DATE : 15/12/2019

07-A/2019-20 (For Class - IX)

Aakash

Medical | IIT-JEE | Foundations

(Divisions of Aakash Educational Services Limited)

Regd. Office : Aakash Tower, 8, Pusa Road, New Delhi-110005 | Ph.: 011-47623456

Time : 4 Hrs.

Answers & Solutions

Max.Marks : 200

for

Junior Science Talent Search Examination (JSTSE) 2019-20

INSTRUCTIONS TO CANDIDATES

1. Use blue/black ball point pen only. There is no negative marking.
2. Part I : G.K. : 1 - 50 questions

   Part II : SAT : 51 - 200 questions
3. This test booklet contains 200 questions of one mark each. All the questions are compulsory.
4. Answer each question by darkening the one correct alternative among the four choices on the OMR Sheet with blue/black ball point pen.

   Example:

	Q.No.	Alternatives
Correct way:	1	① ② ● ④
	Q.No.	Alternatives
Wrong way:	1	⊗ ② ✓ ④

   Student must darkening the right oval only after ensuring correct answer on OMR Sheet.
5. Disparity in mentioning (SC, ST & PH) in application form and OMR Sheet can make your candidature invalid.
6. Students are not allowed to scratch / alter / change out an answer once marked on OMR Sheet, by using white fluid / eraser / blade / tearing / wearing or in any other form.
7. Separate sheet has been provided for rough work in this test booklet.
8. *Please handover the OMR Sheet to the invigilator before leaving the Examination Hall.

   *Take all your question booklets with you.
9. Darken completely the ovals of your answers on OMR Sheet in the time limit allotted for that particular paper.
10. Your OMR Sheet will be evaluated through electronic scanning process. Incomplete and incorrect entries may render your OMR Sheet invalid.
11. Use of electronic gadgets, calculator, mobile etc. is strictly prohibited.

PART-I : GENERAL KNOWLEDGE (GK)

(QUESTION NO. 01 - 50)

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

Answer (2)

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

Answer (2)

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

Answer (3)

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 (1G)
   (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 roaming across multiple networks and multimedia is provided to users at any time and anywhere at a much higher speed in Fourth Generation (4G) mobile communication

Answer (2)

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

Answer (1)

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

Answer (3)

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

Answer (2)

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

Answer (2)

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

Answer (2)

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

Answer (4)

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

Answer (1)

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

Answer (2)

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

Answer (2)

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

Answer (4)

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

Answer (1)

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

Answer (4)

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

Answer (1)

18. The book "Game changer" is the autobiography of
(1) Waqar Younis (2) Javed Miandad
(3) Shahid Afridi (4) Imran Khan

Answer (3)

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

Answer (1)

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

Answer (4)

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

Answer (3)

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

Answer (1)

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

Answer (2)

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

Answer (3)

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

Answer (1)

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

Answer (4)

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

Answer (4)

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

Answer (1)

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

Answer (4)

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

Answer (4)

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

Answer (2)

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. Rajgir	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

Answer (1)

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

Answer (2)

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

Answer (3)

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

Answer (4)

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

Answer (3)

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

Answer (1)

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

Answer (3)

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

Answer (2)

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

Answer (4)

41. Turpentine oil is obtained from
(1) Cashew nut shell
(2) Pine tree
(3) Eucalyptus tree
(4) Banyan tree

Answer (2)

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

Answer (3)

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

Answer (3)

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

Answer (3)

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

Answer (4)

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

Answer (3)

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

Answer (1)

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

Answer (2)

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

Answer (3)

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

Answer (3)

❑ ❑ ❑

PART-II : GENERAL SCIENCE AND MATHEMATICS
(QUESTION NO. 51 - 200)

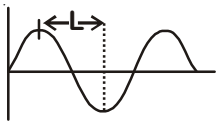
51. The instrument used to conduct electrolysis
(1) Voltmeter (2) Voltameter
(3) Ammeter (4) Electrolyte

Answer (2)

52. If the distance between a crest and trough (consecutive) is L then its wavelength be
(1) $\frac{L}{2}$ (2) L
(3) 4L (4) 2L

Answer (4)

Sol.



Wavelength is distance between two consecutive crust, so wavelength is 2L

53. A particle of mass m at rest is acted upon by a force p for time t. Its kinetic energy after time t is
(1) p^2t^2/m
(2) $p^2t^2/2m$
(3) $p^2t^2/3m$
(4) pt/2m

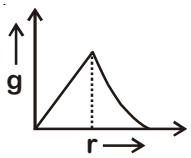
Answer (2)

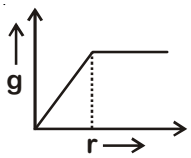
Sol. $\therefore \quad F \times t = \Delta P$

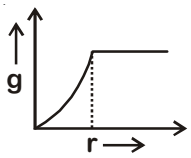
$$KE = \frac{P^2}{2m}$$

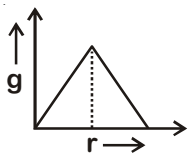
$$KE = \frac{p^2t^2}{2m}$$

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

(1) 

(2) 

(3) 

(4) 

Answer (1)

55. A particle of mass m moving with velocity v strikes a stationary particle of mass 2m and sticks to it, the speed of system will be
(1) $\frac{v}{2}$ (2) 2v
(3) $\frac{v}{3}$ (4) 3v

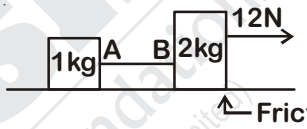
Answer (3)

Sol. By momentum conservation

$mv + 2m \times 0 = (m + 2m)\, v_1$

$mv = 3mv_1$

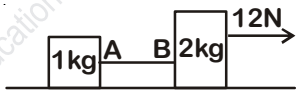
$$v_1 = \frac{v}{3}$$

56. 

Tension in string AB is
(1) 8 N (2) 4 N
(3) 12 N (4) None

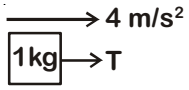
Answer (2)

Sol.



$$a = \frac{\text{Net driving force}}{\text{Total mass}} = \frac{12}{3} = 4\ m/s^2$$

FBD of 1 kg block

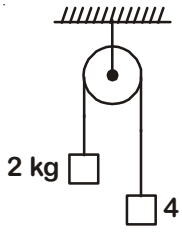


$ma = T$

$a = T$

$T = 4$ N

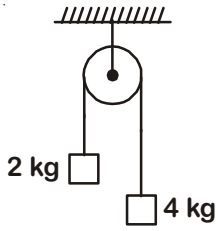
57. For frictionless pulley the acceleration of system will be.



(1) $\frac{10}{3}\ m/s^2$ (2) $\frac{20}{3}\ m/s^2$
(3) $\frac{4}{9}\ m/s^2$ (4) $6\ m/s^2$

Answer (1)

Sol.

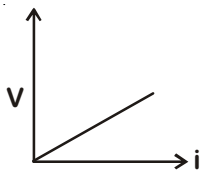


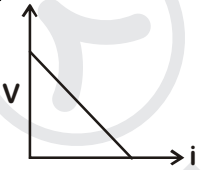
$$a = \frac{(m_2 - m_1)g}{m_1 + m_2} = \frac{(4-2)\times 10}{6}$$

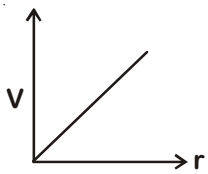
$$= \frac{2\times 10}{6}$$

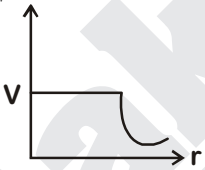
$$a = \frac{10}{3}\ m/s^2$$

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) 

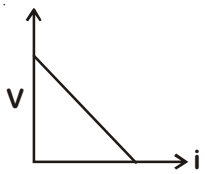
(2) 

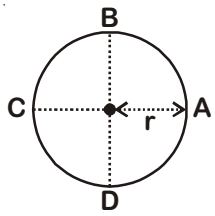
(3) 

(4) 

Answer (2)

Sol. $\therefore \quad V = E - ir$



59. 

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

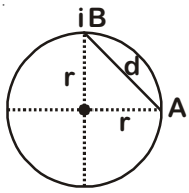
(1) r

(2) 2r

(3) 3r

(4) $\sqrt{2}r$

Answer (4)

Sol. 

By pythagoras $d^2 = r^2 + r^2$

$$d = \sqrt{2r^2}$$

$$d = \sqrt{2}r$$

60. On filing a tuning fork, its frequency

(1) Increases

(2) Decreases

(3) Remain same

(4) Increases then decreases

Answer (1)

61. The height of mercury which exerts the same pressure as 20 cm of water column is equal to

(1) 1.48 cm (2) 14.8 cm

(3) 148 cm (4) None

Answer (1)

Sol. $h_m = \frac{\rho_w \times h_w}{\rho_m} = \frac{20\times 1}{13.6}$

h_m = 1.48 cm

62. A block of wood floats $\frac{2}{3}$ of its volume submerged, its relative density is equal to

(1) $\frac{1}{3}$ (2) $\frac{2}{3}$

(3) $\frac{4}{3}$ (4) $\frac{1}{9}$

Answer (2)

Sol. $v\rho g = 1\times\frac{2}{3}vg$

$$\rho = \frac{2}{3}$$

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

Answer (1)

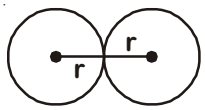
64. Two metallic spheres of same material and of equal radius r are touching each other. The force of attraction F between them is

(1) $F \propto r^6$ (2) $F \propto r^4$

(3) $F \propto r^2$ (4) $F \propto r$

Answer (2)

Sol.



$$F = \frac{Gm_1m_2}{(2r)^2} = \frac{G\frac{4}{3}\pi r^3\rho\cdot\frac{4}{3}\pi r^3\rho}{4r^2}$$

$F \propto r^4$

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) 3.5 sec (2) 4.24 sec

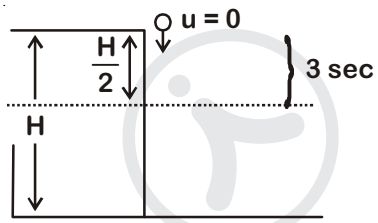
(3) 4.71 sec (4) 6 sec

Answer (2)

Sol. $\frac{H}{2} = \frac{1}{2}g(3)^2$

$\frac{H}{2} = \frac{1}{2}\times 10\times 9$

$H = \frac{1}{2}gt^2$



$t = \sqrt{18}$ = 4.24 sec

66. If a particle is thrown vertically upwards, then its velocity so that, it covers same distance in 5th and 6th sec would be

(1) 48 m/s (2) 14 m/s

(3) 49 m/s (4) 7 m/s

Answer (3)

Sol. $PQ = u - \frac{9g}{2}$ ...(i)

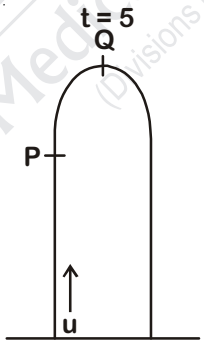
$QP = \frac{g}{2}$ ...(ii)

PQ = QP

$u - \frac{9g}{2} = \frac{g}{2}$

$u = \frac{g}{2} + \frac{9g}{2}$

u = 49 m/s



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

Answer (4)

68. The numerical ratio of average speed to average velocity is

(1) Always equal to one

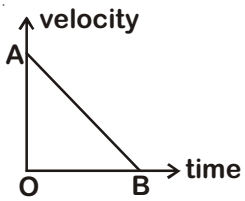
(2) Always less than one

(3) Always more than one

(4) Equal to or more than one

Answer (4)

69.



The graph represents

(1) Constant –ve acceleration with –ve initial velocity

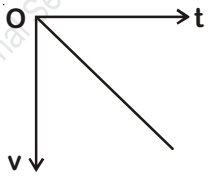
(2) Constant –ve acceleration with +ve initial velocity

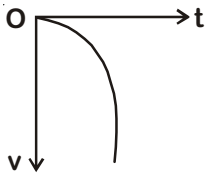
(3) Constant +ve acceleration with –ve initial velocity

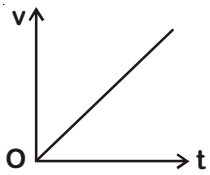
(4) Constant +ve acceleration with +ve initial velocity

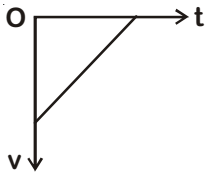
Answer (2)

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

(1) 

(2) 

(3) 

(4) 

Answer (1)

71. Area under acceleration time graph is equal to

(1) Change in acceleration

(2) Velocity

(3) Change in velocity

(4) Displacement

Answer (3)

72. If displacement of object is proportional to t^2(t is time). The acceleration in motion :-

(1) Constant

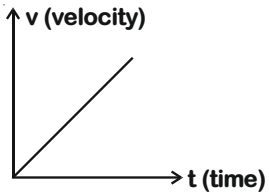
(2) Increase with time

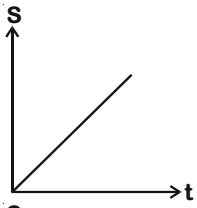
(3) Decrease with time

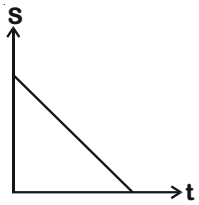
(4) No-relaxation exist

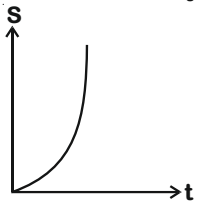
Answer (1)

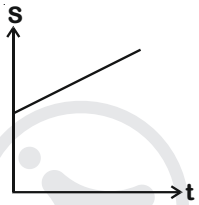
73. Velocity-time graph of an object is given, its displacement time graph will be



(1) 

(2) 

(3) 

(4) 

Answer (3)

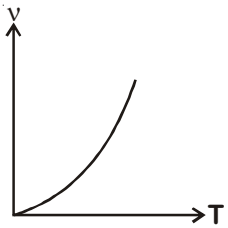
74. When pressure applied on water increases, its boiling point
    (1) Decrease
    (2) Increase
    (3) First increase then decrease
    (4) First decrease then increase

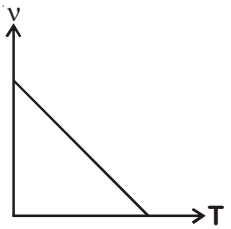
Answer (2)

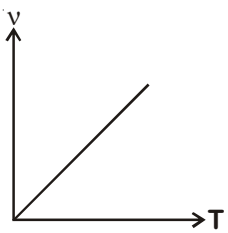
75. On increasing temperature of body its colour
    (1) Changes
    (2) No effect
    (3) Change with decrease in wavelength
    (4) Change with increase in wavelength

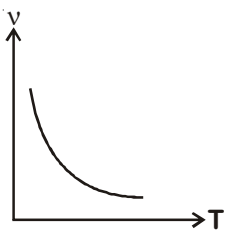
Answer (3)

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

(1) 

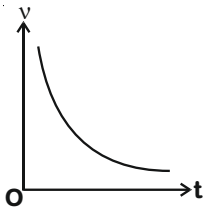
(2) 

(3) 

(4) 

Answer (4)

Sol. $\nu = \frac{1}{T}$



77. The amount of water rises up per minute by a pump of power 2 kW upto height 10 m
    (1) 1200 kg (2) 1150 kg
    (3) 1250 kg (4) 1225 kg

Answer (1)

Sol. $P = \frac{w}{t} = \frac{mgh}{t}$

$2kW = \frac{m \times 10 \times 10}{60}$

$m = 1200$ kg

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

Answer (3)

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

Answer (2)

Sol. $m = 150$ g

$t = 0.1$ sec

$v = 20$ m/s

$F = \frac{150}{1000} \times \frac{20 \times 10}{0.1}$

$F = 30$ N

80. Which one is self adjusting force
    (1) Kinetic friction (2) Static friction
    (3) Nuclear force (4) None

Answer (2)

81. When milk is churned cream separates out because of the
    (1) Cohessive force (2) Gravitational force
    (3) Frictional force (4) Centrifugal force

Answer (4)

82. Work done by a simple pendulum in one complete oscillation is

(1) Zero (2) $\sqrt{mg}$

(3) mg cosθ (4) mg x

Answer (1)

83. A body of mass m accelerates uniformly from rest to v_1 in time t_1. The power delivered to the body as a function of time t is

(1) $\frac{mv_1t}{t_1}$ (2) $\frac{mv_1^2t}{t_1^2}$

(3) $\frac{mv_1t^2}{t_1}$ (4) $\frac{mv_1^2t}{t_1}$

Answer (2)

Sol. $a=\frac{v_1}{t_1}$

$F=\frac{mv_1}{t_1}$

$v=\frac{v_1}{t_1}t$

$P=\frac{mv_1}{t_1}\times\frac{v_1}{t_1}t$

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

84. Two bodies of mass m and 4m are moving with equal kinetic energy the ratio of their momenta is

(1) 1 : 4 (2) 4 : 1

(3) 1 : 2 (4) $1:\sqrt{2}$

Answer (3)

Sol. $\therefore \quad KE=\frac{P^2}{2m}$

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

Answer (3)

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

Answer (2)

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

Answer (3)

88. The loudness and pitch of sound depends on

(1) Intensity and frequency

(2) Frequency and no. of harmonics

(3) Intensity and velocity

(4) Frequency and velocity

Answer (1)

89. –40° F is equal to

(1) –40° C (2) +233K

(3) 312K (4) –72° C

Answer (1)

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

$\Rightarrow C=\frac{-40-32}{180}\times100$

$\Rightarrow$ C = –40°C

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 unchage

(4) First increases than decreases

Answer (2)

91. Latent heat of vaporisation is used to :

(1) Overcome the forces of attraction between molecules in solid state.

(2) Increase kinetic nergy of molecules in liquid state

(3) Overcome force of attraction between molecule in liquid state.

(4) Increase the kinetic energy of molecules in vapour state.

Answer (3)

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

Answer (2)

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

Substance	M.Pt (°C)	B.Pt (°C)
P	–189	–98
Q	–132	–163
R	–166	–103
S	–115	–85

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

Answer (3)

94. The heat of vaporisation 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) $CS_2 > H_2O > C_2H_5OH$

Answer (1)

Sol. $H_2O > C_2H_5OH > CS_2$

$$\text{Intermolecular forces} \propto \frac{1}{\text{heat of vaporisation}}$$

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)

Answer (2)

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

Answer (3)

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

Answer (1)

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

Answer (2)

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

Answer (2)

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

Answer (4)

Sol. True solution does not show tyndall effect.

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

Answer (1)

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

$$= \frac{30}{250} \times 100 = 12\%$$

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

Answer (2)

Sol. 1 g H_2O occupies 1 cm^3

$\frac{1}{18}N_A$ molecules will occupy 1 cm^3

1 molecule will occupy $\frac{1}{\frac{1}{18}N_A}cm^3$

$= \frac{18}{6\times10^{23}} = 3\times10^{-23}cm^3$

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}

Answer (4)

Sol. 1 mol CO_2 contains = $3N_A$ atoms

0.1 mol CO_2 has 0.3 N_A atoms

or $0.3 \times 6 \times 10^{23} = 1.8 \times 10^{23}$ atoms

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

Answer (1)

Sol. Mass of $N = \frac{17.28}{100}\times162$

Number of N atoms $= \frac{17.28\times162}{100\times14} = 2$

105. Numbers of atoms in 558.6 g Fe (atomic mass of Fe = 55.86 g mol^{-1}) is :

(1) 6.022×10^{22}

(2) Twice that in 60 g carbon

(3) Half that of 8 g He

(4) $558.6 \times 6.022 \times 10^{23}$

Answer (2)

Sol. Number of atoms in 558.6 g of Fe

$= \frac{558.6\times N_A}{55.86}$

$= 10\ N_A$

Number of atoms in 60 g of carbon

$= \frac{60\times N_A}{12}$

$= 5\ N_A$

2 × (No. of atoms in 60 g of carbon) = $10\ N_A$

106. 52 u 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

Answer (2)

Sol. 52 u He $\equiv \frac{52}{4} = 13$ atoms

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) $M_2(PO_4)_3$

Answer (1)

Sol. Valency of M = 3

108. Which of the following particles has the highest value of charge/mass ratio?

(1) Electron (2) Alpha particle

(3) Neutron (4) Proton

Answer (1)

109. The ratio between the number of neutrons in C and Si (atomic mass of C = 12 and Si = 28)

(1) 2 : 3 (2) 3 : 2

(3) 3 : 7 (4) 7 : 3

Answer (3)

Sol. Number of neutrons in $^{12}_{6}C$ = 12 – 6 = 6

Number of neutrons in $^{28}_{14}Si$ = 28 – 14 = 14

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

Answer (3)

Sol. $_9A$: 2, 7 $\Rightarrow$ valency = 1

$_{12}B$: 2, 8, 2 $\Rightarrow$ valency = 2

$\therefore$ Formula is BA_2

111. The average atomic mass of an element 'A' is 16.2 u. 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%

Answer (2)

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

$x = 90$

112. Alum helps to purify the muddy water by :

(1) Absorption (2) Dialysis

(3) Precipitation (4) Coagulation

Answer (3)

113. _____ polymer is used for making nonstick utensils.

(1) Teflon (2) PVC

(3) PAN (4) Buna – S

Answer (1)

114. Solder is an alloy of :

(1) Sn and Zn (2) Al and Pb

(3) Pb and Sn (4) Pb and Zn

Answer (3)

115. On heating lead nitrate brown gas obtained is :

(1) N_2O (2) NO

(3) N_2O_5 (4) NO_2

Answer (4)

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

Answer (2)

Sol. After white washing, formation of calcium carbonate gives shiny finish to the walls.

117. Formula of compound used for supporting fractured bones is :

(1) $2\,CaSO_4 \cdot H_2O$ (2) $CaSO_4 \cdot H_2O$

(3) $CaSO_4 \cdot 3/2\,H_2O$ (4) $CuSO_4 \cdot 5H_2O$

Answer (1)

Sol. P.O.P is used for supporting fractured bones

118. Antirust solutions are :

(1) Neutral (2) Alkaline

(3) Acidic (4) Amphoteric

Answer (2)

119. _____ isotope is used to detect blood clot.

(1) Co – 60 (2) I – 131

(3) Na – 24 (4) As – 74

Answer (3)

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

Answer (4)

Sol. Latent heat of vaporisation of water = $540 \times 4.18 \times 10^3$ J/kg

$= 2257.2 \times 10^3$

$= 22.5 \times 10^5$ J/kg

121. The number of atoms present in 4.25 g of NH_3 is

(1) 1.0×10^{23} (2) 6.0×10^{23}

(3) 2.0×10^{23} (4) 4.0×10^{23}

Answer (2)

Sol. No. of atoms $= \frac{4.25}{17} \times 6.022 \times 10^{23} \times 4$

$= \frac{102.374}{17} \times 10^{23}$

$= 6.02 \times 10^{23}$

122. Metal ion present in oxygenated haemoglobin:

(1) Fe^{3+} (2) Fe^{2+}

(3) Co^{2+} (4) Mg^{2+}

Answer (1)

Sol. Fe^{3+}

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 mol (4) 3.0 mol

Answer (2)

Sol. 3 mol CO $\equiv$ 2 mol Fe

16 mol CO $= \frac{2}{3} \times 16 = 10.67$

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

Answer (4)

Sol. Reductant

Mg is used as reductant as it reduces Al_2O_3 to Al

125. If the density of water is 1.0 g cm^{-3} and that of water vapour is 0.0006 g cm^{-3} at 100°C 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

Answer (1)

Sol. Mass = Density × Volume

$\Rightarrow 1 \times V = 6 \times 10^{-4} \times 1$ L

$= 6 \times 10^{-4} \times 1$ dm^3

$= 6 \times 10^{-4} \times 10^3$ cm^3

$= 0.6$ cm^3

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) $^{23}_{11}Na^+$

Answer (3)

Sol. $^{16}_{8}O^{2-}$ has 10 electrons and 8 neutrons

127. _____ is a molecular crystal.

(1) Dry ice (2) Quartz

(3) Rock salt (4) Diamond

Answer (1)

Sol. Dry ice

128. Atomicity of sulphur is

(1) 2 (2) 8

(3) 4 (4) 1

Answer (2)

Sol. Atomicity of S = 8

129. Which of the following metal can displace H_2 gas from an acid?

(1) Pt (2) Cu

(3) Ag (4) Ni

Answer (4)

Sol. Metal Ni is present above hydrogen in the reactivity series.

130. Dissolution of NH_4Cl in water is an

(1) Neutralization Reaction

(2) Exothermic Reaction

(3) Endothermic Reaction

(4) Precipitation Reaction

Answer (3)

Sol. It is an endothermic reaction.

131. In which of the following organism self fertilisation is observed

(1) Rohu (2) Round worm

(3) Earth worm (4) Liver fluke

Answer (4)

Sol. Liver fluke

Liver fluke reproduces both sexually and asexually. Adults are hermaphrodites, capable of both cross and self fertilization

→ Rohu is unisexual

→ Round worm is unisexual

→ Earth worm is bisexual in which cross fertilization occurs

132. Flame cells are excretory organism

(1) Flat worms (2) Earth worms

(3) Glow worms (4) Round worms

Answer (1)

Sol. Flat worms

Flame cells are the excretory structures in flat worms or platyhelminthes.

133. The husk of coconut is made up of

(1) Collenchyma tissue

(2) Parenchyma

(3) Aerenchyma

(4) Sclerenchyma

Answer (4)

Sol. Sclerenchyma

134. Which of the following has pseudocoelom?

(1) Flat worm (2) Round worm

(3) Earth worm (4) Tape worm

Answer (2)

Sol. Round worm

Phylum Nematoda or Aschelminthes has pseudocoelom.

135. Which of the following is an insecticide?

(1) Penicillin (2) BHC

(3) 2-4D (4) IAA

Answer (2)

Sol. BHC → Benzene Hexachloride → Insecticide

Penicillin → Antibiotic

2-4D → Weedicide

IAA → Plant hormone

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

Answer (2)

Sol. Tonoplast

Sap vacuoles have a membrane called tonoplast.

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

Answer (3)

Sol. Buffalo

Murrah is indigenous breed of buffalo.

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

Answer (1)

Sol. Golgi apparatus is involved in the modification and secretion of enzymes, mucous and hormones.

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

Answer (2)

Sol. Both B & T cells are synthesized in bone marrow but B-cells mature in bone marrow and T-cells mature in the thymus.

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

Answer (1)

Sol. Ernst Haeckel introduced third kingdom, Protista, which includes unicellular eukaryotes.

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

Answer (3)

Sol. *Entamoeba gingivalis* found in mouth inside the gingival pocket biofilm near the base of the teeth.

142. Lichen are important in studies on atmospheric pollution because they
(1) Can grow in highly polluted atmosphere
(2) Sensitive to pollutants like SO_2
(3) Efficiently purify the atmosphere
(4) Uses SO_2 to grow

Answer (2)

Sol. Lichens are sensitive to pollutants mainly sulphure dioxide (SO_2) and acts as pollution indicators.

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

Answer (4)

Sol. As animal cells lack cell walls, RBCs when placed in hypotonic solution show endosmosis and burst because of absence of cell wall.

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

Answer (1)

Sol. Earthworm has closed circulatory system.

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

Answer (1)

Sol. BOD is biological oxygen demand. Higher the BOD value of water, higher would be the pollution.

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

Answer (1)

Sol. Skeletal muscles are voluntary muscles which perform fast and powerful contractions and soon get fatigued.

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

Answer (1)

Sol. Double membrane bound cell organelles are absent in prokaryotic cells.

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 – D

Answer (1)

Sol. Rice has high amount of starch which upon adding iodine solution shows blue-black colour.

149. How does protoplasm differs from cytoplasm?

(1) Cytoplasm and protoplasm are parts of nucleus

(2) Protoplasm, includes nucleus and cytoplasm

(3) Protoplasm is same as cytoplasm

(4) Protoplasm is a part of cytoplasm

Answer (2)

Sol. Protoplasm = Nucleus + 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

Answer (3)

Sol. Purkinje coined the term 'Protoplasm' which is the fluid substance of the cell. The concept of protoplasm was not included in the cell theory.

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) Chondrocytes

(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)

Answer (3)

Sol. Tendon → White fibres

Ligament → Yellow fibre

Cartilage → Chondrocytes

Bone → Osteocytes

152. The Principal cereal crop of India is

(1) Wheat (2) Maize

(3) Sorghum (4) Rice

Answer (4)

Sol. Rice is the staple crop of India followed by wheat.

153. Animal husbandry is the scientific management of

(i) Animal breeding

(ii) Culture of animals

(iii) Animal live stick

(iv) Rearing of animals

(1) (i), (ii) and (iii) (2) (i), (iii) and (iv)

(3) (ii), (iii) and (iv) (4) (i), (ii) and (iv)

Answer (2)

Sol. Animal husbandry is the scientific management of animal breeding, animal livestock and rearing of animals.

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

Answer (2)

Sol. The father of white revolution in India is Dr. V. Kurien.

155. Ozone is

(1) Poisonous (2) Sweet

(3) Not harmful (4) Nothing

Answer (1)

Sol. Ozone is poisonous in nature and is present in upper layers of atmosphere.

156. Ipomoea is a

(1) Dicot (2) Monocot

(3) Algae (4) Moss

Answer (1)

Sol. *Ipomoea* is sweet potato which is a dicot plant.

157. Cotton chemically consists of

(1) Cellulose (2) Protein

(3) Nuclein (4) Pectin

Answer (1)

Sol. After the process of scouring and bleaching, cotton contains 99% of cellulose.

158. *Chara* belong to

(1) Thallophyta (2) Gymnosperms

(3) Angiosperms (4) Dicot

Answer (1)

Sol. *Chara* is a green alga which belongs to group Thallophyta.

159. Exocoetus is a

(1) Flying fish (2) Lion fish

(3) Dog fish (4) Angel fish

Answer (1)

Sol. *Exocoetus* → Flying fish

Scoliodon → Dog fish

Pterophyllum → Angel fish

Pterois → Lion fish

160. _____ helds the body parts together and helps the body move.

(1) Muscular system

(2) Skeletal system

(3) Musculoskeletal system

(4) Respiratory system

Answer (3)

Sol. Muscles and its attachment to bones helps in movement of different body parts.

161. _____ is major factor in deciding the soil structure

(1) Fertilizers (2) Roots

(3) Humus (4) Pesticides

Answer (3)

Sol. Humus uses the soil to become more porous and allows water and air to penetrate deep underground. Thus, humus is a major factor in deciding the soil structure.

162. Lichens are very sensitive to _____ in the air

(1) CO_2 (2) NH_3

(3) SO_2 (4) NO_2

Answer (3)

Sol. Lichens are indicators of air pollution as they are very sensitive to sulphur dioxide in the air.

163. When a cell divides by meiosis it produces : _____ new cells

(1) Two (2) Three

(3) Four (4) One

Answer (3)

Sol. In the process of mitosis (equational division), each cell called mother cell divides to form two identical daughter cells with same DNA content whereas in the process of meiosis (reductional division), each cell divides to produce four new cells instead of just two. The new cells have half the number of chromosomes than that of mother cells.

164. Peptic ulcers is related to

(1) Helicobacter pylori

(2) Trypanosoma

(3) Leishmania

(4) Viruses

Answer (1)

Sol. *H. Pylori* is present in pyloric region of stomach and it leads to peptic ulcers.

165. Leghorn is related to

(1) Poultry (2) Apiculture

(3) Dairy Farming (4) Pisciculture

Answer (1)

Sol. White leghorn is the exotic breed of poultry for egg laying.

166. Which is responsible for the increase of the stem in growth?

(1) Cortex (2) Xylem

(3) Cambium (4) Phloem

Answer (3)

Sol. Secondary growth i.e. increase in the girth of the stem is by lateral meristem also known as **Vascular Cambium**.

167. Stomata open at night in

(1) Hydrophytes (2) Halophytes

(3) Mesophytes (4) Succulent

Answer (4)

Sol. Succulents are the xerophytes, those plants present in desert areas and take up carbon dioxide at night with the help of stomata.

168. Haversian canal occurs in

(1) Humerus (2) Scapula

(3) Clavicle (4) Pubis

Answer (1)

Sol. Humerus is the long bone of forelimb having haversian system with haversian canal and concentric lamellae of osteocytes.

169. Hardness and stiffness in plants because of the _____ tissue

(1) Parenchyma (2) Sclerenchyma

(3) Aerenchyma (4) Collenchyma

Answer (2)

Sol. Hardness and stiffness in plants is shown by hard sclerenchymatous fibers having deposition of lignin in their cell walls.

170. Viruses are _____ particles

(1) Nucleoprotein (2) Carboprotein

(3) Mucocasbo (4) Proteinomuco

Answer (1)

Sol. Viruses have nucleic acid (DNA or RNA) enclosed in proteinaceous coat called capsid.

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

Answer (2)

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

by putting $\boxed{x=-2}$ L.H.S. = R.H.S.

$\therefore$ $\boxed{x=-2}$ is the only option

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

Answer (1)

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

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

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

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

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

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

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

$= \frac{36\sqrt{3}+56-16\sqrt{6}-4\sqrt{2}}{47}$

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

173. If $x = \frac{5\sqrt{21}}{\sqrt{3}+\sqrt{7}}$, 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) $\frac{4}{\sqrt{21}}$

Answer (3)

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

$= \frac{x+5\sqrt{7}}{x-5\sqrt{7}} - \frac{x+5\sqrt{3}}{x-5\sqrt{3}}$

$= \frac{\frac{5\sqrt{21}}{\sqrt{3}+\sqrt{7}}+5\sqrt{7}}{\frac{5\sqrt{21}}{\sqrt{3}+\sqrt{7}}-5\sqrt{7}} - \frac{\frac{5\sqrt{21}}{\sqrt{3}+\sqrt{7}}+5\sqrt{3}}{\frac{5\sqrt{21}}{\sqrt{3}+\sqrt{7}}-5\sqrt{3}}$

$= \frac{5\sqrt{21}+5\sqrt{21}+35}{5\sqrt{21}-5\sqrt{21}-35} - \frac{5\sqrt{21}+15+5\sqrt{21}}{5\sqrt{21}-15-5\sqrt{21}}$

$= \frac{5\left(2\sqrt{21}+7\right)}{-35} - \frac{5\left(2\sqrt{21}+3\right)}{-15}$

$= \frac{-6\sqrt{21}-21+14\sqrt{21}+21}{21}$

$= \frac{8\sqrt{21}}{21} = \boxed{\frac{8}{\sqrt{21}}}$

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) 1/2

(3) 3/2 (4) –3/2

Answer ( )

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

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

As when divided by $(x - 1)$ gives same remainder.

$\therefore \quad \boxed{x = 1}$

$4(1)^3 - a(1)^2 + 2 \times 1 - 1 = 3(1)^3 - 7(1)^2 - 8 \times 1 + a$

$4 - a + 1 = 3 - 7 - 8 + a$

$5 - a = -12 + a$

$17 = 2a$

$\boxed{a = \frac{17}{2}}$

Hence, answer is $\frac{17}{2}$.

So, no option is correct.

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

Answer (1)

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

By multiplying the factors or by observation of coefficient.

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

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

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

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

(1) 8 (2) 7

(3) 6 (4) 5

Answer (3)

Sol. $x = (28)^{\frac{1}{3}}, y = (27)^{\frac{1}{3}} = (3^3)^{\frac{1}{3}} = 3$

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

$= x + y - \frac{(x - y)}{(x - y)(x^2 + xy + y^2)}$

$= x + y - \frac{(x - y)}{x^3 - y^3}$

$= x + y - \frac{(x - y)}{28 - 27}$

$= \cancel{x} + y - \cancel{x} + y = 2y = 2 \times 3 = \boxed{6}$

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) $0.\overline{45}$

Answer (3)

Sol. $0.\overline{2} + 0.2\overline{3}$

As $0.\overline{2} = 0.222.....$

$+ \ 0.2\overline{3} = 0.233.....$

$= 0.4555...$

$\therefore \quad 0.\overline{2} + 0.2\overline{3} = \boxed{0.4\overline{5}}$

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

Answer (2)

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

$x = 2$

$y = 3$

$z = 4$

Value of $xy + yz + zx$

$= 2 \times 3 + 3 \times 4 + 4 \times 2$

$= 6 + 12 + 8$

$= \boxed{26}$

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

Answer (3)

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

$p^2 - 1 = 3p$

$\boxed{p - \frac{1}{p} = 3}$

Squaring on both side

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

$$\boxed{p^2 + \frac{1}{p^2} = 11}$$

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

Answer (1)

Sol. If m + n = 7, ...(i)

$m^3 + n^3 = 133$ ...(ii)

Cubing on both side of equation (i)

$m^3 + n^3 + 3mn\,(m + n) = 343$

$133 + 3mn\,(7) = 343$ [$\because$ m + n = 7]

$3mn\,(7) = 210$

$21\ mn = 210$

$\boxed{mn = 10}$

As m + n = 7

Squaring on both side

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

$m^2 + n^2 + 2 \times 10 = 49$ [$\because$ mn = 10]

$m^2 + n^2 = 49 - 20 = \boxed{29}$

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

Answer (4)

Sol. $x + y = \sqrt{3}$, $x - y = \sqrt{2}$

Now, $8xy\,(x^2 + y^2)$

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

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

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

$$= 2 \times \frac{5}{2} = \boxed{5}$$

By adding & subtracting

$$x = \frac{\sqrt{3}+\sqrt{2}}{2}, \quad y = \frac{\sqrt{3}-\sqrt{2}}{2} \quad \boxed{xy = \frac{1}{4}}$$

$(x + y)^2 = x^2 + y^2 + 2xy$

$$\boxed{3 - 2xy = x^2 + y^2}$$

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)

Answer (1)

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

$\Rightarrow -(3x^2 - 2x)\,(3x^2 - 2x - 6) - 5$

Let, $(3x^2 - 2x) = t$

$\therefore\ -t\,(t - 6) - 5$

$= -t^2 + 6t - 5$

$= -(t^2 - 6t + 5)$

$= -(t - 5)\,(t - 1)$

$= -(3x^2 - 2x - 5)\,(3x^2 - 2x - 1)$

$= -(3x^2 - 5x + 3x - 5)\,(3x^2 - 3x + x - 1)$

$= -(3x - 5)\,(x + 1)\,(3x + 1)\,(x - 1)$

$= (x + 1)\,(x - 1)\,(1 + 3x)\,(5 - 3x)$

183. If $m = 2p + \sqrt{P^2 + k}$, then k in 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)

Answer (4)

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

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

Squaring on both sides

$(m - 2p)^2 = p^2 + k$

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

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

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

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

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

$$\boxed{(m - 3p)(m - p) = k}$$

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

Answer (1)

Sol. p – x = 1 ...(i)

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

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

6x + 19 = 5(4p – 3)

6x + 19 = 20p – 15

6x – 20p + 34 = 0 ...(ii)

Put p = (1 + x) in (ii), we get

6x – 20 – 20x + 34 = 0

$\Rightarrow$ 14x = 14

$\Rightarrow$ x = 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) $\frac{1}{36}$

Answer (4)

Sol. $5^{2m-1} = 25^{m-1} + 100$

$5^{2m-1} = (5^2)^{m-1} + 100$

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

$5^{2m}\left(\frac{1}{5}-\frac{1}{5^2}\right)=100$

$5^{2m}\left(\frac{4}{25}\right)=100$

$5^{2m} = 625$

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

$\therefore$ m = 2

Hence, $6^{-m} \Rightarrow 6^{-2} \Rightarrow \frac{1}{36}$

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

(1) –1 (2) 0

(3) 1 (4) 2

Answer (4)

Sol. $x=3+3^{1/3}+3^{2/3}$

$x-3=3^{1/3}+3^{2/3}$

Cubing both sides

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

$x^3-27-9x(x-3)=3+3^2+3.3^{1/3}.3^{2/3}\left(3^{1/3}+3^{2/3}\right)$

$x^3 – 27 – 9x^2 + 27x = 12 + 9 (x – 3)$

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

$x^3 – 9x^2 + 18x – 12 = 0$

$\therefore$ $x^3 – 9x^2 + 18x – 2 – 10 = 0$

$x^3 – 9x^2 + 18 – 10 = 2$

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

Answer (3)

Sol. a + b + c = 2, ab + bc + ca = –1, abc = –2

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

$a^3 + b^3 + c^3 – 3(–2) = 2[(a + b + c)^2 – 3(ab + bc + ca)]$

$a^3 + b^3 + c^3 + 6 = 2[(2)^2 – 3(–1)]$

$a^3 + b^3 + c^3 = 2(7) – 6$

= 8

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

(1) 28 (2) –28

(3) –5 (4) 5

Answer (4)

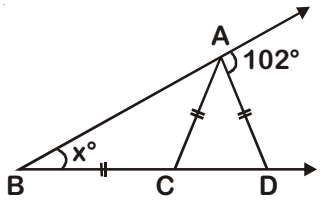
Sol. $\underbrace{(x+3)(x-5)}(x+7)$

$\Rightarrow (x^2 – 2x – 15)(x + 7)$

$\Rightarrow x^3+\underline{7x^2-2x^2}-14x-15x-105$

Coefficient of x^2 is 5.

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

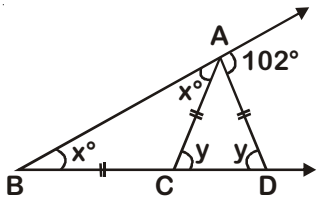


(1) 51° (2) 78°

(3) 34° (4) 43°

Answer (3)

Sol.



$\therefore$ $\angle ACB = 180° - 2x°$ (Angle sum property of ΔACB)

Also, $\angle ACB = 180° - y$ (Linear pair)

$\therefore$ $180° - 2x° = 180° - y$

$\therefore$ $\boxed{2x° = y}$

Again, $\angle CAD = 180° - 2y$ (ASP of ΔACD)

$x° + 180° - 2y + 102° = 180°$

$x° + 180° - 2(2x°) + 102° = 180°$

$3x° = 102°$

$x° = 34°$

190. If $(\sqrt{32})^m \div 2^{n+1} = 1$ and $16^{4-\frac{m}{2}} - 8^n = 0$, 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

Answer (1)

Sol. $(\sqrt{32})^m \div 2^{n+1} = 1$

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

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

$\frac{5m}{2} = n + 1 \Rightarrow \boxed{5m = 2n + 2}$ ...(i)

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

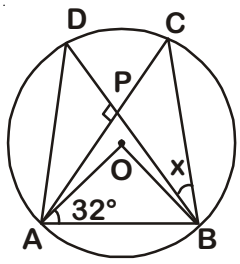
$(2^4)^{\frac{8-m}{2}} - 8^n = 0$

$2^{16-2m} = 2^{3n}$

$\boxed{16 - 2m = 3n}$ ...(ii)

Solving (i) and (ii), 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°

Answer (2)

Sol. In ΔOAB, OA = OB [radii]

$\therefore$ $\angle OAB = \angle OBA = 32°$

Now,

$\angle OAB + \angle AOB + \angle OBA = 180°$ [Angle sum property]

$32° + \angle AOB + 32° = 180°$

$\angle AOB = 180° - 64° = 116°$

and $\angle ACB = \angle ADB$ [Angles in the same segment]

$= \frac{1}{2}\angle AOB$

$\therefore$ $\angle ACB = \angle ADB = \frac{1}{2} \times 116° = 58°$

$\Rightarrow$ $\angle DPA = \angle CPB = 90°$ [Vertically opposite angles]

In ΔCPB,

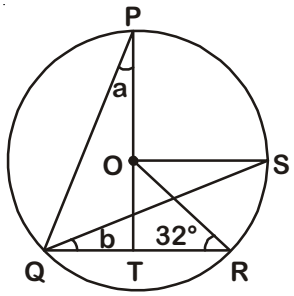
$\angle CPB + \angle PBC + \angle BCP = 180°$

$90° + x + 58° = 180°$

$x = 180° - 148°$

$\boxed{x = 32°}$

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

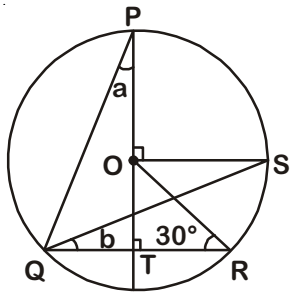


(1) a = 30°, b = 30° (2) a = 15°, b = 15°

(3) a = 15°, b = 30° (4) a = 30°, b = 15°

Answer (4)

Sol. $\angle POS = \angle OTR = 90°$



$\therefore$ OS || TR

and $\angle ROS = \angle ORT$ [Alternate angles]

$\Rightarrow \angle ROS = 30°$

$\therefore \quad b = \angle RQS = \frac{1}{2}\angle ROS$

$b = \frac{1}{2} \times 30° = 15°$

and, $\angle PQS = \frac{1}{2}\angle POS = \frac{1}{2} \times 90°$

$\angle PQS = 45°$

In ΔPQT,

$\angle QPT + \angle PTQ + \angle TQP = 180°$ [angle sum property]

$a + 90° + (45° + 15°) = 180°$

$a = 180° - 150°$

$a = 30°$

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) $6N = LM$

Answer (2)

Sol. Let a be the edge of cube. Then volume of cube = $L = a^3$ ...(i)

Surface area of cube = $M = 6a^2$

$\Rightarrow \quad a^2 = \frac{M}{6}$ ...(ii)

and length of diagonal of cube $= N = \sqrt{3}a$

$\Rightarrow \quad a = \frac{N}{\sqrt{3}}$ ...(iii)

Multiplying equation (ii) and (iii), we get

$a^2 \times a = \frac{M}{6} \times \frac{N}{\sqrt{3}}$

$a^3 = \frac{MN}{6\sqrt{3}}$

$L = \frac{MN}{6\sqrt{3}}$ [From (i)]

or $\boxed{6\sqrt{3}L = MN}$

194. In a triangle, the average of any two sides is 6 cm more than half of third side, then area of the triangle (in sq. cm.) is

(1) $64\sqrt{3}$

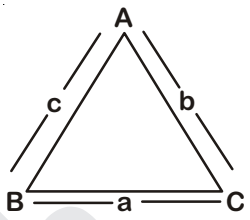
(2) $48\sqrt{3}$

(3) $72\sqrt{3}$

(4) $36\sqrt{3}$

Answer (4)

Sol.



According to question,

$S = \frac{a+b+c}{2}$

$\frac{a+b}{2} = 6 + \frac{c}{2}$

$a + b = 12 + c$

$a + b - c = 12$

$a + b + c - 2c = 12$

$2S - 2c = 12$

$\boxed{S - c = 6}$ ...(i)

Similarly,

$\boxed{S - a = 6}$ ...(ii)

and, $\boxed{S - b = 6}$ ...(iii)

By adding (i), (ii) and (iii)

$3S - (a + b + c) = 18$

$3S - 2S = 18$

$\boxed{S = 18}$

Heron's formula $= \sqrt{S(S-a)(S-b)(S-c)}$

$= \sqrt{18 \times 6 \times 6 \times 6}$

$= 36\sqrt{3}\ cm^2$

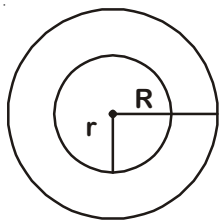
195. The area of circular ring enclosed between two concentric circles is 286 cm^2. If the difference of their radii is 7 cm, then the radii of these circles are

(1) 2 cm and 9 cm (2) 5 cm and 12 cm

(3) 4 cm and 11 cm (4) 3 cm and 10 cm

Answer (4)

Sol.



According to question,

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

$(R^2 - r^2) = \frac{286 \times 7}{22}$

$R^2 - r^2 = 91$

$R - r = 7$ [Given] ...(i)

$(R + r)(R - r) = 91$

Hence, $R + r = 13$ ...(ii)

Solving 2 equations, R = 10, r = 3

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

(1) $(5)^{\frac{5}{2}}$ (2) $(7)^{\frac{7}{2}}$

(3) $(3)^{\frac{3}{2}}$ (4) None of these

Answer (1)

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

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

$49^x\left(1 - \frac{1}{49}\right) = 16464$

$49^x\left(\frac{48}{49}\right) = 16464$

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

$49^x = 343 \times 49$

$7^{2x} = 7^5$

$\Rightarrow \boxed{2x = 5}$ or $x = \frac{5}{2}$

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

197. The ratio of the volumen of a cube to that of a sphere which will fit in side the sphere is

(1) $\sqrt{3}\pi : 2$ (2) $2 : \sqrt{3}\pi$

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

Answer (2)

Sol. Let side of cube be a

and radius of sphere be r

Then,

length of diagonal of cube = Diameter of sphere

$\sqrt{3}a = 2r$

$\Rightarrow \frac{\sqrt{3}a}{2} = r$

$\frac{\text{Volume(cube)}}{\text{Volume(sphere)}} = \frac{a^3}{\frac{4}{3}\pi r^3}$

$\Rightarrow \frac{a^3}{\frac{4}{3}\pi\left(\frac{\sqrt{3}a}{2}\right)^3}$

$\Rightarrow 2 : \sqrt{3}\pi$

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

Answer (1)

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

Cubing both sides

$20 + 14\sqrt{2} + 20 - 14\sqrt{2} + 3\sqrt[3]{(20 + 14\sqrt{2})(20 - 14\sqrt{2})}(k) = k^3$

$40 + 3\sqrt[3]{400 - 392}\, k = k^3$

$40 + 3(2)k = k^3$

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

k = 4 satisfies this equation.

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) $\frac{41}{23}$

Answer (3)

Sol. Here, $m + \frac{1}{m} = 5$

Squaring both sides

$m^2 + \frac{1}{m^2} + 2m \times \frac{1}{m} = 25$

$m^2 + \frac{1}{m^2} = 25 - 2 = 23$

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

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

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

$$= \frac{23+3\times5+5}{23}$$

$$= \frac{43}{23}$$

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

(1) 10 (2) 100

(3) 180 (4) 60

Answer (1)

Sol. Let X = 4k, Y = 3k, Z = 2k

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

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

$29k^2 = 11600$

$k^2 = 400$

$k = 20$

$\therefore$ X = 80, Y = 60, Z = 40

$\sqrt{X+Y-Z} = \sqrt{100} = 10$

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