## FINAL JEE-MAIN EXAMINATION - JULY, 2021

(Held On Tuesday 20th July, 2021)
TIME : 3:00 PM to 6:00 PM

## CHEMISTRY

## SECTION-A

1. Which one of the following pairs of isomers is an example of metamerism?
(1)

(2)

(3)

(4)
 and


Official Ans. by NTA (4)
2.

 (major product)


In the above reactions, product A and product B respectively are :
(1)


(2)


(3)


(4)



Official Ans. by NTA (4)

## TEST PAPER WITH ANSWER

3. The major product $(\mathrm{P})$ in the following reaction is :

(1)

(2)

(3)

(4)


Official Ans. by NTA (2)
4. The single largest industrial application of dihydrogen is :
(1) Manufacture of metal hydrides
(2) Rocket fuel in space research
(3) In the synthesis of ammonia
(4) In the synthesis of nitric acid

Official Ans. by NTA (3)
5. Consider two chemical reactions (A) and (B) that take place during metallurgical process :
(A) $\mathrm{ZnCO}_{3(\mathrm{~s})} \xrightarrow{\Delta} \mathrm{ZnO}_{(\mathrm{s})}+\mathrm{CO}_{2(\mathrm{~g})}$
(B) $2 \mathrm{ZnS}_{(\mathrm{s})}+3 \mathrm{O}_{2(\mathrm{~g})} \xrightarrow{\Delta} 2 \mathrm{ZnO}_{(\mathrm{s})}+2 \mathrm{SO}_{2(\mathrm{~g})}$

The correct option of names given to them respectively is :
(1) (A) is calcination and (B) is roasting
(2) Both (A) and (B) are producing same product so both are roasting
(3) Both (A) and (B) are producing same product so both are calcination
(4) (A) is roasting and (B) is calcination

Official Ans. by NTA (1)
6. A solution is $0.1 \mathrm{M} \mathrm{in}^{-}$and 0.001 M in $\mathrm{CrO}_{4}^{2-}$.

Solid $\mathrm{AgNO}_{3}$ is gradually added to it
Assuming that the addition does not change in volume and $\mathrm{K}_{\mathrm{sp}}(\mathrm{AgCl})=1.7 \times 10^{-10} \mathrm{M}^{2}$ and $\mathrm{K}_{\text {sp }}\left(\mathrm{Ag}_{2} \mathrm{CrO}_{4}\right)=1.9 \times 10^{-12} \mathrm{M}^{3}$.
Select correct statement from the following :
(1) AgCl precipitates first because its $\mathrm{K}_{\text {sp }}$ is high.
(2) $\mathrm{Ag}_{2} \mathrm{CrO}_{4}$ precipitates first as its $\mathrm{K}_{\text {sp }}$ is low.
(3) $\mathrm{Ag}_{2} \mathrm{CrO}_{4}$ precipitates first because the amount of $\mathrm{Ag}^{+}$needed is low.
(4) AgCl will precipitate first as the amount of $\mathrm{Ag}^{+}$ needed to precipitate is low.
Official Ans. by NTA (4)
7. Outermost electronic configuration of a group 13 element, $E$, is $4 s^{2}, 4 p^{1}$. The electronic configuration of an element of p-block period-five placed diagonally to element, E is :
(1) $[\mathrm{Kr}] 3 \mathrm{~d}^{10} 4 \mathrm{~s}^{2} 4 \mathrm{p}^{2}$
(2) $[\mathrm{Ar}] 3 \mathrm{~d}^{10} 4 \mathrm{~s}^{2} 4 \mathrm{p}^{2}$
(3) $[\mathrm{Xe}] 5 \mathrm{~d}^{10} 6 \mathrm{~s}^{2} 6 \mathrm{p}^{2}$
(4) $[\mathrm{Kr}] 4 \mathrm{~d}^{10} 5 \mathrm{~s}^{2} 5 \mathrm{p}^{2}$

Official Ans. by NTA (4)
8. Metallic sodium does not react normally with :
(1) gaseous ammonia
(2) But-2-yne
(3) Ethyne
(4) tert-butyl alcohol

## Official Ans. by NTA (2)

9. Spin only magnetic moment of an octahedral complex of $\mathrm{Fe}^{2+}$ in the presence of a strong field ligand in BM is :
(1) 4.89
(2) 2.82
(3) 0
(4) 3.46

Official Ans. by NTA (3)
10. Which one of the following species doesn't have a magnetic moment of 1.73 BM , (spin only value)?
(1) $\mathrm{O}_{2}^{+}$
(2) CuI
(3) $\left[\mathrm{Cu}\left(\mathrm{NH}_{3}\right)_{4}\right] \mathrm{Cl}_{2}$
(4) $\mathrm{O}_{2}^{-}$

Official Ans. by NTA (2)
11. Which one of the following statements is not true about enzymes?
(1) Enzymes are non-specific for a reaction and substrate.
(2) Almost all enzymes are proteins.
(3) Enzymes work as catalysts by lowering the activation energy of a biochemical reaction.
(4) The action of enzymes is temperature and pH specific
Official Ans. by NTA (1)
12. The hybridisations of the atomic orbitals of nitrogen in $\mathrm{NO}_{2}^{-}, \mathrm{NO}_{2}^{+}$and $\mathrm{NH}_{4}^{+}$respectively are.
(1) $\mathrm{sp}^{3}, \mathrm{sp}^{2}$ and sp
(2) $\mathrm{sp}, \mathrm{sp}^{2}$ and $\mathrm{sp}^{3}$
(3) $\mathrm{sp}^{3}, \mathrm{sp}$ and $\mathrm{sp}^{2}$
(4) $\mathrm{sp}^{2}, \mathrm{sp}$ and $\mathrm{sp}^{3}$

## Official Ans. by NTA (4)

13. Bakelite is a cross-linked polymer of formaldehyde and :
(1) PHBV
(2) Buna-S
(3) Novolac
(4) Dacron

Official Ans. by NTA (3)
14. Benzene on nitration gives nitrobenzene in presence of $\mathrm{HNO}_{3}$ and $\mathrm{H}_{2} \mathrm{SO}_{4}$ mixture, where :
(1) both $\mathrm{H}_{2} \mathrm{SO}_{4}$ and $\mathrm{HNO}_{3}$ act as a bases
(2) $\mathrm{HNO}_{3}$ acts as an acid and $\mathrm{H}_{2} \mathrm{SO}_{4}$ acts as a base
(3) both $\mathrm{H}_{2} \mathrm{SO}_{4}$ and $\mathrm{HNO}_{3}$ act as an acids
(4) $\mathrm{HNO}_{3}$ acts as a base and $\mathrm{H}_{2} \mathrm{SO}_{4}$ acts as an acid

Official Ans. by NTA (4)
15.

$\xrightarrow[273-278 \mathrm{~K}]{\mathrm{NaNO}_{2}, \mathrm{HCl}}$
A
(major


Consider the above reaction, compound B is :
(1)

(2)

(3)

(4)


Official Ans. by NTA (3)
16.


Major product P of above reaction, is :
(1)

(2)

(3)

(4)


Official Ans. by NTA (4)
17. $\mathrm{Cu}^{2+}$ salt reacts with potassium iodide to give
(1) $\mathrm{Cu}_{2} \mathrm{I}_{2}$
(2) $\mathrm{Cu}_{2} \mathrm{I}_{3}$
(3) Cul
(4) $\mathrm{Cu}\left(\mathrm{I}_{3}\right)_{2}$

Official Ans. by NTA (1)
ALLEN Ans. (1, 3)
18. In Carius method, halogen containing organic compound is heated with fuming nitric acid in the presence of :
(1) $\mathrm{HNO}_{3}$
(2) $\mathrm{AgNO}_{3}$
(3) $\mathrm{CuSO}_{4}$
(4) $\mathrm{BaSO}_{4}$

Official Ans. by NTA (2)
19. Which one of the following gases is reported to retard photosynthesis ?
(1) CO
(2) CFCs
(3) $\mathrm{CO}_{2}$
(4) $\mathrm{NO}_{2}$

Official Ans. by NTA (4)
20. (A)

(B)

(C)

(D)


The correct order of their reactivity towards hydrolysis at room temperature is :
(1) $($ A $)>($ B $)>($ C $)>($ D $)$
(2) $($ D $)>($ A $)>($ B $)>($ C $)$
(3) $($ D $)>($ B $)>($ A $)>($ C $)$
(4) $($ A $)>($ C $)>($ B $)>($ D $)$

Official Ans. by NTA (1)

## SECTION-B

1. For a given chemical reaction $\mathrm{A} \rightarrow \mathrm{B}$ at 300 K the free energy change is $-49.4 \mathrm{~kJ} \mathrm{~mol}^{-1}$ and the enthalpy of reaction is $51.4 \mathrm{~kJ} \mathrm{~mol}^{-1}$. The entropy change of the reaction is $\qquad$ $\mathrm{J} \mathrm{K}^{-1} \mathrm{~mol}^{-1}$.

Official Ans. by NTA (360)
2. The wavelength of electrons accelerated from rest through a potential difference of 40 kV is $x \times 10^{-12} \mathrm{~m}$. The value of x is $\qquad$ . (Nearest integer)

Given : Mass of electron $=9.1 \times 10^{-31} \mathrm{~kg}$
Charge on an electron $=1.6 \times 10^{-19} \mathrm{C}$

$$
\text { Planck's constant }=6.63 \times 10^{-34} \mathrm{JS}
$$

Official Ans. by NTA (6)
3. The vapour pressures of A and B at $25^{\circ} \mathrm{C}$ are 90 mm Hg and 15 mm Hg respectively. If A and B are mixed such that the mole fraction of $A$ in the mixture is 0.6 , then the mole fraction of B in the vapour phase is $x \times 10^{-1}$. The value of $x$ is $\qquad$ . (Nearest integer)

Official Ans. by NTA (1)
4. 4 g equimolar mixture of NaOH and $\mathrm{Na}_{2} \mathrm{CO}_{3}$ contains $x \mathrm{~g}$ of NaOH and y g of $\mathrm{Na}_{2} \mathrm{CO}_{3}$. The value of $x$ is $\qquad$ g. (Nearest integer)

Official Ans. by NTA (1)
5. When 0.15 g of an organic compound was analyzed using Carius method for estimation of bromine, 0.2397 g of AgBr was obtained. The percentage of bromine in the organic compound is
$\qquad$ . (Nearest integer)
[Atomic mass : Silver $=108$, Bromine $=80$ ]
Official Ans. by NTA (68)
6. 100 ml of $0.0018 \%(\mathrm{w} / \mathrm{v})$ solution of $\mathrm{Cl}^{-}$ion was the minimum concentration of $\mathrm{Cl}^{-}$required to precipitate a negative sol in one $h$. The coagulating value of $\mathrm{Cl}^{-}$ion is $\qquad$ (Nearest integer)

Official Ans. by NTA (1)
ALLEN Ans. (Bonus)
7. $\mathrm{PCl}_{5}(\mathrm{~g}) \rightarrow \mathrm{PCl}_{3}(\mathrm{~g})+\mathrm{Cl}_{2}(\mathrm{~g})$

In the above first order reaction the concentration of $\mathrm{PCl}_{5}$ reduces from initial concentration $50 \mathrm{~mol} \mathrm{~L}^{-1}$ to $10 \mathrm{~mol} \mathrm{~L}^{-1}$ in 120 minutes at 300 K . The rate constant for the reaction at 300 K is $\mathrm{x} \times 10^{-2} \mathrm{~min}^{-1}$. The value of x is $\qquad$ .
[Given $\log 5=0.6989$ ]
Official Ans. by NTA (1)
8. Diamond has a three dimensional structure of C atoms formed by covalent bonds. The structure of diamond has face centred cubic lattice where $50 \%$ of the tetrahedral voids are also occupied by carbon atoms. The number of carbon atoms present per unit cell of diamond is $\qquad$ .

Official Ans. by NTA (8)
9. An aqueous solution of $\mathrm{NiCl}_{2}$ was heated with excess sodium cyanide in presence of strong oxidizing agent to form $\left[\mathrm{Ni}(\mathrm{CN})_{6}\right]^{2-}$. The total change in number of unpaired electrons on metal centre is $\qquad$ .

Official Ans. by NTA (2)
10. Potassium chlorate is prepared by electrolysis of KCl in basic solution as shown by following equation.

$$
6 \mathrm{OH}^{-}+\mathrm{Cl}^{-} \rightarrow \mathrm{ClO}_{3}^{-}+3 \mathrm{H}_{2} \mathrm{O}+6 \mathrm{e}^{-}
$$

A current of xA has to be passed for 10 h to produce 10.0 g of potassium chlorate. the value of x is $\qquad$ . (Nearest integer)
(Molar mass of $\mathrm{KClO}_{3}=122.6 \mathrm{~g} \mathrm{~mol}^{-1}$, F $=96500 \mathrm{C}$ )
Official Ans. by NTA (1)

