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**SRI JAGADGURU MURUGHARAJENDRA UNIVERSITY**  
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**Part – A**  
**Model Question Paper**  
**Subject Specific (Engineering Discipline)**  
**Chemistry -50Marks**

- 1) The atom with the highest ionization potential is  
A) Boron    B) Carbon    C) Nitrogen    D) Oxygen
- 2) The oxidation number of sulphur in  $S_8$ ,  $S_2F_2$  and  $H_2S$  respectively are  
A) 0, +1 and -2    B) +2, +1 and -2    C) 0, +1 and +2    D) -2, +1 and -2
- 3) The conjugate base of  $H_3O^+$  is  
A)  $H^+$     B)  $H_2O$     C)  $OH^-$     D)  $H_2O_2$
- 4)  $H_2S$  gas is passed through an acidic solution containing  $Pb^{2+}$ ,  $Zn^{2+}$ ,  $Cu^{2+}$  and  $Ni^{2+}$  ions. The precipitate will consist of  
A)  $ZnS$  and  $PbS$     B)  $PbS$  and  $NiS$     C)  $NiS$  and  $CuS$     D)  $CuS$  and  $PbS$
- 5) The ground term symbol of  $Ni^{+2}$  ion has following L and S values  
A)  $L=3, S=1$     B)  $L=1, S=2$     C)  $L=0, S=1$     D)  $L=2, S=3$
- 6) The close structure of  $[B_6H_6]^{2-}$  anion is anticipated by  
A) Huckel rule    B) Wade's rule    C) EAN rule    D) Octet rule
- 7) Which one of the following techniques does not come under the head thermo analytical methods?  
A) Differential thermal analysis    B) Thermomechanical analysis  
C) Differential scanning calorimetry    D) Differential pulse voltammetry
- 8) Which pair of ionic solids has the same Madelung constant?  
A)  $NaCl$  and  $CsCl$     B)  $NaCl$  and  $CaF_2$     C)  $ZnS$  and  $MgO$     D)  $NaCl$  and  $MgO$
- 9) The compound having a diamagnetic ground state is  
A)  $Fe_3O_4$     B)  $K_4[Fe(CN)_6]$     C)  $Hg[Co(NCS)_4]$     D)  $[Mn(H_2O)_6]Cl$
- 10) Which of the following pairs of 4 elements can exhibit +4 oxidation state?  
A) La and Lu    B) Ce and Pr    C) Eu and Yb    D) Sm and Tm

11) Reaction of phenyl glyoxalic acid with optically active(s)(+)-N-benzyl (hydroxymethyl)-4-methyl-1,4-dihydropyridine gives

- A) ( $\pm$ )-Mandelic acid      B) R-( $-$ )-Mandelic acid  
 C) S-( $+$ )-Mandelic acid      D) Phenylacetic acid

12) The species formed when DMT protecting group is cleaved using dichloroacetic acid is

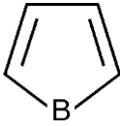
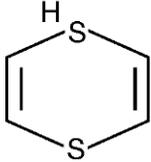
- A) Carbene      B) Carbanion      C) Freeradical      D) Carbocation

13) Which of the following statement(s) is/are correct?

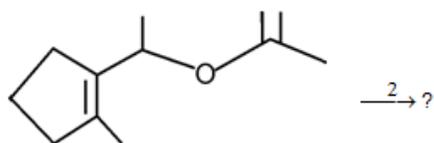
- i)  $\text{RO}^\ominus$  is a stronger nucleophile than  $\text{O}^\ominus\text{H}$   
 ii)  $\text{RCO}^\ominus$  is a stronger nucleophile than  $\text{O}^\ominus\text{H}$   
 iii)  $\text{RCO}^\ominus$  is a stronger nucleophile than  $\text{ROH}$   
 iv)  $\text{RO}^\ominus$  is a weaker nucleophile than  $\text{O}^\ominus\text{H}$

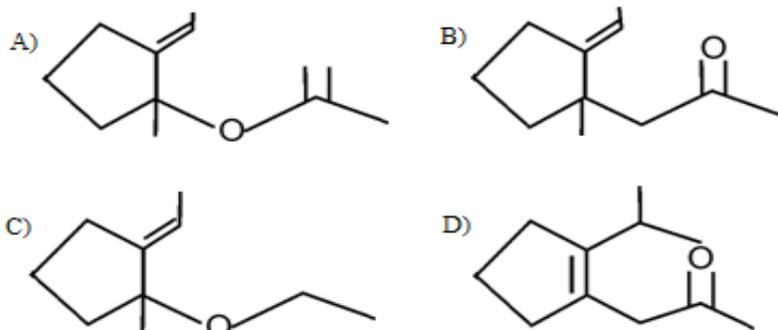
- A) iv is correct      B) ii and iv are correct  
 C) i, ii and iii are correct      D) I and iii are correct

14) Match the following:

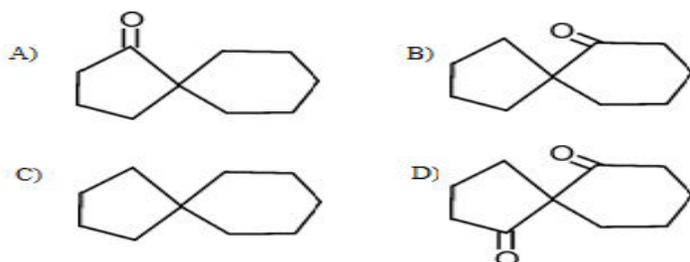
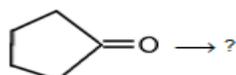
- | List-I  | List-II             |
|---|---------------------|
| i)   | a) Aromatic         |
| ii)  | b) Non-aromatic     |
| i)   | c) Anti-aromatic    |
| A) i-c, ii-a, iii-b   | B) i-b, ii-a, iii-c |
| B) i-a, ii-b, iii-c   | D) i-a, ii-c, iii-b |

15) The product formed in the following thermal reaction is





16) The product of the following reaction is



17) Secondary alcohols can be oxidized in to ketones using Sarett reagent. The Sarett reagent is

- A) Chromic anhydride in acetic acid      B) Chromic anhydride in sulfuric acid  
 C) Chromic anhydride in pyridine      D) Chromic anhydride in pyridine-water

18) Hydration of 3-phenyl-1-propyne in presence of sulfuric acid and mercuric sulphate as catalysts gives

- A) 1-phenyl-2-propanol      B) 3-phenylpropanol  
 C) 3-phenylpropanal      D) phenylacetone

19) The most shielded carbon(s) of 1-chloro-4-fluorobenzene is/are

- A) C<sub>2</sub> and C<sub>6</sub>      B) C<sub>3</sub> and C<sub>5</sub>      C) C<sub>1</sub>      D) C<sub>4</sub>

20) The relative intensities of the halogen isotope peaks in the molecular ions of CHCl<sub>2</sub>Br is

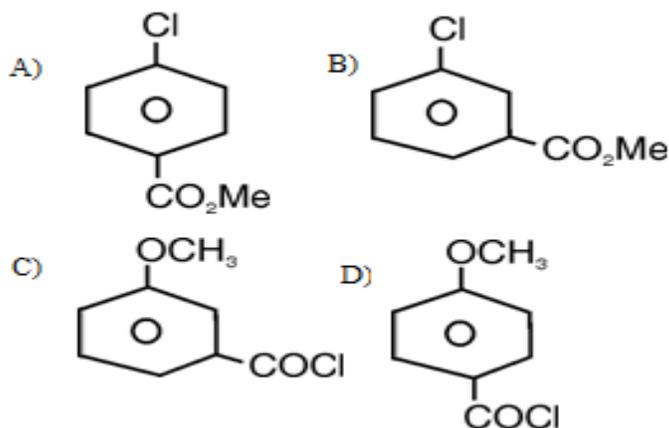
- A) 9:7:15:1      B) 9:15:7:1      C) 3:7:5:1      D) 3:5:7:1

21) Match the following:

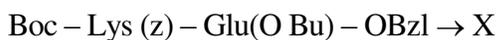
- |                          |                |
|--------------------------|----------------|
| i) Bischler              | a)Quinoline    |
| ii) Bischler-Napieralski | b)Imidazoles   |
| iii) Bredereck           | c)Isoquinoline |
| iv) Doebner-VonMiller    | d)Indole       |

- A) i-d,ii-a,iii-c,iv-b      B) i-c,ii-d,iii-a,iv-b  
 C) i-d,ii-c,iii-b,iv-a      D) i-c,ii-d,iii-b,iv-a

22) A compound of molecular formula  $C_8H_7ClO_2$  had peaks for its benzene ring carbons at  $\delta$  114.3,125.3,134.0 and 165.5. The structure of the compound is



23) In the reaction X is



- A) H N - Lys (z) - Glu - OBzl      B) H N - Lys (z) - Glu - OH  
 C) Boc - Lys (z) - Glu(O Bu) - OH      D) Boc - Lys (z) - Glu - OH

24) Match the following:

List-I

List-II

i) Green

a) 420

ii) Red

b) 620

iii) Orange

c) 530

iv) Violet

d) 700

- A) i - d, ii - c, iii - b, iv - a      B) i - c, ii - d, iii - b, iv - a  
 C) i - a, ii - b, iii - c, iv - d      D) i - c, ii - a, iii - b, iv - d

25) This molecule is an example of  $D_{6h}$  point group

- A)  $H_2O$     B)  $NH_3$     C)  $HOOC-CH(OH)-CH(OH)COOH$     D)  $C_6H_6$

26) Which of the following molecules can show a pure rotational microwave spectrum?

$CO_2, OCS, N_2, C_6H_6, H_2O, CH_2=CH_2$

- A)  $CO_2$  &  $CH_2=CH_2$       B)  $N_2$  &  $CO$   
 C)  $OCS$  &  $H_2O$       D)  $C_6H_6$  &  $CH_2=CH_2$

27) Match the following:

- |                                   |                   |
|-----------------------------------|-------------------|
| i) Molecular partition function   | a) $K = K/K$      |
| ii) Arrhenius equation            | b) $q = \sum g e$ |
| iii) Boltzmann constant           | c) $K = Ae$       |
| iv) Principle of detailed balance | d) $R/N$          |
- A) i – b, ii – c, iii – d, iv – a      B) i – c, ii – b, iii – d, iv – a  
C) i – a, ii – b, iii – c, iv – d      D) i – d, ii – c, iii – b, iv – a

28) Chromophore activity of C = C double bond is due to the transition

- A)  $n \rightarrow \sigma^*$       B)  $\pi \rightarrow \pi^*$       C)  $n \rightarrow \pi^*$       D)  $\sigma \rightarrow \sigma^*$

29) Radiation used for XRD

- A) M  $K\alpha$       B) M  $K\alpha$       C) Nd : YAG      D) Cu  $K\alpha$

30) Which of the following is the strongest bonding between drug and receptor?

- A) Ionic bonding      B) Covalent bonding  
C) Hydrogen bonding      D) VanderWaal's interactions

31) Gold at the nanoscale is \_\_\_\_\_ in color.

- A) Red      B) Yellow      C) Green      D) Violet

32) Minamata disease is caused from which one of the followings?

- A) Tetramethyllead      B) Methyl thallium      C) Methylmercury      D) Methylcobalamin

33) The reaction  $CClF + h\nu \rightarrow Cl + CClF$  occurs in the stratosphere which requires a radiation of Wavelength ( $\lambda$ ) of

- A) 400nm      B) 900nm      C) 100nm      D) 200nm

34) The structure of  $SF_4$  molecule predicted by VSEPR theory is

- A) Square planar      B) Tetrahedral  
C) Trigonal bipyramidal      D) Square pyramidal

35) The number of unpaired electrons present in  $[CoF_6]^{3-}$  and  $[Co(NH_3)_6]^{3+}$  is

- A) 2 and 1      B) 4 and 3      C) 1 and 3      D) 4 and 0

36) Which of the following can be acceptable electronic configuration of xenon atom in the first excited state ?

- A)  $5s^2 5p^6$       B)  $5s^2 5p^4 5d^2$       C)  $5s^2 5p^5 5d^1$       D)  $5s^2 5p^3 5d^3$

- 37) Molten iodine conducts electricity because of the formation of  
 A)  $I_2 + I_3^-$       B)  $I_3^+ + I_3^-$       C)  $I_3^+$       D)  $I_3^-$
- 38) The oxidation state of S in sulphurous acid is  
 A) 2      B) 3      C) 4      D) 6
- 39) If thermal conductivity detector is used as a detector in GLC then the carrier gas should be  
 A) Nitrogen      B) Oxygen      C) Hydrogen      D) Carbondioxide
- 40) The PMR spectra of cis- and trans- isomers of  $NiHCl(Et_3P)_2$  show  
 A) doublet of doublet and a triplet      B) triplet and a doublet  
 C) quartet and a singlet      D) singlet and a quartet
- 41) The separation efficiency of a column can be expressed in terms of  
 A) length of the column      B) width of the column  
 C) diameter of the column      D) number of theoretical plates in the column
- 42) The resonance frequency of a proton in a magnetic field of 14.1 T is  
 A) 400 MHz      B) 649 MHz      C) 562 MHz      D) 333 MHz
- 43) What is the multiplicity expected in the hydrogen NMR spectrum for the hydrogen atoms marked by a "star" in the following compound?  
 A) singlet      B) triplet      C) quartet      D) heptet
- 44) HPLC with solvent gradient system can have the following detector  
 A) Refractive index detector      B) UV detector  
 C) W lamp detector      D) Hg lamp detector
- 45) Which of the following substances is used as a solid standard calibrant in magnetic susceptibility measurements?  
 A)  $K_3[Fe(CN)_6]$       B)  $K_4[Fe(CN)_6]$       C) KCl      D)  $Hg[Co(NCS)]$
- 46) Neutrons ejected from a nucleus usually have a very high energy and are called  
 A) slow neutrons      B) intermediate neutrons  
 C) fast neutrons      D) protons
- 47) The symmetry species of the normal modes of  $H_2O$  are  
 A)  $A_1 + B_1$       B)  $2A_1 + B_2$       C)  $A_2 + B_1$       D)  $3A_1 + B_2$
- 48) Which of the following substance is completely transparent in the infrared region?  
 A) KBr      B)  $NaClO_4$       C)  $MgSO_4$       D)  $BaCl_2$

49) Lux-Flood definition of acids and bases will hold good in explaining the acid-base behaviour of

- A) Molten solids      B) Molten liquids      C) Liquids      D) Gases

50) Liquid sulfur, an important and stable allotropic modification of sulfur contain \_\_\_\_\_ in an unit cell.

- A) 4Satoms      B) 2Satoms      C) 6Satoms      D) 8Satoms



8) The digit in unit's place of the product

- (A) 2 (B) 1  
(C) 0 (D) 4

9) When he

P : did not know

Q : he was nervous and

R : heard the hue and cry at midnight

S : what to do

The Proper sequence should be:

- (A) RQPS (B) PQRS  
(C) SPQR (D) QPRS

10) Correct the sentence "He was very tired as he is working since 6'0 clock in the morning".

- (A) he was working (B) he had been working  
(C) he has been working (D) he will be working

11) Pain: sedative

- (A) Day: Night (B) Dengue: Mosquito  
(C) Malaria: Water (D) Grief: Consolation

12) Find the missing term of the given expression:  $18.834 + 818.34 - ? = 618.43$

- (A) 217.644 (B) 218.744  
(C) 217.744 (D) 217.844

13) The amount of uncertainty in a system of the symbol is called.

- (A) bandwidth (B) Entropy  
(C) loss (D) quantum

14) Buffering is....

- (A) The process of temporarily storing the data to allow for small variation in device speeds.
- (B) A method to reduce cross-talks
- (C) Storage of data within the transmitting medium until the receiver is ready to receive
- (D) A method to reduce the routing overhead

15) What is the name of the virus that fool a user into downloading and executing them by pretending to be useful applications?

- (A) Trojan Horses
- (B) keylogger
- (C) worm
- (D) ransomware

16) Which among the following is NOT a web browser?

- (A) SpaceTim
- (B) NeoPlanet
- (C) Sputnik
- (D) MeeGo

17) Which of the following comprise the software components of a computer?

- (A) Programs
- (B) Keyboard
- (C) BIOS
- (D) Memory

18) Which of the following are the features of a Spreadsheet?

- (A) Layers an Lines
- (B) Rows and Columns
- (C) Layers and Planes
- (D) Height and Width

19) Which of these IEEE standards represent wireless local area network?

- (A) 802.11
- (B) 802.3
- (C) 802.12
- (D) 802.1

- 20) Which of these protocols is used by TFTP for data transport?
- (A) TCP (B) UDP  
(C) Both A&B (D) None of the Above

21) The last Sunday of March, 2006 fell on which date?

Statements:

- I. The first Sunday of that month fell on 5th.  
II. The last day of that month was Friday.
- (A) I alone is sufficient while II alone is not sufficient  
(B) II alone is sufficient while I alone is not sufficient  
(C) Either I or II is sufficient  
(D) Neither I nor II is sufficient

22) Five persons - A, B, C, D and E are sitting in a row. Who is sitting in the middle?

Statements:

- I. B is between E and C.  
II. B is to the right of E  
III. D is between A and E.
- (A) Only I and II  
(B) Only II and III  
(C) Only I and III  
(D) All I, II and III

23) All the trees in the park are flowering trees. Some of the trees in the park are dogwoods. All dogwoods in the park are flowering trees. If the first two statements are true, the third statement is

- (A) True  
(B) False  
(C) Uncertain  
(D) None of the above

24)  $5 : 150 :: 8 : \underline{\quad}$

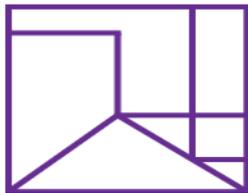
- (A) 576 (B) 567  
(C) 512 (D) 520

25) Find the number of parallelograms.



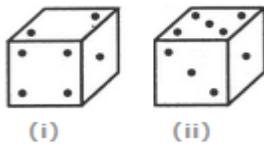
- (A) 8
- (B) 10
- (C) 15
- (D) None of These

26) How many triangles are there in the following figure?



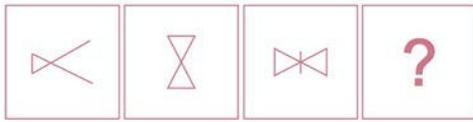
- (A) 2
- (B) 3
- (C) 4
- (D) More than 4

27) Two positions of a cube are shown below. When the number 4 will be at the bottom, then which number will be at the top?

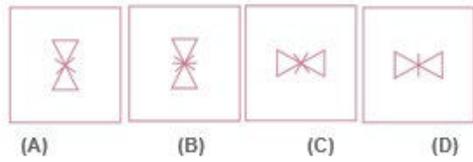


- (A) 3
- (B) 5
- (C) 6
- (D) None of these

28) Questions Figures



Answer figures



- (A) A
- (B) C
- (C) D
- (D) B

29) A man is facing west. He turns 45 degrees in the clockwise direction and then another 180 degrees in the same direction and then 270 degrees in the anticlockwise direction. Find which direction he is facing now?

- (A) South
- (B) West
- (C) South West
- (D) East

30) Statement 1: Pens cost more than pencils. Statement 2: Pens cost less than erasers.

Statement 3: Erasers cost more than pencils and pens. If the first two statements are true, the third Statement is

- (A) True
- (B) False
- (C) Uncertain
- (D) Cannot be determined

## Part –C

### Mathematics Entrance Test Question paper for Ph.D- 20 Marks Common to all branches

1. For the linear transformation,  $X = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 1 & 2 \\ 1 & 0 & -2 \end{bmatrix} Y$ , find the Y co-ordinates for (1, 2, -1) in X.
  - a) (0, -2, 0)
  - b) (-1, 3, 1)
  - c) (-1, -2, 0)
  - d) (-1, 3, 0)
2. Which of the following statements is true about the regression line?
  - a) A regression line is also known as the line of the average relationship
  - b) A regression line is also known as the estimating equation
  - c) A regression line is also known as the prediction equation
  - d) All of the above
3. If the values of two variables move in the same direction, \_\_\_\_\_
  - a) The correlation is said to be non-linear
  - b) The correlation is said to be linear
  - c) The correlation is said to be negative
  - d) The correlation is said to be positive
4. Which of the following are types of correlation?
  - a) Positive and Negative
  - b) Simple, Partial and Multiple
  - c) Linear and Nonlinear
  - d) All of the above
5. A is  $5 \times 5$  matrix, all of whose entries are 1, then
  - a) A is not diagonalizable
  - b) A is idempotent
  - c) A is nilpotent
  - d) The minimal polynomial and the characteristics polynomial of A are not equal.
6.  $T : R^3 \rightarrow R^3$  such that  $T(a, b, c) = (0, a, b)$ , for  $(a, b, c) \in R^3$ . Then  $T + I$  is a zero of the polynomial:
  - a)  $t$
  - b)  $t^2$
  - c)  $t^3$
  - d) None of above

7.  $T : P_2(\mathbb{R}) \rightarrow P_3(\mathbb{R})$  such that  $T(f(x)) = 2f'(x) + 3 \int_0^x f(t)dt$ . Then rank of T is
- a) 1                  b) 2                  c) 3                  d) 4

8. The minimal polynomial of  $\begin{pmatrix} 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 5 \end{pmatrix}$  is

- a)  $(x - 2)$   
 b)  $(x - 2)(x - 5)$   
 c)  $(x - 2)^2(x - 5)$   
 d)  $(x - 2)^3(x - 5)$

9. Number of linearly independent Eigen vectors of  $\begin{pmatrix} 2 & 2 & 0 & 0 \\ 2 & 1 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ 0 & 0 & 1 & 4 \end{pmatrix}$  is
- a) 1    b) 2    c) 3    d) 4

10. A is a 4-square matrix and  $A^5 = 0$ . Then

- a)  $A^4 = I$     b)  $A^4 = A$     c)  $A^4 = 0$     d)  $A^4 = -I$

11. Solve the following equations by Gauss Elimination Method.

$$x+4y-z = -5, \quad x+y-6z = -12, \quad 3x-y-z = 4$$

- a)  $x = 1.64791, y = 1.14085, z = 2.08451$   
 b)  $x = 1.65791, y = 1.14185, z = 2.08441$   
 c)  $x = 1.64691, y = 1.14095, z = 2.08461$   
 d)  $x = 1.64491, y = 1.15085, z = 2.09451$

12. Find the values of x, y, z in the following system of equations by gauss Elimination Method.  $2x + y - 3z = -10, -2y + z = -2, z = 6$

- a) 2, 4, 6  
 b) 2, 7, 6  
 c) 3, 4, 6  
 d) 2, 4, 5

13. In Gauss Jordan method which of the following transformations are allowed?
- Diagonal transformation
  - Column transformation
  - Row transformation
  - Square transformation
14. Solve the equations using Gauss Jordan method.
- $$x + 2y + 6z = 15, \quad 3x + 4y + z = 16, \quad 6x - y - z = 20$$
- $x = 3.735, y = 0.795, z = 1.612$
  - $x = 3.735, y = 3.735, z = 1.612$
  - $x = 3.735, y = 1.612, z = 3.735$
  - $x = 1.612, y = 0.795, z = 3.735$
15. Gauss Seidal method is also termed as a method of \_\_\_\_\_
- Successive displacement
  - Eliminations
  - False positions
  - Iterations
16. Which of the following is not Dirichlet's condition for the Fourier series expansion?
- $f(x)$  is periodic, single valued, finite
  - $f(x)$  has finite number of discontinuities in only one period
  - $f(x)$  has finite number of maxima and minima
  - $f(x)$  is a periodic, single valued, finite
17. If the function  $f(x)$  is odd, then which of the only coefficient is present?
- $a_n$
  - $b_n$
  - $a_0$
  - Everything is present
18. Find  $b_n$  if the function  $f(x) = x^2$ .
- finite value
  - infinite value
  - zero
  - can't be found
19. What is the coefficient of  $x^{101729}$  in the series expansion of  $\cos(\sin(x))$ ?
- 0
  - $\frac{1}{101729!}$
  - $-\frac{1}{101729!}$
  - 1
20. The angle between Radius vector  $r = a(1 - \cos \theta)$  and tangent to the curve is  $\phi$  given by \_\_\_\_\_
- $\phi = \pi/2$
  - $\phi = \pi$
  - $\phi = -\pi/2$
  - $\phi = 0$