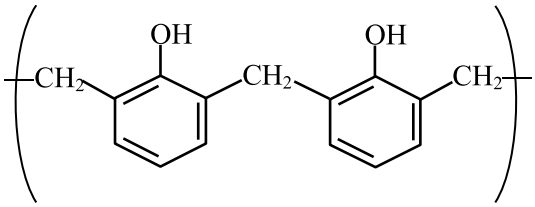
FINAL JEE–MAIN EXAMINATION – JULY, 2021

(Held On Sunday 25th July, 2021) **TIME : 9 : 00 AM to 12 : 00**

CHEMISTRY

TEST PAPER WITH ANSWER

SECTION-A

1. 

is a repeating unit for :

(1) Novolac (2) Buna–N

(3) Acrilan (4) Neoprene

Official Ans. by NTA (1)

2. Which one of the following species responds to an external magnetic field?

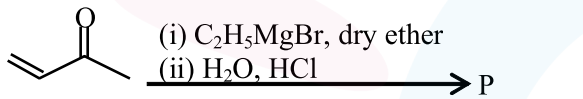
(1) $[Fe(H_2O)_6]^{3+}$

(2) $[Ni(CN)_4]^{2-}$

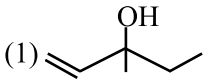
(3) $[Co(CN)_6]^{3-}$

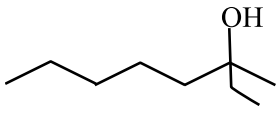
(4) $[Ni(CO)_4]$

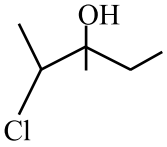
Official Ans. by NTA (1)

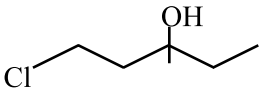
3. 

Consider the above reaction, the major product 'P' is:

(1) 

(2) 

(3) 

(4) 

Official Ans. by NTA (3)

4. Sodium stearate $CH_3(CH_2)_{16}COO^-Na^+$ is an anionic surfactant which forms micelles in oil.

Choose the **correct** statement for it from the following :

(1) It forms spherical micelles with $CH_3(CH_2)_{16}$ – group pointing towards the centre of sphere.

(2) It forms non–spherical micelles with $–COO^-$ group pointing outwards on the surface.

(3) It forms spherical micelles with $CH_3(CH_2)_{16}$ – group pointing outwards on the surface of sphere

(4) It forms non–spherical micelles with $CH_3(CH_2)_{16}$–group pointing towards the centre.

Official Ans. by NTA (1)

5. The water soluble protein is :

(1) Fibrin (2) Albumin

(3) Myosin (4) Collagen

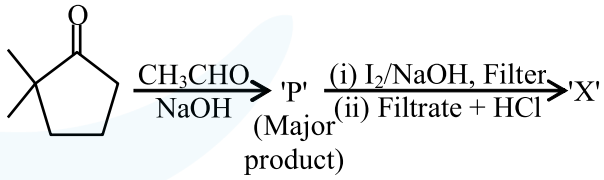
Official Ans. by NTA (2)

6. At 298.2 K the relationship between enthalpy of bond dissociation (in kJ mol^{-1}) for hydrogen (E_H) and its isotope, deuterium (E_D), is best described by :

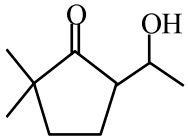
(1) $E_H = \frac{1}{2}E_D$ (2) $E_H = E_D$

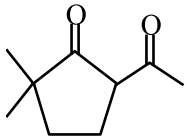
(3) $E_H \simeq E_D - 7.5$ (4) $E_H = 2E_D$

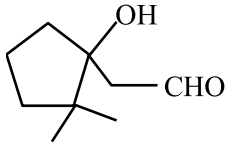
Official Ans. by NTA (3)

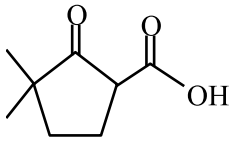
7. 

Consider the given reaction, the product 'X' is:

(1) 

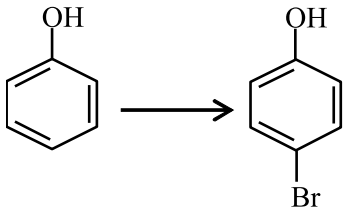
(2) 

(3) 

(4) 

Official Ans. by NTA (4)

8.



(Major product)

The given reaction can occur in the presence of :

(a) Bromine water (b) Br_2 in CS_2, 273 K

(c) $Br_2/FeBr_3$ (d) Br_2 in $CHCl_3$, 273 K

Choose the correct answer from the options given below :

(1) (b) and (d) only

(2) (a) and (c) only

(3) (b), (c) and (d) only

(4) (a), (b) and (d) only

Official Ans. by NTA (3)

9. Given below are two statements, one is labelled as **Assertion (A)** and other is labelled as **Reason (R)**.

Assertion (R) : Gabriel phthalimide synthesis cannot be used to prepare aromatic primary amines.

Reason : Aryl halides do not undergo nucleophilic substitution reaction.

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

(1) Both **(A)** and **(R)** true but **(R)** is not the correct explanation of **(A)**.

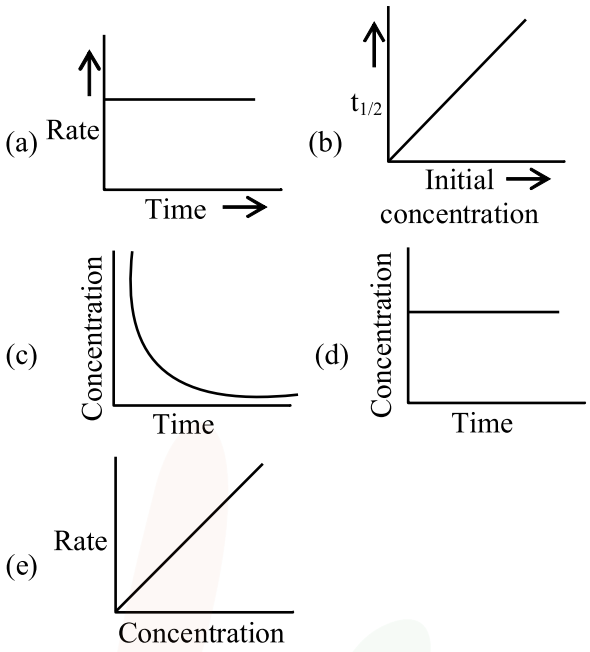
(2) **(A)** is false but **(R)** is true.

(3) Both **(A)** and **(R)** true and **(R)** is correct explanation of **(A)**.

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

Official Ans. by NTA (3)

10. For the following graphs,



Choose from the options given below, the **correct** one regarding order of reaction is :

(1) (b) zero order (c) and (e) First order

(2) (a) and (b) Zero order (e) First order

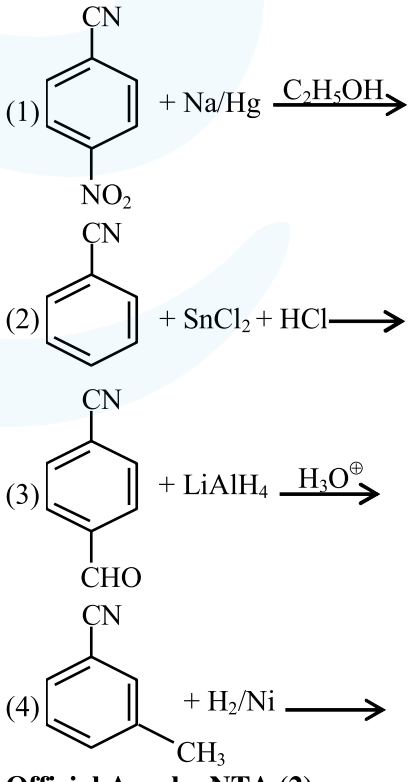
(3) (b) and (d) Zero order (e) First order

(4) (a) and (b) Zero order (c) and (e) First order

Official Ans. by NTA (1)

ALLEN Ans. (2)

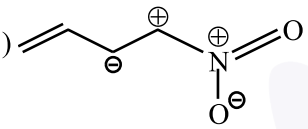
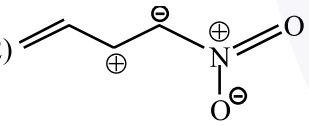
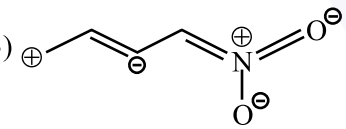
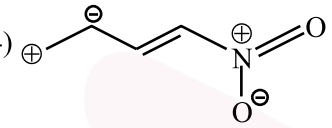
11. Which one of the products of the following reactions **does not** react with Hinsberg reagent to form sulphonamide?



Official Ans. by NTA (2)

12. The ionic radii of K^+, Na^+, Al^{3+} and Mg^{2+} are in the order :
(1) $Na^+ < K^+ < Mg^{2+} < Al^{3+}$
(2) $Al^{3+} < Mg^{2+} < K^+ < Na^+$
(3) $Al^{3+} < Mg^{2+} < Na^+ < K^+$
(4) $K^+ < Al^{3+} < Mg^{2+} < Na^+$
Official Ans. by NTA (3)

13. Which one of the following compounds of Group–14 elements is **not** known?
(1) $[GeCl_6]^{2-}$ (2) $[Sn(OH)_6]^{2-}$
(3) $[SiCl_6]^{2-}$ (4) $[SiF_6]^{2-}$
Official Ans. by NTA (3)

14. Which one among the following resonating structures is **not** correct?
(1) 
(2) 
(3) 
(4) 
Official Ans. by NTA (1)

15. Given below are two statements :
Statement I : None of the alkaline earth metal hydroxides dissolve in alkali.
Srtatement II : Solubility of alkaline earth metal hydroxides in water increases down the group.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) **Statement I** is correct but **Statement II** is incorrect.
(2) **Statement I** is incorrect but **Statement II** is correct.
(3) **Statement I** and **Statement II** both are incorrect.
(4) **Statement I** and **Statement II** both are correct.
Official Ans. by NTA (2)

16. The correct order of following 3d metal oxides, according to their oxidation numbers is :
(a) CrO_3 (b) Fe_2O_3 (c) MnO_2 (d) V_2O_5 (e) Cu_2O
(1) (d) > (a) > (b) > (c) > (e)
(2) (a) > (c) > (d) > (b) > (e)
(3) (a) > (d) > (c) > (b) > (e)
(4) (c) > (a) > (d) > (e) > (b)
Official Ans. by NTA (3)

17. Which one of the following chemical agent is **not** being used for dry–cleaning of clothes?
(1) H_2O_2 (2) CCl_4
(3) Liquid CO_2 (4) $Cl_2C = CCl_2$
Official Ans. by NTA (2)
ALLEN Ans. (1)

18. Which one of the following compounds will liberate CO_2, when treated with $NaHCO_3$?
(1) $(CH_3)_3\overset{\oplus}{N}H\overset{\ominus}{Cl}$ (2) $(CH_3)_4\overset{\oplus\ominus}{N}OH$
(3) $CH_3 - \overset{\overset{O}{\|}}{C} - NH_2$ (4) CH_3NH_2
Official Ans. by NTA (1)

19. In the leaching of alumina from bauxite, the ore expected to leach out in the process by reacting with NaOH is :
(1) TiO_2 (2) Fe_2O_3
(3) ZnO (4) SiO_2
Official Ans. by NTA (4)

20. An organic compound 'A' C_4H_8 on treatment with $KMnO_4/H^+$ yields compound 'B' C_3H_6O.
Compound 'A' also yields compound 'B' an ozonolysis. Compound 'A' is :
(1) 2–Methylpropene
(2) 1–Methylcyclopropane
(3) But–2–ene
(4) Cyclobutane
Official Ans. by NTA (1)

SECTION-B

1. The number of sigma bonds in

$H_3C - \underset{\underset{H}{|}}{C} = CH - C \equiv C - H$ is _____.

Official Ans. by NTA (10)

2. Three moles of AgCl get precipitated when one mole of an octahedral co-ordination compound with empirical formula $CrCl_3.3NH_3.3H_2O$ reacts with excess of silver nitrate. The number of chloride ions satisfying the secondary valency of the metal ion is_____.

Official Ans. by NTA (0)

3. A source of monochromatic radiation of wavelength 400 nm provides 1000 J of energy in 10 seconds. When this radiation falls on the surface of sodium, $x \times 10^{20}$ electrons are ejected per second. Assume that wavelength 400 nm is sufficient for ejection of electron from the surface of sodium metal. The value of x is _____ . (Nearest integer)

($h = 6.626 \times 10^{-34}$ Js)

Official Ans. by NTA (2)

4. CO_2 gas is bubbled through water during a soft drink manufacturing process at 298 K. If CO_2 exerts a partial pressure of 0.835 bar then x m mol of CO_2 would dissolve in 0.9 L of water. The value of x is _____. (Nearest integer)

(Henry's law constant for CO_2 at 298 K is 1.67×10^3 bar)

Official Ans. by NTA (25)

5. For the reaction

$A + B \rightleftharpoons 2C$

the value of equilibrium constant is 100 at 298 K. If the initial concentration of all the three species is 1 M each, then the equilibrium concentration of C is $x \times 10^{-1}$ M. The value of x is _____ .

(Nearest integer)

Official Ans. by NTA (25)

6. Consider the cell at 25°C

$Zn \mid Zn^{2+}(aq), (1\ M) \parallel Fe^{3+}(aq), Fe^{2+}(aq) \mid Pt(s)$

The fraction of total iron present as Fe^{3+} ion at the cell potential of 1.500 V is $x \times 10^{-2}$. The value of x is _____. (Nearest integer)

(Given : $E^0_{Fe^{3+}/Fe^{2+}} = 0.77V, E^0_{Zn^{2+}/Zn} = -0.76V$)

Official Ans. by NTA (24)

7. At 298 K, the enthalpy of fusion of a solid (X) is 2.8 kJ mol^{-1} and the enthalpy of vaporisation of the liquid (X) is 98.2 kJ mol^{-1}. The enthalpy of sublimation of the substance (X) in kJ mol^{-1} is _____. (in nearest integer)

Official Ans. by NTA (101)

8. A home owner uses 4.00×10^3 m^3 of methane (CH_4) gas, (assume CH_4 is an ideal gas) in a year to heat his home. Under the pressure of 1.0 atm and 300 K, mass of gas used is $x \times 10^5$ g. The value of x is _____. (Nearest integer)

(Given R = 0.083 L atm K^{-1} mol^{-1})

Official Ans. by NTA (26)

9. When 10 mL of an aqueous solution of Fe^{2+} ions was titrated in the presence of dil H_2SO_4 using diphenylamine indicator, 15 mL of 0.02 M solution of $K_2Cr_2O_7$ was required to get the end point. The molarity of the solution containing Fe^{2+} ions is $x \times 10^{-2}$ M. The value of x is _____. (Nearest integer)

Official Ans. by NTA (18)

10. Consider the complete combustion of butane, the amount of butane utilized to produce 72.0 g of water is _____ $\times 10^{-1}$ g. (in nearest integer)

Official Ans. by NTA (464)