### Saral

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Water sample is called cleanest on the basis of 1. which one of the BOD values given below

**SECTION-A** 

| (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<sub>3</sub>

- Malachite  $\Rightarrow$  Cu(OH), CuCO,
- Experimentally reducing a functional group 3. cannot be done by which one of the following reagents?

(1) Pt-C/H<sub>2</sub> (2) Na/H<sub>2</sub>  
(3) Pd-C/H (4) 
$$Zn/HC$$

$$\begin{array}{c} (5) & \text{Id-C/II}_2 \\ \text{Official Ans by NTA (2)} \end{array}$$

- Official Ans. by NTA (2)
- Sol. Solution NaH, 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. 3<sup>rd</sup> Option.



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

$$A \xrightarrow{\text{LiAlH}_{4}} B \xrightarrow{\text{Oxidation}} C_{4} - \text{carboxylic acid}$$
(1) CH<sub>3</sub> - CH<sub>2</sub> - COO - CH<sub>2</sub> - CH<sub>2</sub> - CH<sub>3</sub>  
OH  
(2) CH<sub>3</sub>-CH<sub>2</sub>-CH-CH<sub>2</sub>-O-CH=CH<sub>2</sub>  
(3) CH<sub>3</sub> - CH<sub>2</sub> - CH<sub>2</sub> - COO - CH<sub>2</sub> - CH<sub>3</sub>  
(4) CH<sub>3</sub> - CH<sub>2</sub> - CH<sub>2</sub> - O - CH = CH - CH<sub>2</sub> - OH  
Official Ans. by NTA (3)

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$$CH_{3}-CH_{2}-CH_{2}-C-O-CH_{2}-CH_{3}$$
 (A)  $[C_{6}H_{12}O_{2}]$   
 $0$   
 $(1) LiAlH_{4}$   
 $(2) H_{3}O^{+}$   
 $CH_{3}-CH_{2}-CH_{2}-CH_{2}-OH + CH_{3} - CH_{2}-$   
(B)  
 $0$   
 $(O)$   
 $CH_{3}-CH_{2}-CH_{2}-C-OH$   $[C_{4} carboxylic acid]$   
 $O$ 

Match List – I with List - II. 7.

| (Co | List -I<br>olloid Preparation | List -II<br>(Chemical Reaction) |  |
|-----|-------------------------------|---------------------------------|--|
|     | Method)                       | (1)                             |  |
| (a) | Hydrolysis                    | (1)                             | $2AuCl_3 + 3HCHO + 3H_2O$  |
|     |                               |                                 | $\rightarrow$  |
|     |                               |                                 | 2Au(sol) + 3HCOOH +  |
|     |                               |                                 | 6HC1   |
| (b) | Reduction                     | (ii)                            | $\begin{array}{l} As_2O_3 + 3H_2S \rightarrow As_2S_3(sol) \\ + 3H_2O \end{array}$ |
| (c) | Oxidation                     | (iii)                           | $SO_2 + 2H_2S \rightarrow 3S(sol)$   |
|     |                               |                                 | $+2H_2O$   |
| (d) | Double                        | (iv)                            | $FeCl_3 + 3H_2O \rightarrow$   |
|     | Decomposition                 |                                 | $Fe(OH)_3(sol) + 3HCl$   |

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)

- According to type of reactions for preparation, Sol. 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)  $Cr^{3+}$ 

 $(3) \text{ Mn}^{4+}$ (4)  $Co^{2+}$ 

 $\int_{e_{\sigma}} = 2 \times 0.4 \Delta_{0}$ Sol.  $= -0.8 \Delta_0$ = 2 unpaired  $e^{-1}$  $\mu = 2.89 \text{ Bm}$  $= -0.8 \Delta_0$  $[11 | 11 | 1]_{t_{2\sigma}}$  3 unpaired  $e^- \Rightarrow \mu = 3.87 \text{ BM}$ hence  $d^7$  configuration is of  $Co^{2+}$  Ans. 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.

9.



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



Official Ans. by NTA (4) Allen Ans. (1,4)

**Sol.** (1) (Acenaphthene)

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[I]

Hydrogen peroxide reacts with iodine in basic

(2)  $IO^-$  (3)  $I^-$  (4)  $IO_3^-$ 

meso product

Statement II :



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medium to give :

Official Ans. by NTA (3)

Sol.  $I_2 + H_2O_2 + 2OH^- \longrightarrow 2I^- + 2H_2O + O_2$ 

In the following sequence of reactions,

(1)  $IO_4^-$ 

13.

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(3)  $N = N^{\oplus} O^{\oplus}$  unsymmetrical N-O-N symmetrical Number of paramagnetic oxides among the following given oxides is Li<sub>2</sub>O, CaO, Na<sub>2</sub>O<sub>2</sub>, KO<sub>2</sub>, MgO and K<sub>2</sub>O (1)1(2) 2(3)3(4) 0Official Ans. by NTA (1)  $Na_2O_2 \implies 2Na^+ O_2^{2-}$  $KO_2 \implies K^+ = O_2^-$ 

 $O_2^- \Rightarrow$  Complete octet, diamagnetic  $O^{2-} \Longrightarrow \sigma_{1s}^{2} \sigma_{1s}^{*2} \sigma_{2s}^{2} \sigma_{2s}^{*2} \sigma_{2px}^{*2} \pi_{2py}^{2} \simeq \pi_{2pz}^{2} \pi_{2py}^{*2} \simeq \pi_{2pz}^{*2} \text{ (dia)}$  $O_2^- \Rightarrow \sigma_{1s}^2 \sigma_{1s}^{*2} \sigma_{2s}^2 \sigma_{2s}^{*2} \sigma_{2px}^2 \pi_{2py}^2 \simeq \pi_{2pz}^2 \pi_{2py}^{*2} \simeq \pi_{2pz}^{*1}$  (para)

Identify the element for which electronic configuration in +3 oxidation state is [Ar]3d<sup>5</sup>:

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

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

**Sol.**  $Fe^{3+}$  [Ar]  $3d^{5}$ 

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#### **SECTION-B**

 An empty LPG cylinder weighs 14.8 kg. When full, it weighs 29.0 kg and shows a pressure of 3.47 atm. In the course of use at ambient temperature, the mass of the cylinder is reduced to 23.0 kg. The final pressure inside of the cylinder is \_\_\_\_\_atm. (Nearest integer)

(Assume LPG of be an ideal gas)

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

Sol. Initial mass of gas = 29 - 14.8 = 14.2 Kg mass of gas used = 29 - 23 = 6 Kg gas left = 14.2 - 6 = 8.2 Kg

(1) 
$$3.47 \times V = \left(\frac{14.2 \times 10^3}{M}\right) \times R \times T$$

(2) 
$$\mathbf{p} \times \mathbf{V} = \left(\frac{8.2 \times 10^3}{M}\right) \times \mathbf{R} \times \mathbf{T}$$

Divide :

$$\frac{(1)}{(2)} \Rightarrow \frac{3.47}{P} = \frac{14.2}{8.2}$$
$$P = 2.003$$

2. The molar solubility of  $Zn(OH)_2$  in 0.1 M NaOH solution is  $x \times 10^{-18}$  M. The value of x is \_\_\_\_(Nearest integer)

(Given : The solubility product of  $Zn(OH)_2$  is  $2 \times 10^{-20}$ )

Official Ans. by NTA (2)

Sol. 
$$Zn(OH)_2(s) \rightleftharpoons Zn^{+2}(aq) + 2OH^-(aq)$$
  
 $S \qquad (0.1 + 2s) \simeq 0.1$   
 $K_{sp} = S(0.1)^2$   
 $2 \times 10^{-20} = s \times 10^{-2} \Rightarrow s = 2 \times 10^{-18}$   
 $= x \times 10^{-18}$ 

$$x = 2$$

3. For the reaction 
$$2NO_2(g) \rightleftharpoons N_2O_4(g)$$
, when  
 $\Delta S = -176.0 \text{ JK}^{-1}$  and  $\Delta H = -57.8 \text{ kJ mol}^{-1}$ , the  
magnitude of  $\Delta G$  at 298 K for the reaction is  
kJ mol<sup>-1</sup>. (Nearest integer)

Official Ans. by NTA (5)

**Sol.**  $\Delta G = \Delta H - T \Delta S$ 

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 $\Delta G = 57.8 - \frac{298(-176)}{1000}$ 

 $\Delta G = -5.352 \text{ kJ/mole}$ |Nearest integer value| = 5

4. The sum of oxidation states of two silver ions in  $[Ag(NH_3)_2] [Ag(CN)_2]$  complex is \_\_\_\_\_.

Official Ans. by NTA (2)

**Sol.** 
$$[Ag(NH_3)_2]^+ [Ag(CN)_2]^- + 1^{4}$$

5. The number of atoms in 8 g of sodium is  $x \times 10^{23}$ . The value of x is \_\_\_\_\_\_.(Nearest integer) [Given :  $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$ 

Atomic mass of Na = 23.0 u]

Official Ans. by NTA (2)

Sol. No. of atoms = 
$$\frac{8}{23} \times 6.02 \times 10^{23} = 2.09 \times 10^{23}$$
  
=  $2 \times 10^{23}$   
=  $x \times 10^{23}$ 

x = 2

6. If 80 g of copper sulphate  $CuSO_4 \cdot 5H_2O$  is dissolved in deionised water to make 5 L of solution. The concentration of the copper sulphate solution is  $x \times 10^{-3}$  mol L<sup>-1</sup>. The value of x is

> [Atomic masses Cu : 63.54 u, S : 32 u, O : 16 u, H : 1 u] Official Ans. by NTA (64)

**Sol.** Moles of 
$$CuSO_4 \cdot 5H_2O = \frac{80}{249.54}$$

Molarity = 
$$\frac{80}{\frac{249.54}{5}} = 64.117 \times 10^{-3}$$

Nearest integer, x = 64

7. A 50 watt bulb emits monochromatic red light of wavelength of 795 nm. The number of photons emitted per second by the bulb is  $x \times 10^{20}$ . The value of x is \_\_\_\_\_\_. [Given : h =  $6.63 \times 10^{-34}$  Js and c =  $3.0 \times 10^8$  ms<sup>-1</sup>] Official Ans. by NTA (2)

**Sol.** Total energy per sec. = 50 J

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- $50 = \frac{n \times 6.63 \times 10^{-34} \times 3 \times 10^8}{795 \times 10^{-9}}$ n = 1998.49 × 10<sup>17</sup> [n = no. of photons per second] = 1.998 × 10<sup>20</sup>  $\approx 2 \times 10^{20}$ = x × 10<sup>20</sup> x = 2
- 8. The spin-only magnetic moment value of  $B_2^+$ species is \_\_\_\_\_×10<sup>-2</sup> BM. (Nearest integer)

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

Official Ans. by NTA (173)

Sol. 
$$B_2^+ \Rightarrow \sigma_{1s}^2 \sigma_{1s}^{*2} \sigma_{2s}^2 \sigma_{2s}^{*2} \pi_{2py}^1 \simeq \pi_{2pz}^0$$
  
 $\Rightarrow 9e^-$   
 $\mu = \sqrt{1(1+2)} = \sqrt{3} BM$   
 $= 1.73 BM$   
 $= 1.73 \times 10^{-2} BM$ 

9. If the conductivity of mercury at  $0^{\circ}$ C is  $1.07 \times 10^{6}$ S m<sup>-1</sup> and the resistance of a cell containing mercury is 0.243  $\Omega$ , then the cell constant of the cell is x  $\times 10^{4}$  m<sup>-1</sup>. The value of x is \_\_\_\_\_.(Nearest integer)

#### Official Ans. by NTA (26)

Sol. 
$$k = 1.07 \times 10^{6} \text{ Sm}^{-1}$$
,  $R = 0.243 \ \Omega$   
 $G = \frac{1}{R} = \frac{1}{0.243} \Omega^{-1}$   
 $k = G \times G^{*}$   
 $G^{*} = \frac{k}{C} = \frac{1.07 \times 10^{6}}{1} \approx 26 \times 10^{4} \text{ m}^{-1}$ 

0.243

X.

 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)



3 pep<mark>tide</mark> linkage Ans. (3)