

FINAL JEE–MAIN EXAMINATION – AUGUST, 2021
Held On Wednesday 01st September, 2021
TIME: 3:00 PM to 06:00 PM

SECTION-A

1. Water sample is called cleanest on the basis of which one of the BOD values given below
- (1) 11 ppm (2) 15 ppm
 (3) 3 ppm (4) 21 ppm

Official Ans. by NTA (3)

Sol. Clean water could have BOD value of less than 5 ppm whereas highly polluted water could have a BOD value of 17 ppm or more.

2. Calamine and Malachite, respectively, are the ores of :
- (1) Nickel and Aluminium
 (2) Zinc and Copper
 (3) Copper and Iron
 (4) Aluminium and Zinc

Official Ans. by NTA (2)

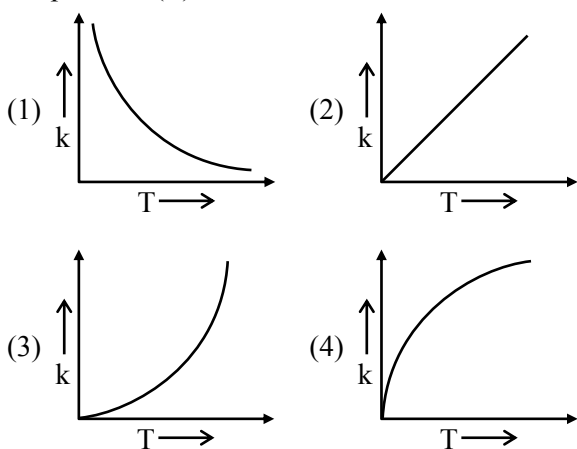
Sol. Calamine \Rightarrow $ZnCO_3$
 Malachite \Rightarrow $Cu(OH)_2 \cdot CuCO_3$

3. Experimentally reducing a functional group **cannot** be done by which one of the following reagents ?
- (1) Pt-C/ H_2 (2) Na/ H_2
 (3) Pd-C/ H_2 (4) Zn/ H_2O

Official Ans. by NTA (2)

Sol. Solution NaH_2 is not reducing agent

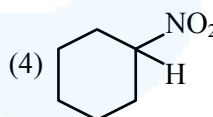
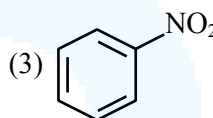
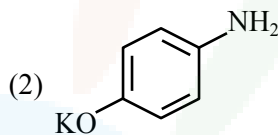
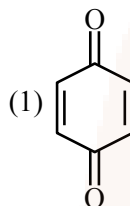
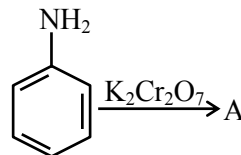
4. Which one of the following given graphs represents the variation of rate constant (k) with temperature (T) for an endothermic reaction ?



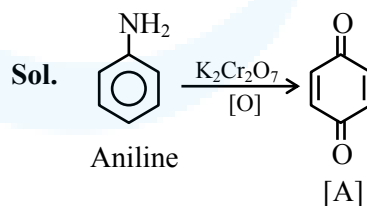
Official Ans. by NTA (3)

Sol. By observation we get this plot during measurable temperatures
 Ans. 3rd Option.

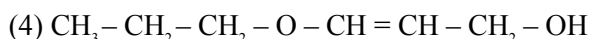
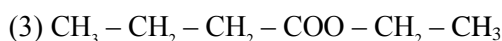
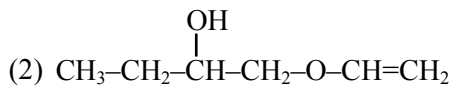
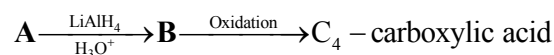
5. Identify A in the following reaction.



Official Ans. by NTA (1)

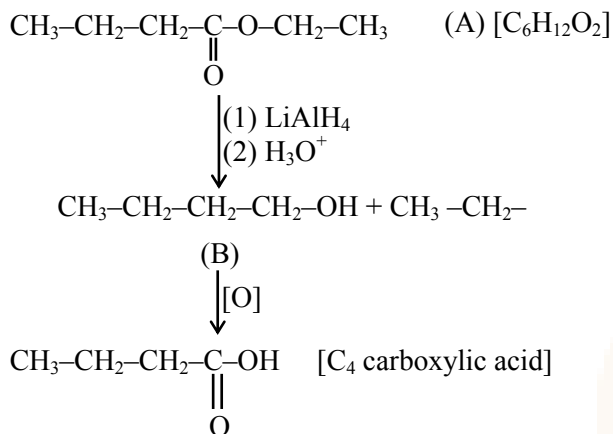


6. In the following sequence of reactions a compound A, (molecular formula $C_6H_{12}O_2$) with a straight chain structure gives a C_4 carboxylic acid. A is :



Official Ans. by NTA (3)

Sol.



7. Match List - I with List - II.

List -I (Colloid Preparation Method)		List -II (Chemical Reaction)	
(a)	Hydrolysis	(i)	$2\text{AuCl}_3 + 3\text{HCHO} + 3\text{H}_2\text{O} \rightarrow 2\text{Au(sol)} + 3\text{HCOOH} + 6\text{HCl}$
(b)	Reduction	(ii)	$\text{As}_2\text{O}_3 + 3\text{H}_2\text{S} \rightarrow \text{As}_2\text{S}_3(\text{sol}) + 3\text{H}_2\text{O}$
(c)	Oxidation	(iii)	$\text{SO}_2 + 2\text{H}_2\text{S} \rightarrow 3\text{S(sol)} + 2\text{H}_2\text{O}$
(d)	Double Decomposition	(iv)	$\text{FeCl}_3 + 3\text{H}_2\text{O} \rightarrow \text{Fe(OH)}_3(\text{sol}) + 3\text{HCl}$

Choose the most appropriate answer from the options given below.

- (1) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
- (2) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)
- (3) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)
- (4) (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)

Official Ans. by NTA (2)

Sol. According to type of reactions for preparation, colloids have been classified

8. The Crystal Field Stabilization Energy (CFSE) and magnetic moment (spin-only) of an octahedral aqua complex of a metal ion (M^{Z+}) are $-0.8 \Delta_0$ and 3.87 BM, respectively. Identify (M^{Z+}):

- (1) V^{3+}
- (2) Cr^{3+}
- (3) Mn^{4+}
- (4) Co^{2+}

Official Ans. by NTA (4)

Sol. $\text{V}^{3+} \Rightarrow \begin{matrix} \square & \square \\ \square & \square \end{matrix} e_g = 2 \times 0.4 \Delta_0$

$\begin{matrix} \square & \square & \square \\ \square & \square & \square \end{matrix} t_{2g} = -0.8 \Delta_0$

$= 2 \text{ unpaired } e^-$
 $\mu = 2.89 \text{ Bm}$

$\text{Co}^{2+} \Rightarrow \begin{matrix} \square & \square \\ \square & \square \end{matrix} e_g [2 \times 0.6 \Delta_0 - 5 \times 0.4 \Delta_0]$
 $= -0.8 \Delta_0$

$\begin{matrix} \uparrow\downarrow & \uparrow\downarrow & \uparrow \\ \square & \square & \square \end{matrix} t_{2g} \quad 3 \text{ unpaired } e^- \Rightarrow \mu = 3.87 \text{ BM}$

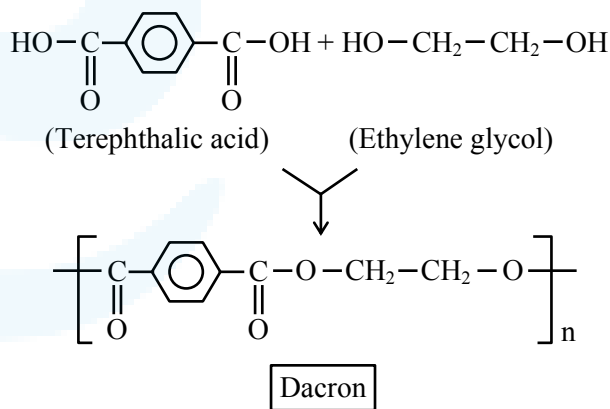
hence d^7 configuration is of Co^{2+} Ans.

9. Monomer units of Dacron polymer are :

- (1) ethylene glycol and phthalic acid
- (2) ethylene glycol and terephthalic acid
- (3) glycerol and terephthalic acid
- (4) glycerol and phthalic acid

Official Ans. by NTA (2)

Sol.



10. Which one of the following compounds is aromatic in nature ?

- (1)
- (2)
- (3)
- (4)

Official Ans. by NTA (4)

Allen Ans. (1,4)

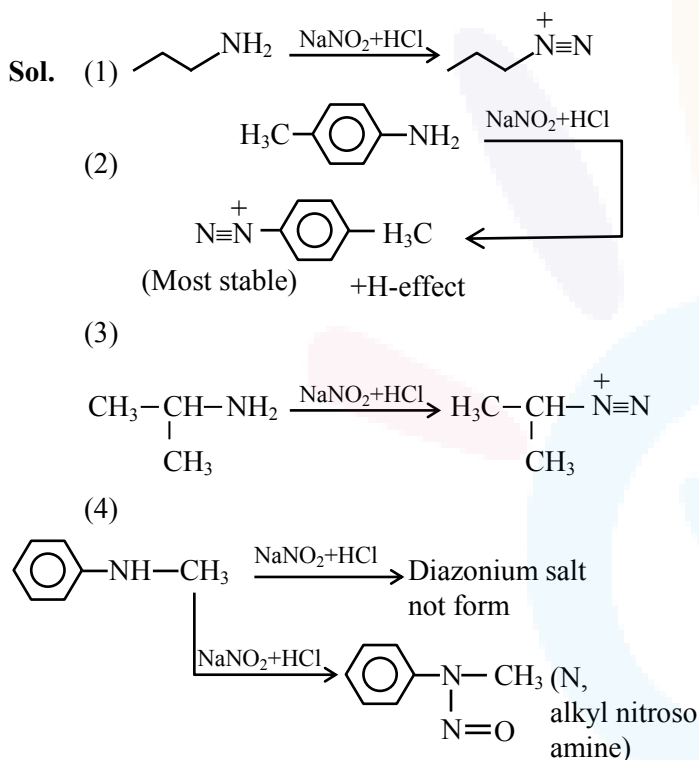
Sol. (1) (Acenaphthene)



16. Which one of the following gives the most stable Diazonium salt ?

- (1) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-NH}_2$ (2)
- (3) $\text{CH}_3\text{-}\overset{\text{CH}_3}{\underset{\text{H}}{\text{C}}}\text{-NH}_2$ (4)

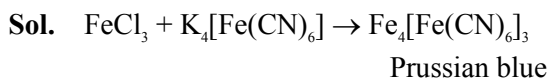
Official Ans. by NTA (2)



17. The potassium ferrocyanide solution gives a Prussian blue colour, when added to :

- (1) CoCl_3 (2) FeCl_2
 (3) CoCl_2 (4) FeCl_3

Official Ans. by NTA (4)

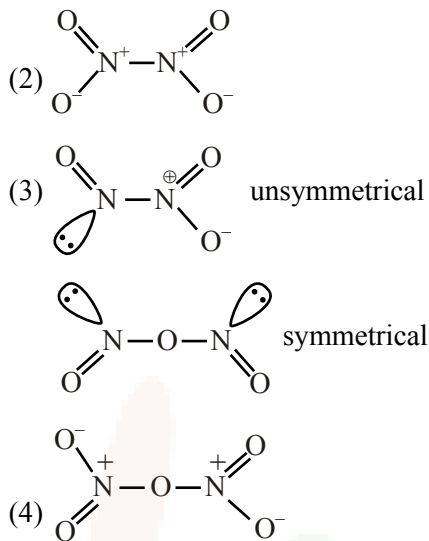


18. The oxide **without** nitrogen-nitrogen bond is :

- (1) N_2O (2) N_2O_4
 (3) N_2O_3 (4) N_2O_5

Official Ans. by NTA (4)

Sol. (1) $\text{N}\equiv\text{N}^+ - \text{O}^-$

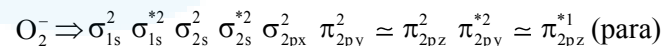
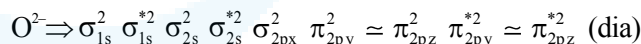
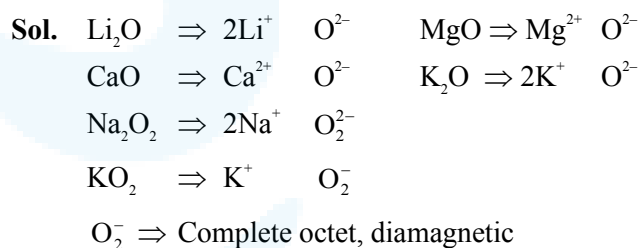


19. Number of paramagnetic oxides among the following given oxides is _____.

Li_2O , CaO , Na_2O_2 , KO_2 , MgO and K_2O

- (1) 1 (2) 2
 (3) 3 (4) 0

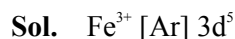
Official Ans. by NTA (1)



20. Identify the element for which electronic configuration in +3 oxidation state is $[\text{Ar}]3d^5$:

- (1) Ru (2) Mn
 (3) Co (4) Fe

Official Ans. by NTA (4)





$$50 = \frac{n \times 6.63 \times 10^{-34} \times 3 \times 10^8}{795 \times 10^{-9}}$$

$$n = 1998.49 \times 10^{17} \text{ [n = no. of photons per second]}$$

$$= 1.998 \times 10^{20}$$

$$\approx 2 \times 10^{20}$$

$$= x \times 10^{20}$$

$$x = 2$$

8. The spin-only magnetic moment value of B_2^+ species is _____ $\times 10^{-2}$ BM. (Nearest integer)

$$\text{[Given : } \sqrt{3} = 1.73 \text{]}$$

Official Ans. by NTA (173)

Sol. $B_2^+ \Rightarrow \sigma_{1s}^2 \sigma_{1s}^{*2} \sigma_{2s}^2 \sigma_{2s}^{*2} \pi_{2py}^1 \approx \pi_{2pz}^0$

$$\Rightarrow 9e^-$$

$$\mu = \sqrt{1(1+2)} = \sqrt{3} \text{ BM}$$

$$= 1.73 \text{ BM}$$

$$= 1.73 \times 10^{-2} \text{ BM}$$

9. If the conductivity of mercury at 0°C is 1.07×10^6 S m^{-1} and the resistance of a cell containing mercury is 0.243Ω , then the cell constant of the cell is $x \times 10^4$ m^{-1} . The value of x is _____. (Nearest integer)

Official Ans. by NTA (26)

Sol. $k = 1.07 \times 10^6 \text{ Sm}^{-1}$, $R = 0.243 \Omega$

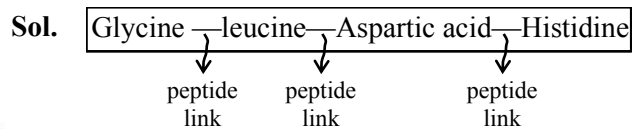
$$G = \frac{1}{R} = \frac{1}{0.243} \Omega^{-1}$$

$$k = G \times G^*$$

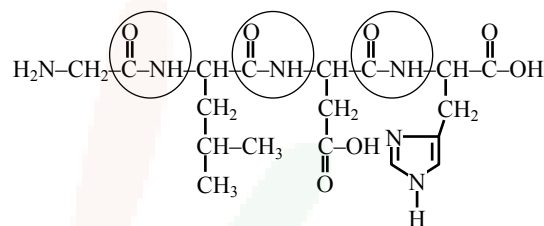
$$G^* = \frac{k}{G} = \frac{1.07 \times 10^6}{\frac{1}{0.243}} \approx 26 \times 10^4 \text{ m}^{-1}$$

10. A peptide synthesized by the reactions of one molecule each of Glycine, Leucine, Aspartic acid and Histidine will have _____ peptide linkages.

Official Ans. by NTA (3)



Total (3) peptide linkages are present



3 peptide linkage

Ans. (3)