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**JEE**  
**(Main)**  
**PAPER-1 (B.E./B. TECH.)**  
**2022**


**COMPUTER BASED TEST (CBT)**  
**Memory Based Questions & Solutions**

**Date: 27 June, 2022 (SHIFT-1) | TIME : (9.00 a.m. to 12.00 p.m)**  
**Duration: 3 Hours | Max. Marks: 300**

**SUBJECT: CHEMISTRY**

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**PART : CHEMISTRY**

1. When white phosphorus react with conc. NaOH product formed are.  
(1)  $\text{PH}_3$  &  $\text{NaH}_2\text{PO}_2$  (2)  $\text{PH}_3$ ,  $\text{Na}_3\text{PO}_4$  (3)  $\text{PH}_3$ , &  $\text{Na}_2\text{HPO}_3$  (4)  $\text{NaH}_2\text{PO}_2$ ,  $\text{Na}_3\text{PO}_4$
- Ans.** (1)
- Sol.**  $\text{P}_4(\text{white}) + \text{NaOH} \longrightarrow \text{PH}_3 + \text{NaH}_2\text{PO}_2$

2. **Statement-I:**  $O^{2-}$  and  $Mg^{2+}$  have equal radii

**Statement-II:** They are isoelectric

- (1) Both Statement-I & Statement-II are True.  
 (2) Both Statement-I & Statement-II are False.  
 (3) Statement-I is True while Statement-II is False.  
 (4) Statement-I is False while Statement-II is True.

**Ans.** (4)

<b>Sol.</b>	ion	$O^{2-}$	$Mg^{2+}$
	No. of $e^-$	10	10
	Z	8	12
	Order of ionic size	$\Rightarrow O^{2-} > Mg^{2+}$	

3. Which of the following complex have maximum value of crystal field splitting energy.

- (1)  $[Co(CN)_6]^{3-}$  (2)  $[Cu(NH_3)_4]^{2+}$  (3)  $[Co(H_2O)_6]^{2+}$  (4)  $[Ti(H_2O)_6]^{3+}$

**Ans.** (2)

<b>Sol.</b>	<b>Complex</b>	<b>Hybridisation</b>
	(1) $[Co(CN)_6]^{3-}$	$d^2sp^3$
	(2) $[Cu(NH_3)_4]^{2+}$	$dsp^2$
	(3) $[Co(H_2O)_6]^{2+}$	$sp^3d^2$
	(4) $[Ti(H_2O)_6]^{3+}$	$d^2sp^3$

$$\Delta_{sp} = 1.3 \Delta_o$$

4. When acidified  $KMnO_4$  reacts with oxalic acid gives a manganese product. Find the magnetic moment (spin only) of Mn in this product.  
 (Report your answer to nearest integer)

**Ans.** (6)



$$^{25}Mn^{2+} = 3d^5$$

No. of unpaired electron = 5

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$$\begin{aligned}\mu(\text{spin only}) &= \sqrt{n(n+2)} \text{ BM} \\ &= \sqrt{5(5+2)} \\ &= \sqrt{35} \\ &= 5.916\end{aligned}$$

**Ans.** 6

5. 2 gram of non-volatile solute dissolve in each 200 gram of two different solvents A and B and have same molality. It ratio of  $K_b$  of solvent A and B is 1 : 8 & the ratio of elevation in boiling point is x : y, then value of y is \_\_\_\_\_.

**Ans.** (8)

**Sol.**  $\Delta T_b = K_b \times m$

$$\frac{(\Delta T_b)_I}{(\Delta T_b)_{II}} = \frac{(K_b)_I}{(K_b)_{II}} = \frac{1}{8} = \frac{x}{y}$$

$$\text{So } y = 8$$

6. **S<sub>1</sub>** : At 20°C molality of KCl solution is 'X' m, on decreasing temperature to -10°C molality remain unchanged.

**S<sub>2</sub>** : On changing temperature mass remain unchanged.

- (1) Both  $S_1$  &  $S_2$  are true (2) Both  $S_1$  &  $S_2$  are false

(3)  $S_1$  is true &  $S_2$  is false

(4)  $S_1$  is false &  $S_2$  is true

**Ans.** (1)

**Sol.** Molality & mass are temperature independent so on changing temperature molality & mass remain unchanged.

7. What product are obtained in following reaction,  $H_2SO_4 + BaO_2 \longrightarrow$  Product.

(1)  $H_2 + O_2$

(2)  $H_2O$

(3)  $BaSO_4 + H_2O_2$

(4)  $H_2SO_8 + H_2O_2$

**Ans.** (3)

**Sol.**  $BaO_2 \cdot 8H_2O(s) + H_2SO_4(aq) \longrightarrow BaSO_4(s) + H_2O_2(aq) + 8H_2O(l)$

8. Two element A & B form two different compound  $A_2B$  &  $AB_3$ . If 0.15 mole of both compound have equal weight then what is the ratio of molar mass of A & B.

**Ans.** (2)

**Sol.** Let molar mass of A is a

B is b

again  $\Rightarrow 0.15 [2a + b] = 0.15 [a + 3b]$

$$a = 2b \Rightarrow \left(\frac{a}{b}\right) = \frac{2}{1}$$

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9. Match the following.

**List-I**

(i)  $Si(CH_3)_4$

(ii)  $Si(CH_3)_2(OH)_2$

(iii)  $Si(CH_3)(OH)_3$

(iv)  $Si(CH_3)_3(OH)$

**List-II**

(a) Silane

(b) 2D silicone

(c) Chain silicone

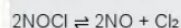
(d) Dimeric silicone

	I	II	III	IV
(1)	a	c	b	d
(2)	a	b	c	d
(3)	a	d	b	c
(4)	d	c	b	a

**Ans.** (1)

**Sol.** (i)  $Si(CH_3)_4$  Silane  
(ii)  $Si(CH_3)_2(OH)_2$  Chain silicone  
(iii)  $Si(CH_3)(OH)_3$  2D silicone  
(iv)  $Si(CH_3)_3(OH)$  Dimeric silicone

10. 2 mole of  $NOCl$  taken in 1 L of closed container it dissociate into  $NO$  &  $Cl_2$  gas



At equilibrium if 0.4 mole of  $NO$  are obtained then value of  $K_c$  is  $\times 10^{-4}$

**Ans.** (125)

**Sol.**  $2NOCl \rightleftharpoons 2NO + Cl_2$

Initially 2 mole 0 0  
At equilibrium (2 - 0.4) 0.4 0.2  
= 1.6

$$K_c = \frac{(NO)^2 (Cl_2)}{(NOCl)^2} = \frac{(0.4)^2 (0.2)}{(1.6)^2}$$

$$= 0.0125$$

$$= 125 \times 10^{-4}$$

**Ans.** = 125

11. The limiting molar conductivities of NaI, NaNO<sub>3</sub>, and AgNO<sub>3</sub> are 12.7 S m<sup>2</sup> mole<sup>-2</sup>, 12 S m<sup>2</sup> mole<sup>-2</sup> and 13.3 S m<sup>2</sup> mole<sup>-2</sup> respectively (all at 25°C). The limiting molar conductivity of AgI at this temperature is :

Ans 14

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Sol. Given  $\lambda_m^\infty(\text{NaI}) = 12.7 \text{ S m}^2 \text{ mole}^{-2}$   
 $\lambda_m^\infty(\text{AgNO}_3) = 13.3 \text{ S m}^2 \text{ mole}^{-2}$   
 $\lambda_m^\infty(\text{NaNO}_3) = 12 \text{ S m}^2 \text{ mole}^{-2}$   
 $\lambda_m^\infty(\text{AgI}) = \lambda_m^\infty(\text{AgNO}_3) + \lambda_m^\infty(\text{NaI}) - \lambda_m^\infty(\text{NaNO}_3)$   
 $= 13.3 + 12.7 - 12$   
 $= 14 \text{ S m}^2 \text{ mole}^{-2}$

12. Find % of Fe<sup>2+</sup> in Fe<sub>0.93</sub>O. [Report your answer to nearest integer]

Ans. (85)

Sol.  $\text{Fe}_{0.93}\text{O}$

```

      +2      +3
     x      (0.93-x)
  
```

$$2x + 3(0.93 - x) = 2$$

$$2x + 0.93 \times 3 - 3x = 2$$

$$2.79 - 2 = x$$

$$x = 0.79$$

$$\% \text{ of Fe}^{2+} = \frac{0.79}{0.93} \times 100 = 84.94\%$$

Ans = 85

13. Identify correct match using Column I & Column II

### Column I

- (i) Spontaneous process  
 (ii)  $\Delta H^\circ$   
 (iii)  $\Delta T = 0, \Delta P = 0$   
 (iv) Exothermic process

### Column II

- (a) Isothermal and isobaric process  
 (b)  $\Delta H < 0$   
 (c)  $\Delta G < 0$   
 (d) (Bond energy of reactant) – (Bond energy of product)

	I	II	III	IV		I	II	III	IV
(1)	c	d	a	b	(2)	b	a	c	d
(3)	d	b	c	d	(4)	a	d	b	c

Ans. (1)

Sol. (i) For spontaneous process  $\Rightarrow \Delta G < 0$   
 (ii) For exothermic process  $\Rightarrow \Delta H < 0$   
 (iii) For isothermal process  $\Rightarrow \Delta T < 0$   
 For isobaric process  $\Rightarrow \Delta P < 0$

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- 14. Column I**  
 (i) Gold (Au)  
 (ii) Blister Copper  
 (iii)  $\text{Al}_2\text{O}_3$   
 (iv) Froth stabilizer  
 Correct matching is
- Column II**  
 (a)  $\text{SO}_2$   
 (b) NaOH  
 (c) NaCN  
 (d) Aniline
- |      |   |    |     |    |     |   |    |     |    |
|------|---|----|-----|----|-----|---|----|-----|----|
|      | I | II | III | IV |     | I | II | III | IV |
| (1*) | c | a  | b   | d  | (2) | a | b  | c   | d  |
| (3)  | b | c  | d   | a  | (4) | c | b  | a   | d  |

**Sol.** Theory based

- 15.** Identify the correct products in following reaction



- (1) Be,  $\text{LiAlCl}_4\text{NCl}$  (2)  $\text{BeH}_2$ , LiCl,  $\text{AlCl}_3$  (3)  $\text{AlH}_3$ ,  $\text{BeH}_2$  HCl (4) Be,  $\text{AlCl}_3$ , LiCl

**Ans** (2)

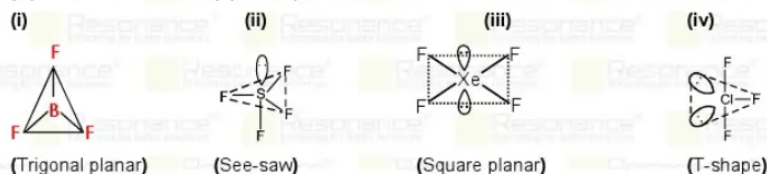
**Sol.**  $2\text{BeCl}_2 + \text{LiAlCl}_4 \rightarrow 2\text{BeH}_2 + \text{LiCl} + \text{AlCl}_3$

- 16. Column I**  
 Compound  
 (i)  $\text{BF}_3$   
 (ii)  $\text{SF}_4$   
 (iii)  $\text{XeF}_4$   
 (iv)  $\text{ClF}_3$   
 Correct matching is
- Column II**  
 Shape  
 (a) T-Shape  
 (b) Square planar  
 (c) See - saw  
 (d) Trigonal planar

- |     |   |    |     |    |     |   |    |     |    |
|-----|---|----|-----|----|-----|---|----|-----|----|
|     | I | II | III | IV |     | I | II | III | IV |
| (1) | d | c  | b   | a  | (2) | a | b  | c   | d  |
| (3) | d | a  | c   | d  | (4) | b | c  | d   | a  |

**Ans** (1)

- Sol.** (i)  $\text{BF}_3$  (a) Trigonal planar  
 (ii)  $\text{SF}_4$  (b) See - saw  
 (iii)  $\text{XeF}_4$  (c) Square planar  
 (iv)  $\text{ClF}_3$  (d) T-shape



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- 17.** 0.76 gram mixture of  $\text{H}_2$  and  $\text{O}_2$  occupy  $2000 \text{ cm}^3$  of volume at  $300\text{K}$  and  $10^5$  Pascal pressure, then molar ratio of Hydrogen and oxygen is

**Sol.** For mixture.

$$PV = nRT$$

$$1 \times 2 = n_{\text{Total}} \times \frac{1}{12} \times 300$$

$$n_{\text{Total}} = \frac{24}{300} = 0.08 \text{ Mole}$$

$$n_{H_2} + n_{O_2} = 0.08$$

$$(i) W_{H_2} + W_{O_2} = 0.76$$

$$(ii) \frac{W_{H_2}}{2} + \frac{W_{O_2}}{32} = 0.08$$

$$16W_{H_2} + W_{O_2} = 0.08 \times 32 ;$$

$$W_{H_2} = \left( \frac{0.08 \times 32 - 0.76}{15} \right) = 0.12 ; \quad W_{O_2} = 0.64$$

$$\text{So } n_{H_2} = \frac{0.12}{2} = 0.06 ; \quad n_{O_2} = \frac{0.64}{32} = 0.02$$

Ans = 3

18. Uncertainty in position of a moving particle is  $10^{-7}$  m and uncertainty velocity is  $2.4 \times 10^{-24}$  m/sec, then mass of particle is  $[X] \times 10^{-6}$  Kg value of X is \_\_\_\_ . [Report your answer to nearest integer]

Sol. According to Heisenberg uncertainty Principle

$$\Delta x \times \Delta p \geq \frac{h}{4\pi}$$

$$\Rightarrow 10^{-7} \times m \Delta v = \frac{6.62 \times 10^{-34}}{4 \times 3.14}$$

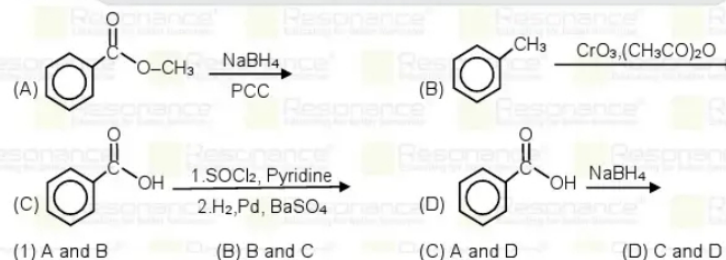
$$\Rightarrow 10^{-7} \times m \times 2.4 \times 10^{-24} = \frac{6.62 \times 10^{-34}}{4 \times 3.14}$$

$$M = 0.2196 \times 10^{-3} \text{ Kg}$$

$$= 21.96 \times 10^{-5} \text{ kg}$$

Ans = 22

19. Which of the following combination gives Benzaldehyde.



Ans. (2)

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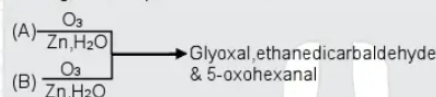
20. **Statement-I:** In Hofmann rearrangement reaction alkyl group shift from carbonyl carbon atom to nitrogen atom.

**Statement-II:** In alkyl shift, the group get shifted to the electron deficient carbon atom.

- (1) Both Statement-I & Statement-II are True. (2) Both Statement-I & Statement-II are False.  
(3) Statement-I is True while Statement-II is False. (4) Statement-I is False while Statement-II is True.

Ans. (1)

21. A mixture of organic compound A and B on reductive ozonolysis



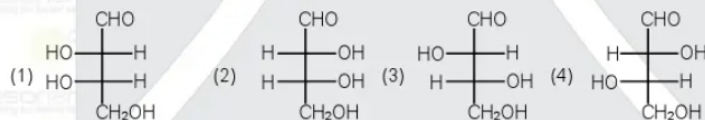
Gives the product glyoxal, ethanedicarbaldehyde and 5-oxohexanal. The compound A and B are :



Ans. (1)

22. L-Isomer of an organic compound with molecular formula  $C_4H_8O_4$ , gives +ve Tollen's reagent test. On treatment with bromine water gives optically active isomer but on treatment with conc.  $HNO_3$  it gives

optically inactive isomer. The correct figure of compound is :



Ans. (1)

23. The correct match of the polymers given in Column-I with their uses in Column-II is

Column - I	Column - II
(A) Bakelite	(i) Water pipe
(B) Polyvinyl Chloride	(ii) Electric Switches
(C) Polystyrene	(iii) TV Cabinet
(D) Glyptal	(iv) Paint and Lacquers
(1) (A)-(ii), (B)-(i), (C)-(iv), (D)-(iii)	(2*) (A)-(ii), (B)-(i), (C)-(iii), (D)-(iv)
(3) (A)-(i), (B)-(ii), (C)-(iii), (D)-(iv)	(4) (A)-(ii), (B)-(iii), (C)-(i), (D)-(iv)

Ans. (2)

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24. Statement-I: Classical fog is reducing smog and found in cold and humid region.

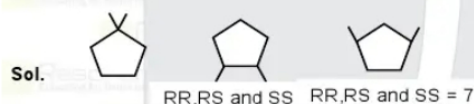
Statement-II: Photo chemical smog is oxidising and consist of oxidising agent as oxides of nitrogen nitrogen oxides, Volatile Organic Compounds (VOCs), tropospheric ozone, and PAN (peroxyacetyl nitrate)

- (1) Both Statement-I & Statement-II are True. (2) Both Statement-I & Statement-II are False.  
(3) Statement-I is True while Statement-II is False. (4) Statement-I is False while Statement-II is True.

Ans. (1)

25. Total number of isomers of dimethylcyclopentane is (including stereoisomers)

Ans. (7)

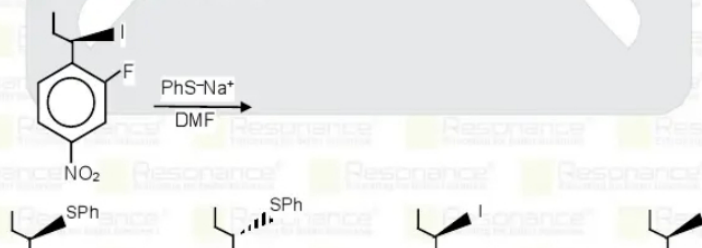


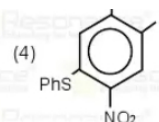
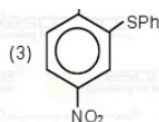
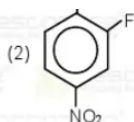
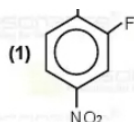
26. Structure of separating funnel is



Ans. (1)

27. Major product of the given reaction is





Ans. (2)

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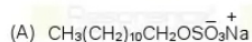


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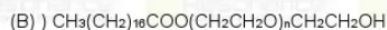
28. The correct match of the compounds given in Column – I with their uses in Column – II

Column – I

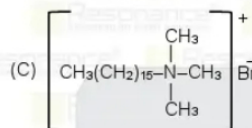
Column – II



(i) Toothpaste



(ii) Dish Washer



(iii) Hair conditioner



(iv) Soap

(1\*) (A)-(i), (B)-(ii), (C)-(iii), (D)-(iv)

(2) (A)-(ii), (B)-(iii), (C)-(iv), (D)-(i)

(3) (A)-(i), (B)-(iv), (C)-(iii), (D)-(ii)

(4) (A)-(iv), (B)-(iii), (C)-(i), (D)-(ii)

Ans. (1)

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