

**FINAL JEE-MAIN EXAMINATION – FEBRUARY, 2021**

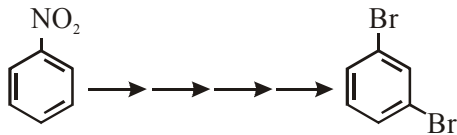
(Held On Wednesday 24<sup>th</sup> February, 2021) TIME : 3 : 00 PM to 6 : 00 PM

**CHEMISTRY**

**TEST PAPER WITH ANSWER**

**SECTION-A**

1. What is the correct sequence of reagents used for converting nitrobenzene into *m*-dibromobenzene ?



- (1)  $\xrightarrow{\text{NaNO}_2} / \xrightarrow{\text{HCl}} / \xrightarrow{\text{KBr}} / \xrightarrow{\text{H}^+}$   
 (2)  $\xrightarrow{\text{Br}_2/\text{Fe}} / \xrightarrow{\text{Sn/HCl}} / \xrightarrow{\text{NaNO}_2/\text{HCl}} / \xrightarrow{\text{CuBr/HBr}}$   
 (3)  $\xrightarrow{\text{Sn/HCl}} / \xrightarrow{\text{KBr}} / \xrightarrow{\text{Br}_2} / \xrightarrow{\text{H}^+}$   
 (4)  $\xrightarrow{\text{Sn/HCl}} / \xrightarrow{\text{Br}_2} / \xrightarrow{\text{NaNO}_2} / \xrightarrow{\text{NaBr}}$

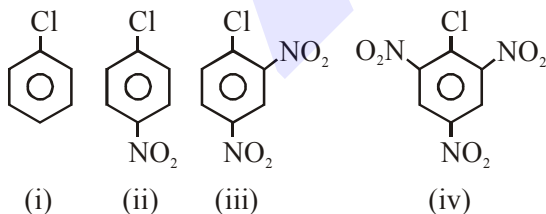
**Official Ans. by NTA (2)**

2. Most suitable salt which can be used for efficient clotting of blood will be :-

- (1)  $\text{NaHCO}_3$                       (2)  $\text{FeSO}_4$   
 (3)  $\text{Mg}(\text{HCO}_3)_2$                 (4)  $\text{FeCl}_3$

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

3. The correct order of the following compounds showing increasing tendency towards nucleophilic substitution reaction is :-



- (1) (iv) < (iii) < (ii) < (i)  
 (2) (iv) < (i) < (ii) < (iii)  
 (3) (iv) < (i) < (iii) < (ii)  
 (4) (i) < (ii) < (iii) < (iv)

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

4. According to Bohr's atomic theory :-

- (A) Kinetic energy of electron is  $\propto \frac{Z^2}{n^2}$ .  
 (B) The product of velocity (v) of electron and principal quantum number (n), 'vn'  $\propto Z^2$ .  
 (C) Frequency of revolution of electron in an orbit is  $\propto \frac{Z^3}{n^3}$ .  
 (D) Coulombic force of attraction on the electron is  $\propto \frac{Z^3}{n^4}$ .

Choose the most appropriate answer from the options given below :

- (1) (C) Only  
 (2) (A) Only  
 (3) (A), (C) and (D) only  
 (4) (A) and (D) only

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

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

5. Match list - I and List - II.

**List-I**

**List-II**

- (a)  $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{Cl} \rightarrow \text{R}-\text{CHO}$                       (i)  $\text{Br}_2/\text{NaOH}$   
 (b)  $\text{R}-\text{CH}_2-\text{COOH} \rightarrow \text{R}-\underset{\text{Cl}}{\text{CH}}-\text{COOH}$                       (ii)  $\text{H}_2/\text{Pd}-\text{BaSO}_4$   
 (c)  $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2 \rightarrow \text{R}-\text{NH}_2$                       (iii)  $\text{Zn}(\text{Hg})/\text{Conc. HCl}$   
 (d)  $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 \rightarrow \text{R}-\text{CH}_2-\text{CH}_3$                       (iv)  $\text{Cl}_2/\text{Red P, H}_2\text{O}$

Choose the correct answer from the options given below :

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

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

6. The calculated magnetic moments (spin only value) for species  $[\text{FeCl}_4]^{2-}$ ,  $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$  and  $\text{MnO}_4^{2-}$  respectively are :

- (1) 5.82, 0 and 0 BM
- (2) 4.90, 0 and 1.73 BM
- (3) 5.92, 4.90 and 0 BM
- (4) 4.90, 0 and 2.83 BM

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

7. Match List-I with List-II :

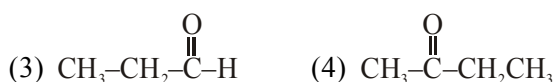
List-I (Salt)	List-II (Flame colour wavelength)
(a) LiCl	(i) 455.5 nm
(b) NaCl	(ii) 670.8 nm
(c) RbCl	(iii) 780.0 nm
(d) CsCl	(iv) 589.2 nm

Choose the correct answer from the options given below :

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

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

8. Which one of the following carbonyl compounds cannot be prepared by addition of water on an alkyne in the presence of  $\text{HgSO}_4$  and  $\text{H}_2\text{SO}_4$  ?

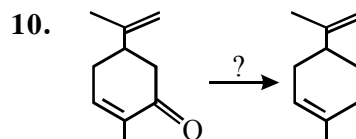


**Official Ans. by NTA (3)**

9. In polymer Buna-S: 'S' stands for :-

- (1) Sulphonation
- (2) Strength
- (3) Sulphur
- (4) Styrene

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



Which of the following reagent is suitable for the preparation of the product in the above reaction ?

- (1)  $\text{NaBH}_4$
- (2)  $\text{NH}_2\text{-NH}_2/\text{C}_2\text{H}_5\overset{\ominus}{\text{O}}\overset{\oplus}{\text{Na}}$
- (3)  $\text{Ni}/\text{H}_2$
- (4) Red P +  $\text{Cl}_2$

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

11. Match List-I and List-II.

List-I	List-II
(a) Valium	(i) Antifertility drug
(b) Morphine	(ii) Pernicious anaemia
(c) Norethindrone	(iii) Analgesic
(d) Vitamin B <sub>12</sub>	(iv) Tranquilizer

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

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

12. Match List-I with List-II.

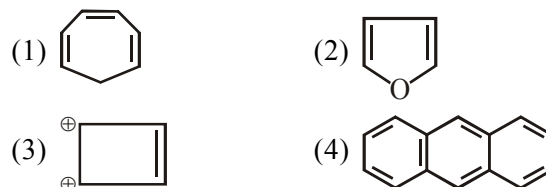
List-I (Metal)	List-II (Ores)
(a) Aluminium	(i) Siderite
(b) Iron	(ii) Calamine
(c) Copper	(iii) Kaolinite
(d) Zinc	(iv) Malachite

Choose the correct answer from the options given below :

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

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

13. Which one of the following compounds is non-aromatic ?



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

14. What is the correct order of the following elements with respect to their density ?

- (1)  $\text{Cr} < \text{Zn} < \text{Co} < \text{Cu} < \text{Fe}$
- (2)  $\text{Zn} < \text{Cu} < \text{Co} < \text{Fe} < \text{Cr}$
- (3)  $\text{Zn} < \text{Cr} < \text{Fe} < \text{Co} < \text{Cu}$
- (4)  $\text{Cr} < \text{Fe} < \text{Co} < \text{Cu} < \text{Zn}$

Official Ans. by NTA (3)

15. Given below are two statements :-

**Statement I :** The value of the parameter "Biochemical Oxygen Demand (BOD)" is important for survival of aquatic life.

**Statement II :** The optimum value of BOD is 6.5 ppm.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (1) Statement I is false but Statement II is true
- (2) Both Statement I and Statement II are true
- (3) Statement I is true but Statement II is false
- (4) Both Statement I and Statement II are false

Official Ans. by NTA (3)

16. The **incorrect** statement among the following is :-

- (1)  $\text{VO}_2$  is a reducing agent
- (2)  $\text{Cr}_2\text{O}_3$  is an amphoteric oxide
- (3)  $\text{RuO}_4$  is an oxidizing agent
- (4) Red colour of ruby is due to the presence of  $\text{Co}^{3+}$

Official Ans. by NTA (4)

17. The correct shape and I-I-I bond angles respectively in  $\text{I}_3^-$  ion are :-

- (1) Distorted trigonal planar;  $135^\circ$  and  $90^\circ$
- (2) T-shaped;  $180^\circ$  and  $90^\circ$
- (3) Trigonal planar;  $120^\circ$
- (4) Linear;  $180^\circ$

Official Ans. by NTA (4)

18. Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R**.

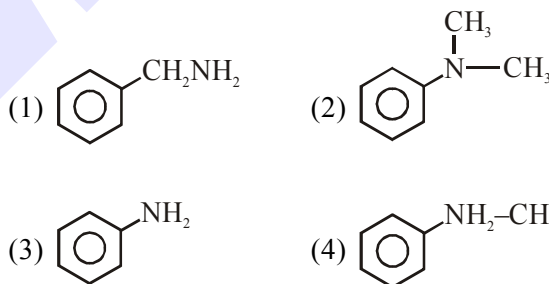
**Assertion A :** Hydrogen is the most abundant element in the Universe, but it is not the most abundant gas in the troposphere.

**Reason R :** Hydrogen is the lightest element. In the light of the above statements, choose the correct answer from the options given below :

- (1) **A** is true but **R** is false
- (2) Both **A** and **R** are true and **R** is the correct explanation of **A**
- (3) **A** is false but **R** is true
- (4) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**

Official Ans. by NTA (2)

19. The diazonium salt of which of the following compounds will form a coloured dye on reaction with  $\beta$ -Naphthol in  $\text{NaOH}$  ?



Official Ans. by NTA (3)

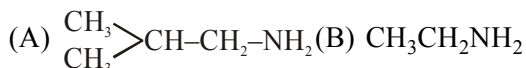
20. The correct set from the following in which both pairs are in correct order of melting point is :-

- (1)  $\text{LiF} > \text{LiCl}$  ;  $\text{MgO} > \text{NaCl}$
- (2)  $\text{LiCl} > \text{LiF}$  ;  $\text{NaCl} > \text{MgO}$
- (3)  $\text{LiF} > \text{LiCl}$  ;  $\text{NaCl} > \text{MgO}$
- (4)  $\text{LiCl} > \text{LiF}$  ;  $\text{MgO} > \text{NaCl}$

Official Ans. by NTA (1)

**SECTION-B**

1. The total number of amines among the following which can be synthesized by Gabriel synthesis is \_\_\_\_\_.



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

2. Among the following allotropic forms of sulphur, the number of allotropic forms, which will show paramagnetism is \_\_\_\_\_.



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

3. The formula of a gaseous hydrocarbon which requires 6 times of its own volume of  $\text{O}_2$  for complete oxidation and produces 4 times its own volume of  $\text{CO}_2$  is  $\text{C}_x\text{H}_y$ . The value of y is \_\_\_\_\_.

**Official Ans. by NTA (8)**

4. The volume occupied by 4.75 g of acetylene gas at  $50^\circ\text{C}$  and 740 mmHg pressure is \_\_\_\_\_ L. (Rounded off to the nearest integer)  
[Given  $R = 0.0826 \text{ L atm K}^{-1} \text{ mol}^{-1}$ ]

**Official Ans. by NTA (5)**

5.  $\text{C}_6\text{H}_6$  freezes at  $5.5^\circ\text{C}$ . The temperature at which a solution 10 g of  $\text{C}_4\text{H}_{10}$  in 200 g of  $\text{C}_6\text{H}_6$  freeze is \_\_\_\_\_  $^\circ\text{C}$ . (The molal freezing point depression constant of  $\text{C}_6\text{H}_6$  is  $5.12^\circ\text{C/m}$ .)

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

6. The magnitude of the change in oxidising power of the  $\text{MnO}_4^- / \text{Mn}^{2+}$  couple is  $x \times 10^{-4} \text{ V}$ , if the  $\text{H}^+$  concentration is decreased from 1 M to  $10^{-4} \text{ M}$  at  $25^\circ\text{C}$ . (Assume concentration of  $\text{MnO}_4^-$  and  $\text{Mn}^{2+}$  to be same on change in  $\text{H}^+$  concentration). The value of x is \_\_\_\_\_.  
(Rounded off to the nearest integer)

[Given :  $\frac{2.303 RT}{F} = 0.059$ ]

**Official Ans. by NTA (3776)**

7. The solubility product of  $\text{PbI}_2$  is  $8.0 \times 10^{-9}$ . The solubility of lead iodide in 0.1 molar solution of lead nitrate is  $x \times 10^{-6} \text{ mol/L}$ . The value of x is \_\_\_\_\_. (Rounded off to the nearest integer)

[Given :  $\sqrt{2} = 1.41$ ]

**Official Ans. by NTA (141)**

8. Sucrose hydrolyses in acid solution into glucose and fructose following first order rate law with a half-life of 3.33 h at  $25^\circ\text{C}$ . After 9 h, the fraction of sucrose remaining is f. The

value of  $\log_{10}\left(\frac{1}{f}\right)$  is \_\_\_\_\_  $\times 10^{-2}$ . (Rounded

off to the nearest integer)

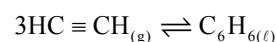
[Assume :  $\ln 10 = 2.303$ ,  $\ln 2 = 0.693$ ]

**Official Ans. by NTA (81)**

9. 1.86 g of aniline completely reacts to form acetanilide. 10% of the product is lost during purification. Amount of acetanilide obtained after purification (in g) is \_\_\_\_\_  $\times 10^{-2}$ .

**Official Ans. by NTA (243)**

10. Assuming ideal behaviour, the magnitude of  $\log K$  for the following reaction at  $25^\circ\text{C}$  is  $x \times 10^{-1}$ . The value of x is \_\_\_\_\_. (Integer answer)



[Given:  $\Delta_f G^\circ(\text{HC} \equiv \text{CH}) = -2.04 \times 10^5 \text{ J mol}^{-1}$ ;  
 $\Delta_f G^\circ(\text{C}_6\text{H}_6) = -1.24 \times 10^5 \text{ J mol}^{-1}$ ;  $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ ]

**Official Ans. by NTA (855)**