

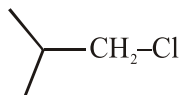


FINAL JEE–MAIN EXAMINATION – APRIL, 2019

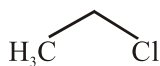
Held On Tuesday 09th APRIL, 2019

TIME: 2 : 30 PM To 5 : 30 PM

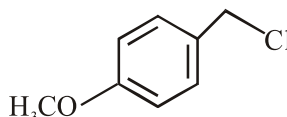
1. Increasing order of reactivity of the following compounds for  $S_N1$  substitution is:



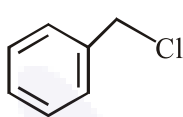
(A)



(B)



(C)

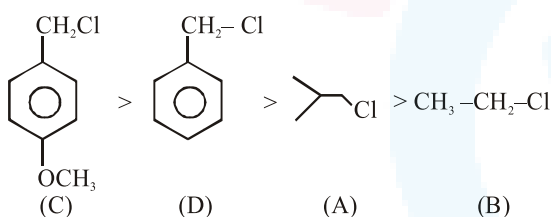


(D)

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

Official Ans. by NTA (3)

Sol.  $S_N1$  Reactivity order



Order C > D > A > B

2. The one that is not a carbonate is :

- (1) bauxite (2) siderite  
 (3) calamine (4) malachite

Official Ans. by NTA (1)

- Sol. 1. Bauxite –  $AlO_x(OH)_{3-2x}$  where  $0 < x < 1$   
 2. Siderite –  $FeCO_3$   
 3. Calamine –  $ZnCO_3$   
 4. Malachite –  $CuCO_3.Cu(OH)_2$

3. During compression of a spring the work done is 10kJ and 2kJ escaped to the surroundings as heat. The change in internal energy,  $\Delta U$ (inkJ) is:

- (1) 8 (2) 12  
 (3) - 12 (4) -8

Official Ans. by NTA (1)

Sol.  $\Delta U = q + w$

$$q = - 2kJ, W = 10kJ$$

$$\Delta U = 8kJ$$

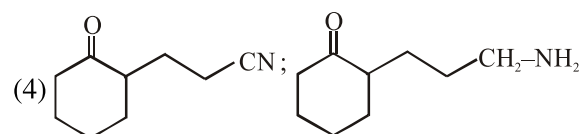
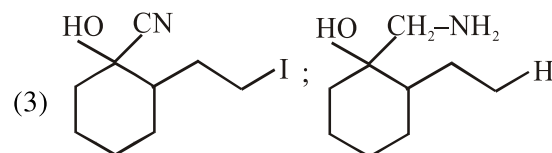
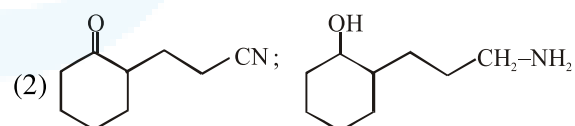
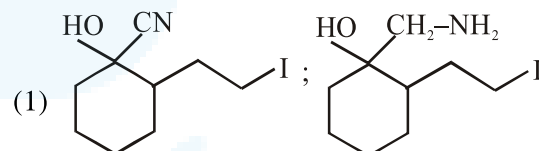
4. The amorphous form of silica is :

- (1) quartz (2) kieselguhr  
 (3) cristobalite (4) tridymite

Official Ans. by NTA (2)

Sol. Kieselguhr is amorphous form of silica, it's a fact

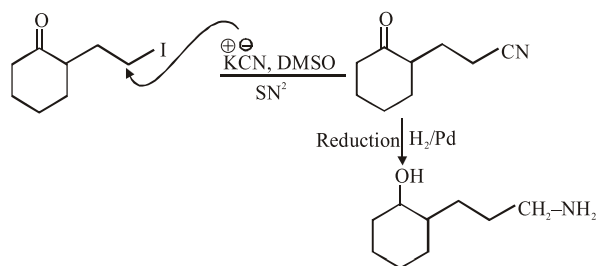
5. The major products A and B for the following reactions are, respectively:



Official Ans. by NTA (2)



Sol.

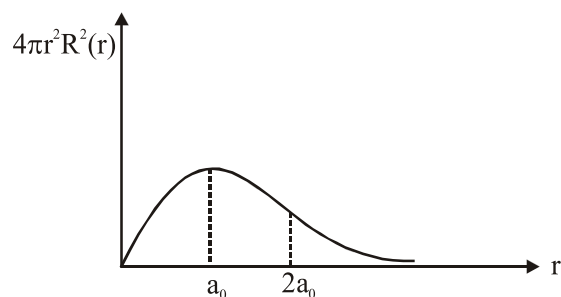
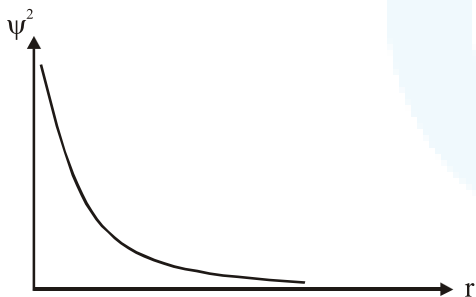


6. Which one of the following about an electron occupying the 1s orbital in a hydrogen atom is incorrect? (The Bohr radius is represented by  $a_0$ )

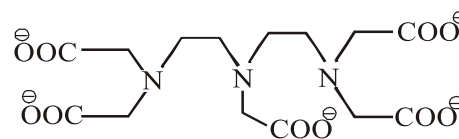
- (1) The electron can be found at a distance  $2a_0$  from the nucleus
- (2) The probability density of finding the electron is maximum at the nucleus.
- (3) The magnitude of potential energy is double that of its kinetic energy on an average.
- (4) The total energy of the electron is maximum when it is at a distance  $a_0$  from the nucleus.

Official Ans. by NTA (4)

Sol.



7. The maximum possible denticities of a ligand given below towards a common transition and inner-transition metal ion, respectively, are :



- (1) 6 and 8
- (2) 8 and 6
- (3) 8 and 8
- (4) 6 and 6

Official Ans. by NTA (1)

Sol. Towards common transition element and inner transition metal ion given ligand can have maximum denticities of 6 and 8 respectively.

8. The correct statements among I to III regarding group 13 element oxides are,

- (I) Boron trioxide is acidic.
- (II) Oxides of aluminium and gallium are amphoteric.
- (III) Oxides of indium and thallium are basic.

- (1) (I), (II) and (III)
- (2) (II) and (III) only
- (3) (I) and (III) only
- (4) (I) and (II) only

Official Ans. by NTA (1)

Sol. All statements are correct

$B_2O_3 \rightarrow$  acidic  
 $Al_2O_3$  &  $Ga_2O_3$  are amphoteric  
 oxides of In & Tl are basic

9. Among the following species, the diamagnetic molecule is

- (1)  $O_2$
- (2) NO
- (3)  $B_2$
- (4) CO

Official Ans. by NTA (4)

Sol.  $O_2, NO, B_2$  are paramagnetic according to M.O.T. where as CO is diamagnetic.

10. The peptide that gives positive ceric ammonium nitrate and carbylamine tests is :

- (1) Lys-Asp
- (2) Ser-Lys
- (3) Gln-Asp
- (4) Asp-Gln

Official Ans. by NTA (2)

Sol. Serine  $\Rightarrow$   $HO - \overset{\overset{O}{\parallel}}{C} - \underset{\underset{NH_2}{|}}{CH} - CH_2 - OH$

Lysine  $\Rightarrow$   $H_2N - CH_2 - CH_2 - CH_2 - CH_2 - \underset{\underset{NH_2}{|}}{CH} - \overset{\overset{O}{\parallel}}{C} - OH$

Lysine has  $-NH_2$  group hence gives  $\oplus$ ve carbylamine test and serine has  $-OH$  group hence gives  $\oplus$ ve ceric ammonium nitrate test



**11. Assertion:** For the extraction of iron, haematite ore is used.

**Reason:** Haematite is a carbonate ore of iron.

- (1) Only the reason is correct.
- (2) Both the assertion and reason are correct and the reason is the correct explanation for the assertion.
- (3) Only the assertion is correct.
- (4) Both the assertion and reason are correct, but the reason is not the correct explanation for the assertion.

**Official Ans. by NTA (3)**

**Sol.** Assertion is correct as Haemetite ore is used for extraction of Fe.

Haemetite is an oxide ore so reason is incorrect

**12.** 10 mL of 1mM surfactant solution forms a monolayer covering 0.24 cm<sup>2</sup> on a polar substrate. If the polar head is approximated as cube, what is its edge length?

- (1) 2.0 pm
- (2) 2.0 nm
- (3) 1.0 pm
- (4) 0.1 nm

**Official Ans. by NTA (1)**

**Sol.** Millimoles =  $10 \times 10^{-3} = 10^{-2}$

Moles =  $10^{-5}$

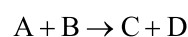
No. of molecules =  $6 \times 10^{23} \times 10^{-5} = 6 \times 10^{18}$   
surface area occupied by one molecule

$$= \frac{0.24}{6 \times 10^{18}} = 0.04 \times 10^{-18} \text{ cm}^2$$

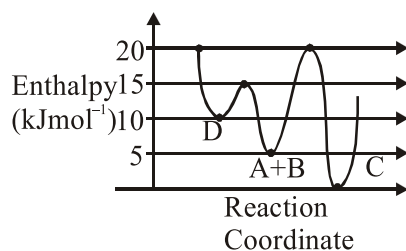
$$4 \times 10^{-20} = a^2$$

$$a = 2 \times 10^{-10} \text{ cm} = 2 \text{ pm}$$

**13.** Consider the given plot of enthalpy of the following reaction between A and B.



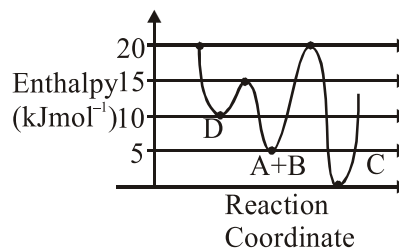
Identify the incorrect statement.



- (1) C is the thermodynamically stable product.
- (2) Formation of A and B from C has highest enthalpy of activation.
- (3) D is kinetically stable product.
- (4) Activation enthalpy to form C is 5kJ mol<sup>-1</sup> less than that to form D.

**Official Ans. by NTA (4)**

**Sol.**  $A + B \rightarrow C + D$



Activation enthalpy for C =  $20 - 5 = 15 \text{ kJ/mol}$

Activation enthalpy for D =  $15 - 5 = 10 \text{ kJ/mol}$

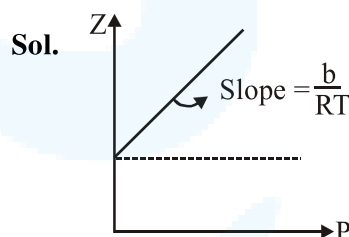
**14.** At a given temperature T, gases Ne, Ar, Xe and Kr are found to deviate from ideal gas behaviour. Their equation of state is given as

$$p = \frac{RT}{V-b} \text{ at T.}$$

Here, b is the van der Waals constant. Which gas will exhibit steepest increase in the plot of Z (compression factor) vs p?

- (1) Ne
- (2) Ar
- (3) Xe
- (4) Kr

**Official Ans. by NTA (3)**



As  $b \uparrow \Rightarrow \text{slope} \uparrow$

Hence, Xe, will have highest slope

**15.** A solution of  $\text{Ni}(\text{NO}_3)_2$  is electrolysed between platinum electrodes using 0.1 Faraday electricity. How many mole of Ni will be deposited at the cathode?

- (1) 0.20
- (2) 0.05
- (3) 0.10
- (4) 0.15

**Official Ans. by NTA (2)**

**Sol.** 0.1 eq. of  $\text{Ni}^{+2}$  will be discharged.

No. of eq = (No of moles)  $\times$  (n-factor)

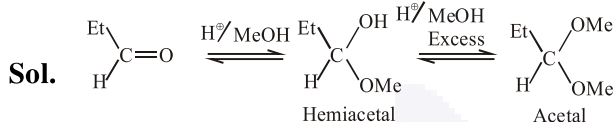
$$0.1 = (\text{No. of moles}) \times 2$$

$$\text{No. of moles of Ni} = \frac{0.1}{2} = 0.05$$



16. In the following reaction  
 carbonyl compound + MeOH  $\xrightleftharpoons{HCl}$  acetal  
 Rate of the reaction is the highest for :  
 (1) Acetone as substrate and methanol in stoichiometric amount  
 (2) Propanal as substrate and methanol in stoichiometric amount.  
 (3) Acetone as substrate and methanol in excess  
 (4) Propanal as substrate and methanol in excess

Official Ans. by NTA (4)



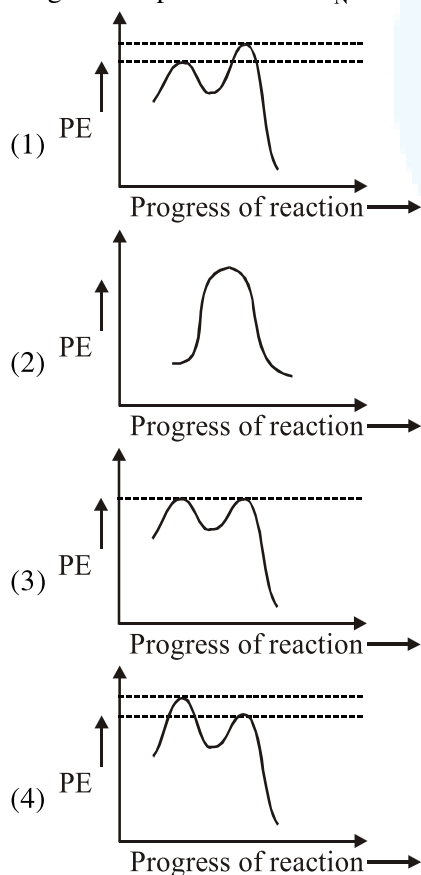
Acetone as substrate is less reactive than propanal towards nucleophilic addition.

17. The structures of beryllium chloride in the solid state and vapour phase, respectively, are :  
 (1) chain and dimeric (2) chain and chain  
 (3) dimeric and dimeric (4) dimeric and chain

Official Ans. by NTA (1)

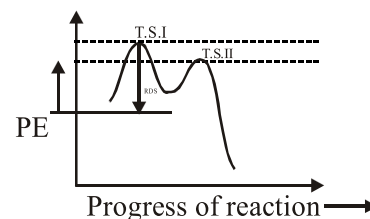
Sol.  $\text{BeCl}_2$  exist as  $(\text{BeCl}_2)_n$  polymeric chain in solid form, while  $\text{BeCl}_2$  exist as dimer  $(\text{BeCl}_2)_2$  in vapour phase.

18. Which of the following potential energy (PE) diagrams represents the  $\text{S}_{\text{N}}1$  reaction?



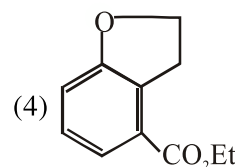
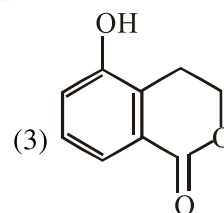
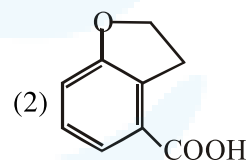
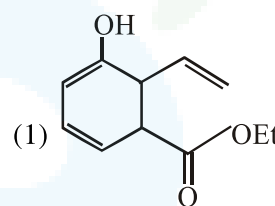
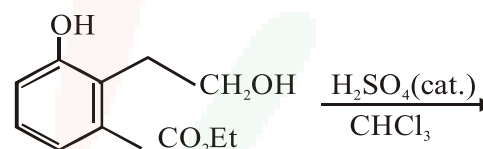
Official Ans. by NTA (4)

Sol. PE diagram for  $\text{S}_{\text{N}}1$



$\text{S}_{\text{N}}1$  is two step reaction where in step (1) formation of carbocation is RDS

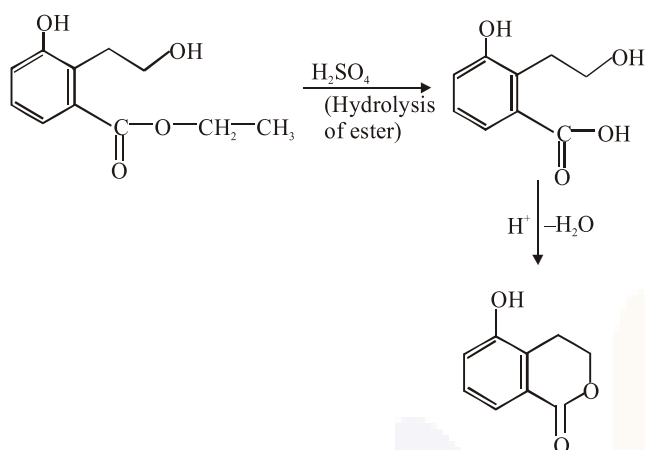
19. The major product of the following reaction is:



Official Ans. by NTA (3)



Sol.



20. The maximum number of possible oxidation states of actinoides are shown by
- (1) berkelium (Bk) and californium (Cf)
  - (2) nobelium (No) and lawrencium (Lr)
  - (3) actinium (Ac) and thorium (Th)
  - (4) neptunium (Np) and plutonium (Pu)
- Official Ans. by NTA (4)**

Sol. Np and Pu show maximum no. of oxidations states starting from +3 to +7 all oxidation states.

21. Molal depression constant for a solvent is  $4.0 \text{ kg mol}^{-1}$ . The depression in the freezing point of the solvent for  $0.03 \text{ mol kg}^{-1}$  solution of  $\text{K}_2\text{SO}_4$  is :
- (Assume complete dissociation of the electrolyte)
- (1) 0.12 K
  - (2) 0.36 K
  - (3) 0.18 K
  - (4) 0.24 K

**Official Ans. by NTA (2)**

Sol.  $K_f = 4 \text{ K-kg/mol}$   
 $m = 0.03 \text{ mol/kg}$   
 $i = 3$   
 $\Delta T_f = iK_f \times m$   
 $\Delta T_f = 3 \times 4 \times 0.03 = 0.36\text{K}$

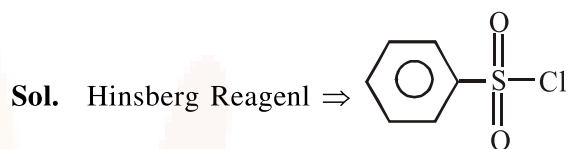
22. Noradrenaline is a /an
- (1) Neurotransmitter
  - (2) Antidepressant
  - (3) Antihistamine
  - (4) Antacid

**Official Ans. by NTA (1)**

Sol. Nor adrenaline is a neurotransmitter and it belongs to catecholamine family that functions in brain & body as a hormone & neurotransmitter.

23. Hinsberg's reagent is :
- (1)  $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$
  - (2)  $\text{C}_6\text{H}_5\text{COCl}$
  - (3)  $\text{SOCl}_2$
  - (4)  $(\text{COCl})_2$

**Official Ans. by NTA (1)**



[Benzene Sulphonyl chloride]

24. The layer of atmosphere between 10 km to 50 km above the sea level is called as :
- (1) troposphere
  - (2) mesosphere
  - (3) stratosphere
  - (4) thermosphere

**Official Ans. by NTA (3)**

Sol. It's a fact, the layer of atmosphere between 10km to 50km above sea level is called as stratosphere.

25. HF has highest boiling point among hydrogen halides, because it has :
- (1) lowest dissociation enthalpy
  - (2) strongest van der Waals' interactions
  - (3) strongest hydrogen bonding
  - (4) lowest ionic character

**Official Ans. by NTA (3)**

Sol. HF has highest boiling point among hydrogen halides because it has strongest hydrogen bonding

26. What would be the molality of 20% (mass/mass) aqueous solution of KI?
- (molar mass of KI =  $166 \text{ g mol}^{-1}$ )
- (1) 1.08
  - (2) 1.48
  - (3) 1.51
  - (4) 1.35

**Official Ans. by NTA (3)**



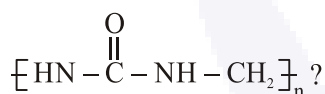
Sol.  $\frac{w}{w} \% = 20$

100 gm solution has 20 gm KI

80 gm solvent has 20 gm KI

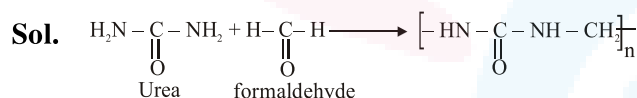
$$m = \frac{\frac{20}{80}}{\frac{166}{1000}} = \frac{20 \times 1000}{166 \times 80} = 1.506 \approx 1.51 \text{ mol/kg}$$

27. Which of the following compounds is a constituent of the polymer



- (1) Formaldehyde (2) Ammonia  
(3) Methylamine (4) N-Methyl urea

Official Ans. by NTA (1)



28. The correct statements among I to III are :

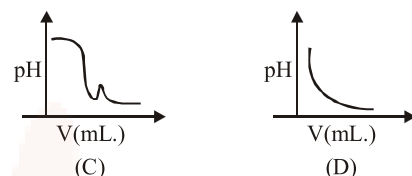
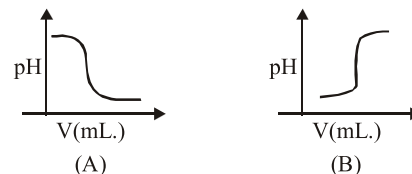
- (I) Valence bond theory cannot explain the color exhibited by transition metal complexes.  
 (II) Valence bond theory can predict quantitatively the magnetic properties of transition metal complexes.  
 (III) Valence bond theory cannot distinguish ligands as weak and strong field ones.

- (1) (I) and (II) only  
 (2) (I), (II) and (III)  
 (3) (I) and (III) only  
 (4) (II) and (III) only

Official Ans. by NTA (3)

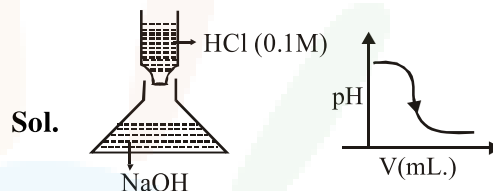
Sol. Based on NCERT, statement of limitations of VBT, I & III are correct

29. In an acid-base titration, 0.1 M HCl solution was added to the NaOH solution of unknown strength. Which of the following correctly shows the change of pH of the titration mixture in this experiment?

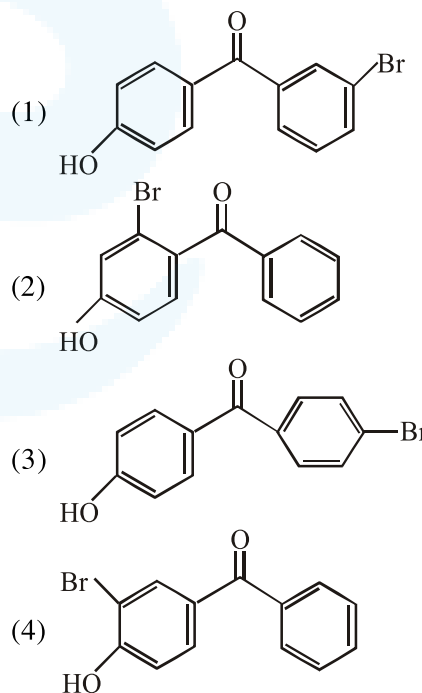


- (1) (A) (2) (C) (3) (D) (4) (B)

Official Ans. by NTA (1)



30. p-Hydroxybenzophenone upon reaction with bromine in carbon tetrachloride gives:



Official Ans. by NTA (4)

