JUNIOR SCIENCE TALENT SEARCH EXAMINATION-2019-20, DELHI

G.A.T 1 to 50

1. In VVPAT 'A' stands for–
(1) Auction (2*) Audit (3) Augmentation (4) Apply

2. What is the vote percentage for General Loksabha Election 2019?
(1) 76.42% (2*) 67.11% (3) 64.15% (4) 69.21%

3. The worlds' first human rights TV Channel has been launched in which of the following cities?
(1) New Delhi (2) New York (3*) London (4) Tokyo

4. Which one of the following statements is incorrect about the different generations of mobile communication?
(1) Only one subscriber at any given time is assigned a channel in the first generation
(2*) In second generation (2G) mobile communication, 5MHz multi-carrier system is used
(3) For third generation (3G) voice call and data is an important feature.
(4) Global roaring across multiple networks and multimedia is provided to users at anytime and anywhere at a much higher speed in Fourth Generation (4G) mobile communication.

5. Which of the following day is observed as International Day for zero tolerance for Female Genital Mutilation?
(1*) 6 February (2) 31 January (3) 14 March (4) 14 February

6. Who among the following is considered as the 'Father of Artificial Intelligence'?
(1) Charles Babbage (2) Lee De Forest (3*) John Me Carthy (4) Microsoft

7. What was the name of the first newspaper to announce the partition of Bengal on July 6th 1905?
(1) Swaraj (2*) Sanjivani (3) Kalantar (4) Anand Bazar Patrika

8. The "Independence of Judiciary" in Indian Constitution is taken from:
(1) Britain (2*) America (3) South Africa (4) Australia

9. Uranium found in 'Ladakh' is an example of which resource–
(1) Actual resource (2*) Potential resource (3) Biotic resource (4) Human made resource

10. 'Teressa Island' is located in which of the following union territories of India?
(1) Lakshadweep (2) Pudducherry (3) Daman and Diu (4*) Andaman and Nicobar

11. Which of the following canal has reduced India's distance from Europe by 7000km?
(1*) Suez Canal (2) Eriez Canal (3) Indira Canal (4) Panama Canal

12. The term 'monsoon' is originated from:
(1) German (2*) Arabic (3) Latin (4) Hindi

13. Which insurance company has recently launched the 'Mosquito Disease Protection Policy'?
(1) LIC (2*) HDFC-ERGO (3) S.B.I. Life Insurance (4) Bajaj Alliance Insurance

14. Who has been appointed as the first female match referee by ICC?
(1) Mary Waldron (2) Shirvani Mishra (3) Jacqueline William (4*) G.S. Lakshmi

15. Which was the first country to implement GST? (Goods and Services Tax)
(1*) France (2) United Kingdom (3) Japan (4) Australia

16. Which country has launched the 45-days 'Mt-Everest cleaning campaign?
(1) China (2) India (3) Bhutan (4*) Nepal

17. The first parliament in the world to declare climate emergency?
(1*) United Kingdom (2) United States of America
(3) Japan (4) Germany

18. The book "Game Changer" is the autobiography of:
(1) Waqar Uounis (2) Javed Miandad (3*) Shahid Afridi (4) Imran Khan

19. Where is the headquarters of National centre for good Governance?
(1*) New Delhi (2) Chennai (3) Dehradun (4) Pune

20. Indian Railways has developed which A1 – powered robot for finding faults in trains?
(1) Madad (2) Milap (3) Cris (4*) Ustaad

21. In India, how many states share the coastline?
(1) 7 (2) 8 (3*) 9 (4) 10

22. The world's first floating Nuclear Power Plant has become operational in which country?
(1*) Russia (2) France (3) Japan (4) United States of America

23. Tropic of cancer passes through which of the following group of Indian states?
(1) Gujarat, Madhya Pradesh, Chhattisgarh, Manipur
(2*) Rajasthan, Jharkhand, West Bengal, Mizoram
(3) Uttar Pradesh, Madhya Pradesh, Bihar, Jharkhand
(4) Maharashtra, Chhattisgarh, Orissa, Andhra Pradesh

24. Which IIT has successfully converted petroleum waste product, toluene into a useful product benzoic acid?
(1) IIT Indore (2) IIT Kanpur (3*) IIT Madras (4) IIT Bombay

25. First Indian railway station to get and ISO certification from the National Green Tribunal:
(1*) Guwahati (2) Delhi (3) Hyderabad (4) Bhopal

26. India's longest suspension bridge built in Leh by Indian Army:
(1) Gagan Bridge (2) Mahatma Bridge (3) Sardar Bridge (4*) Maitri Bridge

27. Which of the following sport has/have been recommended by International Olympic Committee (IOC) for 2024 Paris Olympics?
(1) Break dance (2) Skate Boarding (3) Surfing (4*) All the Above

28. United Kingdom has issued new 'Black Hole' coin in honour of which of the following renowned personalities?
(1*) Stephan Hawking (2) Charles Darwin (3) Tim Berners – Lee (4) Thomas Edison

29. Diffo Bridge is located in:
(1) Andhra Pradesh (2) Himachal Pradesh (3) Uttar Pradesh (4*) Arunachal Pradesh

30. Who was the first Lieutenant Governor of Delhi?
(1) Sunder Lal Khurana (2) M.C. Pimputkar (3) Baleshwar Prasad (4*) Aditya Nath Jha

31. Porcine Reproductive and Respiratory Syndrome (PRRS) is related to:
(1) Cow (2*) Pig (3) Camel (4) Goat

32. Match the following hot spring locations of India with their states:

1. Manikaran	A. Himachal Pradesh
2. Bakreshwar	B. Gujarat
3. Unai	C. Patna
4. Rajgar	D. West Bengal

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

33. Which city is called 'Zero mile Centre' of India?
(1) Bhopal (2*) Nagpur (3) Jabalpur (4) Indore

34. Which state government has launched 'Shiksha Setu' app to ensure a better connectivity with college students?
(1) Punjab (2) Assam (3*) Haryana (4) Uttar Pradesh

35. Which among the following is not a 'hereditary' Disease?
(1) Thalessemia (2) Color-Blindness (3) Haemophilia (4*) Leukemia

36. The Sharda Act is related to:
(1) Upliftment of scheduled tribes (2) Upliftment of minorities
(3*) Child Marriage (4) Empowerment of women

37. In the Indian Parliamentary system 'Vote on Account' a valid for how many months (except the year of election)?
(1*) 2 months (2) 3 months (3) 6 months (4) 9 months

38. What will you call a system of taxation under which the poorer sections are taxed at higher rates than the richer sections?
(1) Progressive Tax (2) Proportional Tax (3*) Regressive Tax (4) Degressive Tax

39. What is the accounting year of the Reserve Bank of India?
(1) April-March (2*) July-June (3) October-September (4) Juanuary-December

40. Podu is a form of shifting cultivation in:
(1) Madhya Pradesh (2) Nagaland (3) Manipur (4*) Andhra Pradesh

41. Turpentine oil is obtained from:
(1) Cashew Nut Shell (2*) Pine Tree (3) Eucalyptus Tree (4) Banyan Tree

42. The yield per unit area is known as:
(1) Crop Concentration (2) Agriculture Intensity
(3) Agriculture Productivity (4*) None of these

43. In which city of India is Dhamek Stupa located?
(1) Pune (2) Delhi (3*) Varanasi (4) Hyderabad

44. India's fastest and first multi-pet flops super computer named Pratyush was unveiled at…….
(1) Indian Institute of Science, Bangalore (2) Indian Space Research Organization Bangalore
(3*) Indian Institute of Tropical Meteorology, Pune (4) Indian Institute of Technology, New Delhi

45. Protocol used for sending an email is:
(1) HTTP (2) FTP (3) POP-3 (4*) SMTP

46. In Networks, WEP stands for
(1) Wireless Equivalent Privacy (2) Wired Extra Privacy
(3*) Wired Equivalent Privacy (4) Wireless Embedded Privacy

47. The mulberry fruit is:
(1*) Sorosis (2) Syconus (3) Samara (4) Nut

48. Linseed is a rich source of–
(1) Vitamin C (2*) Omega-3 fatty acid
(3) Essential amino acids (4) Antioxidants

49. White leg-horn is a variety of–
(1) Parrot (2) Peacock (3*) Fowl (4) Owl

50. Itai-Itai disease is caused by which metal?
(1) Mercury (2) Nickel (3*) Cadmium (4) Lead

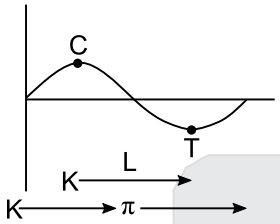
Physics 51 to 90

51. The instrument used to conduct electrolysis:
(1) Voltmeter (2*) Voltameter (3) Ammeter (4) Electrolyte

Sol. Voltameter is a container in which electrolysis conduct.

52. If the distance between a crest and trough (consecutive) is L then it's wavelength be:
(1) L/2 (2) L (3) 4L (4*) 2L

Sol. $\lambda = 2L$



53. A particle of mass m at rest is acted upon by a force p for time t. It's kinetic energy after time t is:
(1) p^2t^2/m (2*) $p^2t^2/2m$ (3) $p^2t^2/3m$ (4) $pt/2m$

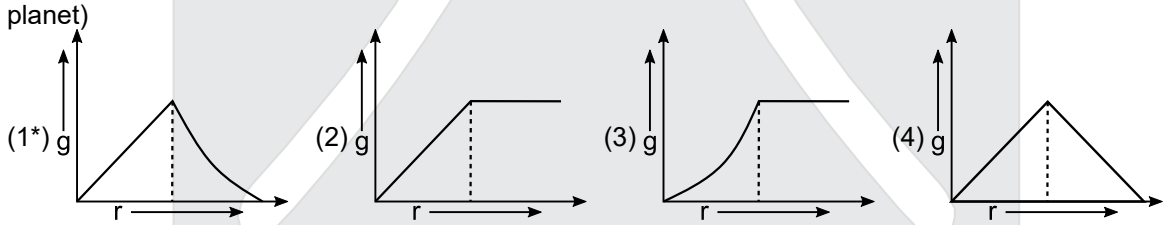
Sol. (m) ⟶ p ····· (m)
t

$p = ma \Rightarrow a = \frac{p}{m}$

$S = \frac{1}{2}at^2 = \frac{1}{2}\times\frac{p}{m}\times t^2$

$K.E.W = F.S = P \times \frac{1}{2}\times\frac{p}{m}\times t^2 = \frac{p^2t^2}{2m}$

54. Correct variation of acceleration due to gravity with distance from centre of planet is: (R is radius of planet)



55. A particle of mass m moving with velocity v strike a stationary particle of mass 2m and sticks to it, the speed of system will be:
(1) v/2 (2) 2v (3*) v/3 (4) 3v

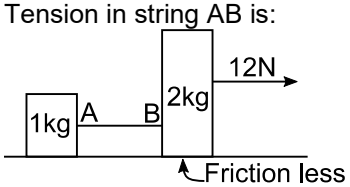
Sol. (m) ⟶ v (2m) ⟶ v = 0 (m)(2m) ⟶ v^1

By LOCM

$m \times v + 2m \times 0 = 3m \times v^1 \Rightarrow mv = 3mv^1$

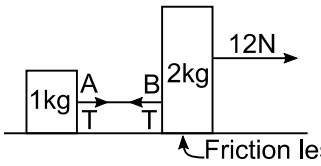
$\Rightarrow v^1 = \frac{v}{3}$

56. Tension in string AB is:



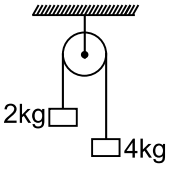
(1) 8N (2*) 4N (3) 12N (4) None

Sol.



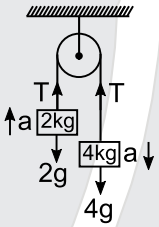
For 2kg block, $12 - T = 2a$ (i)
For 1kg block, $T = 1a$ (ii)
From (i) + (ii), $3a = 12 \Rightarrow a = 4 m/sec^2$
From (ii) $T = 4N$

57. For frictionless pulley the acceleration of system will be:



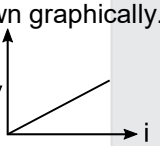
(1*)10/3 m/s^2 (2) 20/3 m/s^2 (3) 4/9 m/s^2 (4) 6 m/s^2

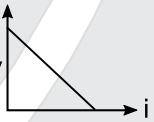
Sol. For 4kg block
$4g - T = 4a$ (i)
For 2kg block
$T - 2g = 2a$ (ii)
From (i) + (ii)
$2g = 6a$

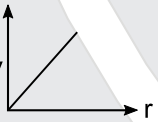


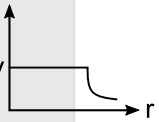
$\Rightarrow a = \frac{8}{3} = \frac{10}{3} m/sec^2$

58. Relation between potential difference (V) and current (i) for a cell of emf (E) and internal resistance (r) is, shown graphically. Which graph is correct?

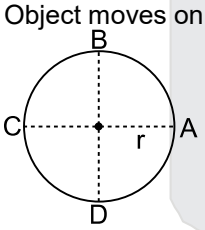
(1) 

(2*) 

(3) 

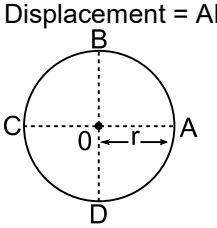
(4) 

59. Object moves on circular path. Find displacement from B $\rightarrow$ A (r is the radius of circular path)



(1) r (2) 2r (3) 3r (4*) $\sqrt{2}$ r

Sol. Displacement = AB



$= \sqrt{0A^2 + 0B^2}$
$= \sqrt{r^2 + r^2} = \sqrt{2r^2}$
$S = r\sqrt{2}$

60. On filling a tuning fork, its frequency:
(1*) Increases (2) Decreases (3) Remain Same (4) Increases then decreases

61. The height of mercury which exerts the same pressure as 20cm of water column is equal to:
(1*) 1.48 cm (2) 14.8 cm (3) 148cm (4) None

Sol. Pressure due to Hg = Pressure due to water

$\Rightarrow \rho_{Hg} \times g \times \rho_{Hg} = \rho_w \times g \times \rho_w$

$\Rightarrow 13.6 \times \rho_{Hg} = 1 \times 20$

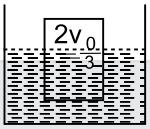
$\Rightarrow \rho_{Hg} = \frac{20}{13.6} = 1.48\text{cm}$

62. A block of wood floats 2/3 of it's volume sue merged, its relative density is equal to:
(1) 1/3 (2*) 2/3 (3) 4/3 (4) 1/9

Sol. v_0 = Volume of object

ρ_0 = Density of object

ρ_e = Density of uq



Bouyant force = weight of object

$\Rightarrow \frac{2v_0}{3} \times \rho_e \times g = v_0 \times \rho_0 \times g$

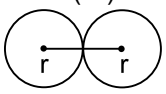
$\Rightarrow \frac{\rho_0}{\rho_e} = \frac{2}{3}$

63. The gravitational field intensity at a point on surface of earth is: [R is radius of earth]
(1*) g (2) gR (3) $\frac{1}{2}$gR (4) Zero

64. Two metallic spheres of same material and of equal radius r are touching each other. The force of attraction F between then is:
(1) $F \propto r^6$ (2*) $F \propto r^4$ (3) $F \propto r^2$ (4) $F \propto r$

Sol. $m_1 = m_2 = \frac{4}{3}\pi r^3 \times \rho$

$F = \frac{Gm_1m_2}{(2r)^2}$



$F = \frac{G \times \left(\frac{4}{3}\pi r^3 \times \rho\right)^2}{4r^2}$

$= \left(F \propto r^4\right)$

65. A body released from top of tower falls through half of height of tower in 3 sec, it will reach the ground after:
(1) 3.5sec (2*) 4.24sec (3) 4.71 (4) 6 sec

Sol. $\frac{h}{2} = 0 \times t + \frac{1}{2} \times g \times (3)^2$

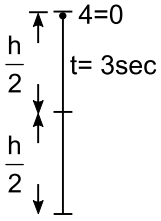
$\Rightarrow h = 9g$

Now, $h = 0 \times t + \frac{1}{2} g t^2$

$\Rightarrow 9g = \frac{1}{2} gt^2$

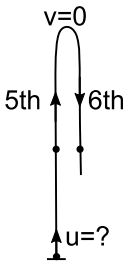
$\Rightarrow t^2 = 18 \Rightarrow t = \sqrt{18}$

$\Rightarrow t = 4.24$ sec



66. If a particle thrown vertically upwards, then its velocity so that, it covers same distance in 5^{th} and 6^{th} see would be:
(1) 48 m/s (2) 14 m/s (3*) 49 m/s (4) 7m/s

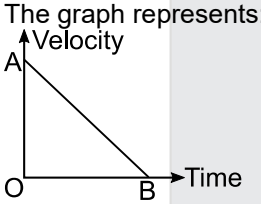
Sol. Total time to reach maximum height = 5sec
V = u + at
$\Rightarrow 0 = u - 9.8 \times 5$
$\Rightarrow u = 49$m/sec



67. An object while moving may not have:
(1) Constant speed but constant velocity (2) Variable velocity but constant speed
(3) Non-zero acceleration but constant speed (4*) Non-zero acceleration but constant velocity

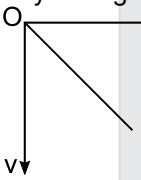
68. The numerical ratio of average speed to average velocity is:
(1) Always equal to one (2) Always less than one
(3) Always more than one (4*) Equal to or more than one

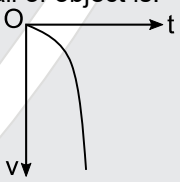
69. The graph represents:

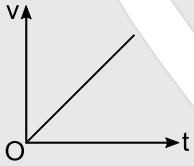


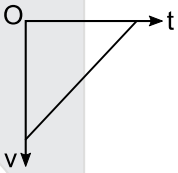
(1) Constant –ve acceleration with –ve initial velocity
(2*) Constant –ve acceleration with +ve initial velocity
(3) Constant +ve acceleration with –ve initial velocity
(4) Constant +ve acceleration with +ve initial velocity

70. Velocity-time graph for free fall of object is:

(1*) 

(2) 

(3) 

(4) 

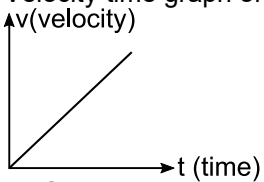
Sol. Acceleration is negative and constant.

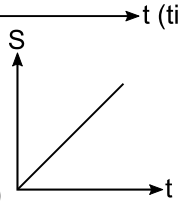
71. Area under acceleration time graph is equal to:
(1) Change in acceleration (2) Velocity
(3*) Change in velocity (4) Displacement

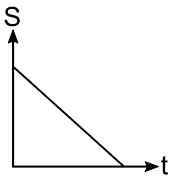
72. If displacement of object is proportional to r^2 (t is time). The acceleration in motion:
(1*) Constant (2) Increase with time (3) Decrease with time (4) No-relaxation exist

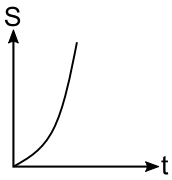
Sol. Displacement $\propto t^2$
Velocity $\propto t$

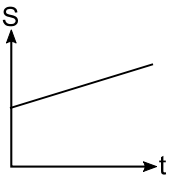
73. Velocity-time graph of an object is given, its displacement time graph will be:



(1) 

(2) 

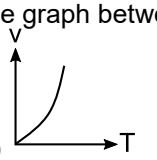
(3*) 

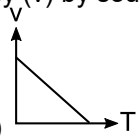
(4) 

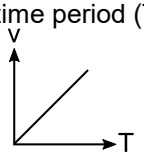
74. When pressure applied on water increases, it's boiling point:
(1) Decreases (2*) Increases
(3) First increase then decreases (4) First decrease then increase

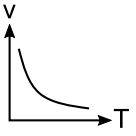
75. On increasing temperature of body its colour:
(1) Changes (2) No effect
(3*) Change with decrease in wavelength (4) Change with increase in wavelength

76. The graph between frequency (v) by sources and its time period (T) is:

(1) 

(2) 

(3) 

(4*) 

77. The amount of water rises up per minute by a pump of power 2 KW up to Height 10m:
(1) 1200Kg (2) 1150Kg (3) 1250Kg (4*) 1225Kg

Sol. P = 2KW = 2000 watt
h = 10m, g = 9.8m/sec^2, t = 60 sec

$P = \frac{mgh}{t} \Rightarrow$ m = 1225kg

78. S.I. unit of Intensity of sound is:
(1) J m^2s^{-1} (2) W m^2 (3*) J $m^{-2}s^{-1}$ (4) $J^{-1}m^{-1}s$

79. A cricketer catches a ball of mass 150g in 0.1 sec moving with speed 20m/s. He experiences a force of:
(1) 300N (2*) 30N (3) 3N (4) 0.3N

Sol. m = 150gm

t = 0.1sec

u = 20m/sec

v = 0m/sec

$F = \frac{m(v-u)}{t}$

$= \frac{0.15(0-20)}{0.1}$

= 30N

80. Which one is self-adjusting force?
(1) Kinetic Friction (2*) Static Friction (3) Nuclear Force (4) None

81. When milk is churned cream separates out because of the:
(1) Cohesive Force (2) Gravitational Force (3) Frictional Force (4*) Centrifugal Force

82. Work done by a simple pendulum in one complete oscillation is:
(1*) Zero (2) $\sqrt{mg}$ (3) mg cos θ (4) mg x

83. A body of mass m accelerates uniformly form rest to v_1 in time t_1. The power delivered to the body as a function of time t is:
(1) mv_1t/t_1 (2*) mv_1^2t/t_1^2 (3) mv_1t^2/t_1 (4) mv_1^2t/t_1

Sol. $P = \frac{dw}{dt}$

$= \frac{d}{dt}\left(\frac{1}{2}mv^2\right)$ $\left[a = \frac{v_1}{t_1}\right]$

$= \frac{m}{2} \times 2v \times \frac{dv}{dt}$ [v = at]

$= \frac{m}{2} \times 2at \times a$

$= ma^2t = \frac{mv_1^2t}{t_1^2}$

84. Two bodies of mass m and 4m are moving with equal kinetic energy the ratio of their moments is:
(1) 1:4 (2) 4:1 (3) 1:2 (4) $1:\sqrt{2}$

Sol. $(K1E)_1 = (k, E)_2$

$$\Rightarrow \frac{P_1^2}{2\times m} = \frac{P_2^2}{2\times 4m}$$

$$\Rightarrow \frac{P_1}{P_2} = \sqrt{\frac{1}{4}}$$

$$\Rightarrow \frac{P_1}{P_2} = 1:2$$

85. On temperature scales upper fixed point is:
(1) Boiling point of alcohol (2) Boiling point of mercury
(3*) Boiling point of water (4) Boiling point of petrol

86. A body is just floating in a liquid. If the body is slightly pressed downwards and released it will:
(1) Start oscillating (2*) Sink to bottom
(3) Comeback to same position immediately (4) Comeback to same position slowly

87. Why dam of water reservoir is thick at the bottom:
(1) Quantity of water increase with depth (2) Density of water increase with depth
(3*) Pressure of water increase with depth (4) Temperature of water increase with depth

88. The loudness and pitch of sound depends on:
(1*) Intensity and frequency (2) Frequency and number of harmonics
(3) Intensity and velocity (4) Frequency and velocity

89. –40ºF is equal to:
(1*) –40ºC (2) +233K (3) 312K (4) –72ºC

Sol. $\frac{F-32}{180} = \frac{C}{100}$

$$\Rightarrow \frac{-40-32}{18} = \frac{C}{100}$$

$$\Rightarrow \frac{-72}{18} = \frac{C}{10}$$

$\Rightarrow C = -40°$

Chemistry 91 to 130

90. If mass energy equivalence is taken into account, when water is cooled to form ice, the mass of water should?
(1*) Increases (2) Decreases (3) Remain unchanged (4) First increases than decreases

91. Latent heat of vaporization is used to:
(1) Overcome the forces of attraction between molecules in solid state.
(2) Increase kinetic energy of molecules in liquid state
(3*) Overcome force of attraction between molecules in liquid state.
(4) Increase the kinetic energy of molecules in vapour state.

92. Which of the following choice will not change the state of matter?
(1) Temperature (2*) Crushing of the crystal
(3) Pressure (4) Electricity

93. The melting and boiling point of four substances P, Q, R and S are given below.

Substance	M.Pt (ºC)	B.Pt (ºC)
P	–189	–98
Q	–132	–163
R	–166	–103
S	–115	–86

Which of these substances will exist in liquid state at –140ºC and in gaseous state at –100ºC.
(1) P (2) Q (3*) R (4) S

94. The heat of vaporization of H_2O, C_2H_5OH and CS_2 are 40.6, 38.6 and 26.8 KJ mol^{-1} respectively. The order of decreasing inter molecular force in these liquids is:
(1*) $H_2O > C_2H_5OH > CS_2$ (2) $CS_2 > C_2H_5OH > H_2O$
(3) $H_2O > CS_2 > C_2H_5OH$ (4) $CS_2 > H_2O > C_2H_5OH$

95. Match the given substances with their properties and choose the correct option.

Column I	Column II
1. Water	(P) Particles move randomly
2. Sugar	(Q) Layers can slide over each other
3. Nitrogen	(R) Changes directly to gaseous phase
4. Ammonium Chloride	(S) Particles are not free to move

(1) 1-(S), 2-(R), 3-(P), 4-(Q) (2*) 1-(Q), 2-(S), 3-(P), 4-(R)
(3) 1-(P), 2-(S), 3-(Q), 4-(R) (4) 1-(R), 2-(Q), 3-(S), 4-(P)

96. Which of the following is correctly matched?
(1) Emulsion – Curd (2) Foam – Mist (3*) Aerosol – Smoke (4) Solid Sol – Cake

97. Which method cannot be used for the purification of liquids?
(1*) Sublimation (2) Chromatography (3) Distillation (4) Fractional Distillation

98. In modern surgery, metal pins are used for holding the broken bones together. These pins are made up of:
(1) Copper (2*) Stainless Steel (3) Aluminium (4) Brass

99. Which of the following is not a pure substances?
(1) Tin (2*) Coal (3) Ice (4) Lime Stone

100. Which of the following solution does not show tyndall effect?
(1) Soap solution (2) Starch solution
(3) Solution of egg white in water (4*) Copper sulphate solution

101. What will be the mass percentage of a solution containing 30g of common salt in 220g water?
(1*) 12% (2) 22% (3) 1.2% (4) 3%

Sol. $\text{Mass\%} = \frac{\text{mass of solute}}{\text{mass of solution}} \times 100$

$= \frac{30}{30+220} \times 100\%$

$= \frac{30}{250} \times 100\%$

$= 12\%$

102. Volume occupied by 1 molecule of water (density of water = 1g cm^{-3}) is:–
(1) $6.023 \times 10^{-23}\ cm^3$ (2*) $3.0 \times 10^{-23}\ cm^3$ (3) $5.5 \times 10^{-23}\ cm^3$ (4) $9.0 \times 10^{-23}\ cm^3$

Sol. $\text{Density(d)} = \frac{\text{mass}}{\text{Volume}}$

$1 = \frac{\text{mass of } 1H_2O \text{ molecule}}{\text{Volume occupied by } 1H_2O \text{ molecule}}$

$1 = \frac{18 \times 1.67 \times 10^{-24}}{v}$

$v = 30.06 \times 10^{-24}\ cm^3$

$v = 3 \times 10^{-23}\ cm^3$

103. The number of atoms in 0.1 mol of CO_2 gas is:
(1) 1.8×10^{22} (2) 6.02×10^{22} (3) 3.6×10^{22} (4*) 1.8×10^{23}

Sol. Number of atoms = $3 \times 0.1 \times N_A$
$= 0.3 \times 6.022 \times 10^{23}$
$= 1.8 \times 10^{23}$

104. An alkaloid contains 17.28% of nitrogen and its molar mass is 162. The number of nitrogen atoms present in one molecule of alkaloid is:
(1*) 2 (2) 4 (3) 1 (4) 3

Sol. Mass of nitrogen in the alkaloid = 17.28% of total mass

$\Rightarrow \frac{17.28}{100} \times 162 = 28$ i.e. 2 nitrogen atoms

105. Numbers of atoms in 558.6g Fe (Atomic mass of Fe = 55.86g mol^{-1}) is:
(1) 6.022×10^{27} (2*) Twice that in 60g carbon
(3) Half that of 8g He (4) $558.6 \times 6.022 \times 10^{23}$

Sol. Number of atoms in 55.86g Fe = 1 mole
$= 6.022 \times 10^{23}$
$\therefore$ Number of atoms in 558.6g Fe = 10 mole
$= 10N_A$
Same as twice of 60g carbon.

106. 52u of He contains
(1) $4 \times 6.022 \times 10^{23}$ atoms (2*) 13 atoms
(3) $13 \times 6.022 \times 10^{23}$ atoms (4) 4 atoms

Sol. Number of atoms = $\frac{52u}{4u} = 13$

107. The formula of a metal chloride is MCl_3 then the formula of the phosphate of metal M will be:
(1*) MPO_4 (2) M_2PO_4 (3) M_3PO_4 (4) $M_2(PO_4)_3$

Sol.
M Cl
3 1 → MCl_3
$\therefore$ Valency of Metal is 3
& Charge on phosphate ion $(PO_4)^{3-}$
M PO_4
3 3 3: 3 or 1: 1
Hence MPO_4

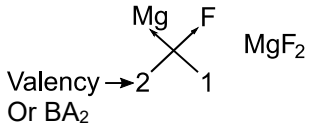
108. Which of the following particles has the highest value of charge/mass ratio?
(1*) Electron (2) Alpha particle (3) Neutron (4) Proton

109. The ratio between the number of neutron in C and Si (atomic mass of C = 12 and Si = 28).
(1) 2:3 (2) 3:2 (3*) 3:7 (4) 7:3

Sol. Number of neutrons is C = 12 – 6 = 6
Number of neutrons in Si = 28 – 14 = 14
C : Si $\Rightarrow$ 6 : 14 or 3 : 7

110. If A has 9 protons, 9 electrons and 10 neutrons, B has 12 protons, 12 electrons and 12 neutrons. Formula of the compound between A and B is:
(1) B_2A_3 (2) AB_2 (3*) BA_2 (4) AB_4

Sol. A → i.e. Flourine
2, 7
B → i.e. Magnesium
2, 8, 2



111. The average atomic mass of an element 'A' is 16.2u. There are two isotopes $^{16}_{8}A$ and $^{18}_{8}A$ of the element. The percentage of these two isotopes in element 'A' are respectively
(1) 10% 90% (2*) 90% 10% (3) 20% 80% (4) 80% 20%

Sol. Let $^{16}_{8}A$ be x%

& $^{18}_{8}A$ be (100 – x)%

Average atomic mass = $\frac{x}{100}\times 16+\frac{(100-x)\times 18}{100}$

16.2 = $\frac{16x}{100}+\frac{18(100-x)}{100}$

x = 90% & 10% (100 – x)

112. Alum helps to purify the muddy water by:
(1) Absorption (2) Dialysis (3) Precipitation (4*) Coagulation

113. ……..polymer is used for making non-stick utensils.
(1*) Teflon (2) PVC (3) PAN (4) Buna – s

114. Solder is an alloy of:
(1) Sn and Zn (2) Al and Pb (3*) Pb and Sn (4) Pb and Zn

115. On heating lead nitrate brown gas obtained is:
(1) N_2O (2) NO (3) N_2O_2 (4*) NO_2

116. After white washing, formation of …….. substance gives shiny finish to the walls.
(1) Quick lime (2*) Lime stone (3) Slaked lime (4) Calcium sulphate

117. Formula of compound used for supporting fractured bones is:
(1*) 2 $CaSO_4$. H_2O (2) $CaSO_4$. H_2O (3) $CaSO_4$. 3/2 H_2O (4) $CuSO_4$ .5H_2O

118. Antirust solutions are:
(1) Neutral (2*) Alkaline (3) Acidic (4) Amphoteric

119. ……..isotope is used to detect blood clot.
(1) Co – 60 (2) 1 – 131 (3*) Na – 24 (4) As –74

120. The latent heat of vaporization of water is:
(1) 2.25 × 10^5 J/Kg (2) 225 × 10^5 J/Kg (3) 0.225 × 10^5 J/Kg (4*) 22.5 × 10^5 J/Kg

121. The number of atoms present in 4.25g of NH_3 is:
(1) 1.0 × 10^{23} (2*) 6.0 × 10^{23} (3) 2.0 × 10^{23} (4) 4.0 × 10^{23}

Sol. Number of moles = $\frac{4.25}{17}$

Number of atoms = $\frac{4.25}{17}\times 4\times N_A$

= N_A = 6.022 × 10^{23}

122. Metal ion present in oxygenated haemoglobin:
(1*) Fe^{3+} (2) Fe^{2+} (3) Co^{2+} (4) Mg^{2+}

123. How many moles of iron can be made from Fe_2O_3 by the use of 16 mol of CO in the given reaction?
$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
(1) 1.67 mol (2*) 10.67 mol (3) 2.0 (4) 3.0 mol

Sol. 3 mole of CO form 2 moles of Fe

$\therefore$ 16 mole CO will form $\frac{2}{3} \times 16 = \frac{32}{3}$ mole Fe

i.e. 10.67 mole Fe

124. In the given reaction $Al_2O_3 + 3Mg \rightarrow 3MgO + 2Al$, Mg is used as:
(1) Oxidant (2) catalyst (3) Dehydrating agent (4*) Reductant

125. If the density of water is 1.0 g cm^{-3} and that of water vapour is 0.0006 g cm^{-3} at 100ºC and 1 atm, then the volume occupied by water molecules in 1 litre of steam at this temperature and pressure is:
(1*) 0.6 cm^3 (2) 6.0 cm^3 (3) 60.0 cm^3 (4) 0.06 cm^3

Sol. density of water vapor = 0.0006 g cm^{-3}
$\therefore$ 1cm^3 steam contains = 0.0006 g water vapor
1000cm^3 steam contains = 0.6g water vapor
Or 1 ltr. Steam contains = 0.6g H_2O which is equivalent to 0.6cm^3 of water molecules.

126. Which of the following has more electrons than neutrons?
(1) $^{19}_{9}F^-$ (2) $^{26}_{13}Al^{3+}$ (3*) $^{16}_{8}O^{2-}$ (4) $^{23}_{11}Na^+$

127. …… is a molecular crystal.
(1*) Dry ice (2) Quartz (3) Rock salt (4) Diamond

128. Atomicity of sulphur is:
(1) 2 (2*) 8 (3) 4 (4) 1

129. Which of the following metal can displace H_2 gas from an acid?
(1) Pt (2) Cu (3) Ag (4*) Ni

130. Dissolution of NH_4Cl in water is an:
(1) Neutralization Reaction (2) Exothermic Reaction
(3*) Endothermic Reaction (4) Precipitation Reaction

Biology 131 to 170

131. In which of the following organism self-fertilisation is observed
(1) Rohu (2*) Round worm (3) Earth worm (4) Liver fluke

132. Flame cells are excretory organism
(1*) Flat worms (2) Earth worms (3) Glow worms (4) Round worms

133. The husk of coconut is madeup of
(1) Collenchyma tissue (2) Parenchyma (3) Aerenchyma (4*) Sclerenchyma

134. Which of the following has pseudocoelom
(1) Flat worm (2*) Round worm (3) Earth worm (4) Tape worm

135. Which of the following is an insecticide
(1) Pencillin (2*) BHC (3) 2-4D (4) IAA

136. Vacuolar membrane is called
(1) Plasma membrane (2*) Tonoplast (3) Turgid membrane (4) Chromoplast

137. Murrah is a high yielding breed of
(1) Cow (2) Hen (3*) Buffalo (4) Sheep

138. Secretion of enzymes, mucous and hormones is done by
(1*) Golgi apparatus (2) Mitochondria (3) Ribosomes (4) Plastids

139. Both B & T cells of immune system are produced in
(1) Spleen (2*) Bone marrow (3) Lymphoid organ (4) Thymus

140. The third kingdom added in Haeckel's system of classification was
(1*) Protista (2) Monera (3) Fungi (4) Archaea

141. Entamoeba gingivalis lives in
(1) Intestine (2) Colon
(3*) Pus pocket of pyorrhea (4) Stomach

142. Lichen are important in studies on atmospheric pollution because they
(1) Can grow in highly polluted atm (2*) sensitive to pollutants like So_2
(3) Efficiently purify the atmosphere (4) Use S So_2 to grow

143. Which of the following cell will burst when placed in hypotonic media
(1) Onion peel cell (2) Fungal cell (3) Ecoli (4*) Red Blood cell

144. Haemoglobin is dissolved in plasma in
(1*) Earthworm (2) A scaris (3) Tape worm (4) Insect

145. A river with high BOD value is
(1*) highly polluted (2) Highly clean (3) Highly productive (4) None of these

146. Which muscle cells get tired soon?
(1*) Skeletal muscle (2) Cardiac muscle (3) Smooth muscle (4) All of these

147. Prokaryotic cells do not have
(1*) Lysosomes (2) Plasma membrane (3) Nucleoid (4) Ribosome

148. The test tubes A, B, C are taken with good material sample of rice, mustard and dal respectively in powdered form. On adding iodine solution the black colour is observed in
(1*) Test tube – A (2) Test tube – B (3) Test tube – C (4) Test tube – B

149. How does protoplasm differs from cytoplasm?
(1) Cytoplasm & protoplasm are parts of nucleus (2*) Protoplasm included nucleus and cytoplasm
(3) Protoplasm is same as cytoplasm (4) Protoplasm is a part of cytoplasm

150. Which is not a postulate of cell theory?
(1) All cells arise from pre-existing cells (2) Cell is the basic unit of life
(3*) The fluid substance of the cell is protoplasm (4) All organisms are composed of cells

151. Match the items of column 'A' Column 'B'

Column 'A'	Column 'B'
(a) Tendon	(i) yellow fibre
(b) Ligament	(ii) white fibre
(c) Cartilage	(iii) osteocytes
(d) Bone	(iv) chondriocytes

(1) a – (i), b – (ii), c – (iii), d – (iv) (2) a – (iv), b – (iii), c – (ii), d – (i)
(3*) a – (ii), b – (i), c – (iv), d – (iii) (4) a – (iii), b – (iv), c – (i), d – (ii)

152. The principal cereal crop of India is
(1) Wheat (2) Maize (3) Sorghum (4*) Rice

153. Animal husbandry is the scientific management of
(i) Animal breeding
(ii) Culture of animals
(iii) Animal live stock
(iv) Rearing of animals
(1) (i), (ii) and (iii) (2*) (i), (iii) and (iv) (3) (ii), (iii) and (iv) (4) (i), (ii) and (iv)

154. Who is known as the father of white revolution in India?
(1) Prof. M.S. Swaminathan (2*) Dr. V. Kurien
(3) Dr. Yashpal (4) Mrs. Indira Nancy

155. Ozone is
(1*) Poisonous (2) Sweet (3) Not harmful (4) Nothing

156. Ipomoea is a
(1*) Dicot (2) Monocot (3) Algae (4) Moss

157. Cotton chemically consists of
(1*) Cellulose (2) Protein (3) Nuclein (4) Pectin

158. Chara belong to
(1*) Thallophyta (2) Gymnosperms (3) Angiosperms (4) Dicot

159. Exocoetus is a
(1*) Flying fish (2) Lion fish (3) Dog fish (4) Angles fish

160. _____helds the body parts together and helps the body move.
(1) Muscular system (2) Skeletal system
(3*) Musculoskeletal system (4) Respiratory system

161. _____ is major factor in deciding the soil structure
(1) Fertilizers (2) Roots (3*) Humus (4) Pesticides

162. Lichens are very sensitive to _____ in the air
(1) Co_2 (2) NH_3 (3*) SO_2 (4) NO_2

163. When a cell divides by meiosis it produces: _____
(1) Two (2) Three (3*) Four (4) One

164. Peptic ulcers is related to
(1*) Helicobacter pylori (2) Trypanosoma (3) Leishmania (4) Viruses

165. Leghorn is related to
(1*) Poultry (2) Apiculture (3) Diary farming (4) Pisciculture

166. Which is responsible for the increase of the stem in growth.
(1) Cortex (2) Xylem (3*) Cambium (4) Phloem

167. Stomata open at night in
(1) Hydrophytes (2) Halophytes (3) Mesophytes (4*) Succulent

168. Haversian canal occurs in
(1*) Humerus (2) Scapula (3) Clavicle (4) Pubis

169. Hardness and stiffness in plants because of the _____ tissue
(1) Parenchyma (2*) Sclerenchyma (3) Aerenchyma (4) Collenchyma

170. Viruses are _____ particles
(1*) Nucleoprotein (2) Carboprotein (3) Musocasbo (4) Proteinomuco

171. If $\left(\frac{x+1}{x+3}\right)^3 = \frac{x-1}{x+5}$, then the value of x is

(1) 2 (2*) –2 (3) 1 (4) –1

Sol. $=\left(\frac{x+1}{x+3}\right)^3 = \frac{x-1}{x+5}$

= Put the value of x

$\Rightarrow x = 2\left(\frac{2+1}{2+3}\right)^3 \qquad \frac{2-1}{2+5}$

$= \left(\frac{3}{5}\right)^3 \neq \frac{1}{7}$

$\Rightarrow x = -2$

$= \left(\frac{-2+1}{-2+3}\right)^3 \qquad \frac{-2-1}{-2+5}$

$= \left(\frac{-1}{+1}\right)^3 = \left(\frac{-3}{3}\right)$

$= -1$

172. Value of $\frac{1}{2+\sqrt{3}-2\sqrt{2}} + \frac{3}{2+\sqrt{3}+2\sqrt{2}}$ is

(1*) $\frac{4}{47}\left[9\sqrt{3}-4\sqrt{6}-\sqrt{2}+14\right]$ (2) $\frac{4}{47}\left[9\sqrt{3}+4\sqrt{6}-\sqrt{2}+14\right]$

(3) $\frac{4}{47}\left[9\sqrt{3}-4\sqrt{6}-\sqrt{2}-14\right]$ (4) $\frac{4}{47}\left[9\sqrt{3}+4\sqrt{6}+\sqrt{2}+14\right]$

Sol. $= \frac{1}{2+\sqrt{3}-2\sqrt{2}} + \frac{3}{2+\sqrt{3}+2\sqrt{2}}$

$= \frac{2+\sqrt{3}+2\sqrt{2}+3\left(2+\sqrt{3}-2\sqrt{2}\right)}{\left(2+\sqrt{3}\right)^2-\left(2\sqrt{2}\right)^2}$

$= \frac{2+\sqrt{3}+2\sqrt{2}+6+3\sqrt{3}-6\sqrt{2}}{7+4\sqrt{3}-8}$

$= \frac{8+4\sqrt{3}-4\sqrt{2}}{4\sqrt{3}-1} \times \frac{4\sqrt{3}+1}{4\sqrt{3}+1}$

$= \frac{8\left(4\sqrt{3}+1\right)+4\sqrt{3}\left(4\sqrt{3}+1\right)-4\sqrt{2}\left(4\sqrt{3}+1\right)}{47}$

$= \frac{1}{47}[32\sqrt{3}+8+48\,4\sqrt{3}-16\sqrt{6}-4\sqrt{2}]$

$= \frac{1}{47}[36\sqrt{3}-4\sqrt{2}-16\sqrt{5}+56]$

$= \frac{4}{47}[\sqrt{3}-\sqrt{2}-4\sqrt{6}+14]$

173. If $x = \frac{5\sqrt{7}}{\sqrt{3}+\sqrt{7}}$, then the value of $\frac{x+5\sqrt{7}}{x-5\sqrt{7}} - \frac{x+5\sqrt{3}}{x-5\sqrt{3}}$ is

(1) 2 (2) $\sqrt{21}$ (3*) $\frac{8}{\sqrt{21}}$ (4) $\frac{4}{\sqrt{21}}$

Sol. $x = \dfrac{5\sqrt{21}}{\sqrt{3}+\sqrt{7}}$

$= \dfrac{x}{5\sqrt{7}} = \dfrac{\sqrt{3}}{\sqrt{3}+\sqrt{7}}$, $\dfrac{x}{5\sqrt{3}} = \dfrac{\sqrt{7}}{\sqrt{3}+\sqrt{7}}$

Applying C.D.

$\dfrac{x+5\sqrt{7}}{x-5\sqrt{7}} = \dfrac{\sqrt{3}+\sqrt{3}+\sqrt{7}}{\sqrt{3}-\sqrt{3}-\sqrt{7}} \Rightarrow \dfrac{2\sqrt{3}+\sqrt{7}}{-\sqrt{7}}$ (i)

$\dfrac{x+5\sqrt{3}}{x-5\sqrt{3}} = \dfrac{\sqrt{7}+\sqrt{3}+\sqrt{7}}{\sqrt{7}-\sqrt{3}-\sqrt{7}} \Rightarrow \dfrac{2\sqrt{7}+\sqrt{3}}{-\sqrt{3}}$ (ii)

(i) – (ii)

$\dfrac{2\sqrt{3}+\sqrt{7}}{-\sqrt{7}} - \dfrac{2\sqrt{7}+\sqrt{3}}{-\sqrt{3}}$

$\Rightarrow \dfrac{-\left(6+\sqrt{21}\right)+\sqrt{21}+14}{\sqrt{21}} \Rightarrow \dfrac{8}{\sqrt{21}}$

174. If the polynomials $p(x) = 4x^3 - ax^2 + 2x - 1$ and $q(x) = 3x^3 - 7x^2 - 8x + a$ leave the same remainder, when divided by $(x - 1)$. Then the value of

(1) 1 (2) $\dfrac{1}{2}$ (3) $\dfrac{3}{2}$ (4) $\dfrac{-3}{2}$

Sol. $p(x) = 4x^3 - ax^2 + 2x - 1$

$q(x) = 3x^3 - 7x^2 - 8x + a$

$p(1) = q(1)$

$4 - a + 2 - 1 = 3 - 7 - 8 + a$ **BONUS**

$5 - a = -12 + a$

$2a = 17$

$a = \dfrac{17}{2}$

175. Factors of $6x^2 - 5xy - 4y^2 + x + 17y - 15$

(1*) $(2x + y - 3)(3x - 4y + 5)$ (2) $(2x - y - 3)(3x - 4y - 5)$

(3) $(2x - y - 3)(3x + 4y + 5)$ (4) $(2x + y + 3)(3x + 4y - 5)$

Sol. $6x^2 - 5xy - 4y^2 + x + 17y - 15$

By options constant is -15

(i) -3×5

Or and co-efficient of y should be opposite sign

(ii) -5×3

$(2x + y - 3)(3x - 4y + 5)$

$6x^2 - 8xy + 10x + 3xy - 4y^2 + 5y - 9x + 12y - 15$

$6x^2 - 5xy - 4y^2 + x + 17y - 15$

176. If $x = \sqrt[3]{28}$ and $y = \sqrt[3]{27}$ then value of $x + y - \dfrac{1}{x^2 + xy + y^2}$ is

(1) 8 (2) 7 (3*) 6 (4) 5

Sol. $x = \sqrt[3]{28}$

$y = \sqrt[3]{27} - 3^{\frac{1}{3}} = 3$

$x + y - \dfrac{1}{x^2 + xy + y^2} \times \dfrac{x - y}{x - y}$

$x + y - \dfrac{x - y}{x^3 - y^3}$

$x + y - x + y$
$\Rightarrow 2y$
$2 \times 3 \Rightarrow 6$

177. The value of $0.\overline{2} + 0.2\overline{3}$ is

(1) $0.4\overline{3}$ (2) $0.\overline{43}$ (3*) $0.4\overline{5}$ (4) $0.\overline{45}$

Sol. $x = 0.\overline{2}$ $y = 0.2\overline{3}$

$x = 0.222\ldots\ldots$ $10y = 2.333\ldots\ldots$

$10x = 2.2222\ldots\ldots..$

$10x + 10y = 2.222\ldots\ldots..$

$+ \underline{2.333}\ldots\ldots..$

$4.\overline{5}$

$x + y = \frac{4.\overline{5}}{10}$

$\Rightarrow 0.4\overline{5}$

178. If x, y and z are real and $(x-2)^2 + (y-3)^2 + (z-4)^2 = 0$, then the value of xy + yz + zx is

(1) 24 (2*) 26 (3) 28 (4) 30

Sol. $(x-2)^2 + (y-3)^2 + (z-4)^2 = 0$

$x = 2,\ y = 3, z = 4$

$xy + yz + zx$

$6 + 12 + 8 \Rightarrow 26$

179. If $p^2 - 3p - 1 = 0$, then the value of $p^2 + \frac{1}{p^2}$ is

(1) 7 (2) 9 (3*) 11 (4) 13

Sol. $p^2 - 3p - 1 = 0$

$p^2 + \frac{1}{p^2}$

$p^2 - 3p - 1$ $p^2 + (p-3)^2$

$p(p-3) = 1$ $p^2 + p^2 + 9 - 6p$

$p - 3 = \frac{1}{p}$ $2p^2 - 6p + 9$

$2(p^2 - 3p) + 9$

$2(1) + 9$

$\Rightarrow 11$

180. If $m + n = 7$ and $m^3 + n^3 = 133$, then the value of $m^2 + n^2$ is

(1*) 29 (2) 49 (3) 69 (4) 59

Sol. $m + n = 7$

$m^3 + n^3 = 133$

$m^2 + n^2 \Rightarrow ?$

$(m+n)^2 = m^2 + n^2 + 2mn$

$49 = m^2 + n^2 + 2mn$ (i)

$(m+n)^3 = m^3 + n^3 + 3mn(m+n)$

$343 = 133 + 3mn(7)$

$343 - 133 = 21mn$

$\frac{210}{21} = mn$

$mn = 10$

$49 = m^2 + n^2 + 20$

$m^2 + n^2 = 29$

181. If $x + y = \sqrt{3}$, $x - y = \sqrt{2}$ then the expression $8xy(x^2 + y^2)$ has the value

(1) $5\sqrt{2}$ (2) $10\sqrt{2}$ (3) 20 (4*) 5

Sol. $x + y = \sqrt{3} \quad \rightarrow x^2 + y^2 + 2xy = 3$

$x - y = \sqrt{2} \quad \rightarrow \underline{x^2 + y^2 - 2xy = 2}$

$8xy \quad (x^2 + y^2) \quad$ Add $\quad 2(x^2 + y^2) = 5$

$$x^2 + y^2 = \frac{5}{2}$$

$$8 \times \left(\frac{1}{4}\right)\left(\frac{5}{2}\right) \quad \text{Sub} \Rightarrow 4xy = 1$$

$\Rightarrow 5$ Ans $\quad xy = \frac{1}{4}$

182. Factors of $(3x^2 - 2x)(6 - 3x^2 + 2x) - 5$ are

(1*) $(x - 1)(x + 1)(1 + 3x)(5 - 3x)$ (2) $(x - 1)(x + 1)(1 + 3x)(5 + 3x)$

(3) $(x - 1)(x + 1)(1 - 3x)(3 + 5x)$ (4) $(x - 1)(x + 1)(3 - x)(5 - 3x)$

Sol. $(3x^2 - 2x)(6 - 3x^2 + 2x) - 5$

$3x2 - 2x = a$

$(a)(6 - a) - 5$

$6a - a^2 - 5$

$-(a2 - 6a + 5)$

$-(a - 5)(a - 1)$

$-(3x^2 - 2x - 5)(3x^2 - 2x - 1)$

$-[3x^2 - 5x + 3x - 5][3x^2 - 3x + x - 1]$

$-[x(3x - 5) + 1(3x - 5)][3x(x - 1) + 1(x - 1)]$

$-[(3x - 5)(x + 1)][(3x + 1)(x - 1)]$

$\Rightarrow (x - 1)(x + 1)(1 + 3x)(5 - 3x)$

183. If $m = 2p + \sqrt{p^2 + k}$, then k is terms of p and m is

(1) $(m + p)(m + 3p)$ (2) $(m + p)(m - 3p)$ (3) $(m - 2p)(m - 3p)$ (4*) $(m - p)(m - 3p)$

Sol. $m = 2p + \sqrt{p^2 + k}$

$m - 2p = \sqrt{p^2 + k}$

$m^2 + 4p^2 - 4mp = p^2 + k$

$m^2 - 4mp + 3p^2 = k$

$m^2 - 3mp - mp + 3p^2 = k$

$m(m - 3p) - p(m - 3p) = k$

$(m - 3p)(m - p) = k$

184. If $p - x = 1$ and $\frac{3x+2}{5} + \frac{3}{2} = \frac{4p-3}{2}$, then the value of x is

(1*) 1 (2) –1 (3) 0 (4) 2

Sol. $p - x = 1$

$x = p - 1$

$$= \frac{3x+2}{5} + \frac{3}{2} = \frac{4p-3}{2}$$

$$= \frac{3(p-1)+2}{5} + \frac{3}{2} = \frac{4p-3}{2}$$

$$= \frac{3p-1}{5} + \frac{3}{2} = \frac{4p-3}{2}$$

$$= \frac{6p-2+15}{10} = \frac{4p-3}{2}$$

$6p + 13 = 20p - 15$

$20p - 6p = 28$

$14p = 28$

$p = 2 \quad x = 2 - 1 = 1$

185. If $5^{2m-1} = 25^{m-1} + 100$, then the value of 6^{-m} is

(1) 6 (2) 36 (3) $\frac{1}{6}$ (4*) $\frac{1}{36}$

Sol. $52^{m-1} = 25^{m+1} + 100$

$$\frac{5^{2m}}{5} = 5^{2m+2} + 100$$

$$\frac{5^{2m}}{5} - \frac{5^{2m}}{25} = 100$$

$$5^{2m}\left[\frac{5-1}{25}\right] = 100$$

$5^{2m} = 5^4$

$2m = 4$

$m = 2$

$6^{-m} \Rightarrow 6^{-2}$

$\Rightarrow \frac{1}{36}$

186. If $x = 3 + 3^{\frac{1}{3}} + 3^{\frac{2}{3}}$, then the value of $x^3 - 9x^2 + 18x - 10$ is

(1) –1 (2) 0 (3) 1 (4*) 2

Sol. $x = 3 + 3^{\frac{1}{3}} + 3^{\frac{2}{3}}$ $\quad x^3 - 9x^2 + 18x - 10$

$x - 3 = 3^{\frac{1}{3}} + 3^{\frac{2}{3}}$

$$(x-3)^3 = \left(3^{\frac{1}{3}} + 3^{\frac{2}{3}}\right)^3$$

$x^3 - 27 - 9x(x-3) = 3 + 3^2 + 3 \times 3^{\frac{1}{3}} + 3^{\frac{2}{3}}(x-3)$

$x^3 - 27 - 9x^2 + 27x = 3 + 9 + 9(x-3)$

$x^3 - 9x^2 + 27x - 27 = 12 + 9x - 27$

$x^3 - 9x^2 + 18x - 10 = 12 - 10$

$\Rightarrow$ 2 Ans

187. If $a + b + c = 2$, $ab + bc + ca = -1$ and $abc = -2$, then the value of $a^3 + b^3 + c^3$ is

(1) –8 (2) 0 (3*) 8 (4) 16

Sol. $a + b + c = 2$

$ab + bc + ca = -1$

$abc = -2$

$a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$4 = a^2 + b^2 + c^2 + 2(-1)$

$a^2 + b^2 + c^2 = 6$

$a^3 + b^3 + c^3 - 3(-2) = (2)(6 + 1)$

$a^3 + b^3 + c^3 = 14 - 6$

$= 8$ Ans

188. The coefficient of x^2 in $(x + 3)(x - 5)(x + 7)$ is

(1) 28 (2) –28 (3) –5 (4*) 5

Sol. $(x + 3)(x - 5)(x + 7)$

$\alpha = -3$

$\beta = 5$

$\gamma = -7$

$x^3 - (\alpha+\beta+\gamma)x^2 + (\alpha\beta+\beta\gamma+\gamma\alpha)x - 2\beta\gamma = 0$

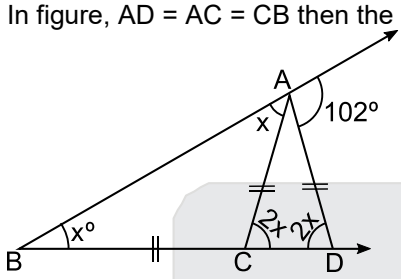
Co-efficient of

$x^2 \Rightarrow -(\alpha+\beta+\gamma)$

$\Rightarrow -(-5)$

$\Rightarrow 5$

189. In figure, AD = AC = CB then the value of x is



(1) 51° (2) 78° (3*) 34° (4) 43°

Sol. $3x = 102°$

$x = \frac{102°}{3}$

$\Rightarrow 34°$

190. If $\left(\sqrt{32}\right)^n + 2^{m+1}$ and $16^{4-\frac{n}{1}} - 8^n = 0$, then the value of m and n are

(1*) m = 2, n = 4 (2) m = 2, n = 3 (3) m = 4, n = 2 (4) m = 3, n = 2

Sol. $\left(\sqrt{3}\right)^m \div 2^{n+1} = 1$

$\frac{2^{\frac{5m}{2}}}{2^{n+1}} = 1$

$2^{\left(\frac{5m}{2}-(n+1)\right)} = 2^0$

$\frac{5m}{2} = n+1$

$m = \frac{2n+2}{5}$

$m = \frac{10}{5} = 2$

$16^{4-\frac{m}{2}} - 8^n = 0$

$2^{4\left(4-\frac{m}{2}\right)} = 2^{3n}$

$16 - \frac{4m}{2} = 3n$

$16 = 3n + 2m$

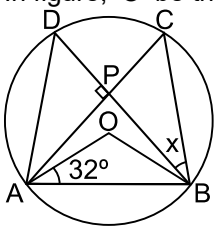
$16 = 3n + 2\left(\frac{2n+2}{5}\right)$

$16 = \frac{5n+4n+4}{5}$

$80 - 4 = 19n$

$m = 2, n = 4$

191. In figure, 'O' be the centre of the circle, $\angle OAB = 32°$, $\angle APD = 90°$ then the value of x is



(1) 30° (2*) 32° (3) 34° (4) 36°

Sol. $\angle AOB = 180° - 64° \Rightarrow 116°$

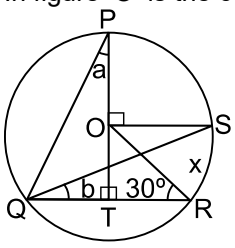
$\angle ADB = \frac{116}{2} \Rightarrow 58°$

$\angle ADB = \angle ACB = 58°$

In ΔPCB

$90° + \angle PCB + \angle PBC = 180°$
$90° + x + 58° = 180°$
$x = 32°$ Ans

192. In figure 'O' is the centre of the circle $\angle QRO = 30°$, values of a and b are



(1) a = 30°, b = 30° (2) a = 15°, b = 15° (3) a = 15°, b = 30° (4*) a = 30°, b = 15°

Sol. $45 + b + a = 90°$
$a + b = 45°$ .....(i)
$2b + 60° = 90°$
$b = 15°$
$a = 30°$

193. If volume of a cube is L cubic units, its surface are is M square units and length of the diagonal is N unit, then

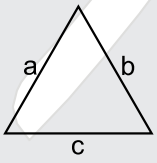
(1) 6L = MN (2*) $6\sqrt{3}L = MN$ (3) $\sqrt{3}M = LN$ (4) 6N = LM

Sol. $a^3 = L$
$6a^2 = M$
$\sqrt{3}a = N$
$6\sqrt{3}a^3 = MN$
$\Rightarrow 6\sqrt{3}L = MN$

194. In a triangle, the average of any two sides is 5cm more than half of third side, then area of the triangle (in sq. cm) is

(1) $64\sqrt{3}$ (2) $48\sqrt{3}$ (3) $72\sqrt{3}$ (4*) $36\sqrt{3}$

Sol. $\left(\frac{a+b}{2}\right) - 6 = \frac{1}{2}C$

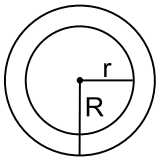


$a + b - c = 12$
$b + c - a = 12$
$a + c - b = 12$
Now we will get $a = b = c = 12$
Area = $\frac{\sqrt{3}}{4} \times (12^2) = 36\sqrt{3}$

195. The area of circular ring enclosed between two concentric circles is 286cm2. If the difference of their radii is 7cm, then the radii of these circles are

(1) 2cm and 9cm (2) 5cm and 12cm (3) 4cm and 11cm (4*) 3cm and 10cm

Sol. $R - r = 7$



$\pi R^2 - \pi r^2 = 286$

$\frac{22}{7}(R+r)(R-r) = 286$

R + r = 13

R – r = 7

2R = 20

R = 10, r = 3

196. If $49^x - 49^{x-1} = 16464$, then which of the following is equivalent of $(2x)^x$?

(1*) $5^{\frac{5}{2}}$ (2) $(7)^{\frac{5}{2}}$ (3) $(3)^{\frac{5}{2}}$ (4) None of these

Sol. $49^x - 49^{x-1} = 16464$

$49^x\left[1-\frac{1}{49}\right] = 16464$

$49^x\left[\frac{48}{49}\right] = 16464$

$\frac{49^x}{49} = \frac{16464}{48}$

$49^{x-1} = 343$

$7^{2x-2} = 7^3$

$2x - 2 = 3$

$2x = 5$

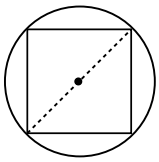
$x = \frac{5}{2}$

$(2x)^x \Rightarrow 5^{\frac{5}{2}}$

197. The ratio of the volume of a cube to that of a sphere which will fit inside the sphere is

(1) $\sqrt{3}\pi : 2$ (2*) $2 : \sqrt{3}\pi$ (3) $3 : \sqrt{2}\pi$ (4) None of these

Sol. $\sqrt{3}\,a = 2r$ $\frac{a}{r} = \frac{2}{\sqrt{3}}$



$\frac{a^3}{\frac{4}{3}\pi(r)^3} \Rightarrow \frac{3}{4\pi}\left(\frac{a}{r}\right)^3$

$\frac{3}{4\pi}\left(\frac{8}{3\sqrt{3}}\right)$

$\Rightarrow \frac{2}{\sqrt{3}\,\pi}$

198. The value of $\sqrt[3]{20+14\sqrt{2}} + \sqrt[3]{20-14\sqrt{2}}$ is

(1*) 4 (2) 6 (3) 8 (4) 10

Sol. $\sqrt[3]{20+14\sqrt{2}} + \sqrt[3]{20-14\sqrt{2}} = k$

Cubing

$20 + 14\sqrt{2} + 20 - 14\sqrt{2} + 3\left[20^2 - \left(14\sqrt{2}\right)^2\right]^{\frac{1}{3}} \times k = k^3$

$40 + 3\left(2^3\right)^{\frac{1}{3}} \times k = k^3$

$40 + 6k = k^3$

$k^3 - 6k - 40 = 0$

at $k = 4$

199. If $m + \frac{1}{m} = 5$, then the value of $\frac{m^4 + 3m^3 + 5m^2 + 3m + 1}{m^4 + 1}$ is

(1) $\frac{47}{21}$ (2) $\frac{45}{21}$ (3*) $\frac{43}{23}$ (4) $\frac{41}{23}$

Sol. $m + \frac{1}{m} = 5 \rightarrow m^2 + 1 = 5m$

$\frac{m^4 + 3m^3 + 5m^2 + 3m + 1}{m^4 + 1}$ $\quad m^4 + 1 + 2m^2 = 25m^2$

$m^4 + 1 = 23m^2$

$\frac{(m^4 + 1) + 3m(m^2 + 1) + 5m^2}{m^4 + 1}$

$\Rightarrow \frac{23m^2 + 3m \times 5m + 5m^2}{m^4 + 1}$ $\quad \Rightarrow \frac{23m^2 + 15m^2 + 5m^2}{23m^2}$

$\Rightarrow \frac{43m^2}{23m^2} \Rightarrow \frac{43}{23}$

200. If X:Y:Z = 4:3:2 and $x^2 + y^2 + z^2 = 11600$, then the value of $\sqrt{X + Y - Z}$ is

(1*) 10 (2) 100 (3) 180 (4) 60

Sol. X:Y:Z = 4:3:2

$x = 4a$

$y = 3a$

$z = 2a$

$x^2 + y^2 + z^2 = 11600$

$(4a)^2 + (3a)^2 + (2a)^2 = 11600$

$16a^2 + 9a^2 + 4a^2 = 11600$

$29a^2 = 11600$

$a^2 = \frac{11600}{29} = 400$

$a = 20$

$\sqrt{X + Y - Z} \Rightarrow \sqrt{80 + 60 - 40}$

$\Rightarrow \sqrt{100} \Rightarrow 10$