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# JEE

## (Main)

PAPER-1 (B.E./B. TECH.)

# 2022

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

Date: 26 July, 2022 (SHIFT-2) | TIME : (3.00 p.m. to 6.00 p.m)

Duration: 3 Hours | Max. Marks: 300

**SUBJECT: CHEMISTRY**

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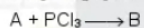
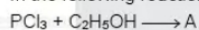
$$\Delta I_f = K_f \times m$$

$$\Rightarrow \frac{3}{6} = \frac{k_b}{k_f} \times \frac{1}{2}$$

$$\frac{k_b}{k_f} = 1$$

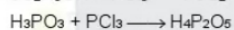
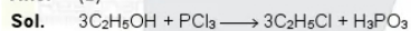
$$\text{So, } X = 1$$

6. In the following reaction sequence.



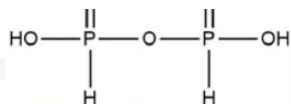
How many non-ionisable H atom are present in B.

Ans. (2)



Pyrophosphorous acid





No. of non-ionisable hydrogen atoms are two.

7. Identify diamagnetic species from following.

- (1)  $\text{K}_3[\text{Cu}(\text{CN})_4]$  (2)  $\text{K}_2[\text{Cu}(\text{CN})_4]$  (3)  $\text{K}_3[\text{Fe}(\text{CN})_6]$  (4)  $\text{K}_4[\text{FeCl}_6]$

Ans. (1)

Sol. Complex

No. of unpaired electrons

(i) $\text{K}_3[\text{Cu}(\text{CN})_4]$	$\text{Cu}^{+1} = 3d^{10}$	0	DM
(ii) $\text{K}_2[\text{Cu}(\text{CN})_4]$	$\text{Cu}^{2+} = 3d^9$	1	PM
(iii) $\text{K}_3[\text{Fe}(\text{CN})_6]$	$\text{Fe}^{3+} = 3d^5$	5	PM
(iv) $\text{K}_4[\text{FeCl}_6]$	$\text{Fe}^{2+} = 3d^6$	4	PM

8. We have to prepare a buffer solution of  $\text{NH}_3$  and  $\text{NH}_4\text{Cl}$  which have  $\text{pH} = 8.26$ . For this initially we have 1 litre 0.2 M ammonia solution, then how much amount of  $\text{NH}_4\text{Cl}$  in gram is added for this [ $\text{p}K_b = 4.74$  & GMM of  $\text{NH}_4\text{Cl} = 53.5 \text{ g}$ ]

Ans. (107)

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Sol.  $\text{p}^n = 8.26$   $\text{p}^{un} = 5.74$   
 $\text{NH}_3 + \text{NH}_4\text{Cl} \Rightarrow$  Basic buffer solution.

$$\text{pOH} = \text{p}K_b + \log \frac{[\text{NH}_4\text{Cl}]}{[\text{NH}_3]}$$

$$5.74 = 4.74 + \log \frac{[\text{NH}_4\text{Cl}]}{[\text{NH}_3]}$$

$$\frac{[\text{NH}_4\text{Cl}]}{[\text{NH}_3]} = 10$$

$$n_{\text{NH}_4\text{Cl}} = n_{\text{NH}_3} = 2 \text{ mole} \\ = 2 \times 53.5 = 107 \text{ gram.}$$

9. A compound  $\text{AB}_2$  dissociate with half-life 200 sec and half-life is independent of concentration of  $\text{AB}_2$ , find time taken for 80% dissociation of  $\text{AB}_2$ .

- (1) 467 sec (2) 100 sec (3) 326 sec (4) 587 sec

Ans. (1)

Sol. As  $\frac{\pi}{2}$  is independent an initial concentration so reaction is 1<sup>st</sup> order.

$$t = \frac{2.303}{k} \log \left( \frac{100}{100 - x\%} \right)$$

$$t = \frac{2.303}{0.693} \times 200 \log \left( \frac{100}{20} \right)$$

$$= \frac{2.303 \times 200}{0.693} \times \log 5 \\ = 664.65 \times 0.7 = 466.66 \approx 467 \text{ sec}$$

10. Find correct order of covalent character in

$\text{CaF}_2$ ,  $\text{CaCl}_2$ ,  $\text{CaBr}_2$ ,  $\text{CaI}_2$

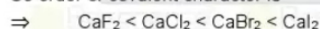
(a) (b) (c) (d)

- (1)  $a < b < c < d$  (2)  $b < c < a < d$  (3)  $c < c < b < a$  (4)  $d < c < a < b$

Ans. (1)

Sol. As per Fazan rule as the size of anion increases covalent character increase.

So order of covalent character is



11. Assertion :  $\text{LiF}$  is less soluble in water

Reason:  $\text{Li}^+$  has small size, thus it has very low hydration enthalpy.

(1) Assertion is true. Reason is true and Reason is correct explanation of Assertion

- (1) Assertion is true, Reason is true and Reason is correct explanation of Assertion.  
 (2) Assertion is true, Reason is true and Reason is not correct explanation of Assertion.  
 (3) Assertion is true and Reason is false  
 (4) Assertion is false and Reason is true

**Ans.**

(3)

**Sol.**

LiF is less soluble due to high value of lattice energy.  
 Li<sup>+</sup> has small size and has very high hydration enthalpy.

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**12. Assertion :** Boric acid is a weak acid.

**Reason:** Boric acid does not release its own H<sup>+</sup>, but it accepts OH<sup>-</sup> from water and release H<sup>+</sup> from water.

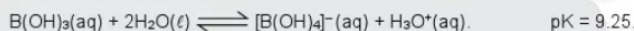
- (1) Assertion is true, Reason is true and Reason is correct explanation of Assertion  
 (2) Assertion is true, Reason is true and Reason is not correct explanation of Assertion.  
 (3) Assertion is true and Reason is false  
 (4) Assertion is false and Reason is true

**Ans.**

(1)

**Sol.**

It is a weak monobasic acid, soluble in water and in aqueous solution the boron atom completes its octet by accepting OH<sup>-</sup> from water molecules:



It, therefore, functions as a Lewis acid and not as a proton donor like most acids.

Since B(OH)<sub>3</sub> only partially reacts with water to form H<sub>3</sub>O<sup>+</sup> and [B(OH)<sub>4</sub>]<sup>-</sup>, it behaves as a weak acid.

**13. For three compounds of Mn**

MnF<sub>2</sub>, MnF<sub>3</sub>, MnF<sub>4</sub>

Find magnetic moment (Spin only) for the compound which has highest oxidising tendency.

[Report your answer to nearest integer]

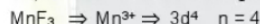
**Ans.**

(5)

**Sol.**

the change from Mn<sup>2+</sup> to Mn<sup>3+</sup> results in the half-filled (d<sup>5</sup>) configuration which has extra stability.

So, MnF<sub>3</sub> has most oxidising tendency.



$$\mu = \sqrt{4(4+2)} = \sqrt{24} \text{ BM} \approx 4.89 \text{ BM} \approx 5 \text{ BM}$$

**14. Assertion :** Finely divided gold particles are red in colour as concentration increase colour changes from purple to blue and finally Golden.

**Reason:** The colour particle depends on wave length of light scattered.

- (1) Assertion is true, Reason is true and Reason is correct explanation of Assertion  
 (2) Assertion is true, Reason is true and Reason is not correct explanation of Assertion.  
 (3) Assertion is true and Reason is false  
 (4) Assertion is false and Reason is true

**Ans.**

(1)

**Sol.**

The colour of colloidal solution depends on the wavelength of light scattered by the dispersed particles. The wavelength of light further depends on the size and nature of the particles. The colour of colloidal solution also changes with the manner in which the observer receives the light. For example, a mixture of milk and water appears blue when viewed by the reflected light and red when viewed by the transmitted light. Finest gold sol is red in colour; as the size of particles increases, it appears purple, then blue and finally golden

**15. Assertion :** Phenolphthalein is a pH dependent indicator which is colourless in acidic medium and change its colour to pink in basic medium.

**Reason:** Phenolphthalein is weak acid that does not dissociate in basic medium.

- (1) Assertion is true, Reason is true and Reason is correct explanation of Assertion  
 (2) Assertion is true, Reason is true and Reason is not correct explanation of Assertion.  
 (3) Assertion is true and Reason is false  
 (4) Assertion is false and Reason is true

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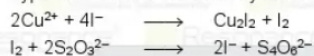
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Ans. (3)

Sol.  $\text{HPh} \rightleftharpoons \text{H}^+ + \text{Ph}^-$   
 Colourless                      Pink colour  
 (acidic medium)                      (Basic medium)

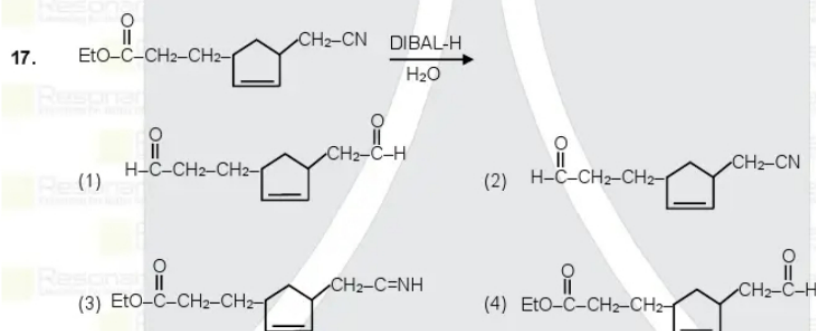
16. 10 ml of  $\text{CuSO}_4$  solution is treated with excess of KI solution, thus the liberated  $\text{I}_2$  required 20 ml, 0.02 M hypo solution find the molarity of  $\text{CuSO}_4$  solution using following reactions.



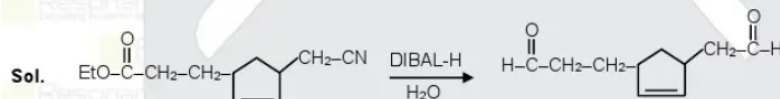
Then molarity of  $\text{CuSO}_4$  solution is  $\times 10^{-2}\text{M}$

Ans. (4)

Sol. Mili eq. of  $\text{Cu}^{2+}$  = mili eq. of  $\text{I}_2$  = mili eq. of Hypo  
 $1[M \times 10] = 1[0.02 \times 20]$   
 $M = 4 \times 10^{-2}$



Ans. (1)



18. Match the following

- |  |  |
|--|--|
| (1) Plant Nutrient                             | (A) Domestic sewage                            |
| (2) Heavy toxic metals                         | (B) Chemical fertilizers                       |
| (3) Microbes                                   | (C) Chemical factory                           |
| (4) Sediments                                  | (D) Strip mining                               |
| (1) (1) - (B), (2) - (C), (3) - (A), (4) - (D) | (2) (1) - (C), (2) - (B), (3) - (A), (4) - (D) |
| (3) (1) - (B), (2) - (C), (3) - (D), (4) - (A) | (4) (1) - (D), (2) - (C), (3) - (A), (4) - (B) |

Ans. (1)

Sol. From NCERT

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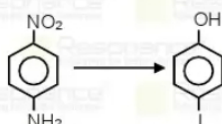
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19. The reagents required for the following conversions is



(1)  $\text{HNO}_2$ , KI,  $\text{Fe}/\text{H}^+$ ,  $\text{HNO}_2$ , Warm water

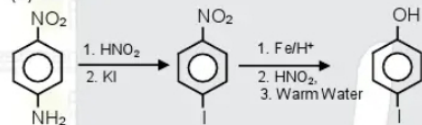
(2)  $\text{Fe}/\text{H}^+$ ,  $\text{HNO}_2$ , KI,  $\text{HNO}_2$ , Warm water

(3) KI,  $\text{HNO}_2$ ,  $\text{Fe}/\text{H}^+$ ,  $\text{HNO}_2$ , Warm water

(4)  $\text{HNO}_2$ ,  $\text{Fe}/\text{H}^+$ , KI, Warm water,  $\text{HNO}_2$

Ans.

(1)



Sol.

20. Which is not a benzenoid compound



Ans. (1)

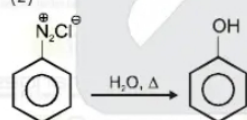
Sol.

is not a benzenoid compound

21. \_\_\_\_\_ on hydrolyses produce carbolic acid .

- (1) Cumene (2) Benzene diazonium chloride  
(3) Benzyl chloride (4) Ethyl ketal

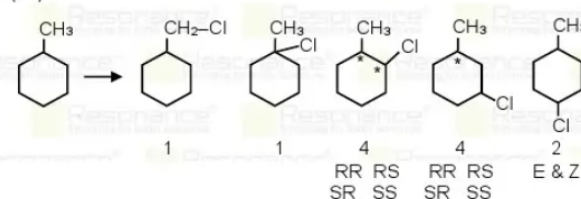
Ans. (2)



Sol.

22. Methylcyclohexane on mono-chlorination gives how many product (including stereoisomers).

Ans. (12)



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23. Ethylmagnesium bromide with methanol gives 2.24 ml gas at STP. Weight of the gas in mg.

Ans. (3)

Sol.  $\text{C}_2\text{H}_5\text{MgBr} + \text{CH}_3\text{OH} \longrightarrow \text{C}_2\text{H}_6(\text{g}) + \text{CH}_3\text{OMgBr}$

Volume of ethane = 2.24 ml

$$\text{Mole of ethane} = \frac{2.24}{22400} = \frac{2.24}{2.24 \times 10^4}$$

$$\text{Weight of ethane} = \frac{2.24}{2.24} \times \frac{30}{10^4} = 3 \times 10^{-3} \text{ gm} = 3 \text{ mg}$$

24. How many of the given is a broad spectrum antibiotic.

Peniciline G, Ofloxacin, Terpinol, Salvarsan

Ans. (1)

Sol. Ofloxacin is a broad spectrum antibiotic.

25. Which of the following is animal starch:

- (1) Glycogen (2) Amylose (3) Amylopectin (4) Cellobiose

Ans. (1)

Sol. Glycogen is an animal starch:

26. Which is correct order of priority of functional groups as per IUPAC

- (1)  $\text{RSO}_3\text{H} > \text{RCOOR} > \text{RCOCl} > \text{RCONH}_2$  (2)  $\text{RCOOR} > \text{RCONH}_2 > \text{RSO}_3\text{H} > \text{RCOCl}$   
(3)  $\text{RCOOH} > \text{RCOCl} > \text{NH}_2 > \text{C=O}$  (4)  $\text{RCOOR} > \text{RSO}_3\text{H} > \text{RCOCl} > \text{RCONH}_2$

Ans. (1)

Sol. The correct order of priority of functional groups as per IUPAC is  
 $\text{RSO}_3\text{H} > \text{RCOOR} > \text{RCOCl} > \text{RCONH}_2$

27. Which process takes place in vulcanisation of rubber

- (1) Neoprene is heated with sulphur (2) Isoprene is heated with sulphur  
(3) Isoprene is heated with styrene (4) Neoprene is heated with Styrene

Ans. (2)



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