



श्री चित्रा तिरुनाल आयुर्विज्ञान और प्रौद्योगिकीसंस्थान, तिरुवनंतपुरम्-11  
SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY  
THIRUVANANTHAPURAM—695 011

ENTRANCE EXAMINATION - ACADEMIC SESSION JANUARY 2018

PROGRAMME: Ph.D. CHEMICAL SCIENCES STREAM

Time:120 Minutes

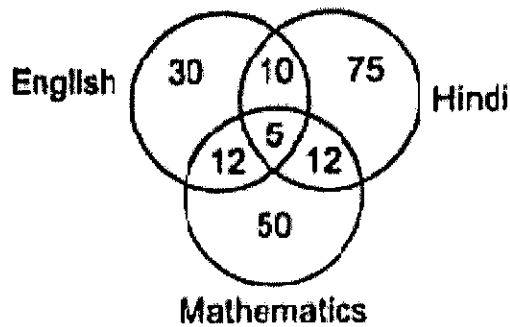
Max.Marks: 100

(Select the most appropriate answer)  
(There are **no negative** marks for wrong answers)

- 1) If 'a' is the smallest prime number greater than 39 and 'b' is the largest prime number less than 10, then ab =  
a) 299      b) 287      c) 229      d) 261
- 2) Find the odd number from the series 8, 64, 99, 216, 343, 729, 1728  
a) 64      b) 216      c) 729      d) 99
- 3) Which of the following options is the closest in meaning to the word 'ephemeral'?  
a) short-lived      b) effeminate      c) oppose      d) ghostly
- 4) A person has the capability of thinking 100 lines of code in five minutes and can type 100 lines of code in 10 minutes. He takes a break for five minutes after every ten minutes. How many lines of codes will he complete typing after an hour?  
a) 100      b) 250      c) 350      d) 600
- 5) GENEALOGY: ANCESTRY, ETYMOLOGY: \_\_\_\_\_  
a) Words      b) Insects      c) Fossils      d) Inscriptions
- 6) Complete the equation by correctly identifying the incomplete number of the calculation from the list of options given below.  
Equation:  $(4.25 + 2.75)^2 + \underline{\quad} = 5^3 - (9 \times 8)$   
a) 2      b) 4      c) 6      d) 8
- 7) Cobalt-60 is used in the radiation therapy of cancer and can be produced by bombardment of cobalt-59 with which of the following?  
a) Neutrons      b) Alpha particles      c) Beta particles      d) X-rays
- 8) When you reverse the age of the father you will get the age of the son. One year ago the age of the father was twice that of son's age. What are the current ages of son and father?  
a) 37 and 73      b) 24 and 42      c) 13 and 31      d) 15 and 51

- 9) Which of the following microorganism does not cause disease in human beings?  
 a) *Vibrio cholerae*    b) *Salmonella typhi*    c) *Clostridium typhi*    d) *Brevibacterium linens*
- 10) The anhydride of  $\text{Ba}(\text{OH})_2$  is  
 a)  $\text{BaOH}$     b)  $\text{BaO}$     c)  $\text{BaO}_2$     d)  $\text{Ba}$
- 11) Inheritance of acquired characteristics is called \_\_\_\_\_  
 a) Lamarckism    b) Neo-Lamarckism    c) Mendelism    d) Darwinism
- 12) A buffer is made from equal concentrations of a weak acid and its conjugate base. Doubling the volume of the buffer solution by adding water has what effect on its pH?  
 a) It has little effect.  
 b) It significantly increases the pH  
 c) It significantly decreases the pH  
 d) It changes the pH asymptotically to the pKa of the acid.
- 13) All proteins absorb electromagnetic radiation of wavelength around 190 nm, which corresponds to an excitation in the protein molecule. In which region of the spectrum is this wavelength found?  
 a) X-ray    b) Ultraviolet    c) Microwave    d) Infrared
- 14) What will be the pH of  $10^{-8}$  M HCl?  
 a) 7.22    b) 7.14    c) 7.0    d) 6.98
- 15) Which of the following is not having an electromagnetic nature?  
 a) X-rays    b) UV-rays    c)  $\beta$ -rays    d) Microwave
- 16) Which number comes next in this sequence? 1, 1.5, 2.5, 4, \_\_\_?  
 a) 9    b) 8    c) 7    d) 6
- 17) If 3 less than twice a certain number is equal to 2 more than 3 times the number, then 5 less than 5 times the number is  
 a) -30    b) -20    c) -5    d) 0
- 18) What is the greatest value of x for which  $(3x-2)(x+1) = 0$  ?  
 a) -1    b)  $-\frac{2}{3}$     c)  $\frac{2}{3}$     d) 1
- 19) If the average of 5 numbers is 36 and the average of four of those numbers is 34, then what is the value of the fifth number?  
 a) 2    b) 34    c) 35    d) 44
- 20) The surface tension of a liquid vanishes at  
 a) triplet point    b) the boiling point    c) critical temperature    d) none of the above

21) Five hundred candidates appeared for the test conducted for English, Mathematics and Hindi. The below diagram gives the number of candidates failed at different tests. What is the percentage of students who failed for at least two tests?



- a) 0.078%                      b) 1.0%                      c) 6.8%                      d) 7.8%

22) A worker may claim Rs15 for each km he travelled in taxi and Rs 5 for each km he travelled in his own car. If in a month he is claiming Rs 500 for travelling 80km, how much does he travelled by taxi?

- a) 10                                      b) 20                                      c) 70-                                      d) 40

23) At the end of a business conference ten people shook hands each other. Then how many handshakes were there altogether?

- a) 100                                      b) 55                                      c) 10                                      d) 45

24) A number of people decided to go to picnic and spent Rs.96 on eatables. At the end, four people did not turn up. As a result, others had to contribute Rs. 4 each extra. The number of those who attended the meeting was

- a) 12                                      b) 8                                      c) 10                                      d) 6

25) A bus starts from city X. The number of women in the bus is equal to half the number of men in the bus. When the bus reached city Y, 10 men left the bus and 5 women boarded it. Now, the number of women and men in the bus become equal. If so, how many passengers entered the bus in the beginning from city X.

- a) 15                                      b) 30                                      c) 36                                      d) 45

26) Today is Wednesday, after 62 days it would be

- a) Monday                                      b) Tuesday                                      c) Wednesday                                      d) Saturday

**Choose the appropriate word closest to meaning of word given in italics (questions 27 & 28)**

27) A *baffling* problem

- a) Simple                                      b) Puzzling                                      c) Difficult                                      d) Fresh

28) *Posthumous* child

- a) illegitimate                                      b) Brilliant                                      c) Born after death of father                                      d) physically weak

Choose the appropriate word closest to meaning of word given in italics (questions 29 to 32)

29) *Hooligan*

- a) Tin Whistle      b) Thug      c) Street gang      d) commotion

30) *Modus vivendi*

- a) Way of work      b) Way of life      c) Way of Operation      d) Way of game

31) *Elucidate*

- a) Clarify      b) Interpret      c) Confuse      d) Contradict

32) *Claustrophobia*

- a) Fear of spider      b) Fear of computers      c) Fear of being in enclosed area      d) Fear of foreigners

33) The length of the side of a square is represented by  $x+2$ . The length of the side of an equilateral triangle is  $2x$ . If the square and the equilateral triangle have equal perimeter, then the value of  $x$  is

- \_\_\_\_\_      a) 3      b) 5      c) 6      d) 4

34) The area of the circle is increasing at the rate of  $0.7 \text{ cm}^2/\text{sec}$ . What is the rate of increase of its circumference?

- a) 0.84      b) 1.4      c) 0.7      d) 1

35) The frequency of the second harmonic of 60 Hz is:

- a) 60 Hz      b) 180Hz      c) 100Hz      d) 120Hz

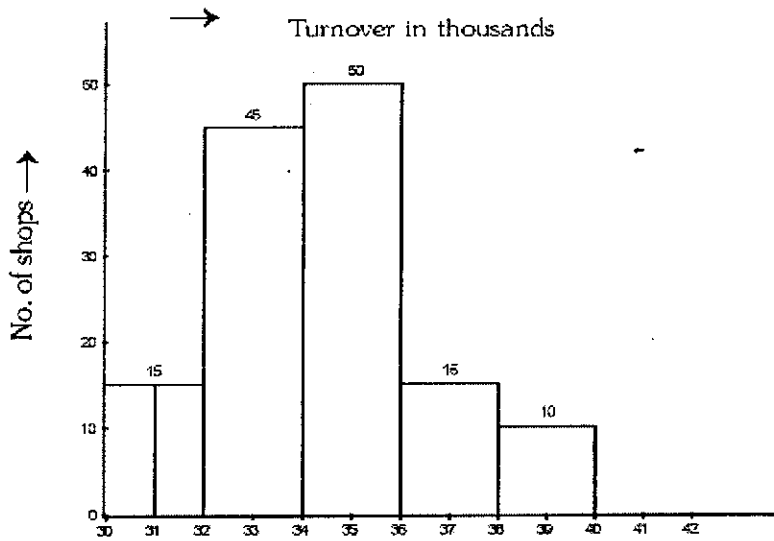
36) If  $a - b = 3$  and  $a^2 + b^2 = 29$ . Find the value of  $ab$ .

- a) 10      b) 12      c) 15      d) 18

37) An accurate clock shows o'clock in the morning. Through how many degrees will the hour hand rotate when the clock shows 2 o'clock in the afternoon?

- a)  $144^\circ$       b)  $160^\circ$       c)  $168^\circ$       d)  $180^\circ$

The results of a survey done on the monthly turnover of some shops are represented as a bar diagram below. Study the chart carefully and answer the questions 38 & 39.



- 38) What percentage of shops has turnover of over Rs.36 thousands  
 a) 20%                      b) 25%                      c) 5%                      d) 23%
- 39) How many shops have turnover between Rs.32 thousand and Rs.38 thousand  
 a) 35                      b) 95                      c) 110                      d) 55
- 40) Find the word which is nearly opposite in meaning for the word "Extrinsic"  
 a) Severe                      b) Shallow                      c) Incidental                      d) Inherent
- 41) Structure of solid NaCl crystal is  
 a) cubic                      b) tetragonal                      c) triclinic                      d) monoclinic
- 42) Which of the following is an example of ore of lead?  
 a) Galena                      b) Magnetite                      c) Siderite                      d) Calamine
- 43) Which of the following is associated with Torsional Strain?  
 a) Repulsion of like charges  
 b) Inductive effect  
 c) Bond angle strain  
 d) Attraction of opposite charges
- 44) Bohr's atomic model does not agree with  
 a) Line spectra of hydrogen atom  
 b) Heisenberg's principle  
 c) Planck's theory  
 d) Pauli's principle

- 45) Formation of interstitial compound makes the transition metal more  
a) ductile    b) metallic    c) hard    d) soft
- 46) The boat conformation of cyclohexane has (i) Torsional strain (ii) angle strain (iii) Van der Waals interaction  
a) both (i) and (ii)  
b) both (i) and (iii)  
c) only (ii)  
d) only (iii)
- 47) The dual nature of wave was proposed by  
a) Einstein    b) Pauli    c) de-Broglie    d) Heisenberg
- 48) Hydrogen bombs are based on  
a) nuclear fission  
b) spallation reaction  
c) nuclear fusion  
d) spontaneous chemical reaction
- 49) A diastereomer  
a) does not contain a chiral centre  
b) is a mirror image of an enantiomer  
c) always optically active  
d) may or may not be optically active.
- 50) In hydrogen spectrum, the series of lines appearing in visible region of spectrum are known as  
a) Lyman    b) Paschen    c) Pfund    d) Balmer
- 51) Vitamin B<sub>12</sub> contains  
a) Co    b) Mn    c) Fe    d) Ni
- 52) A molecule which is optically active  
a) is asymmetric as a whole  
b) contains a least three chiral centres  
c) is superimposable on its mirror image  
d) must be a meso compound
- 53) The magnetic quantum number (m) gives idea of  
a) orbital angular momentum  
b) shape of the orbital  
c) spatial orientation of orbital  
d) spin angular momentum
- 54) Which of the following halogen does not form oxyacids?  
a) F    b) Cl    c) Br    d) I
- 55) Meso-tartaric acid is  
a) an equimolar mixture of (+) and (-) and tartaric acid  
b) neither dextro nor laevo rotatory  
c) laevorotatory  
d) dextro rotatory

- 56) Neutron is discovered by  
a) Austen                      b) Rutherford                      c) Chadwick                      d) Heisenberg
- 57) In the froth floatation method for the extraction sulphide of ores, the ore particles floats because  
a) they are insoluble  
b) they have electrostatic charge on them  
c) their surface does not get easily wet by the water  
d) they are light
- 58) Deviations from the usual bond angle of the bonding orbitals due to molecular geometry is called  
a) torsional strain  
b) angle strain  
c) steric strain  
d) shear strain
- 59) The splitting of spectral lines when the source is placed in an electric field is known as  
a) Stark effect                      b) Zeeman effect                      c) Compton effect                      d) Kerr effect
- 60) Which of the following element is not found in 's' block?  
a) Cs                      b) Ra                      c) Fr                      d) Os
- 61) The conformation of cyclohexane which is free from all strains is  
a) boat                      b) chair                      c) half-chair                      d) twist
- 62) Azimuthal quantum number determines the  
a) spin  
b) angular momentum of orbital  
c) size  
d) orientation
- 63) Which of the following transition element in a given oxidation state has partially filled *d* orbitals?  
a) Zn(II)                      b) Cu(I)                      c) V(I)                      d) Ti(IV)
- 64) Enantiotropic groups react with chiral reagents  
a) at different rate  
b) at the same rate  
c) same rate at first and different rates later  
d) do not react at all
- 65) The phenomenon of removal of degeneracy of an energy state by the application of external magnetic field is known as  
a) normalization                      b) Stark effect                      c) Zeeman effect                      d) Kerr effect
- 66) In a period, electronegativity and ionization potential of alkali metal is  
a) maximum  
b) minimum  
c) intermediate  
d) same as halogens

- 67) Which of the following has the same configuration as D(+) glyceraldehyde?  
 a) (+) lactic acid  
 b) (+) alanine  
 c) (+) glyceric acid  
 d) (+) tartaric acid
- 68) The amount of energy absorbed or released in a nuclear reaction is called  
 a) Mass constant    b) M value    c) Q value    d) Heat of reaction
- 69) Rare gases are sparingly soluble in water due to  
 a) hydrogen bonding  
 b) dipole – dipole interaction  
 c) induced dipole – induced dipole interaction  
 d) dipole – induced dipole interaction
- 70) A molecule is superimposable on its mirror image is called  
 a) achiral    b) chiral    c) prochiral    d) supra-chiral
- 71) The free-energy change of reversible reaction at equilibrium state of reaction is  
 a) positive    b) zero    c) negative    d) infinite
- 72) The alkali metal which is liquid at room temperature is  
 a) Rb    b) Li    c) Fr    d) Cs
- 73) Glucose molecule reacts with X number of molecules of phenylhydrazine to yield osazone. The value of X is  
 a) Three    b) Two    c) One    d) Four
- 74) According to the third law of thermodynamics at zero degree Kelvin the entropy is zero for  
 a) covalent solids at 25 atm pressure  
 b) elements in their stable form  
 c) perfectly crystalline solids  
 d) any compound in their liquid form
- 75) Which of the following has diagonal relationship with Al?  
 a) Ga    b) Be    c) B    d) Mg
- 76) Mutarotation does not occur in  
 a) Sucrose    b) D-Glucose    c) L-Glucose    d) None of these
- 77) A process is said to be spontaneous if  
 a)  $\Delta G$  is positive  
 b)  $\Delta G$  is negative  
 c)  $\Delta S$  is negative  
 d)  $\Delta H$  is negative
- 78) Bleaching powder is an example of  
 a) mixed salt    b) double salt    c) complex salt    d) acidic salt
- 79) Complete hydrolysis of cellulose gives  
 a) L-glucose    b) D-fructose    c) D-ribose    d) D-glucose



- 80) A biological catalyst is  
a) an amino acid      b) an enzyme      c) vitamin      d) a carbohydrate
- 81) Which of the following species of ammoniacal solution of sodium acts as a reducing agent?  
a) Sodium atom  
b) Sodium hydride  
c) Solvated electron  
d) Solvated sodium ion
- 82) Among the following, a sugar that is not a disaccharide is  
a) Lactose      b) Galactose      c) Sucrose      d) Maltose
- 83) A catalyst increases the rate of a reaction by  
a) decreasing internal energy  
b) decreasing activation energy  
c) increasing activation energy  
d) decreasing enthalpy
- 84) Which of the following is an example of sandwich compound?  
a) Ferrocene  
b) Chromocene  
c) Dibenzene Chromium  
d) All the above
- 85) The number of tripeptides formed by three different amino acids are  
a) Three      b) Four      c) Five      d) Six
- 86) The unit of Rydberg's constant is  
a) cm      b)  $\text{sec}^{-1}$       c)  $\text{cm}^{-1}$       d)  $\text{cm}\cdot\text{sec}^{-1}$
- 87) The donor atoms in EDTA are  
a) two N and two O  
b) two N and four O  
c) Four N and two O  
d) three N and three O
- 88) A nucleoside on hydrolysis gives  
a) An aldopentose and orthophosphoric acid  
b) An aldopentose and a heterocyclic base  
c) An aldopentose, a heterocyclic base and orthophosphoric acid  
d) A heterocyclic base and orthophosphoric acid
- 89) When a solid transforms into liquid at its melting point, the entropy  
a) remains constant      b) becomes zero      c) increases      d) decreases
- 90) Oxidation state of Hg in amalgams is  
(a) 0      b) +1      c) +2      d) +3
- 91) The number of polypeptide chains present in a molecule of haemoglobin is  
a) Four      b) One      c) Two      d) Six

- 92) Ethyl acetoacetate is prepared from ethyl acetate by  
a) Claisen condensation  
b) Aldol condensation  
c) Beckmann rearrangement  
d) Dieckmann rearrangement
- 93) Which metal is protected by a layer of its own oxide?  
a) Tl      b) Al      c) Ag      d) Au
- 94) Which functional group participates in disulphide bond formation in proteins?  
a) Thioether      b) Thio      c) Thioester      d) Thioactone
- 95) The rate constant of a reaction depends upon  
a) mass  
b) time  
c) catalyst  
d) none of the above
- 96) Highly electropositive metals form  
a) ionic organometallic compounds  
b) sigma bonded organometallic compounds  
c) electron-deficient organometallic compounds  
d) all of these
- 97) Which substance is not present in nucleic acids?  
a) Cytosine    b) Adenine    c) Thymine    d) Guanidine
- 98) Tetraethyl lead is  
a) an ionic organometallic compound  
b) a sigma bonded organometallic compound  
c) electron-deficient organometallic compound  
d) none of the above
- 99) Which of the following is the most polar bond?  
a) C-F      b) C-O      c) O-F      d) N-F
- 100) 1,2-dihydroxy benzene is also known as  
a) resorcinol    b) cresol    c) quinol    d) catechol