Nirmal Vidya

I I T A C A D E M Y

ADMISSION TEST

One Year Classroom Program

(XII-PASS)

IQ & PCM

Time: 120 Min. **Maximum Marks: 175**

INSTRUCTIONS

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

1. *There are **105** questions in this paper.*
2. Each question has only ONE, correct answer. In case you wish to change an answer, erase the old answer and mark your fresh choice.
3. *For each correct answer in IQ 2 marks and PCM 3 marks will be awarded. For each wrong answer 1 mark will be deducted.*
4. *Question No. 1 to 20 of IQ, 21 to 35 of Physics, 36 to 50 of Chemistry and 51 to 65 of Mathematics.*
5. *Use of calculator is not permitted.*
6. *Use of Logarithmic table is not permitted.*
7. *Darken the bubble by pencil only.*
8. *Write your Roll number, Name at the specified space on the OMR Sheet.*
9. *All the notations used in this paper are standard.*

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TO BE FILL IN CAPITAL LETTERS

NAME OF THE STUDENT: _____

FATHER NAME : _____

ROLL NO : _____ **TEST DATE:** _____

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IQ

Direction (Question No. 1 – 3):
In each of the following questions, there is a certain relationship between two given words on one side of : : and one word is given on another side of : : while another word is to be found from the given alternatives, having the same relation with this word as the words of the given pair has. Choose the correct alternative.

1. Roster : Duty : : Inventory : ?
   (A) Furnace (B) Exports
   (C) Goods (D) Produce
2. Wine : Grapes : : Vodka : ?
   (A) Potatoes (B) Apples
   (C) Oranges (D) Flour
3. Karnataka : Gold : : Madhya Pradesh : ?
   (A) Diamond (B) Iron
   (C) Copper (D) Gems

Direction (Question No. 4 – 5):
In each of the following questions, there is some relationship between the two terms to the left of : : and the same relationship holds between the two terms to its right. Also, in each question, one term either to the right of : : or to the left of it is missing. This term is given as one of the alternatives given below each question. Find out this term.

4. EGIK : FILO : : FHJL : ?
   (A) GJMP (B) GMJP
   (C) JGMP (D) JGPM
5. LORU : NQTW : : PSVY: ?
   (A) SVYZ (B) QTWZ
   (C) ORUX (D) RUXA
6. If L denotes ×, M denotes ÷, P denotes + and Q denotes –, then
   16 P 24 M 8 Q 6 M 2 L 3 = ?
   (A) 16 (B) 8
   (C) 20 (D) 10
7. If A means 'Plus', B means 'minus', C means 'divided by' and D means 'multiplied by', then 18A 12C 6D 2B 5 = ?
   (A) 15 (B) 25
   (C) 17 (D) 45
8. Early morning after sunrise, Rajesh was standing infront of his house in such a way that his shadow was falling exactly behind him. He starts walking straight and walks 5 metres. He turns to his left and walks 3 metres and again turning to his left walks 2 metres. Now in which direction is he from his starting point?
   (A) South (B) West (C) South-East (D) North-East
9. In a class of 39 students the ratio of boys and girls is 2 : 1. Radhika ranks 15th among all the students from top and 8th among girls from bottom. How many boys are there below Radhika?
   (A) 16 (B) 17 (C) 15 (D) Data inadequate

10. In a certain code language AUTHORITY is written as YTUROHTIA. How will DESIGNATE be written in that code language?
(A) ESENGATDI (B) ESEGNITAD (C) ESENGITAD (D) ESNEIGTDA

DIRECTIONS : (11-12) : Read the following information carefully and answer the questions given below:

(i) There are five buildings – A, B, C, D and E in a row facing towards East but not necessarily in the same order. Five other buildings – P, Q, R, S and T are in another row facing towards West. The buildings in each row are arranged infront of one another.
(ii) B is at one of the end. There is only C between B and D. A is to the immediate left of D.
(iii) R is just opposite to C and is between P and Q. S is to the immediate right of P.

11. Which of the following pairs is at both the ends in any of the two rows?
(A) B and A (B) Q and S (C) P and T (D) B and E

12. A is in front of which of the following buildings?
(A) S (B) P (C) T (D) Q

13. "Some stones are rocks" and "Some rocks are clouds". If both the statements are true, then which of the following statements is DEFINITELY TRUE?
(A) Some clouds are stones (B) All clouds are rocks
(C) No rock is stone (D) None of that

14. It is given that M is either greater than or equal to P, P is smaller than Q and Q is not greater than R. Which of the following is DEFINITELY TRUE?
(A) M is either greater than or equal to R. (B) M is either greater than or equal to Q.
(C) R is greater than P. (D) R is either greater than or equal to P.

15. The students of a class are divided into two groups-A and B. If Sangita is included in the group A then her rank is 7th from the top and if she in included in the group B, her rank is 13th from the top. If the students of both groups are brought together, what will be the rank of Sangita?
(A) 20 (B) 19 (C) 21 (D) Data inadequate

16. A and B are married couple. X and Y are brothers. X is the brother of A. How is Y related to B?
(A) Brother-in-law (B) Brother
(C) Cousin (D) None of these

17. Daya has a brother Anil. Daya is the son of Chandra, Bimal is Chandra s father. In terms of relationship, what is Anil of Bimal?
(A) Son (B) Grandson (C) Brothers (D) Grandfather

Direction (Question No. 18-20) In each of the following questions various terms of a letter series are given with one term missing as shown by (?). choose the missing term out of the given alternatives.

18. Y, W, U, S, Q, ?, ?
(A) N,J (B) O,M
(C) M,L (D) J,R

19. A, B, D, G, ?
(A) M (B) L
(C) K (D) H

20. AZ, XB, CV, TD, ?
(A) PD (B) ER
(C) RE (D) OQ

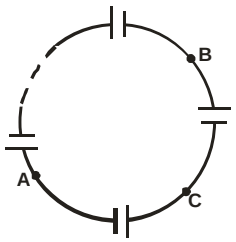
PHYSICS

21. Two thin wire rings each having a radius R are placed at a distance 'd' apart with their area coincide. The charges on the two ring are +q and − q. The potential difference between the centres of two rings is

(A) $\frac{q}{4\pi\varepsilon_0}\left[\frac{1}{R}-\frac{1}{\sqrt{R^2+d^2}}\right]$ (B) Zero

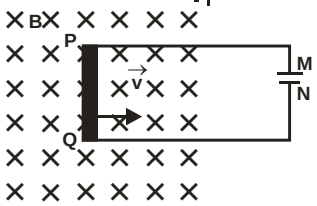
(C) $\frac{q}{2\pi\varepsilon_0}\left[\frac{1}{R}-\frac{1}{\sqrt{R^2+d^2}}\right]$ (D) $\frac{q}{4\pi\varepsilon_0 d^2}$

22. 50 identical cells having e.m.f. E, and internal resistance 'r' are connected as shown in figure. The potential difference between pints A and B is



(A) 4E (B) 2E
(C) E (D) zero

23. A proton, a deutron and an $\alpha-$particle having the same kinetic energy are moving in circular trajectories is a constant magnetic field. If r_ρ, r_d and r_α denote respectively the radii of the trajectories, then



(A) $r_\alpha = r_\rho < r_d$ (B) $r_\alpha > r_d > r_\rho$
(C) $r_\alpha = r_d > r_\rho$ (D) $r_\rho = r_d = r_\alpha$

24. A rod PQ is connected to capacitor plates. The rod is placed in a magnetic field (B) directed downwards perpendicular to the plane of the paper. If the rod is pulled out of magnetic field with velocity $\vec{v}$ as shown
(A) Plate M will be positively charged
(B) Plate N will be positively charged
(C) Both plates will be similarly charged
(D) No charge will be collected on plates

25. Two coherent beams of light of same wavelength superpose in a certain region of space. If the intensity of one beam is 4 times that of other, then the ratio of intensity at a biggest point to that at a dark point is
(A) 16 : 1 (B) 2 : 1
(C) 5 : 3 (D) 9 : 1

26. A car is moving towards a high different. The car driver, sounds a horn of frequency f. The reflected sound heard by the driver has a frequency 2f. If v be the velocity of sound. The velocity of car is

(A) $\frac{v}{3}$ (B) $\frac{v}{4}$

(C) $\frac{v}{2}$ (D) $\frac{v}{\sqrt{2}}$

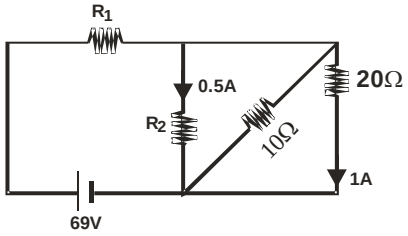
27. The energy of a photon is equal to kinetic energy of a proton. The energy of the photon is E. Let λ_1 be the de-broglie wavelength of proton and λ_2 be the wavelength of photon. The ratio $\frac{\lambda_1}{\lambda_2}$ is proportional to
(A) E^o (B) $E^{1/2}$
(C) E^{-1} (D) $E^{-1/2}$

28. A nucleus disintegrates into two nuclear parts which have their velocities in the ratio 2 : 1. The ratio of their nuclear size will be

(A) $3^{1/2}:1$ (B) $1:2^{1/3}$

(C) $2^{1/3}:1$ (D) $1:3^{1/2}$

29. In the circuit shown, value of R_1 and R_2 are



(A) 14Ω and 40Ω (B) 40Ω and 14Ω

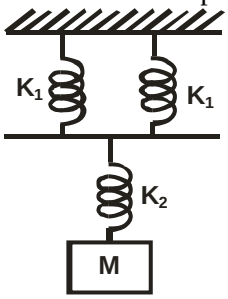
(C) 40Ω and 30Ω (D) 14Ω and 30Ω

30. A source X of unknown frequency produces 8 beats/sec with a source of 250 Hz and 12 beats/sec with a source of 270 hz. The frequency of source X is

(A) 242 Hz (B) 258 Hz

(C) 282 Hz (D) 262 Hz

31. What will be the force constant of the spring system shown



(A) $\frac{K_1}{2}+K_2$ (B) $\left[\frac{1}{2K_1}+\frac{1}{K_2}\right]^{-1}$

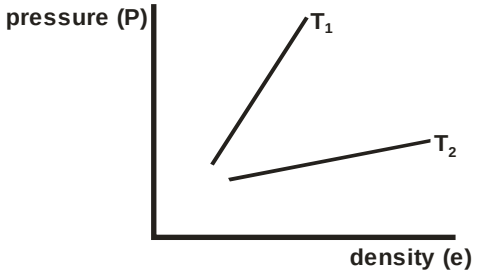
(C) $\left(\frac{1}{2K_1}+\frac{1}{K_2}\right)$ (D) $\left(\frac{2}{K_1}+\frac{1}{K_2}\right)^{-1}$

32. A bimetallic strip, with thickness of each strip d, is heated through $\Delta t°C$. If α_1 and α_2 be the linear coefficient of expansion for two metals, the compound strip bends into an one of radius

(A) $\frac{d}{(\alpha_2-\alpha_1)\Delta t}$ (B) $\frac{d\Delta T}{\alpha_2-\alpha_1}$

(C) $(\alpha_2-\alpha_1)d\Delta T$ (D) $\frac{(\alpha_2-\alpha_1)}{d}\Delta t$

33. Figure shows graphs of pressure 'V_S' density for an ideal gas at two temperature T_1 and T_2. Which of the following is correct ?



(A) $T_1 > T_2$

(B) $T_1 = T_2$
(C) $T_1 < T_2$
(D) Any of the three is possible

34. A tank full of water has a small hole at its bottom. If t_1 and t_2 are the times taken to empty the first half and remaining half respectively, then $t_1 : t_2$ is
(A) 1.732 (B) 0.928
(C) $2^{3.1}$ (D) 0.414

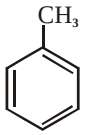
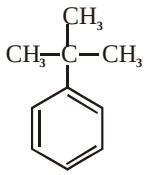
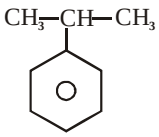
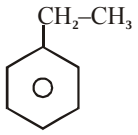
35. A uniform rod surfers a longitudinal strain of 2×10^{-3}. The poisson's ratio of the material is 0.50. The percentage change in volume is
(A) zero (B) 0.1
(C) 0.2 (D) 0.6

CHEMISTRY

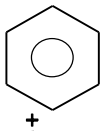
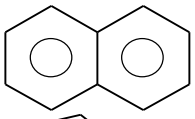
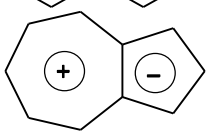
36. Least mobile ion is
(A) $[Na(H_2O)_n]^+$ (B) $[Be(H_2O)_n]^{+2}$
(C) $[Rb(H_2O)_n]^+$ (D) $[Ba(H_2O)_n]^{+2}$

37. The common features among the species CN^-, CO & NO^+ are
(A)Bond order 3 and different no. of electrons (B) Bond order 2 and electron acceptor
(C)Bond order 3 and isoelectronic (D) Isoelectronic & bond order 2

38. Which of the following will function as buffer?
(A) NaCl + NaOH (B) Borax + boric acid
(C) $Na_2SO_4 + H_2SO_4$ (D) All of above

39. The most reactive alkyl benzene towards electrophilic substitution is
(A) 
(B) 
(C) 
(D) 

40. Which of the following has maximum unpaired d-electrons?
(A) Zn^{2+} (B) Fe^{2+}
(C) Ni^{2+} (D) Cu^+

41. The chemical system that is non-aromatic is
(A) 
(B) 
(C) 
(D) 

42. In benzene, all the C – C bonds have the same length because of
(A) Inductive effect (B) Tautomerism (C) Isomerism (D) Resonance

43. Resonance is due to
(A) Delocalization of sigma electrons (B) Migration of H atoms
(C) Migration of proton (D) Delocalization of pi electrons

44. Which of the following is always negative for exothermic reaction?
(A) ΔH (B) ΔS

(C) ΔG (D) None of these

45. K_{SP} of $Mg(OH)_2$ of its solubility is 'S' mole litre^{-1} is
(A) S^3 (B) S^2 (C) $4S^3$ (D) $4S^2$

46. The equilibrium constant K_P for the reaction, $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ is
(A) More than one (B) less than one (C) equal to K_C (D) Zero

47. In which of the following crystals alternate tetrahedral voids are occupied?
(A) NaCl (B) ZnS (C) CaF_2 (D) Na_2O

48. If liquid A and B form ideal solution, then :
(A) $\Delta G_{mix} = 0$ (B) $\Delta H_{mixing} = 0$
(C) $\Delta G_{mix} = 0 \ \ \Delta S_{mix} = 0$ (D) $\Delta V_{mix} = -ve$

49. Which one of the following types of drugs reduces fever?
(A) Analgesic (B) Tranquilizer
(C) Antipyretics (D) Antibitoics

50. The half life period of a first order chemical reaction is 6.93 minutes. The time required for the completion of 99% of the chemical reaction will be (og 2 = 0.301).
(A) 230.3 minutes (B) 23.03 minutes
(C) 46.06 minutes (D) 460.6 minutes

MATHEMATICS

51. If l_1 , m_1 , n_1 and l_2 , m_2 , n_2 are dc's of two lines and θ is the acute angle between the two lines then $\cos\theta$ =
A) $|l_1m_1 + l_2m_2 + n_1n_2|$ B) $|l_1m_1n_1 + l_2m_2n_2|$
C) $|l_1l_2 + m_1m_2 + n_1n_2|$ D) $|l_1l_2 + m_1m_2 - n_1n_2|$

52. The sum of the series $^{20}C_0 - {}^{20}C_1 + {}^{20}C_2 - {}^{20}C_3 + \ldots + {}^{20}C_{10}$ is
(A) $-{}^{20}C_{10}$ (B) $\frac{1}{2}{}^{20}C_{10}$
(C) 0 (D) $^{20}C_{10}$

53. If $A = \begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$, then A is
(A) idempotent (B) involuntary
(C) nilpotent (D) scalar

54. If $a_1, a_2, a_3, \ldots, a_n$, are in G.P. then the value of $\begin{vmatrix} \log a_n & \log a_{n+1} & \log a_{n+2} \\ \log a_{n+3} & \log a_{n+4} & \log a_{n+5} \\ \log a_{n+6} & \log a_{n+7} & \log a_{n+8} \end{vmatrix}$ is
(A) 0 (B) 3
(C) 2 (D) 1/2

55. Let A and B be two events such that P(A) = 0.3 and P(A∪B) = 0.8. If A and B are independent events then P(B) is equal to
(A) $\frac{3}{7}$ (B) $\frac{4}{7}$
(C) $\frac{5}{7}$ (D) $\frac{6}{7}$

56. If m sample points are in favour of any event and n sample points are in against then odd in favour of the event will be

(A) m : m + n (B) n : m + n

(C) m : n (D) n : m

57. The value of $\left\{\tan\left(\cos^{-1}\left(-\frac{2}{7}\right)-\pi/2\right)\right\}$ is

(A) $\frac{2}{3\sqrt{5}}$ (B) $\frac{2}{3}$

(C) $\frac{1}{\sqrt{5}}$ (D) $\frac{4}{\sqrt{5}}$

58. The general value of θ satisfying the equation $2\sin^2\theta-3\sin\theta-2=0$ is

(A) $n\pi+(-1)^n(-\pi/6)$ (B) $n\pi+(-1)^n\pi/2$

(C) $n\pi+(-1)^n 5\pi/6$ (D) $n\pi+(-1)^n 7\pi/3$

59. For all complex numbers z_1 and z_2 satisfying $|z_1|=12$ and $|z_2-3-4i|=5$, the maximum value of $|z_1-z_2|$ is

(A) 6 (B) 22

(C) 7 (D) 17

60. If z_1 and z_2 are two distinct non zero complex numbers such that $|z_1|=|z_2|$, then $\frac{z_1+z_2}{z_1-z_2}$ is always

(A) Purely real (B) Purely imaginary

(C) Equal to zero (D) Whose modulus is 9

61. The two circles $x^2+y^2+ax=0$ and $x^2+y^2=c^2$ touch each other, if

(A) $a+c=0$ (B) $a-c=0$

(C) $a^2=c^2$ (D) none of these

62. The angle between lines represented by the equation $4x^2-4xy-y^2=0$ is

(A) $\tan^{-1}\frac{4}{3}$ (B) $\tan^{-1}\frac{4\sqrt{2}}{3}$ (C) $\tan^{-1}\frac{3}{4}$ (D) $\tan^{-1}\frac{3\sqrt{2}}{4}$

63. If $i=\sqrt{-1}, a=\frac{1+\sqrt{5}}{2}, b=\frac{1-\sqrt{5}}{2}$ then which of the following matrix is Idempotent

(A) $\begin{bmatrix} a & i \\ i & -b \end{bmatrix}$ (B) $\begin{bmatrix} b & i \\ i & a \end{bmatrix}$ (C) $\begin{bmatrix} a & i \\ i & b \end{bmatrix}$ (D) $\begin{bmatrix} a & b \\ b & a \end{bmatrix}$

64. Five boys and three girls are seated at random in a row. The probability that no boy sits between two girls is

(A) $\frac{1}{56}$ (B) $\frac{1}{8}$

(C) $\frac{3}{28}$ (D) $\frac{3}{56}$

65. The least value of a, for which roots of the equation $x^2-2x-\log_4 a=0$ are real, is

(A) $\frac{1}{16}$ (B) $\frac{1}{4}$

(C) 4 (D) 20

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