrazine to yield osazone. The value of X is

(A) 3 (B) 2 (C) 1 (D) 4

15. In vulcanization of rubber -

(A) Sulphur reacts to form a new compound

(B) Sulphur cross-links are introduced

(C) Sulphur forms a very thin protective layer over rubber

(D) All statements are correct

16. Teflon, polystyrene and neoprene are all -

(A) Copolymers (B) Condensation polymer

(C) Homopolymers (D) Monomers

17. The pH value of solution in which a polar amino acids does not migrate under the influence of electric field is called -

(A) Iso electric point (B) electronic point

(C) Neutralisation point (D) None

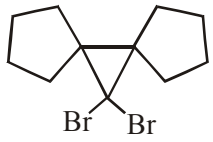
18. Glucose $\xrightarrow{Br_2+H_2O}$ product is -

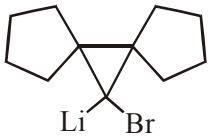
(A) Glucaric acid (B) Gluconic acid (C) Hexanoic acid (D) Bromo hexane

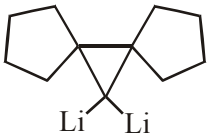
19. Hydrolysis followed by condensation of caprolatctum gives-

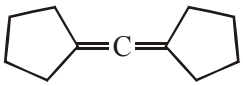
(A) Nylon-6,6 (B) Nylon-6

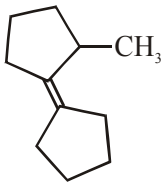
(C) Nitrile rubber (D) Nylon-6,10

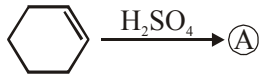
20.  'A' product 'A' will -

(A) 

(B) 

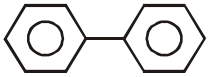
(C) 

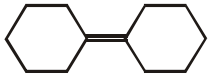
(D) 

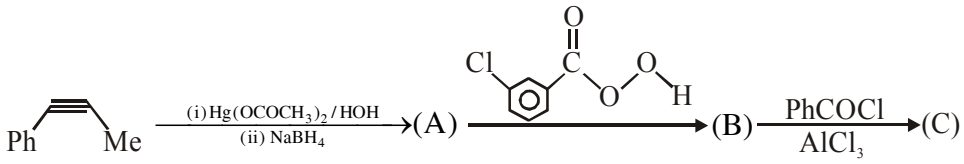
21.  ; product 'A' of the reaction will be-

(A) 

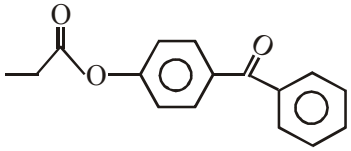
(B) 

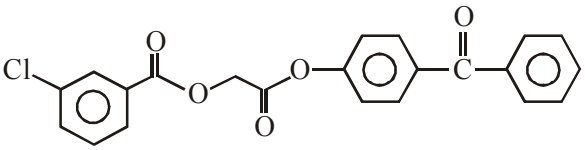
(C) 

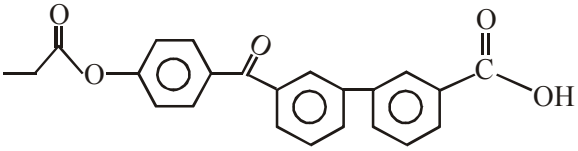
(D) 

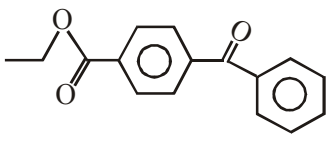
22. 

The final product C will be -

(A) 

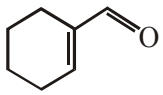
(B) 

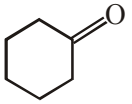
(C) 

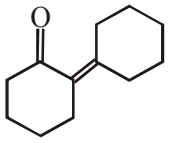
(D) 

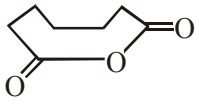
23. Cycloheptane $\xrightarrow[\text{small amount}]{Cl_2/h\nu}$ (A) $\xrightarrow[\text{(ii) }\Delta]{\text{(i) AcOAg}}$ (B) $\xrightarrow[H_2O]{O_3}$ (C) $\xrightarrow{\Delta}$ (D)

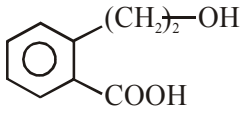
The final product 'D' obtained in above reaction will be -

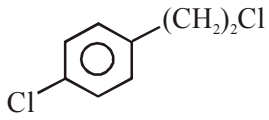
(A) 

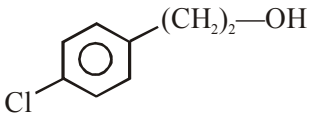
(B) 

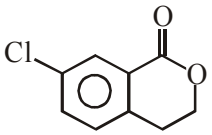
(C) 

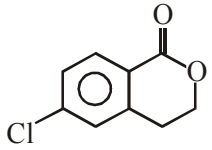
(D) 

24.  $\xrightarrow[\text{(ii) } Cl_2/InCl_3]{\text{(i) }\Delta}$ (A) , product which is most apropriate among following:

(A) 

(B) 

(C) 

(D) 

25. Which among following pair produces same product when reacted with $H_2N–NH–Ph$:

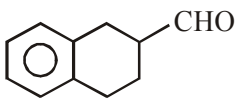
(A) Glucose & Fructose
(B) Glucose & Sucrose
(C) Fructose & Sucrose
(D) None of these

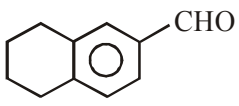
26. Glucose $\xrightarrow[\text{(ii) } Al_2O_3-Cr_2O_3/\Delta]{\text{(i) HI/Red–P}}$ (A)

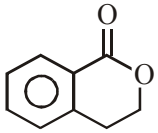
Select correct statement regarding product 'A'.

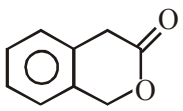
(A) the final product (A) is antiaromatic
(B) the final product (A) is aromatic
(C) the final product (A) is non-antiaromatic
(D) the final product (A) is unsaturated aliphatic

27. Select correct order of following compound with EtMgBr.

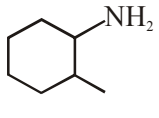

(I)

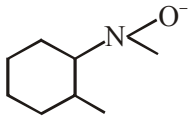
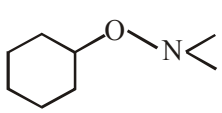
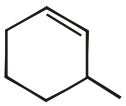
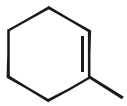

(II)


(III)

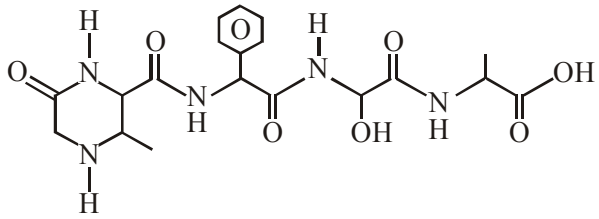

(IV)

(A) III > IV > II > I
(B) IV > III > I > II
(C) I > II > IV > III
(D) II > I > III > IV

28.  $\xrightarrow[\text{(ii) moist } Ag_2O]{\text{(i) MeI (excess)}}_{\text{(iii) } \Delta}$ (A) , Final product 'A' of the reaction :

(A)  (B)  (C)  (D) 

29. Number of peptide bond present in following compounds :



(A) 3 (B) 4 (C) 5 (D) 6

30. Urine sample of a diabetic patient contains :

(A) Sucrose (B) Glucose (C) Fructose (D) All of these

31. β-pleated sheet structure of protein is due to -

(A) Intramolecular hydrogen bonding

(B) Intermolecular hydrogen bonding

(C) Hydrophobic bond

(D) Due to disulphide linkage

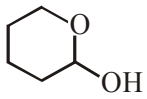
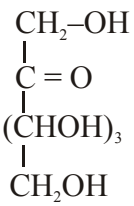
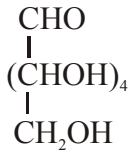
One or more than may be correct ::

32. Reagent which can be used to protect carbonyl group.

(A) $OHC-(CH_2)_2-CHO$ (B) $HS-(CH_2)_3-SH$

(C) $HO-(CH_2)_2-OH \mid H^{\oplus}$ (D) $HO-(CH_2)_3-OH \mid H^{\oplus}$

33. Silver mirror test with Tollen's reagent is/are given by -

(A) Ph – CHO (B)  (C)  (D) 

34.  $\xrightarrow{O_3/H_2O/Zn}$ mixture of product (A + B)

Product A & B are organic compound which can be differenciated chemicaly by -

(A) $NaHSO_3$ (B) $[Ag(NH_3)_2]OH$ (C) $HCl + ZnCl_2$ (D) shiff's reagents

35. How many alkyl halide gives SN^1 mechanism in presence of aqueous KOH

(A) $MeOCH_2$–Cl (B) Tertiary pentyl chloride

(C) 3-chloropropene (D) Tertiary butyl chloride

36. D-erythrose reacts with which of the following reagents to give optically inactive product -

(A) conc.HNO_3 (B) Br_2/H_2O (C) H_2/Ni (D) $NaBH_4$

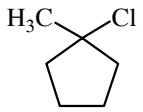
Paragraph ::

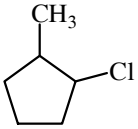
$C_6H_{11}Cl$ (A) $\xrightarrow{\text{Tertiary butoxide}}$ (B) (major product) + C (minor product)

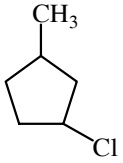
3° alkyl halide

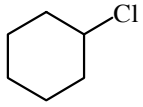
On reaction with H_2/Ni B & C both gives methylcyclopentane.

37. A is -

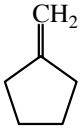
(A) 

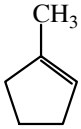
(B) 

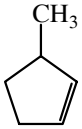
(C) 

(D) 

38. B is-

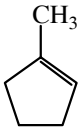
(A) 

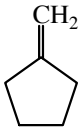
(B) 

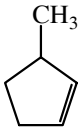
(C) 

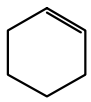
(D) 

39. C is -

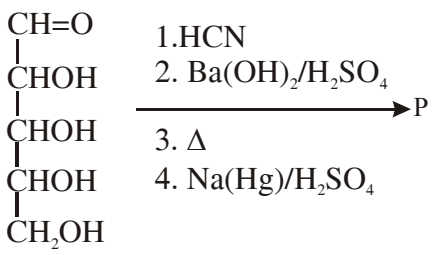
(A) 

(B) 

(C) 

(D) 

Integer ::

40. 

Number of carbon atoms present in P

HOME ASSIGNMENT # 04

ANSWERS KEY-ORGANIC CHEMISTRY

1.	(C)	2.	(A)	3.	(B)	4.	(D)
5.	(C)	6.	(C)	7.	(A)	8.	(C)
9.	(C)	10.	(D)	11.	(D)	12.	(B)
13.	(C)	14.	(A)	15.	(B)	16.	(C)
17.	(A)	18.	(B)	19.	(B)	20.	(C)
21.	(D)	22.	(A)	23.	(B)	24.	(C)
25.	(A)	26.	(B)	27.	(C)	28.	(C)
29.	(B)	30.	(D)	31.	(B)	32.	(B,C,D)
33.	(A,B,C,D)	34.	(B,D)	35.	(A, B, C, D)	36.	(A,C,D)
37.	(A)	38.	(A)	39.	(A)	40.	(6)