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**JEE**  
**(Main)**

**2021**

**COMPUTER BASED TEST (CBT)**

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**Date: 27 July, 2021 (SHIFT-2) | TIME : (3.00 p.m. to 6.00 p.m)**

**Duration: 3 Hours | Max. Marks: 300**

**SUBJECT: CHEMISTRY**

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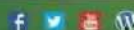
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**| JEE MAIN-2021 | DATE : 27-07-2021 (SHIFT-2) | PAPER-1 | MEMORY BASED | CHEMISTRY**

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1. If Thomson model is considered to be true then in Rutherford model.
- (1) All  $\alpha$  particles deflects at  $180^\circ$
  - (2) They deflect at wide range of angle
  - (3) All will pass through foil without deflection
  - (4) They will pass but with reduced speed.

**Ans. (1)**

**Sol.** Theory Based.

2. Identify the correct increasing order of 1<sup>st</sup> ionisation enthalpy order of Mg, Al, P, S
- (1) Al, Mg, S, P
  - (2) Mg, Al, P, S
  - (3) Al, Mg, P, S
  - (4) Mg, Al, S, P

**Ans. (1)**

**Sol.** Correct increasing order of 1<sup>st</sup> ionisation enthalpy is :  $Al < Mg < S < P$ .

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- |        |                                          |
|--------|------------------------------------------|
| (a) Li | (i) used in devising photoelectric cell  |
| (b) Na | (ii) used to make electrochemical cell   |
| (c) K  | (iii) used as coolant in nuclear reactor |
| (d) Cs | (iv) used in absorption of $CO_2$        |

Identify the correct match

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

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

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

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

Ans. (1)

- Sol. (a) Li  $\Rightarrow$  used in electrochemical cell  
(b) Na  $\Rightarrow$  used as coolant in fast breeder nuclear reactors  
(c) K  $\Rightarrow$  used as an absorbent of  $\text{CO}_2$   
(d) Cs  $\Rightarrow$  used in devising photoelectric cell.

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4. How many number of electron are there in bonding molecular orbital of  $\text{O}_2^{2-}$ ?

Ans. 10

Sol.  $\text{O}_2^{2-}$  (Total electron = 18)

$$\text{EC} = (\sigma 1s)^2(\sigma^* 1s)^2(\sigma 2s)^2(\sigma^* 2s)^2(\sigma 2p_z)^2(\pi 2p_x)^2 = \pi 2p_y^2(\pi^* 2p_x)^2 = \pi^* 2p_y^2$$

Total electron in BMO = 10.

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5. How many total C=O bonds are there in  $\text{HClO}_4$ ,  $\text{HClO}_3$  and  $\text{HClO}_2$ .

Ans. 6

Sol.

| Compounds       | Structure | Total C=O bond |
|-----------------|-----------|----------------|
| $\text{HClO}_4$ |           | 3              |

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|                 |  |   |
|-----------------|--|---|
| $\text{HClO}_3$ |  | 2 |
| $\text{HClO}_2$ |  | 1 |

6. Identify the incorrect statement from following.

- (1) crystalline solids are isotropic  
(2) amorphous solids are also called pseudo solid

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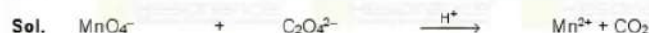
Ans. (1)

Sol. Crystalline solids are anisotropic in nature.

7. 10 ml 0.05 M  $\text{KMnO}_4$  is titrated with 10 ml of oxalic acid, find strength of oxalic acid (in g/l).

[Report your answer to nearest integer]

Ans. 11



Valency factor = 5

Valency factor = 2

mili eq. of  $\text{C}_2\text{O}_4^{2-}$  = mili eq. of  $\text{MnO}_4^-$

$$2 [M \times 10] = 5 [0.05 \times 10]$$

$$M = 0.125 \text{ mole/lit.}$$

$$\text{Strength of oxalic acid} = 0.125 \times 90 = 11.25 \text{ g/l}$$

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PAGE # 2

8. 1 mole of A takes 100 minutes to give 0.2 mole of B in the reaction  $A \longrightarrow 2B$  (According to 1<sup>st</sup> order reaction). The half life of the reaction is :  
[Report your answer to nearest integer]  
[Given  $\ln 2 = 0.693$  &  $\ln 10 = 2.303$ ]

Ans. 752

Sol.  $A \longrightarrow 2B$   
Initially 1 mole 0  
After 100 min  $(1 - 0.1)$  mole 0.2 mole

$$k = \frac{1}{t} \ln \left( \frac{a}{a-x} \right)$$

$$k = \frac{2.303}{100} \log \left( \frac{1}{0.9} \right)$$

$$\frac{0.693}{t_{1/2}} = \frac{2.303}{100} [1 - 2 \times 0.48]$$

$$t_{1/2} = \frac{69.3}{2.303 \times 0.04} \text{ min}$$

$$t_{1/2} = 752.3 \text{ min}$$

9. The total number of neutrons and electrons present in radioactive isotope of Hydrogen is :

Ans. (3)

Sol. Radioactive isotope of Hydrogen is tritium ( ${}^3_1\text{H}$ )

Number of  $\{P = 1, n = 2, e^- = 1\}$ , so  $(n + e^-) = 3$

10.  $\text{Fe}(\text{CO})_5 \longrightarrow \text{Fe}(\text{CO})_4 + \text{CO}$

Ans. (16)

Sol.  $K_p = (P_{\text{O}_2})^{1/2} = 4$

$$P_{\text{O}_2} = 16$$

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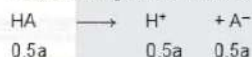
critical temperature, easier is liquification of gas and more is adsorption of gas on charcoal.

12. An electrolyte AB is 50% dimerise and rest is ionise in a solvent, then Van't hoff factor (i) for this acid is.  
 (1) 1 (2) 1.25 (3) 2 (4) 1.5

Ans. (2)

Sol.  $i = \frac{\text{Total no. of particle after dissociation/association}}{\text{Total number of particle before dissociation/association}}$

dissociation [Let total mole of acid HA = a]



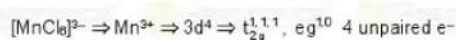
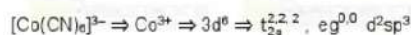
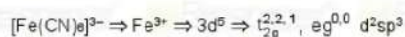
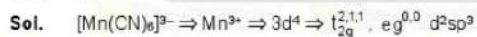
association



$$i = \left( \frac{1}{a} \right) = 1.25$$

13.  $\text{S}_1$ :  $[\text{Mn}(\text{CN})_6]^{3-}$ ,  $[\text{Fe}(\text{CN})_6]^{3-}$  and  $[\text{Co}(\text{CN})_6]^{3-}$  have  $d^2sp^3$  hybridisation.  
 $\text{S}_2$ :  $[\text{MnCl}_6]^{3-}$  and  $[\text{FeCl}_6]^{3-}$  are paramagnetic with 4 and 5 unpaired electrons respectively.  
 (1) Both  $\text{S}_1$  &  $\text{S}_2$  are true. (2)  $\text{S}_1$  is true and  $\text{S}_2$  is false  
 (3)  $\text{S}_1$  is false and  $\text{S}_2$  is true (4) Both  $\text{S}_1$  &  $\text{S}_2$  are false.

Ans. (1)



so both  $\text{S}_1$  &  $\text{S}_2$  are true.

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- $\left\{ \begin{array}{l} 2^{\text{nd}} \text{ group cation } \text{Cu}^{2+} \\ 3^{\text{rd}} \text{ group cation } \text{Al}^{3+}, \text{Fe}^{3+} \\ 4^{\text{th}} \text{ group cation } \text{Co}^{2+}, \text{Ni}^{2+}, \text{Zn}^{2+} \\ 5^{\text{th}} \text{ group cation } \text{Ba}^{2+} \end{array} \right.$

16. In a closed container initially  $\text{SO}_2$  and  $\text{O}_2$  are taken at 750 bar and 250 bar and following reaction takes place.



then what will be the total pressure of gases after completion of reaction (in bar.)

Ans. 750

Sol.  $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \longrightarrow 2\text{SO}_3(\text{g})$   
Initially 750 bar 250 bar (LR is  $\text{O}_2$ )

$$P_{\text{Total}} = 250 + 500 = 750 \text{ bar}$$

17. 1 Mole of complex  $\text{CoCl}_2 \cdot 6\text{NH}_3$  on reaction with  $\text{AgNO}_3$  gives 3 moles of  $\text{AgCl}$  precipitate. The secondary valency of complex is-

Ans. 6

Sol. As complex give 3 moles  $\text{AgCl}$  precipitate so all 3 chloride ions are in ionisation sphere so complex is  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$   
secondary valency of complex = 6.

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18.

| List - I<br>(Metal) | List - II<br>(Colour during flame test) |
|---------------------|-----------------------------------------|
| a) Li               | (i) Golden yellow                       |

|       |                |
|-------|----------------|
| d) Ba | (iv) Brick Red |
|-------|----------------|

Identify the correct matching from List - I with List - II :

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

Ans. (1)

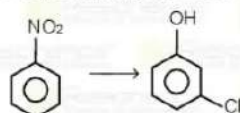
| Sol.  | Metal | Flame colour test |
|-------|-------|-------------------|
| (i)   | Li    | Crimson Red       |
| (ii)  | Na    | Golden Yellow     |
| (iii) | Ca    | Brick Red         |
| (iv)  | Ba    | Apple green       |

19. Statement-I : Hyper conjugation is a permanent effect.

- (1) Both Statement-I & Statement-II are correct.  
 (2) Statement-I is correct and Statement-II is incorrect.  
 (3) Statement-I is incorrect and Statement-II is correct.  
 (4) Both Statement-I and Statement-II are incorrect.

Ans. (2)

20. For the following conversion.



the appropriate sequence of reagent will be.

Ans. (3)

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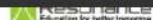
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21. D-Galactose & D-Glucose are formed by the hydrolysis of following disaccharide.

- (1) Sucrose (2) Lactose (3) Maltose (4) Amylose

Ans. (2)

22. Statement-I : Penicillin is Bacteriostatic.

Statement-II : The correct structure of penicillin is

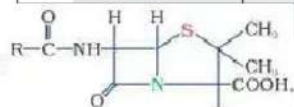
- (1) Both Statement-I & Statement-II are correct  
 (2) Statement-I is correct and Statement-II is incorrect  
 (3) Statement-I is incorrect and Statement-II is correct  
 (4) Both Statement-I and Statement-II are incorrect

Ans. (3)

Sol

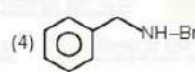
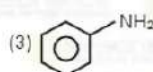
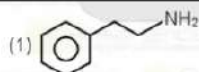
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|                 |                 |
|-----------------|-----------------|
| Penicillin      | Erythromycin    |
| Aminoglycosides | Tetracycline    |
| Ofloxacin       | Chloramphenicol |



General Structure of Penicillin

23. In following sequence of reaction final product will be



Ans. (2)

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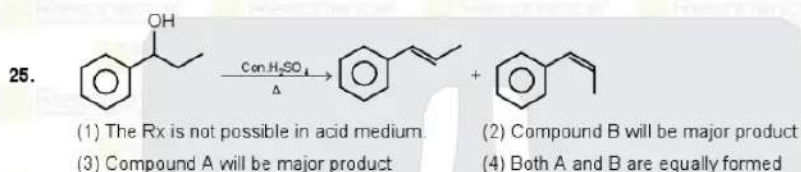
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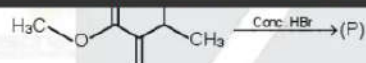
Ans. (3)

26. Dihedral angle in 1,1,1-trichloro ethane in staggered conformation (in degree) is

Ans. 60

27. Which of the following product is not possible

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Product (P)



Ans. (4)

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