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

## 2022

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

Date: 28 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. Which of the following statement is incorrect regarding defects in solid.

(1) In schottky defect density decreases

(2) In Frenkel defect density remain unchanged

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(4) Due to electronic vacancy density of solid increases.

**Ans. (4)**

**Sol.** Theory based.

2. If work function of a metal is  $6.63 \times 10^{-19}$  J minimum wave length of photon which is just sufficient to eject electron from metal surface is \_\_\_ nm. (Given  $h = 6.63 \times 10^{-34}$  J/sec)

**Ans. (300)**



**Sol.**  $E = E_0 + KE$

for just ejection of electron

$$E = E_0 = \frac{hc}{\lambda} = 6.63 \times 10^{-34}$$

$$\Rightarrow \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{\lambda} = 6.63 \times 10^{-19}$$

$$\lambda = 3 \times 10^{-7} \text{ m}$$

$$= 300 \times 10^{-9} \text{ m}$$

$$= 300 \text{ nm}$$

3. What is the correct electronic configuration of an element which is just above 16<sup>th</sup> group 4<sup>th</sup> period element.

(1)  $4s^2 3d^{10} 4p^4$       (2)  $2s^2 2p^4$       (3)  $3s^2 3p^4$       (4)  $5s^2 5d^{10} 4p^4$

**Ans. (3)**

<b>Sol.</b>	16 <sup>th</sup> group	EC
2 <sup>nd</sup>	$s^2 O$	$2s^2 2p^4$
3 <sup>rd</sup>	$s^2 S$	$3s^2 3p^4$
4 <sup>th</sup>	$s^2 Se$	$4s^2 4p^4$
5 <sup>th</sup>	$s^2 Te$	$5s^2 5d^{10} 4p^4$

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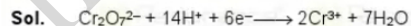
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4. How many charge in Faraday's is required in conversion of 1 mole  $Cr_2O_7^{2-}$  in to  $Cr^{3+}$ .

**Ans. (6)**



1 mole      6 mole

Charge = 6F

5. For 2 mole of an ideal mono atomic gas at 300 K calculate internal energy. (Given  $R = 8.31$  J/mol  $\times$  k)

**Ans. (7479)**

**Sol.**  $U = \frac{f}{2} nRT$   
 $= \frac{3}{2} \times 2 \times 8.31 \times 300$   
 $= 7479 \text{ J}$

6. An ideal gas expands isothermally from 4 lit. to 20 lit. against vaccum, then how much amount of heat is absorbed.

**Ans. (0)**

**Sol.** Work done against vaccum = 0

As process is isothermal so  $\Delta U = 0$

$$\Delta U = q + w$$

7. For a first order reaction  $t_{67\%} = \left(\frac{x}{10}\right)t_{50\%}$  &  $k = 3.84 \times 10^0 \text{ sec}^{-1}$  then value of x is \_\_\_\_\_  
(Report your answer to nearest integer)

Ans. (16)

Sol.  $t_{67\%} = \frac{1}{k} \ln\left(\frac{100}{33}\right)$

$t_{50\%} = \frac{1}{k} \ln(2)$

$\frac{t_{67\%}}{t_{50\%}} = \frac{\ln\left(\frac{100}{33}\right)}{\ln(2)}$

$\Rightarrow \frac{t_{67\%}}{t_{50\%}} = \frac{\log\left(\frac{100}{33}\right)}{\log 2}$

$\Rightarrow \frac{\log 3}{\log 2} = \frac{0.4771}{0.3} = 1.585$

So  $x = 15.85$

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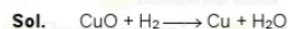
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8. Dihydrogen react with CuO and form :  
(1) Cu (2) Cu(OH)<sub>2</sub> (3) CuH<sub>2</sub> (4) Cu<sub>2</sub>O

Ans. (1)



9. Vapour pressure of pure A is 50 mm of Hg and vapour pressure of pure B is 100 mm of Hg in mixture of liquid A and B mole fraction of A is 0.3, then mole fraction of B in vapour phase is  $\left(\frac{x}{17}\right)$ . The value of X is:

Ans. (14)

Sol.  $P_{\text{Total}} = P^{\circ}_A \times A + P^{\circ}_B \times B$   
 $= (50) 0.3 + (100) 0.7$   
 $= 15 + 70$   
 $= 85 \text{ mm of Hg.}$

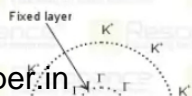
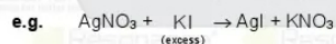
$P_B = (P_{\text{Total}}) Y_B$   
 $\Rightarrow 70 = (85)Y_B$   
 $\Rightarrow Y_B = \frac{70}{85} = \frac{14}{17} = 14$

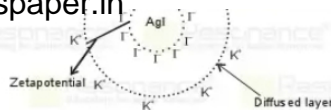
10. Zeta potential is related to :  
(1) Brownian movement (2) Tyndall effect  
(3) Colour (4) Charge on colloid

Ans. (4)

Sol. This potential difference between the fixed layer and diffused layer of opposite charges is called electrokinetic potential or zeta potential.

$Z = \frac{4\pi\eta\mu}{D}$        $n = \text{Viscosity coefficient}$   
 $D = \text{Dielectric constant of medium}$   
 $\mu = \text{Velocity of colloidal particle when an electric field is applied.}$





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11.  $S_1$  :  $E_2O_5$  is less acidic than  $E_2O_3$  (element E is belongs to 15<sup>th</sup> group).

$S_2$  :  $E_2O_3$  acidic strength decreases down the group (element E is belongs to 15<sup>th</sup> group).

(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.  $S_1$  : In 15<sup>th</sup> group oxide higher the oxidation state of element higher is acidic character

Example :  $P_2O_3$  less acidic than  $P_2O_5$ .

15<sup>th</sup> group

$N_2O_3$  Acidic

$P_2O_3$  Acidic

$As_2O_3$  Amphoteric

$Sb_2O_3$  Amphoteric

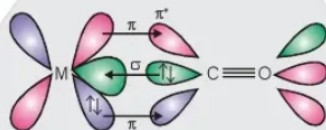
$Bi_2O_3$  Basic

12. In how many of the following synergic bonding is present :

(i)  $[Mn(CO)_5]$  (ii)  $[Mn_2(CO)_{10}]$  (iii)  $[Cr(CO)_6]$

Ans. (3)

Sol. The  $M-C\pi$  bond is formed by the donation of a pair of electrons from a filled d orbital of metal into the vacant antibonding  $\pi^*$  orbital of carbon monoxide. Thus carbon monoxide acts as  $\sigma$  donor ( $OC \rightarrow M$ ) and a  $\pi$  acceptor ( $OC \leftarrow M$ ), with the two interactions creating a synergic effect which strengthens the bond between CO and the metal as shown in figure.



Synergic bonding

13. Assertion : Below 1350°C Mg reduces  $Al_2O_3$  above 1350°C Al reduces MgO.

Reason : Mg melting point & boiling point is less than Al.

(1) Assertion and reason both are correct and reason is correct explanation of assertion.

(2) Assertion and reason both are correct statements but reason is not correct explanation of assertion.

(3) Assertion is correct but reason is wrong statement.

(4) Assertion is wrong but reason is correct statement.

Ans. (2)

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**Sol.** Below 1350°C graph of  $\Delta G^\circ$  v/s T of MgO is lower than  $\text{Al}_2\text{O}_3$  while above 1350°C graph of MgO is above than  $\text{Al}_2\text{O}_3$  so assertion is true.

Al	Mg
M.P. 933 K	924 K
B.P. 2740 K	1363 K

**14.** Which of the following f block element is most stable in divalent oxidation state ?

- (1) Sm (2) Eu (3) Tb (4) Ce

**Ans. (2)**

**Sol.**  ${}_{63}\text{Eu} = [\text{Xe}]4f^7 6s^2$      ${}_{62}\text{Sm} = [\text{Xe}]4f^6 6s^2$      ${}_{65}\text{Tb} = [\text{Xe}]4f^9 6s^2$      ${}_{58}\text{Ce} = [\text{Xe}]4f^1 5d^1 6s^2$   
 ${}_{63}\text{Eu}^{2+} = [\text{Xe}]4f^7$      ${}_{62}\text{Sm}^{2+} = [\text{Xe}]4f^6$      ${}_{65}\text{Tb}^{2+} = [\text{Xe}]4f^9$      ${}_{58}\text{Ce}^{2+} = [\text{Xe}]4f^1 5d^1$

**15.** Which of the following compound on thermal decomposition give nitrogen gas.

- (1)  $\text{Ba}(\text{N}_3)_2$  (2)  $\text{NaNO}_2$  (3)  $\text{Ba}(\text{NO}_3)_2$  (4)  $\text{NaNO}_3$

**Ans. (1)**

**Sol.**  $\text{Ba}(\text{N}_3)_2 \xrightarrow{\Delta} \text{Ba} + \text{N}_2$   
 $2\text{NaNO}_2 \xrightarrow{\Delta} \text{Na}_2\text{O} + \text{NO} + \text{NO}_2$   
 $\text{NaNO}_3 \xrightarrow{\Delta} \text{NaNO}_2 + \text{O}_2$   
 $\text{Ba}(\text{NO}_3)_2 \xrightarrow{\Delta} \text{BaO} + \text{NO}_2 + \text{O}_2$

**16. S<sub>1</sub> :** Hybridisation of  $[\text{Ni}(\text{CN})_4]^{2-}$  is  $\text{dsp}^2$  with square planar geometry & diamagnetic character while hybridisation of  $[\text{Ni}(\text{CO})_4]$  is  $\text{sp}^3$  with tetrahedral geometry and paramagnetic character.

**S<sub>2</sub> :**  $[\text{NiCl}_4]^{2-}$  and  $[\text{Ni}(\text{CO})_4]$  have same geometry and hybridisation and both are paramagnetic and have same d orbital configuration.

- (1) Both  $\text{S}_1$  &  $\text{S}_2$  are true (2) Both  $\text{S}_1$  &  $\text{S}_2$  are false  
 (3)  $\text{S}_1$  is true &  $\text{S}_2$  is false (4)  $\text{S}_1$  is false &  $\text{S}_2$  is true

**Ans. (2)**

**Sol.**  $[\text{Ni}(\text{CN})_4]^{2-} \Rightarrow \text{Ni}^{2+} \Rightarrow 3d^8 4s^0 \Rightarrow \text{dsp}^2 = \text{Square planar} \Rightarrow \text{diamagnetic}$   
 $[\text{Ni}(\text{CO})_4] \Rightarrow \text{Ni} \Rightarrow 3d^8 4s^2 \Rightarrow 3d^{10} = \text{sp}^3 \Rightarrow \text{Tetrahedral} \Rightarrow \text{diamagnetic}$   
 $[\text{NiCl}_4]^{2-} \Rightarrow \text{Ni}^{2+} \Rightarrow 3d^8 4s^0 \Rightarrow \text{sp}^3 \Rightarrow \text{Tetrahedral} \Rightarrow \text{paramagnetic}$

**17.** Hybridisation of  $\text{PF}_5$  is  $\text{SP}^x\text{d}^y$ , then value of Y is :

**Ans. (1)**

**Sol.** Hybridisation of  $\text{PF}_5$  is  $\Rightarrow \text{sp}^3\text{d}$ .  
 so  $y = 1$

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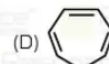
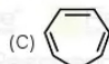
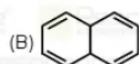
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**18.** Which force is responsible for stability of helical structure in  $\alpha$ -helix protein.

- (1) Vander wall force (2) Hydrogen bonding (3) Pi interaction (4) Dipole interaction

**Ans. (2)**

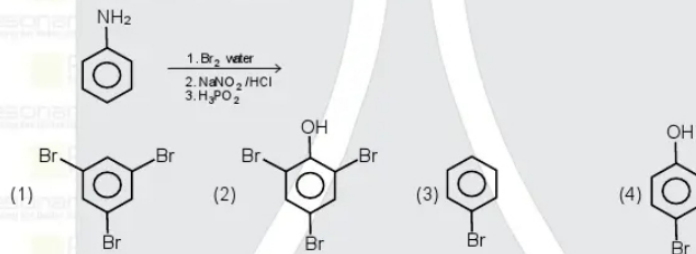
**19.** Which of the following is aromatic.



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

Ans. (2)

20. The product of given reaction is :



Ans. (1)

21. Which of the following does not give SN<sup>1</sup> reaction



Ans. (2)

22. Which of the given is not a pesticide.

- (1) D.D.T.      (2) Organophosphate  
(3) Sodium arsenate      (4) Dieldrin

Ans. (3)

23. The violet coloured complex formed in Lassaigne test is :

- (1) Na<sub>4</sub>[Fe(CN)<sub>6</sub>NOS]      (2) Na<sub>2</sub>[Fe(CN)<sub>5</sub>NO]      (3) K<sub>4</sub>[Fe(CN)<sub>6</sub>]      (4) Fe<sub>4</sub>[Fe(CN)<sub>6</sub>]<sub>3</sub>

Ans. (1)

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24. Which is not a copolymer.

- (1) PHBV      (2) Neoprene      (3) Buna-S      (4) Butadiene-styrene

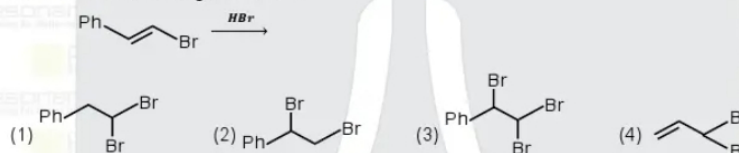
Ans. (2)

25. Reaction of 1<sup>o</sup> aliphatic amine with HNO<sub>2</sub> at 273 K initially gives a product, but if temperature is increased to 298, the product formed is :

- (1) Nitrile      (2) Alcohol      (3) Diazonium salt      (4) Secondary amine

Ans. (2)

26. Product of the following reaction is :

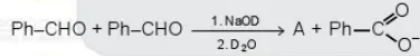


Ans. (2)

27. 0.5 gram of an organic compound gives 0.4 gram of dry AgBr ppt. % of Br in organic compound is [At. Wt. of Ag = 108, At. Wt. of Br = 80]

26. Wt. of AgBr = 0.4 g  
 $\text{Wt. of AgBr} = \frac{0.4}{188}$   
 $\text{Wt. of Br} = \frac{0.4}{188} \times 80 \text{ g}$   
 $\% \text{ of Br} = \frac{0.4}{188} \times \frac{80}{0.5} \times 100 = 34\%$

28. In the given reaction, A is :



Ans. (1)

29. In thin layer chromatography, which of the following is not used to visualise the separated layer.

- (1) Visualising agent in mobile phase      (2) Spraying of suitable reagent  
 (3) uv light      (4) I<sub>2</sub> solid

Ans. (1)

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