FINAL JEE–MAIN EXAMINATION – JANUARY, 2023

(Held On Tuesday 31ST January, 2023)   **TIME : 3 : 00 PM to 6 : 00 PM**

CHEMISTRY	TEST PAPER WITH ANSWER

SECTION-A

31. In the following halogenated organic compounds the one with maximum number of chlorine atoms in its structure is :

(1) Chloral   (2) Gammaxene

(3) Chloropicrin   (4) Freon -12

Official Ans. by NTA (2)

Allen Ans. (2)

32. Incorrect statement for the use of indicators in acid-base titration is :

(1) Methyl orange may be used for a weak acid vs weak base titration.

(2) Methyl orange is a suitable indicator for a strong acid vs weak base titration

(3) Phenolphthalein is a suitable indicator for a weak acid vs strong base titration

(4) Phenolphthalein may be used for a strong acid vs strong base titration.

Official Ans. by NTA (1)

Allen Ans. (1)

33. Which of the following compounds are not used as disinfectants?

(A) Chloroxylenol

(B) Bithional

(C) Veronal

(D) Prontosil

(E) Terpineol

Choose the **correct** answer from the options given below:

(1) A, B, E   (2) A, B

(3) B, D, E   (4) C, D

Official Ans. by NTA (4)

Allen Ans. (1)

34. A hydrocarbon 'X' with formula C_6H_8 uses two moles of H_2 on catalytic hydrogenation of its one mole. On ozonolysis, 'X' yields two moles of methane dicarbaldehyde. The hydrocarbon 'X' is :
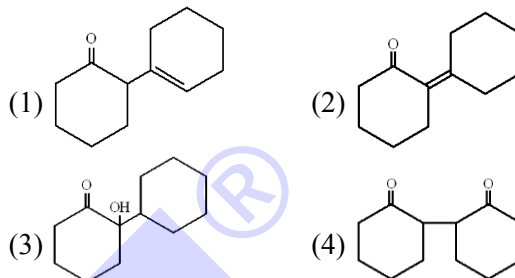
(1) hexa-1, 3, 5-triene

(2) 1-methylcyclopenta-1, 4-diene

(3) cyclohexa-1, 3-diene

(4) cyclohexa-1, 4-diene

Official Ans. by NTA (4)

Allen Ans. (4)

35. Cyclohexylamine when treated with nitrous acid yields (P). On treating (P) with PCC results in (Q). When (Q) is heated with dil. NaOH we get (R) The final product (R) is :

Official Ans. by NTA (2)

Allen Ans. (2)

36. Given below are two statements :

Statement I : Upon heating a borax bead dipped in cupric sulphate in a luminous flame, the colour of the bead becomes green.

Statement II : The green colour observed is due to the formation of copper(I) metaborate.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **Statement I** and **Statement II** are true

(2) **Statement I** is true but **Statement II** is false

(3) Both **Statement I** and **Statement II** are false

(4) **Statement I** is false but **Statement II** is true

Official Ans. by NTA (3)

Allen Ans. (3)

37. Evaluate the following statements for their correctness.

(A) The elevation in boiling point temperature of water will be same for 0.1 M NaCl and 0.1 M urea.

(B) Azeotropic mixtures boil without change in their composition

(C) Osmosis always takes place from hypertonic to hypotonic solution

(D) The density of 32% H_2SO_4 solution having molarity 4.09 M is approximately 1.26 g mL^{-1}

(E) A negatively charged sol is obtained when KI solution is added to silver nitrate solution.
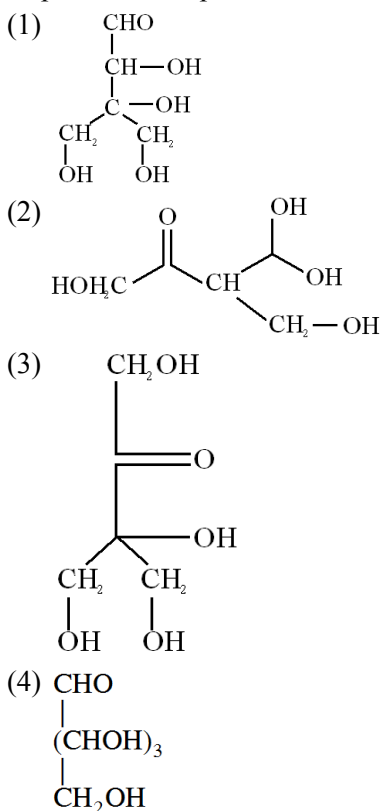
Choose the **correct** answer from the options given below :

(1) B, D, and E only   (2) A, B, and D only

(3) A and C only   (4) B and D only

Official Ans. by NTA (4)

Allen Ans. (4)

38. Compound A, $C_5H_{10}O_5$, given a tetraacetate with Ac_2O and oxidation of A with $Br_2 - H_2O$ gives an acid, $C_5H_{10}O_6$. Reduction of A with HI gives isopentane. The possible structure of A is :

(1)
```
        CHO
        |
        CH—OH
        |
        C—OH
       / \
     CH₂  CH₂
      |    |
     OH   OH
```

(2)
```
         O           OH
         ||          |
HOH₂C    CH          OH
              \      /
               CH₂—OH
```

(3)
```
        CH₂OH
        |
        |
        |————O
        |
        |————OH
       / \
     CH₂  CH₂
      |    |
     OH   OH
```

(4)
```
CHO
|
(CHOH)₃
|
CH₂OH
```

Official Ans. by NTA (1)

Allen Ans. (1)

39. Arrange the following orbitals in decreasing order of energy ?

(A) $n = 3, l = 0, m = 0$

(B) $n = 4, l = 0, m = 0$

(C) $n = 3, l = 1, m = 0$

(D) $n = 3, l = 2, m = 1$

The correct option for the order is :

(1) $B > D > C > A$

(2) $D > B > C > A$

(3) $A > C > B > D$

(4) $D > B > A > C$

Official Ans. by NTA (2)

Allen Ans. (2)

40. The Lewis acid character of boron tri halides follows the order :

(1) $BBr_3 > BI_3 > BCl_3 > BF_3$

(2) $BCl_3 > BF_3 > BBr_3 > BI_3$

(3) $BF_3 > BCl_3 > BBr_3 > BI_3$

(4) $BI_3 > BBr_3 > BCl_3 > BF_3$

Official Ans. by NTA (4)

Allen Ans. (4)

41. Match **List-I** with **List-II**

	List-I		List-II
(A)	Physisorption	I	Single layer adsorption
(B)	Chemisorption	II	20-40 kJ mol^{-1}
(C)	$N_2(g) + 3H_2(g) \xrightarrow{Fe(s)} 2NH_3(g)$	III	Chromatography
(D)	Analytical Application or Adsorption	IV	Heterogeneous catalysis

Choose the correct answer from the options given below :

(1) A – II, B – III, C – I, D – IV

(2) A – III, B – IV, C – I, D - II

(3) A – IV, B – II, C – III, D - I

(4) A – II, B – I, C – IV, D – III

Official Ans. by NTA (4)

Allen Ans. (4)

42. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**

Assertion (A) : The first ionization enthalpy of 3d series elements is more than that of group 2 metals

Reason (R) : In 3d series of elements successive filling of d-orbitals takes place.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**

(2) Both **(A)** and **(R)** are true but **(R)** is **not** the correct explanation of (A)

(3) **(A)** is false but **(R)** is true

(4) **(A)** is true but **(R)** is false

Official Ans. by NTA (1)

Allen Ans. (3)

43. The element playing significant role in neuromuscular function and interneuronal transmission is :

(1) Be   (2) Ca   (3) Li   (4) Mg

Official Ans. by NTA (2)

Allen Ans. (2)

44. Given below are two statements :

Statement I : H_2O_2 is used in the synthesis of Cephalosporin

Statement II : H_2O_2 is used for the restoration of aerobic conditions to sewage wastes.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **Statement I** and **Statement II** are correct

(2) **Statement I** is incorrect but **Statement II** is correct

(3) **Statement I** is correct but **Statement II** is incorrect

(4) Both **Statement I** and **Statement II** are incorrect

Official Ans. by NTA (1)

Allen Ans. (1)

45. The normal rain water is slightly acidic and its pH value is 5.6 because of which one of the following ?

(1) $CO_2 + H_2O \rightarrow H_2CO_3$

(2) $4NO_2 + O_2 + 2H_2O \rightarrow 4HNO_3$

(3) $2SO_2 + O_2 + 2H_2O \rightarrow 2H_2SO_4$

(4) $N_2O_5 + H_2O \rightarrow 2HNO_3$
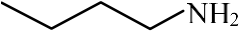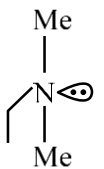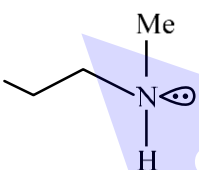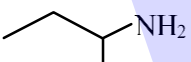
Official Ans. by NTA (1)

Allen Ans. (1)

46. When a hydrocarbon A undergoes complete combustion it requires 11 equivalents of oxygen and produces 4 equivalents of water. What is the molecular formula of A ?

(1) C_9H_8

(2) $C_{11}H_4$

(3) C_5H_8

(4) $C_{11}H_8$

Official Ans. by NTA (1)

Allen Ans. (1)

47. An organic compound $[A](C_4H_{11}N)$, shows optical activity and gives N_2 gas on treatment with HNO_2. The compound $[A]$ reacts with $PhSO_2Cl$ producing a compound which is soluble in KOH. The structure of A is:

(1)

(2)

(3)

(4)

Official Ans. by NTA (4)

Allen Ans. (4)

48. Which one of the following statements is incorrect ?

(1) Boron and Indium can be purified by zone refining method.

(2) Van-Arkel method is used to purify tungsten.

(3) Cast iron is obtained by melting pig iron with scrap iron and coke using hot air blast.

(4) The malleable iron is prepared from cast iron by oxidising impurities in a reverberatory furnace.

Official Ans. by NTA (2)

Allen Ans. (2)

49. Which of the following elements have half-filled f-orbitals in their ground state ?

(Given : atomic number

$Sm = 62; Eu = 63; Tb = 65; Gd = 64, Pm = 61$)

A. Sm

B. Eu

C. Tb

D. Gd

E. Pm

Choose the **correct** answer from the options given below:

(1) B and D only   (2) A and E only

(3) A and B only   (4) C and D only

Official Ans. by NTA (1)

Allen Ans. (1)

50. In Dumas method for the estimation of N_2, the sample is heated with copper oxide and the gas evolved is passed over :

(1) Ni   (2) Copper gauze

(3) Pd   (4) Copper oxide

Official Ans. by NTA (2)

Allen Ans. (2)

SECTION-B

51. If the CFSE of $\left[Ti(H_2O)_6 \right]^{3+}$ is $-96.0 \, kJ/mol$, this complex will absorb maximum at wavelength ___ nm. (nearest integer)

Assume Planck's constant $(h) = 6.4 \times 10^{-34}$ Js Speed of light $(c) = 3.0 \times 10^8 \, m/s$ and Avogadro's constant $(N_A) = 6 \times 10^{23} / mol$.

Official Ans. by NTA (480)

Allen Ans. (480)

52. Amongst the following, the number of species having the linear shape is _____.

$XeF_2, I_3^+, C_3O_2, I_3^-, CO_2, SO_2, BeCl$ and $BCl_2^\ominus$

Official Ans. by NTA (5)

Allen Ans. (5)

53. The resistivity of a 0.8 M solution of an electrolyte is $5 \times 10^{-3} \, \Omega cm$. Its molar conductivity is _____ $\times 10^4 \, \Omega^{-1} \, cm^2 \, mol^{-1}$. (Nearest integer)

Official Ans. by NTA (25)

Allen Ans. (25)

54. At 298 K, the solubility of silver chloride in water is 1.434×10^{-3} g L^{-1}. The value of $-\log K_{sp}$ for silver chloride is _____.

(Given mass of Ag is 107.9 g mol^{-1} and mass of Cl is 35.5 g mol^{-1})
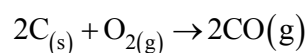
Official Ans. by NTA (10)

Allen Ans. (10)

55. A sample of a metal oxide has formula $M_{0.83}O_{1.00}$. The metal M can exist in two oxidation states $+2$ and $+3$. In the sample of $M_{0.83}O_{1.00}$, the percentage of metal ions existing in +2 oxidation state is _____ % (nearest integer)

Official Ans. by NTA (59)

Allen Ans. (59)

56. Assume carbon burns according to following equation :

$$2C_{(s)} + O_{2(g)} \rightarrow 2CO(g)$$

When 12 g carbon is burnt in 48 g of oxygen, the volume of carbon monoxide produced is _____ $\times 10^{-1}$ L at STP [nearest integer]

[Given : Assume CO as ideal gas, Mass of C is 12 g mol^{-1}, Mass of O is 16 g mol^{-1} and molar volume of an ideal gas at STP is 22.7 L mol^{-1}]

Official Ans. by NTA (227)

Allen Ans. (227)

57. The number of alkali metal(s), from Li, K, Cs, Rb having ionization enthalpy greater than 400 kJ mol^{-1} and forming stable super oxide is _____.
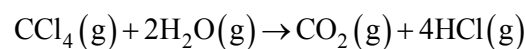
Official Ans. by NTA (2)

Allen Ans. (2)

58. Enthalpies of formation of $CCl_4(g), H_2O(g), CO_2(g)$ and $HCl(g)$ are $-105, -242, -394$ and -92 kJ mol^{-1} respectively. The magnitude of enthalpy of the reaction given below is _____ kJ mol^{-1} (nearest integer)
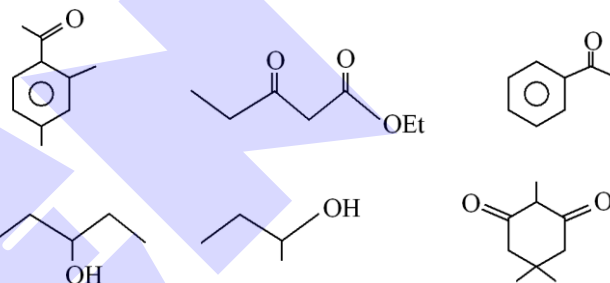
$$CCl_4(g) + 2H_2O(g) \rightarrow CO_2(g) + 4HCl(g)$$

Official Ans. by NTA (173)

Allen Ans. (173)

59. The number of molecules which gives haloform test among the following molecules is _____ .

Official Ans. by NTA (3)

Allen Ans. (3)

60. The rate constant for a first order reaction is 20 min^{-1}. The time required for the initial concentration of the reactant to reduce to its $\frac{1}{32}$ level is _____ $\times 10^{-2}$ min . (Nearest integer)

(Given : ln 10 = 2.303

log 2 = 0.3010)

Official Ans. by NTA (17)

Allen Ans. (17)