



## PHYSICS

- The numerical value of the ratio of average velocity to average speed is**  
1) Always less than one                      2) Always equal to one  
3) Always more than one                     4) Equal to less than one
- For a body moving with uniform acceleration 'a' initial and final velocities in a time interval 't' are 'u' and 'v' respectively. Then its average velocity in the time interval 't' is**  
1)  $(v + at)$                       2)  $\left(v - \frac{at}{2}\right)$                       3)  $(v - at)$                       4)  $\left(u - \frac{at}{2}\right)$
- A particle starts moving from rest under uniform acceleration. It travels a distance 'x' in the first two seconds and a distance 'y' in the next two seconds. If  $y = nx$ , then  $n =$**   
1) 1                                      2) 2                                      3) 3                                      4) 4
- Two trains are each 50m long moving parallel towards each other at speeds 10 m/s and 15 m/s respectively, at what time will they pass each other?**  
1) 8 sec                                2) 4 sec                                3) 2 sec                                4) 6 sec
- A moving car possesses average velocities of 5m/sec, 10m/sec and 15m/sec in the first, second and third seconds respectively. What is the total distance covered by the car in these 3 sec?**  
1) 15 m                                2) 30 m                                3) 55 m                                4) 45 m
- If  $\vec{A} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ , its components in yz-plane and zx-plane are respectively**  
1)  $\sqrt{13}$  and 5                      2) 5 and  $2\sqrt{5}$                       3)  $2\sqrt{5}$  and  $\sqrt{13}$                       4)  $\sqrt{13}$  and  $\sqrt{29}$
- The resultant of two forces  $2p$  and  $\sqrt{2}p$  is  $\sqrt{10}p$ . The angle between the forces is**  
1)  $30^\circ$                                 2)  $60^\circ$                                 3)  $45^\circ$                                 4)  $90^\circ$
- 11 forces each equal to 5N act on a particle simultaneously. If each force makes an angle  $30^\circ$  with neat one, the resultant of all forces is**  
1) 15 N                                2) 55 N                                3) 5 N                                4) Zero
- An aeroplane moving in a circular path with a speed 250 km/h. The change in velocity in half of the revolution is**  
1) 500 km/h                          2) 250 km/h                          3) 120 km/h                          4) Zero
- A particle is fired with velocity 'u' making angle ' $\theta$ ' with the horizontal. What is the change in velocity when it is at the highest point?**  
1)  $4\cos\theta$                           2) 4                                      3)  $4\sin\theta$                           4)  $(4\cos\theta - 4)$
- A boat takes 4 hours upstream and 2 hours down the stream for covering the same distance. The ratio of velocity of boat to the water in river is**  
1) 1:3                                  2) 3:1                                  3)  $1:\sqrt{3}$                                   4)  $\sqrt{3}:1$
- The quantity of motion of a body is best represented by**  
1) Its mass                          2) Its speed                          3) Its velocity                          4) Its linear momentum
- If a force of 250 N acts on a body, the momentum required is 125 kg m/s. The point for which the force acts on the body is**  
1) 0.1 sec                          2) 0.3 sec                          3) 0.5 sec                          4) 0.2 sec
- A 10kg mass is resting on a horizontal surface and horizontal force of 80 N is applied. If  $\mu = 0.2$ . The ratio of acceleration without and with friction is ( $g = 10m/s^2$ )**  
1)  $\frac{3}{4}$                                   2)  $\frac{4}{3}$                                   3)  $\frac{1}{2}$                                   4) 2

15. An impulse is supplied to a moving object with the force at an angle  $120^\circ$  with the velocity vector. The angle between the impulse vector and the change in momentum vector is  
 1)  $120^\circ$                       2)  $0^\circ$                       3)  $60^\circ$                       4)  $240^\circ$
16. What is the smallest radius of a circle at which a bicyclist can travel if his speed is 7 m/sec and the coefficient of static friction between tyres and road is 0.25  
 1) 10 m                      2) 20 m                      3) 5 m                      4) 15 m
17. The centripetal force required for a 1000 kg car travelling at 36 kmph to take a turn by  $90^\circ$  in travelling along an arc of length 625 m is  
 1) 250 N                      2) 500 N                      3) 1000 N                      4) 125 N
18. If 'E' represents total mechanical energy of a system while 'U' represents the potential energy. Then  $E - U$  is  
 1) Always zero                      2) Negative  
 3) Either positive or negative                      4) Positive
19. A force of 1200 N acting a stone by means of rope slides. The stone through a distance of 10 m in a direction inclined at  $60^\circ$  to the force. The work done by the force is  
 1)  $6000\sqrt{3}$  J                      2) 6000 J                      3) 12000 J                      4) 8000 J
20. A tank of size  $5 \times 10^5$  J is full of water and built on the ground. If  $g = 10 \text{ m/s}^2$ , the potential energy of the water in the tank is  
 1)  $5 \times 10^7$  J                      2)  $1 \times 10^8$  J                      3)  $5 \times 10^7$  J                      4)  $5 \times 10^5$  J
21. A spring when compressed by 4 cm has 2J energy stored in it. The force required to extend it by 8cm will be  
 1) 20 N                      2) 2 N                      3) 200 N                      4) 2000 N
22. An electric motor operates with an efficiency of 90%. A pump operated by the motor has an efficiency of 80%. The overall efficiency of the system is  
 1) 85%                      2) 100%                      3) 72%                      4) 60%
23. A neutron travelling with a velocity 'v' and kinetic energy 'E' collides perfectly elastically head on with the nucleus of an atom of mass number 'A' at rest. The fraction of the total kinetic energy retained by the neutron is  
 1)  $\left(\frac{A-1}{A+1}\right)^2$                       2)  $\left(\frac{A+1}{A-1}\right)^2$                       3)  $\left(\frac{A-1}{A}\right)^2$                       4)  $\left(\frac{A+1}{A}\right)^2$
24. A satellite moving in a circular path of radius 'r' around earth has a circular path period 'T'. If its radius slightly increases by 4%, then percentage change in its time period is  
 1) 1%                      2) 6%                      3) 3%                      4) 9%
25. The angle between the equatorial plane and the orbital plane of a polar satellite is  
 1)  $45^\circ$                       2)  $0^\circ$                       3)  $90^\circ$                       4)  $60^\circ$
26. Energy required to shift a body of mass 'm' from an orbit of radius 2R to 3R is  
 1)  $\frac{GMm}{12R}$                       2)  $\frac{GMm}{3R^2}$                       3)  $\frac{GMm}{8R}$                       4)  $\frac{GMm}{6R}$
27. A body is projected vertically up from surface of the earth with a velocity half of escape velocity. The ratio of its maximum height of ascent and radius of earth is  
 1) 1:1                      2) 1:2                      3) 1:3                      4) 1:4
28. A particle executes SHM with a time period T. The time period with which its potential energy changes is  
 1) 2T                      2) T                      3)  $\frac{T}{2}$                       4)  $\frac{3T}{2}$
29. The equation of motion of particle in SHM is  $a + 4x = 0$ . Here 'a' is linear acceleration of the particle at displacement 'x' in metre. Its time period is  
 1)  $\pi$  sec                      2)  $2\pi$  sec                      3)  $\frac{\pi}{2}$  sec                      4) 2 sec

30. A pendulum of length 'L' swings from rest to rest 'n' times in one second. The value of acceleration due to gravity is  
 1)  $4\pi^2 n^2 L$                       2)  $2\pi^2 n^2 L$                       3)  $\pi^2 n^2 L$                       4)  $\frac{\pi^2 n^2 L}{2}$
31. Find the average kinetic energy of a simple harmonic oscillator if its total energy is 10 joule and minimum potential energy is 2 joule  
 1) 1J                                      2) 4J                                      3) 8J                                      4) 5J
32. The period of simple pendulum is found to be increased by 50% when the length of the pendulum is increased by 0.6 m. The initial length is  
 1) 0.16 m                              2) 0.32 m                              3) 0.48 m                              4) 0.60 m
33. A body dropped from a height 'h' on to the floor makes elastic collision with the floor. The frequency of oscillation of its periodic motion is  
 1)  $\frac{1}{2} \sqrt{\frac{g}{2h}}$                       2)  $\frac{1}{2} \sqrt{\frac{2h}{g}}$                       3)  $\frac{1}{2\pi} \sqrt{\frac{g}{2h}}$                       4)  $2\pi \sqrt{\frac{g}{2h}}$
34. A spring balance has a scale that reads 0 to 20 kg. The length of the scale is 10 cm. A body suspended from this balance when displaced and released oscillates with period of  $\frac{\pi}{10}$  sec. The mass of the body is  
 1) 2.45 kg                              2) 4.9 kg                              3) 9.8 kg                              4) 19.6 kg
35. A seconds pendulum is attached to roof of a car that is sliding down along a smooth inclined plane of inclination  $60^\circ$ . Its period of oscillation is  
 1) 2 sec                                      2)  $\sqrt{2}$  sec                                      3)  $2\sqrt{2}$  sec                                      4) 1 sec
36. Pitch of sound primarily depend upon  
 1) Intensity                              2) Frequency                              3) Quality                                      4) Overtone
37. The pressure of air increases by 100 mm of Hg and the temperature decreases by  $1^\circ C$  the change in the speed of sound in air at STP is  
 1) 61 m/sec                              2) 61 mm/s                              3) 61 cm/s                              4) 0.61 m/s
38. A closed organ pipe is vibrating in first overtone and is in resonance with another open organ pipe vibrating in third harmonic. The ratio of lengths of the pipes respectively is  
 1) 1:2                                      2) 4:1                                      3) 8:3                                      4) 3:8
39. The speed at which a source of sound should move so that a stationary observer finds the apparent frequency equal to  $\frac{11}{12}$  of the original frequency  
 1)  $\frac{v}{2}$                                       2)  $2v$                                       3)  $\frac{v}{4}$                                       4)  $\frac{v}{11}$
40. A source of sound is travelling towards stationary observer. The frequency of sound heard by the observer is 25% more than that of the actual frequency if speed of sound is v, that of the source is  
 1)  $\frac{v}{5}$                                       2)  $\frac{v}{4}$                                       3)  $\frac{v}{3}$                                       4)  $\frac{v}{2}$

### CHEMISTRY

41. The energy of first excited state of  $Li^{+2}$  will be  
 1) 13.6 ev                              2) 27.2 ev                              3) 30.6 ev                              4) 40.8 ev
42. Which of the following phenomena will occur when two atoms the elements having same spin of electron approach for bonding  
 1) Orbital overlap will not occur                              2) Bonding will not occur  
 3) Both (1) and (2) are correct                              4) None of these is correct
43. In  $P_4O_{10}$  the number of oxygen atoms attached to each phorus atom is  
 1) 2                                      2) 3                                      3) 4                                      4) 5

44. Which of the following compound acts both as an oxidizing reducing agent  
 1)  $SO_2$                                       2)  $MnO_2$                                       3)  $Al_2O_3$                                       4)  $CrO_3$
45. Only lanthanide which is radio active is  
 1) Sn    2) Yb    3) Pm    4) Eu
46. Which of the following has the highest para magnetism?  
 1)  $[Cr(H_2O)_6]^{+3}$                               2)  $[Fe(H_2O)_6]^{+2}$                               3)  $[Cu(H_2O)_6]^{+2}$                               4)  $[Zn(H_2O)_6]^{+2}$
47. Which of the following will form an octahedral complex?  
 1)  $d^4$  (low spin)                              2)  $d^8$  (high spin)                              3)  $d^5$  (low spin)                              4) All of these
48. Gay Lussac's law of gaseous volume is derived from  
 1) Law of definite proportions                                      2) Law of multiple proportions  
 3) Law of reciprocal proportions                                      4) Experimental observations
49. One litre flask contains air water vapour and small amount of liquid at a pressure of 200 mmHg. If this is connected to another one litre evacuated flask. What will be the final pressure of the gas mixture. (Aqueous tension at  $50^\circ C = 93$  mm Hg)  
 1) 120.56 mm                                      2) 230 mm                                      3) 146.5 mm                                      4) 109.4 mm
50. The correct order of decreasing ionic radius among the following anions would be  
 1)  $Se^{2-}, I^-, Br^-, F^-, O^{2-}$                                       2)  $F^-, Br^-, O^{2-}, Se^{2-}, I^-$   
 3)  $I^-, Se^{2-}, Br^-, O^{2-}, F^-$                                       4)  $F^-, O^{2-}, Br^-, Se^{2-}, I^-$
51. At  $90^\circ C$  pure water has  $[H^+] = 10^{-6} m$  the value of  $K_w$  at  $90^\circ C$  is  
 1)  $10^{-6}$     2)  $10^{-8}$     3)  $10^{-12}$     4)  $10^{-14}$
52. Nitrogen dioxide cannot be obtained by heating  
 1)  $Pb(NO_3)_2$                                       2)  $Cu(NO_3)_2$                                       3)  $AgNO_3$                                       4)  $KNO_3$
53. Green vitriol is  
 1)  $CuSO_4$     2)  $CuSO_4 \cdot 7H_2O$                                       3)  $CuSO_4 \cdot 5H_2O$                                       4)  $FeSO_4 \cdot 7H_2O$
54.  $I_2 + I^- \rightleftharpoons I_3^-$ . The reaction is set up in a aqueous medium we start with 1 mole of  $I_2$  and 0.5 mole of  $I^-$  in 1 litre flask after equilibrium the excess of  $AgNO_3$  gave 0.25 mole of yellow ppt then the equilibrium constant is  
 1) 1.33    2) 2.66    3) 2.00    4) 3.00
55. The mutual heat of neutralization of 40 gram NaOH and of  $CH_3COOH$  will be  
 1) 57.1 KJ    2) Less than 57.1 KJ                                      3) More than 57.1 KJ                                      4) 13.7 KJ
56. Which has the smallest size?  
 1)  $Al^{+3}$     2)  $Mg^{+2}$     3)  $P^{+5}$     4)  $Na^+$
57. 1 litre of a gas is a pressure of  $10^{-6}$  mm of Hg at  $25^\circ C$ . How many molecules are present in the vessel  
 1)  $3.2 \times 10^6$                                       2)  $3.2 \times 10^{13}$                                       3)  $3.2 \times 10^{10}$                                       4)  $3 \times 10^4$
58. In which of the following molecules 'S' atom does not assume  $Sp^3$  hybridization  
 1)  $SO_4^{2-}$     2)  $SF_4$     3)  $SF_2$     4)  $S_8$
59. For the reaction  $N_2 + 3H_2 \rightleftharpoons 2NH_3$  the units of 'K' are  
 1)  $L \text{ mol}^{-1}$     2)  $L^2 \text{ mol}^{-2}$     3)  $\text{mol L}^{-1}$     4) No units
60. The oxidation number of 'N' and 'Cl' in  $NaClO_4$  respectively are  
 1) +2 and +7    2) +3 and +7    3) -3 and +5    4) +2 and -7
61. When potassium Ferro cyanide crystals are heated the gas evolved is  
 1)  $SO_2$     2)  $NH_3$     3)  $CO_2$     4) CO
62. Pyrolusite is a/an  
 1) Oxide ore    2) Sulphide ore    3) Carbide ore    4) Notan ore

63. The products of the reaction  $Na_2CO_3 + CO_2 + H_2O \rightarrow$  is/are  
 1)  $2NaOH + CO_2$                       2)  $Na_2CO_3 + H_2CO_3$     3)  $2NaHCO_3$                                       4) None of these
64. Sodium carbonate reacts with  $SO_2$  in aqueous medium to give  
 1)  $NaHSO_3$                                   2)  $Na_2S_2O_3$                                   3)  $NaHSO_4$                                       4)  $Na_2SO_4$
65. The number of unpaired electrons in Nickel carbonyl is  
 1) Zero    2) One    3) Four    4) Five
66. The pH of a 0.01 M HCN solution for which  $Pk_a$  is 4  
 1) 0.47    2) 1.2    3) 3.0    4) 4.0
67. Which of the following does not contain coordinate bond  
 1)  $H_3O^+$     2)  $BF_4^-$     3)  $HF_2^-$     4)  $NH_4^+$
68. Given that  $H_2O \xrightarrow{(l)} H^+ + OH^-$ ;  $\Delta H = 57.32 kJ$ ,  $H_2 + \frac{1}{2} O_2 \xrightarrow{(g)} H_2O$ ;  $\Delta H = -286.02 kJ$ . Then calculate the enthalpy of formation of  $OH^-$  at  $25^\circ C$   
 1)  $-22.8 KJ$                                       2)  $-343.52 KJ$                                       3)  $+228.8 KJ$                                       4)  $+343.52 KJ$
69. Calculate the amount of heat evolved when  $500 cm^3$  of 0.1m HCl is mixed with  $200 cm^3$  of 0.2 M NaOH  
 1) 57.3 KJ    2) 2.865 KJ    3) 2.292 KJ    4) 0.573 KJ
70. Which of the following is iso electronic of carbon?  
 1)  $Na^+$     2)  $Al^{+3}$     3)  $O^{-2}$     4)  $N^+$
71.  $2MnO_4^- + 5H_2O + 6H^+ \rightarrow 2Z + 5O_2 + 8H_2O$  Identify 'Z' in the above reaction  
 1)  $Mn^{+2}$     2)  $Mn^{+4}$     3)  $Mn$     4)  $MnO_2$
72. In the titration of NaOH and HCl which of the following Indicator will be used  
 1) Methyl Orange                                  2) Methyl red    3) Both 1 and 2    4) None of these
73. Which of the following is correct IUPAC name for  $K_2 [Cr(CN)_2 O_2 O_2 NH_3]$   
 1) Potassium ammine cyanoperoxo dioxo chromatic (IV)  
 2) Potassium ammine cyanoperoxo dioxo chromium (V)  
 3) Potassium ammine cyanoperoxo dioxo chromine (VI)  
 4) Potassium ammine dicyanodioxoper oxo chromate (VI)
74. 5 moles of  $Ba(OH)_2$  are treated with excess of  $CO_2$ . How much  $BaCO_3$  will be formed  
 1) 39.4 grams                                      2) 197 grams    3) 591 grams    4) 985 grams
75. A diatomic molecule has a dipole moment of 1.2 D. If its distance is  $1.0 \text{ \AA}$ . What fraction of an electronic charge 'e' exist on each atom  
 1) 25%    2) 50%    3) 60%    4) 75%
76. A gas is heated through  $1^\circ C$  in a closed vessel and so the pressure increases by 0.4%. The initial temperature of the gas was  
 1)  $-23^\circ C$     2)  $+23^\circ C$     3)  $250^\circ C$     4)  $523^\circ C$
77. For  $2NO \rightleftharpoons 2NO + Br_2$  at equilibrium and p is the total pressure the ratio  $\frac{kp}{p}$  will be  
 1)  $\frac{1}{3}$     2)  $\frac{1}{9}$     3)  $\frac{1}{27}$     4)  $\frac{1}{81}$
78. Which of the following have the largest ionic size  
 1)  $F^-$     2)  $O^{-2}$     3)  $Na^+$     4)  $Mg^{+2}$
79. If the radius of H is  $0.53 \text{ \AA}$  then what will be the radius of  $Li^{2+}$   
 1)  $0.17 \text{ \AA}$     2)  $0.36 \text{ \AA}$     3)  $0.53 \text{ \AA}$     4)  $0.59 \text{ \AA}$
80.  $CO_2$  goes to air, causes green house effect and gets dissolved in water. What will be the effect on soil fertility and pH of the water.  
 1) Increases    2) Decreases    3) Remain same    4) None of theses

**ENGLISH**

81. Out of the four alternatives, choose the one which express the correct meaning of the word, **AUGMENT**  
 1) Increase                                  2) Decrease                                  3) Save    4) Mention
82. Choose the word opposite is meaning to the given word, **RECOMPENSE**  
 1) Emolument                                  2) Reward                                      3) Payment                                      4) Penalty
83. Choose the word which is most opposite in meaning to the word 'Drowsy'.  
 1) Sleepy    2) Nodding                                      3) Yawning                                      4) Wakeful
84. In each of the following question choose the alternative which is opposite in meaning to the word given capital letters **GATHER**  
 1) Scatter    2) Suspend                                      3) Glorify    4) Spend
85. Read each sentence to and out whether there is any grammatical error in it. The error, if any will be in one part of the sentence. The letter of that part is the answer. If there is no error, the answer is d.  
 1) We discussed about the problem so thoroughly    2) On the eve of the examination  
 3) That I found it very easy to work it out.              4) No error.
86. In the following question, out of four alternatives, choose the one which is best expresses the meaning of the given word, **LOQUACIOUS**  
 1) Talkative    2) Slow    3) Content    4) Unclear
87. Choose the word which best expresses the meaning of the underlined word in sentence. He's a such a glutton that he ate the whole cake  
 1)Gorger    2)Picker    3)Dieter    4)Nibbler
88. Choose the word which is closest to the opposite in meaning of the underlined word in the sentence. Hydra is biologically believed to be immortal  
 1)Undying    2)Perishable    3)Ancient    4)Eternal
89. Choose the word which best expresses the meaning of the underlined word in sentence. It was an ignominious defect for the team.  
 1)Shameful    2)Admirable    3)Unaccountable    4)Worthy
90. Choose the word which best expresses the meaning of the underlined word in the sentence. The attitude of western countries towards the third countries is rather callous to say the least.  
 1)Cursed    2)Kindful    3)Unfeeling    4)Passive
91. In each of the following questions choose the alternative which can be substituted for the given words/sentence.  
 Elderly woman in charge of a girl on social occasions.  
 1)Spinster    2)Matron    3)Chaperon    4)Chandler
92. Choose the word which is closest to the opposite in meaning of the underlined word in the sentence. The gupta rulers patronised all cultural activities and thus gupta period was called the golden era in Indian history  
 1)Criticised    2)Rejected    3)Opposed    4)Spurned
93. Choose the word which is closest to the opposite in meaning of the underlined word in the sentence. The general manager is quite tactful and handles the workers union very effectively.  
 1)Incautious    2)Discreet    3)Strict    4)Disciplined
95. In each of the following questions, out of the four alternatives, choose the one which can be substituted for the given words/sentence.  
 A person who does not believe in any religion.  
 1) Philatelist    2) Rationalist    3) Atheist    4) Pagan

**LOGICAL REASONING**

96. If the following numbers are rewritten by interchanging the digits in ten's place and hundred's place and then arranging them in the descending order. What will be the second digit of the newly formed fifth number from your right? 479, 736, 895, 978, 389, 675  
 1) 3                                      2) 4                                      3) 5                                      4) 6
97. P is 60 m South-East of Q. R is 60 m North-East of Q. Then R is in which direction of P?  
 1) North                                      2) North-East                                      3) South                                      4) South-East
- Directions - (Q. 98-100) Read the following information for answering the questions that follow**  
**On a playing ground A, B, C, D and E are standing as described below facing the North.**  
 i) B is 50 meters to the right of D  
 ii) A is 60 meters to the South of B  
 iii) C is 40 meters to the West of D  
 iv) E is 80 meters to the North of A
98. If a body walks from C, meets D followed by B, A and then E, how many metres has he walked if he has travelled the straight distance all through?  
 1) 120                                      2) 150                                      3) 170                                      4) 230
99. What is the minimum distance (in metre approximately) between C and E?  
 1) 53                                      2) 78                                      3) 92                                      4) 120
100. Who is to the South-East of the person who is to the left of D?  
 1) A                                      2) B                                      3) C                                      4) E
101. A man was walking in the evening just before the sun set. His wife said that, his shadow fell on his right. If the wife was walking in the opposite direction of the man, then which direction the wife was facing?  
 1) North                                      2) West                                      3) South                                      4) East

**Directions – (Q. 120-123) In each of the following questions choose the set of numbers from the four alternative sets that is similar to the given set.**

102. **Given set: (4, 9, 18)**  
 1) (8, 14, 22)                                      2) (10, 15, 25)                                      3) (6, 12, 23)                                      4) (12, 17, 26)
103. **Given set: (10, 14, 17)**  
 1) (4, 11, 14)                                      2) (9, 12, 15)                                      3) (8, 13, 18)                                      4) (6, 9, 12)
104. **Given set (7, 27, 55)**  
 1) (21, 35, 52)                                      2) (18, 42, 65)                                      3) (16, 40, 72)                                      4) (13, 30, 58)
105. **Given set: (39, 28, 19)**  
 1) (84, 67, 52)                                      2) (52, 25, 17)                                      3) (70, 49, 36)                                      4) (65, 45, 21)

**MATHS**

106. If  $x = \{4^n - 3n - 1 : n \in N\}$  and  $y = \{9(n-1) : n \in N\}$  where N is the set of natural numbers then  $x \cup y$  is equal to  
 1) x                                      2) y                                      3) N                                      4) y-x
107. If  $f(x)$  is a function such that  $f(xy) = f(x) + f(y)$  and  $f(2) = 1$  then  $f(x) =$  \_\_\_\_\_  
 1)  $x^2$                                       2)  $2^x$                                       3)  $\log_2 x$                                       4)  $\log_x^2$
108. The domain of the function  $f(x) = \frac{1}{\sqrt{|x|-x}}$  is  
 1)  $(-\alpha, 0)$                                       2)  $(-\alpha, \alpha) - \{0\}$                                       3)  $(-\alpha, \alpha)$                                       4)  $(0, \alpha)$
109. If  $A = \begin{bmatrix} -8 & 5 \\ 2 & 4 \end{bmatrix}$  satisfies the equation  $x^2 + 4x - p = 0$  then  $P =$  \_\_\_\_\_  
 1) 64                                      2) 42                                      3) 36                                      4) 24

110. Let  $A = \begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$ . If  $|A^2| = 25$  then  $|\alpha|$  equals
- 1)  $5^2$                                       2) 1                                      3)  $\frac{1}{5}$                                       4) 5
111. If  $ab \neq 0$  and the sum of the coefficients of  $x^7$  and  $x^4$  in the expansion of  $\left(\frac{x^2}{a} - \frac{b}{x}\right)^{11}$  is zero then
- 1)  $a = b$                                       2)  $a + b = 0$                                       3)  $ab = -1$                                       4)  $ab = 1$
112. If the expansion in powers of x of the function  $\frac{1}{(1-ax)(1-bx)}$  is  $a_0 + a_1x + a_2x^2 + a_3x^3 + \dots$  then  $a_n$  is
- 1)  $\frac{a^{n+1} - b^{n+1}}{b-a}$                                       2)  $\frac{b^{n+1} - a^{n+1}}{b-a}$                                       3)  $\frac{b^n - a^n}{b-a}$                                       4)  $\frac{a^n - b^n}{b-a}$
113. The number of five digit numbers divisible by 5 that can be formed using the numbers 0,1,2,3,4,5 without repetition is
- 1) 240                                      2) 216                                      3) 120                                      4) 96
114. The number of subsets  $\{1,2,3,\dots,9\}$  containing at least one odd number is
- 1) 324                                      2) 396                                      3) 496                                      4) 512
115. Let  $\alpha$  and  $\beta$  be the roots of equation  $px^2 + qx + r = 0$ ,  $p \neq 0$ , If  $p, q, r$  are in A.P and  $\frac{1}{\alpha} + \frac{1}{\beta} = 4$  then the value of  $|\alpha - \beta|$  is
- 1)  $\frac{\sqrt{34}}{9}$                                       2)  $\frac{2\sqrt{13}}{9}$                                       3)  $\frac{\sqrt{61}}{9}$                                       4)  $\frac{2\sqrt{17}}{9}$
116. The number of real solutions of the equation  $x^2 - 3|x| + 2 = 0$  is
- 1) 4                                      2) 1                                      3) 3                                      4) 2
117. If one root of the equation  $x^3 - 9x^2 + 26x - 24 = 0$  is twice the other then the sum of the cubes of those two roots is
- 1) 72                                      2) 253                                      3) 9                                      4)  $\frac{9}{64}$
118.  $\sin^2 1^\circ + \sin^2 2^\circ + \sin^2 3^\circ + \sin^2 4^\circ + \dots + \sin^2 180^\circ = \underline{\quad}$
- 1) 0                                      2) 1                                      3) 90                                      4) 89
119. If  $0 < \alpha, \beta < \frac{\pi}{4}$ ,  $\cos(\alpha + \beta) = \frac{4}{5}$ ,  $\sin(\alpha - \beta) = \frac{5}{13}$  then  $\tan 2\alpha = \underline{\quad}$
- 1)  $\frac{33}{56}$                                       2)  $\frac{56}{33}$                                       3)  $\frac{16}{63}$                                       4) None
120. In a  $\Delta PQR$ , if  $3\sin P + 4\cos Q = 6$  and  $4\sin Q + 3\cos P = 1$  then the angle R is equal to
- 1)  $\frac{\pi}{4}$                                       2)  $\frac{3\pi}{4}$                                       3)  $\frac{5\pi}{6}$                                       4)  $\frac{\pi}{6}$
121.  $\tan 9^\circ - \tan 27^\circ - \tan 63^\circ + \tan 81^\circ$
- 1) 4                                      2) 3                                      3) 2                                      4) 1
122.  $\cos A = \frac{3}{4} \Rightarrow 32 \sin\left(\frac{A}{2}\right) \sin\left(\frac{5A}{2}\right) = \underline{\quad}$
- 1) 7                                      2) 8                                      3) 13                                      4) 11



**123. The period of  $\tan(x+4x+9x+\dots+n^2x)$  is**

- 1)  $\frac{2\pi}{n(n+1)}$                       2)  $\frac{4\pi}{n^2(n+1)^2}$                       3)  $\frac{6\pi}{n(n+1)(2n+1)}$                       4)  $\frac{12\pi}{n(n+1)(2n+1)}$

**124. If  $f(x) = \sin^6 x + \cos^6 x$  for  $x \in R$ , then  $f(x)$  lies in the interval**

- 1)  $\left[\frac{7}{8}, \frac{5}{4}\right]$                       2)  $\left[\frac{1}{2}, \frac{5}{8}\right]$                       3)  $\left[\frac{1}{4}, 1\right]$                       4)  $\left[\frac{1}{4}, \frac{1}{2}\right]$

**125. If  $\tan(\pi \cos \theta) = \cot(\pi \sin \theta)$  then a value of  $\cos\left(\theta - \frac{\pi}{4}\right)$  among the following is**

- 1)  $\frac{1}{2\sqrt{2}}$                       2)  $\frac{1}{\sqrt{2}}$                       3)  $\frac{1}{2}$                       4)  $\frac{1}{4}$

**126. The sum of the solutions in  $(0, 2\pi)$  of the equation  $\cos x \cos\left(\frac{\pi}{3} - x\right) \cos\left(\frac{\pi}{3} + x\right) = \frac{1}{4}$  is**

- 1)  $\pi$                       2)  $2\pi$                       3)  $3\pi$                       4)  $4\pi$

**127. If  $x, y, z$  are in A.P and  $\tan^{-1} x, \tan^{-1} y, \tan^{-1} z$  are also in A.P then**

- 1)  $6x = 3y = 2z$                       2)  $6x = 4y = 3z$                       3)  $x = y = z$                       4)  $2x = 3y = 6z$

**128. Range of  $\sin^{-1} x + \cos^{-1} x + \tan^{-1} x$  is**

- 1)  $[0, \pi)$                       2)  $(0, \pi]$                       3)  $\left(\frac{\pi}{4}, \frac{3\pi}{4}\right)$                       4)  $[0, \pi]$

**129. In  $\Delta ABC$ , if  $a \cos^2 \frac{C}{2} + c \cos^2 \frac{A}{2} = \frac{3b}{2}$  then a, b, c are in**

- 1) A.P                      2) G.P                      3) H.P                      4) None

**130. In a triangle ABC, let  $\angle C = \frac{\pi}{2}$ . If  $r$  is the inradius and  $R$  is circum radius of the triangle ABC,**

**then  $2(r+R) =$  \_\_\_\_\_**

- 1)  $b+c$                       2)  $a+b$                       3)  $a+b+c$                       4)  $c+a$

**131. From the top of the hill  $h$  meters high the angles of depression of the top and the bottom of a pillar are  $\alpha$  and  $\beta$  respectively. The height (in meters) of the pillar is \_\_\_\_\_**

- 1)  $\frac{h(\tan \beta - \tan \alpha)}{\tan \beta}$                       2)  $\frac{h(\tan \alpha - \tan \beta)}{\tan \alpha}$                       3)  $\frac{h(\tan \beta + \tan \alpha)}{\tan \beta}$                       4)  $\frac{h(\tan \beta + \tan \alpha)}{\tan \alpha}$

**132.  $Z = 1 + i\sqrt{3} \Rightarrow |\text{Arg } z| + |\text{Arg } \bar{z}| =$  \_\_\_\_\_**

- 1) 0                      2)  $\frac{\pi}{3}$                       3)  $\frac{\pi}{2}$                       4)  $\frac{2\pi}{3}$

**133. If  $w = \frac{z}{z - \frac{1}{3}p}$  and  $|w| = 1$  then  $z$  lies on**

- 1) An ellipse                      2) A circle                      3) A straight line                      4) A parabola

**134.  $(\sqrt{3} + i)^7 + (\sqrt{3} - i)^7 =$**

- 1)  $121\sqrt{3}$                       2)  $256\sqrt{3}$                       3)  $-128\sqrt{3}$                       4)  $-256\sqrt{3}$

**135. If  $\alpha$  and  $\beta$  are the roots of equation  $x^2 - 2x + 4 = 0$  then  $\alpha^9 + \beta^9 =$  \_\_\_\_\_**

- 1)  $-2^8$                       2)  $2^9$                       3)  $-2^{10}$                       4)  $2^{10}$

- 136.** If a line  $l$  passes through  $(k, 2k), (3k, 3k)$  and  $(3, 1), k \neq 0$  then the distance from the origin to the line  $l$  is  
 1)  $\frac{4}{\sqrt{5}}$                       2)  $\frac{3}{\sqrt{5}}$                       3)  $\frac{2}{\sqrt{5}}$                       4)  $\frac{1}{\sqrt{5}}$
- 137.** If non-zero numbers  $a, b, c$  are in H.P then the straight line  $\frac{x}{a} + \frac{y}{b} + \frac{1}{c} = 0$  always passes through a fixed point. That point is  
 1)  $(-1, 2)$                       2)  $(-1, -2)$                       3)  $(1, -2)$                       4)  $(1, -1/2)$
- 138.** If  $s$  and  $p$  are respectively the sum and the product of the slopes of the lines  $3x^2 - 2xy - 15y^2 = 0$  then  $S : P =$  \_\_\_\_  
 1) 4:3                      2) 2:3                      3) 3:5                      4) 3:4
- 139.** If  $3x^2 - 11xy + 10y^2 - 7x + 13y + k = 0$  denotes a pair of straight lines, then the point of intersection of the lines is  
 1)  $(1, 3)$                       2)  $(3, 1)$                       3)  $(-3, 1)$                       4)  $(1, -3)$
- 140.** If the lines  $2x + 3y + 1 = 0$  and  $3x - y - 4 = 0$  lie along diameters of a circle of circumference  $10\pi$ , then the equation of the circle is \_\_\_\_  
 1)  $x^2 + y^2 - 2x + 2y - 23 = 0$  2)  $x^2 + y^2 + 2x - 2y - 23 = 0$   
 3)  $x^2 + y^2 + 2x + 2y - 23 = 0$  4)  $x^2 + y^2 - 2x - 2y - 23 = 0$
- 141.** A variable circle passes through the fixed point  $(2, 0)$  and touches the  $y$ -axis. Then the locus of its centre is  
 1) A parabola                      2) A circle                      3) An ellipse                      4) A hyperbola
- 142.** The locus of the centre of the circle which cuts the circle  $x^2 + y^2 - 20x + 4 = 0$  orthogonally and touches the line  $x = 2$  is  
 1)  $y^2 = ax$                       2)  $y^2 = 16x$                       3)  $x^2 = 4y$                       4)  $x^2 = 16y$
- 143.** The equation of the circle which passes through the origin and cuts orthogonally each of the circles  $x^2 + y^2 - 6x + 8 = 0$  and  $x^2 + y^2 - 2x - 2y - 7 = 0$  is  
 1)  $3x^2 + 3y^2 - 8x - 13y = 0$                       2)  $3x^2 + 3y^2 - 8x + 29y = 0$   
 3)  $3x^2 + 3y^2 + 8x + 29y = 0$                       4)  $3x^2 + 3y^2 - 8x + 29y = 0$
- 144.** The slope of the line touching both the parabolas  $y^2 = 4x$  and  $x^2 = -32y$  is  
 1)  $\frac{1}{8}$                       2)  $\frac{2}{3}$                       3)  $\frac{1}{2}$                       4)  $\frac{3}{2}$
- 145.** The normal at point  $(bt_1^2, 2bt_1)$  on a parabola meets the parabola again in the point  $(bt_2^2, 2bt_2)$  then  
 1)  $t_2 = -t_1 + \frac{2}{t_1}$                       2)  $t_2 = t_1 - \frac{2}{t_1}$                       3)  $t_2 = t_1 + \frac{2}{t_1}$                       4)  $t_2 = -t_1 - \frac{2}{t_1}$
- 146.** Let  $x + y = k$  be normal to the parabola  $y^2 = 12x$ . If  $P$  is the length of the perpendicular from the focus of the parabola on to this normal, then  $4k^2 - 2P^2 =$  \_\_\_\_  
 1) 1                      2) 0                      3) -1                      4) 2
- 147.** In an ellipse the distance between the foci is 6 and its minor axis is 8. Then its eccentricity is  
 1)  $\frac{4}{5}$                       2)  $\frac{1}{\sqrt{52}}$                       3)  $\frac{3}{5}$                       4)  $\frac{1}{2}$

**148. The equation of the circle passing through the foci of the ellipse  $\frac{x^2}{16} + \frac{y^2}{9} = 1$ , and having centre at  $(0,3)$  is**

1)  $x^2 + y^2 - 6y - 5 = 0$

2)  $x^2 + y^2 - 6y + 5 = 0$

3)  $x^2 + y^2 - 6y - 7 = 0$

4)  $x^2 + y^2 - 6y + 7 = 0$

**149. The locus of a point  $p(\alpha, \beta)$  moving under the condition the line  $y = \alpha x + \beta$  is a tangent to the hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$  is**

1) An ellipse

2) A circle

3) A parabola

4) A hyperbola

**150. The angle between the asymptotes of the hyperbola  $x^2 - 3y^2 = 3$  is**

1)  $\frac{\pi}{3}$

2)  $\frac{\pi}{5}$

3)  $\frac{\pi}{2}$

4)  $\frac{\pi}{7}$