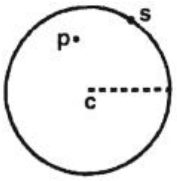
NATIONAL TALENT SEARCH EXAMINATION-2019-20, HARYANA
SCHOLASTIC APTITUDE TEST (SAT) PAPER & SOLUTION

1. The Force between a hollow sphere 'S' and a point mass 'P' inside it, is shown in figure is.



(1) Attractive & Constt.

(2) Repulsive & Constt.

(3) Attractive & depends upon the location of P w.r.t. Centre

(4) Zero

Sol. (4)

2. Read the following statements.

Statement – I : Plaster of Paris is stored in moisture proof containers.

Statement – II : Plaster of Paris on reaction with water changes into a hard solid gypsum.

Select the correct answer from the options given below:

(1) Statement – I is true,
Statement – II is false.

(2) Statement – I is false,
Statement – II false,

(3) Both statements are true and statement – II provides explanation to statement – I

(4) Both Statements are true but statement – II does not provide explanation to Statement – I.

Sol. (3)

$$CaSO_4.\frac{1}{2}H_2O + \frac{3}{2}H_2O \rightarrow CaSO_4.2H_2O$$

Plaster of Paris Gypsum

3. Two organic compounds 'X and 'Y' react with sodium metal and both produce same gas 'A'. With sodium hydrogen carbonate only compound 'Y' reacts to produce gas 'B' identity X, Y, A and B.

(1) X =C_2H_4 Y= C_2H_6OH A=CO_2 B=H_2

(2) X = C_2H_5OH Y= CH_3COOH, A =H_2B=CO_2

(3) X = CH_3OH , Y = C_2H_5OH, A =H_2B =CO_2

(4) X = CH_3COOH, Y = HCOOH, A= CO_2 B =H_2

Sol. (2)

$2C_2H_5OH + 2Na \rightarrow 2C_2H_5Na + H_2$

X A (Gas)

$2CH_3COOH + 2Na \rightarrow 2CH_3COONa + H_2$

Y A (gas)

$CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + CO_2 + H_2O$

Y B (gas)

4. Which of the following statements are correct in relation to liberal Nationalism in 19th C. Europe?

I. Freedom for the invididual and equality of all before the law.

II. Government by concent of all.

III. End of autocracy and the privileges of clergy.

IV. Equal political rights for women and non – propertied men.

(1) I, II, IV (2) I, II, III (3) II, III, IV (4) I, III, IV

Sol. (2)

5. How many valence electrons are present in Cl^- ion?

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

Sol. (4)

Electronic configuration of Cl = 2,8,7

Cl^- = 2,8,8

Valence e^- = 8

6. Which of the following were the famous three demands of Lenin that are also known as 'April Theses'?

I. The war be brought to close.

II. Land be transferred to the peasants.

III. Restrictions on public meetings be imposed.

iv. Banks be nationalised

(1) I, II, III (2) II, III, IV (3) I, III, IV (4) I, II, IV

Sol. (4)

7. Carrying the flag, holding it aloft during marches in Indian National movement, was a symbol of:

(1) Leadership (2) Defiance (3) Non - Violence (4) Satyagrah

Sol. (4)

8. Organs which look different and perform different functions but have similar basic structure and origin are called:

(1) Analogous organs (2) Homologous organs

(3) Similar organs (4) Dissimilar organs

Sol. (2)

9. A person of weight W jumps to ground with his legs fixed & comes to rest with an upward acceleration of 3 g. (g = acceleration due to gravity). The force exerted by him during landing is:

(1) W (2) 2W (3) 3W (4) 4W

Sol. (4)

N – W = ma

a = 3g

N – W = 3mg

N – W = 3w

N= 4W

10. Which of the following organ in human male is called thermoregulator?

(1) Vas deferens (2) Ejaculatory ducts (3) Scrotum (4) Cowper's gland

Sol. (3)

11. What did freedom mean for the plantation workers of Assam?

(1) Self Government

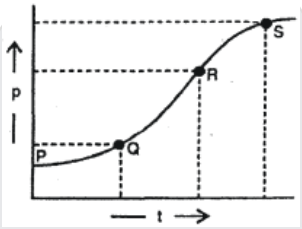
(2) Freedom from Zamindars

(3) Fare labour

(4) Right to move freely in and out of the plantations

Sol. (4)

12. In a two body collision, the momentum is varying with time as shown in graph. The instantaneous force is maximum at.



(1) P (2) Q (3) R (4) S

Sol. (3)

Slope of momentum time graph = force.

And slope is maximum at R.

13. If $\frac{3}{\sqrt{28+10\sqrt{3}}-\sqrt{7-4\sqrt{3}}} = a+\sqrt{3}b$ Where a and b are integers, then the value of $\sqrt{5a+12b}$ is:

(1) 4 (2) 3 (3) $\sqrt{11}$ (4) $\sqrt{13}$

Sol. (Bonus)

14. The graph of the equations 2x + 3y = A and x + 2y = B intersect at the point P, which also lies on the graph of the equation:

(1) 5x + 3y = A – B (2) 3x – 5y = A + B (3) 3x – 5y = A – B (4) 3x + 5y = A +B

Sol. $2x + 3y = A$, ; $x + 2y = B$

Solving by substitution method we get,

$X = 2A - 3B$ and $Y = 2B - A$

$\Rightarrow 3x = 6A - 9B$ and $5y = 10B - 5A$

$\Rightarrow 3x + 5y = A + B$

15. What is the mass of 2.5 moles of CO_2 ?

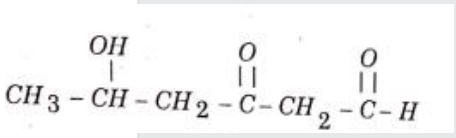
(1) 100g (2) 110g (3) 88g (4) 98g

Sol. **(2)**

Mass of 1 mole CO_2 = 44g

Mass of 2.5 mole CO_2 = 2.5 × 44 = 110 g

16.



Which functional groups are present in this organic compound?

(1) Alcohol, ketone and ester (2) Alcohol, ketone and carboxylic acid

(3) Alcohol, ketone and aldehyde (4) Alcohol, aldehyde and carboxylic acid

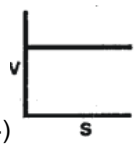
Sol. **(3)**

17. A body is dropped from rest, It's velocity varies with displacement covered as:

(1) 

(2) 

(3) 

(4) 

Sol. **(3)**

$V^2 \alpha S$

18. How many numbers lie between 100 and 400 which when divided by 9 leave a remainder 6, and when divided by 21, leave a remainder 12 ?

(1) 3 (2) 4 (3) 5 (4)6

Sol. **(2)**

Set the number be x then

$X = 9m + 6$

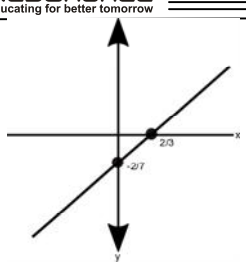
and $x = 21n + 12$

$\Rightarrow 9m + 6 = 21n + 12$

$\Rightarrow 9m - 21n = 6$

$\Rightarrow 3m - 7n = 2$

Graphically,



Positive integral solutions are,(17,7) (24,10), (31,13) and (38,16)

Hence x = 159,222,285,348

19. Element M forms a chloride with the formula MCl_3. Element M would most likely in the same group of periodic table as:

(1) Si (2) Al (3) Mg (4) Na

Sol. **(2)**

Valency of Al = 3

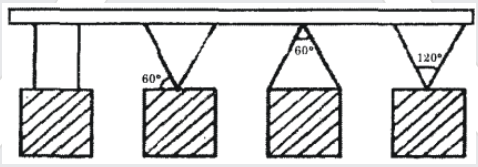
So it will form $AlCl_3$

20. Which of the following is not a part of human hind brain?

(1) Crura cerebri (2) Medulla oblongata (3) Pons varoli (4) Cerebellum

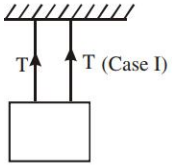
Sol. **(1)**

21. A 10 kg box is suspended from a beam in three ways as shown in figure. In which case, tension in string is maximum?



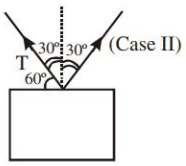
(1) i (2) ii (3) iii (4) iii & iv both

Sol. **(Bonus)**



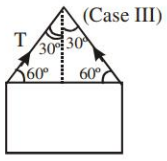
2T = Mg

$T = \frac{Mg}{2}$



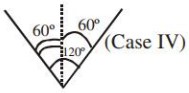
2T Cos 30° = mg

$T = \frac{Mg}{\sqrt{3}}$



2T sin60° = mg

$T = \frac{Mg}{\sqrt{3}}$



2T cos60° = mg

T= mg

22. If a, b and c are integers such that $\left(\sqrt[3]{4}+\sqrt[3]{2}-2\right)\left(\sqrt[3]{4a}+\sqrt[3]{2b}+c\right)=20$,

then which one of the following is true?

(1) a + b + c = 0 (2) a – b + c = 10 (3) a + b = 2c (4) a + b + c = 16

Sol. **(3)**

23. Blood cells are manufactured in our:

(1) Bone marrow (2) Liver (3) Spleen (4) Pancreas

Sol. (1)

24. If $a = (\sin\theta - \cos\theta)^4, b = \sin^6\theta + \cos^6\theta$ and $c = (\sin\theta + \cos\theta)^2$, then the value of $\sqrt{3a + 4b + 6c}$ lies between:

(1) 2 and 3 (2) 3 and 4 (3) 4 and 5 (4) 5 and 6

Sol. (2)

$a = (\sin\theta - \cos\theta)^4 = (\sin^2\theta + \cos^2\theta - 2\sin\theta\cos\theta)^2$

$= (1 - 4\sin\theta\cos\theta + 4\sin^2\theta\cos^2\theta)$

$b = \sin^6\theta + \cos^6\theta = (\sin^2\theta + \cos^2\theta)[1 - 3\sin^2\theta\cos^2\theta]$ = (1-3 $\sin^2\theta\cos^2\theta$)

$c = (\sin\theta - \cos\theta)^2 = 1 - 2\sin\theta\cos\theta$

$\therefore \sqrt{3a + 4b + 6c} = \sqrt{13}$

and $\sqrt{9} < \sqrt{13} < \sqrt{16}$

$\Rightarrow$ 3< $\sqrt{13} < 4$

25. A cork is immersed in a jar of water & released. How the cork will move if the jar is assumed to be kept in a satellite orbiting earth:

(1) Sink (2) Rise

(3) Remain where left (4) Depends upon the satellite velocity

Sol. (3)

In satellite g =0 $\because$ buoyant force = 0

26. Headquarter of UNESCO is at ?

(1) Geneva (2) Rome (3) Paris (4) London

Sol. (3)

27. Maintaining the proper amount of water and proper ionic balance in the body is named as:

(1) Homeostasis (2) Osmoregulation (3) Excretion (4) Nutrition

Sol. (2)

28. What model of government did Montesquieu propose in his book 'A Spirit of Laws' ?

(1) To refute the doctrine of the divine and absolute rights of the monarch.

(2) A government based on the social contract between people and their representatives.

(3) Division of powers within the government between the legislative, the executive and the judiciary.

(4) Concentration of all the powers in the hands of a monarch and his group of loyal people.

Sol. (3)

29. How many subjects are given in central list?

(1) 97 (2) 66 (3) 50 (4) 47

Sol. **(1)**

30. Which of the following statement does not match the Nazi views on women?

(1) Women are radically different from men.

(2) Women must become good mothers and rear pure blooded 'Aryan' children.

(3) Women should be entitited equal rights to men.

(4) Women must produce more children.

Sol. **(3)**

31. Which kind of disease is arthritis?

(1) Acute disease (2*) Chronic disease

(3) Infectious disease (4) Communicable disease

32. The arithmetic progressions : 1,4,7 …… and 2,10,18, ……. Each contains 100 terms. How many terms are common to both progression?

(1) 10 (2) 12 (3) 13 (4)14

Sol. **(C)**

First AP : 1,4,7, ……..

a = 1, d = 3

Second AP : 2,10,18

a = 2, d = 8

$\therefore$ First common term = 10 & d = 24

$a_{100} = 1 + 3\,(99) = 298$

$\therefore 298 = 10 + (n-1)\,24$

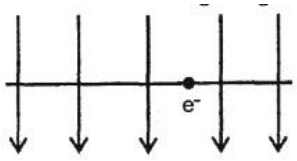
$\therefore$ n = 13

33. Which one of the following is not an example of fixed capital?

(1) Tools (2) Raw materials (3) Machines (4) Buildings

Sol. **(2)**

34. A uniform magnetic field pointing top to bottom in a plane of paper. When an electron is allowed to move perpendicular to it, it get deflected outwards. The electron must be moving along:



(1) Left to Right (2) Right to Left

(3) It is stationary (4) It can't deflect outward

Sol. **(1)**

Using right hand palm rule.

35. Consider the following statements

A. The velocity of sound in air increases due to presence of moisture in it.

R. The presence of moisture in air lowers the density of air.

In above statements:

(1) Both 'A' & 'R' are correct &'R' is the correct explanation of 'A'

(2) Both 'A' & 'R' are correct but 'R' is not the correct explanation of 'A'

(3) 'A' is correct 'R' is incorrect

(4) 'A' is incorrect, 'R' is correct.

Sol. (1)

Velocity of sound increase with moisture due to decrease in density

$V\alpha\sqrt{P}$

$V\alpha\frac{1}{\sqrt{\rho}}$ if density decreases, velocity increases

36. Each exterior angle of a regular polygon is less than 40º and the sum of its interior angles is less than 1980º, If N is the number of sides of the polygon, then the number of possible values of N is:

(1) 7 (2) 5 (3) 3 (4) 2

Sol. (3)

$\frac{360}{N} < 40, \quad \therefore N > 9$

$(2N - 4)\ 90^\circ < 1980^\circ \Rightarrow 2N - 4 < 22 \Rightarrow 2N < 26 \Rightarrow N < 13$

$\therefore$ N = 10 or 11 or 12

$\therefore$ 3 Possible values

37. Ram was working with his father in their farm. His father was small farmer. Income generated from the farm was not enough for the family. Ram got an opportunity to get loan from the bank under a govt. Programme. He bought a rickshaw with that money and started working as a rickshaw puller in the city. Now he is able to earn good enough and their family income is increased that earlier. Such kind of activity done by Ram to improve his financial condition comes under:

(1) Primary Sector (2) Secondary Sector

(3) Manufacturing Sector (4) Service Sector

Sol. (4)

38. Arrange the following in a chronological sequence:

I. Second Round table conference

II. Establishment of Depressed class Association.

III. Breaking of salt law and beginning of civil disobedience Movement.

IV. Lahore Congress.

(1) II, III, IV, I (2) I, II, III, IV (3) IV, II, III, I (4) III, I, II, IV

Sol. (4)

39. Teacher wrote following points on the blackboard about a particular crop i.e. Temp. 20º, 35ºC, Rainfall not less than 200 cm Terrain undulating, soil – laterite, red, yellow. Which of the following crop the teacher is discussing about?

(1) Jute (2) Millet (3) Coffee (4) Rubber

Sol. (4)

40. The number of integral solutions (x,y) of the system of equations $x^2 - xy + 8 = 0$ and $x^2 - 8x + y = 0$ is:

(1) 1 (2) 2 (3) 3 (4) 0

Sol. (1)

$x^2 - xy + 8 = 0$

$\underline{x^2 - 8x + y = 0}$

$-xy - y + 8x + 8 = 0$

$(x+1)(8 - y) = 0$

$\therefore$ $x = -1$ or $y = 8$

At $x = -1$, $y = -9$

At $y = 8$, $x = \frac{8 \pm \sqrt{32}}{2} \rightarrow$ not an integer

$\therefore$ one solution $(-1, -9)$

41. Which of the following does not have poison apparatus?

(1) Scorpion (2) Centipede (3) Spider (4) Crab

Sol. (4)

42. Which is the ruling party in Telangana?

(1) T.D.P (2) Indian National congress (3) B.J.D (4) T.R.S

Sol. (4)

43. India imports Chinese toy at Rs. 100, whereas the same toy is manufactured and available in India for Rs. 150. Now If Indian Govt. puts tax of Rs. 50 on import of the toy. This practice of Indian Govt. is known as:

(1) Export Substation (2) Trade barrier

(3) Import Substitution (4) Dumping

Sol. (3)

44. The Vapour density of an organic compound is 30. This organic compound can be:

(1) Ethanol (2) Ethanal

(3) Ethanoic acid (4) Methyl ethanotae

Sol. (3)

Molecular weight = 2 × vapour density

= 2 × 30

= 60

Molecular weight of CH_3COOH (Ethanoic Acid) = 60

45. Which of the following UT does not have its own Assembly?

(1) Delhi (2) J & K (3) Ladakh (4) Pondicherry

Sol. **(2)**

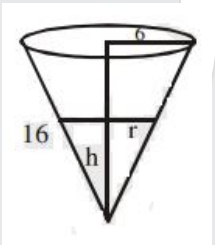
46. A conical paper cup with height 16 cm and base radius 6 cm is filled to the top with water. If 19/27 of the water is removed, then water level in the cup will drop by (in cm) :

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

Sol. **(1)**

$\frac{16}{6} = \frac{h}{r}$ .....(1)

Given: $\frac{8}{27} \times \frac{1}{3}\pi 6^2 \times 16 = \frac{1}{3}\pi r^2 \times h$



$\frac{8}{27} \times \frac{1}{3}\pi 6^2 \times 16 = \frac{1}{3}\pi r^2 \times \left(\frac{16}{6} r\right)$

$\therefore r^3 = 6^3 \times \frac{8}{27} \Rightarrow r = 4 \Rightarrow h = \frac{32}{3}$

$16 - \frac{32}{3} = \frac{48-32}{3} = 16/3$

47. Match the following states with respect to their highest literacy rate:

State	**Literacy Rate %**
A. Kerala	(i) 91.85
B. Lakswadeep	(ii) 91.33
C. Mizoram	(iii) 94.00
D. Tripura	(iv) 87.75

(1) A (ii), B (iii), C (i), D (iv) (2) A (iii), B (iv), C (i), D(ii)

(3) A (iii), B (i) C(ii), D(iv) (4) A (iv), B (iii), C(ii) , D (i)

Sol. **(3)**

48. A metal sphere is dipped in water. It at 0ºC & 4ºC the buoyancies in water are β_1 & β_2 respectively. **then**

(1) $\beta_1 > \beta_2$ (2) $\beta_2 > \beta_1$

(3) $\beta_1 > \beta_2$ (4) It depends upon radius of sphere

Sol. **(2)**

Density of water at 4° C > density of water at 0°C

$\because F = V \rho g.$

$F \alpha \rho$

$\beta_2 > \beta_1$

49. Which Indian soil is formed due to weathering of basic igneous rock?

(1) Lignite Soil (2) Alluvial soil (3) Desert Soil (4) Black Soil

Sol. (4)

50. The seasonal or periodic movement of pastoral farmer with their livestock over relatively short distances seeking fresh pastures between two areas of different climatic conditions is called as:

(1) Lay farming (2) Crop rotation (3) Trashumance (4) Ground farming

Sol. (3)

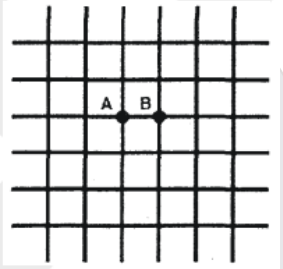
51. Who among the following coined the phrase 'Jet Stream'?

(1) H. Seilkoph (2) Wiley Post

(3) Herodotus (4) Sir Gilbert Walker

Sol. (1)

52. Consider an infinite gird with square cells. The resistance between two adjacent joints is R. Find the net resistance Rnet of the whole grid between two points A & B.



(1) R (2) R/2 (3) R/4 (4) 4R

Sol. (2)

At point A current coming from every branch = I/4

Similarly at Point B current from every branch = I/4

$V = IR_{eq} = I_0R_O$ .....(1)

$BA = I/2 - I/4 = I_4$

$AB = I/2 - I/4 = I_4$

$AB + BA = I/2$

$I_0 = I/2$

Using equation (1)

$IR_{eq} = I/2\ R_0$

$= R_{eq} = R_0/2$

53. Choose the **correct** statement :

(1) Lok Sabha and Rajya Sabha have equal power in financial bill.

(2) Lok Sabha and Rajya Sabha have equal power on oridinary bill

(3) Lok Sabha and Rajya Sabha have equal power on constitutional amendement bill.

(4) Rajya Sabha is house of general people.

Sol. (3)

54. Anything we get from the physical environment to fulfill our needs is called:

(1) Resource (2) Agriculture (3) Domestication (4) Horticulture

Sol. (1)

55. ABCD is cyclic quadrilateral in which AB = 14.4 cm, BC = 12.8 cm and CD = 9.6 cm. If AC bisects BD, then what is the length of AD?

(1) 16.4 cm (2) 13.6 cm (3) 15.8 cm (4) 19.2 cm

Sol. (4)

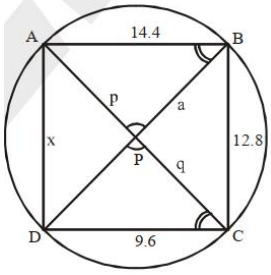
$\Delta APB \sim \Delta DPC$

$\frac{q}{a} = \frac{9.6}{14.4} = \frac{a}{p}$ .....(1)

$\therefore p = \frac{3}{2}a$ .....(2)

$\therefore q = \frac{2}{3}a$ ..... (3)

Applying Apollonius Theorem



in $\Delta ADB \Rightarrow x^2 + (14.4)^2 = 2(p^2 + a^2)$

in $\Delta ADB \Rightarrow (9.6)^2 + (12.8)^2 = 2(q^2 + a^2)$

$(9.6)^2 + (12.8)^2 = 2\left(\frac{4}{9}a^2 + a^2\right)$

$\therefore a^2 = \frac{\left[(9.6) + (12.8)^2\right]9}{2 \times 13}$

$\therefore a^2 = \frac{128 \times 9}{13}$

$\therefore x^2 + (14.4)^2 = 2\left(\frac{9}{4}a^2 + a^2\right)$

$\therefore\ x^2 = 2\times\frac{13}{4}\times\frac{128\times 9}{13} - (14.4)^2 = 368.64$

$\therefore$ x = 19.2 cm

56. Mark the **correct** reason for the following statement Karnataka has developed as an in state for the growth of silk industry:

(1) Availability of good market skilled labour and political reasons.

(2) Availability of good market, good climate and political reasons.

(3) Good climate, availability of soft water and mulberry plants.

(4) Availability of soft water, good climate and nearness to port.

Sol. (2)

57. Which atom has the smallest size?

(1) B (2) N (3) Al (4) P

Sol. (2)

Directions : (Q. 58 to 61) Read the statements and select the correct answer from the options given below.

(1) Statement – I is true
Statement – II is false.

(2) Statement – I is false
Statement – II is true.

(3) Both statement are true and statement – II provides explanation to statement –I

(4) Both statements are true but statement – II does not provide explanation of Statement - I

58. **Statement – I :** Three wars over seven years with Austria, Denmark and France ended in Prussian Victory and completed the process of unification of Germany.

Statement – II : On 18th January, 1871 new German Empire was proclaimed headed by Kaiser William I of Prussia in the Palace of Versailles.

Sol. (3)

59. **Statement – I :** On 5th May, 1789 Louis XVI called together an assembly of the Estate General to pass proposals for new taxes.

Statement – II : The members of the third estate demanded that voting now be conducted by the principle that each estate had one vote.

Sol. (3)

60. **Statement – I :** Under the shadow of the Second World War Germany had waged a genocidal war, which resulted in the mass murder of selected groups of innocent civilians of Europe.

Statement – II : Germany's conduct during the war, especially those actions which came to be called 'Crimes Against Humanity' raised serious moral and ethical question and invited world wise condemnation.

Sol. (3)

61. **Statement – I :** After the corn laws were scrapped the condition of peasants deteriorated as they were unable to compete with imports.

Statement – II : Around the world in Eastern Europe, Russia, America and Australia lands were cleared and food production expanded to meet the British demand.

Sol. **(4)**

62. On which basis, the sectors can be classified into Public and Private sector?

(1) Ownership of enterprises (2) The nature of economic activity

(3) Number of workers employed in the enterprise (4) Employment conditions

Sol. **(1)**

63. A dice is constructed so that when it is thrown each even number is twice a likely to come up as each of the odd number. What is the probability of getting 6, when it is thrown once?

(1) $\frac{1}{6}$ (2) $\frac{1}{9}$ (3) $\frac{2}{9}$ (4) $\frac{1}{3}$

Sol. P (Even) = 2 × P (Odd)

Let P(1) = P(3) = P(5) = x

Then P(2) = P(4) : P(6) = 2x

Total P (Event) = 1

P (1) + P (2) + P(3) + P(4)

+ P (5) + P (6) = 1

x + 2x + x + 2x +x +2x = 1

x = 1

x = 1/9

$\therefore$ P(6) = 2x $\Rightarrow$ 2/9

64. Which of the following type of teeths are called as tearing teeth?

(1) Incissors (2) Canines (3) Premolars (4) Molars

Sol. **(2)**

65. Which metallic mineral is famous in the Balaghat district of Madhya Pradesh?

(1) Gold (2) Iron (3) Copper (4) Zinc

Sol. **(3)**

66. Which British banned sati in India?

(1) William Bentinck (2) Lord Cornwallis (3) Lord Dalhouie (4) Lansdown

Sol. **(1)**

67. A screen bearing a real image of magnification m_1, formed by a convex lens, is moved by a distance x. The object is then moved until a new image of magnification m_2 is formed on screen. The focal length of lens is:

(1) $\frac{x}{m_2 - m_1}$ (2) $\frac{m_2 - m_1}{x}$ (3) $\frac{x}{m_1 - m_2}$ (4) $\frac{m_1 - m_2}{x}$

Sol. Magnification = $\frac{f-v}{f}$

$m_1 = \frac{f-v}{f}$

$m_2 = \frac{f-(v+x)}{f}$

$\frac{m_1}{m_2} = \frac{f-v}{(f-v)} - x$

$\frac{m_1}{m_2} = \frac{f-v-x}{f-v} \Rightarrow \frac{m_2}{m_1} = 1 - \frac{x}{f-v}$

$\frac{m_1}{m_2} = \frac{f-v-x}{f-v} \Rightarrow \frac{m_2}{m_1} = 1 - \frac{x}{f-v}$

$= \frac{x}{f-v} = 1 - \frac{m_2}{m} \Rightarrow \frac{x}{f-v} = \frac{m_1 - m_2}{m_1}$

Now $\frac{m_1}{f-v} = \frac{1}{f} = f = \frac{x}{m_1 - m_2}$

68. Match the following famous place with their respective states.

I	**II**
A. Pampa Sagar lake	(i) Tamil Nadu
B. Dibang Multipurpose project	(iii) Arunachal Pradesh
C. Umnanda Island	(iii) Karnataka
D. Anicut Canal	(iv) Guwahati

(1) A (ii), B(i), C(iii), D(iv) (2) A (iii), B(ii), C (iv), D(i)

(3) A (iii), B(iv), C(i), D(ii) (4) A(iv), B (ii), C(i), D(iii)

Sol. (2)

69. Tracheal respiration is found in :

(1) Birds (2) Reptiles (3) Mammals (4) Insects

70. If $\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} \times \sqrt{\frac{\operatorname{cosec}\theta - \cot\theta}{\operatorname{cosec}\theta + \cot\theta}} = \frac{r+1}{r+1}$ then:

(1) $\tan\theta = \sqrt{r^2 - 1}$ (2) $\cos\theta = r$

(3) $\sin\theta + \cos\theta = \frac{\sqrt{r^2+1}}{r}$ (4) $\cot\theta = \sqrt{1-r^2}$

Sol. (1)

$\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} \times \frac{1-\cos\theta}{1-\cos\theta} \times \sqrt{\frac{\operatorname{cosec}\theta - \cot\theta(\operatorname{cosec}\theta - \cot\theta)}{\cos\theta + \cot\theta(\operatorname{cosec}\theta - \cot\theta)}}$

$= \frac{r-1}{r+1}$

$$\frac{1-\cos\theta}{\sqrt{1-\cos^2\theta}}\times\frac{\operatorname{cosec}\theta-\cot\theta}{\operatorname{cosec}^2\theta-\cot^2\theta}=\frac{r-1}{r+1}$$

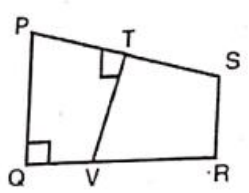
$$\frac{1\times\cos\theta}{\sin\theta}\times\frac{1-\cos\theta}{\frac{\sin\theta}{1}}=\frac{r-1}{r+1}$$

$$\frac{(1-\cos\theta)^2}{1-\cos^2\theta}\Rightarrow\frac{(1-\cos\theta)(1-\cos\theta)}{(1+\cos\theta)(1-\cos\theta)}=\frac{r-1}{r+1}$$

$$\frac{1-\cos\theta}{1+\cos\theta}=\frac{r-1}{r+1}$$

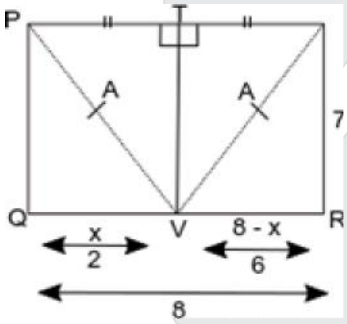
$\cos\theta=\frac{1}{r}$ and $\tan\theta=\sqrt{r^2-1}$

71. In the figure PT = TS, PQ $\perp$ QR and PQ || SR. If PQ = 9 cm, QR =8 cm and , SR = 7 cm, then what is the area (in cm^2) of quad (PTVQ) ?



(1) 22 (2) 24 (3) 25 (4) 26

Sol. (4)



ar PQRS = $\frac{1}{2}(9+7)\times 9$

= 64 cm^2

$\because$ PV = SV

$x^2 + 81 = (8-x)^2 + 49$

x = 2

ar (PVS) = 64 – (21 + 9) = 34 cm^2

A = 17 cm^2

$\therefore$ ar PQVT = 9 + 17 = 26 cm^2

72. Muscles involved in the movement of the arm are:

(1) Striated (2) Non Striated (3) Cardiac (4) Smooth

Sol. **(1)**

73. The daily wage of a person in rural area is Rs. 200 and the poverty line for a person is fixed at Rs. 800 per month for rural areas. Following table shows the detail of employment of four families living in a village. Identify the family living below poverty line:

Family	Total days of Employement *got* in a month by the family	Members of family
Ram	10	2
Radha	18	3
Raju	12	4
Pooja	25	5

(1) Pooja (2) Ram (3) Radha (4) Raju

Sol. **(2)**

74. If $x^4 - 83x^2 + 1 = 0$, then a value of $x^3 - x^{-3}$ is:

(1) 758 (2) 756 (3) 739 (4) 737

Sol. **(2)**

$x^4 - 83x^2 + 1 = 0$

dividing by x^2

$$x^2 + \frac{1}{x^2} = 83$$

$$\left(x - \frac{1}{x}\right)^2 = 81 \Rightarrow \left(x - \frac{1}{x}\right) = 9$$

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

= 9 (83 + 1)

$$x^3 - \frac{1}{x^3} = 756$$

75. Choose the **wrong** statements in the following :

(1) India has unity in diversity.

(2) India has parliamentary democracy.

(3) India is Republic

(4) India is not member of commonwealth countries

Sol. **(4)**

76. The % age of irrigated land in India is about _____ as per 2017 datas.

(1) 45% (2) 65% (3) 25% (4) 35%

Sol. **(4)**

77. Who was the author of Arthashastra?

(1) Kautilya (2) Plato (3) Aristotle (4) Mehiavelli

Sol. **(1)**

78. 'Ratoon Cropping' is gaining popularity among which of the following crop cultivators?

(1) Sugarcane (2) Millet (3) Rice (4) Wheat

Sol. **(1)**

79. Which statement out of following is **true?** Isobars have:

(1) Same protons (2) Same electrons (3) Same neutrons (4) Same nucleons

Sol. **(4)**

Isobar = Same mass number

= Same number of nucleons

80. Arrange the following in a chronological sequences:

I. Abdication of Tsar

II. Bloody Sunday

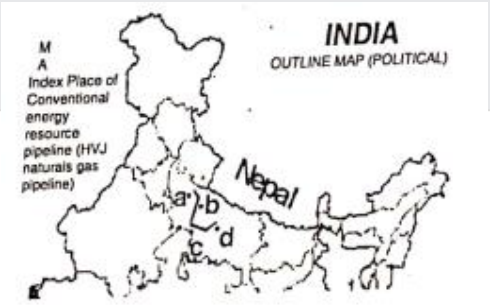
IIII. Formation of Comintern

IV. Civil War

(1) II, I, IV, III (2) III, IV, I, II (3) I, III, II, IV (4) I, IV, III, II

Sol. **(1)**

81. Observe the map given below.



Identify the correct marked points of a pipeline of conventional energy reason with a sequence:

(1) (a) Anola (b) Shahjahanapur
(c) Auraiya (b) Jagdishpur

(2) (a) Jadishpur (b) Aonla
(c) Shahjahanpur (d) Auraiya

(3) (a) Auraiya (b) Shahjahanpur
(c) Aonla (b) Jagdishpur

(4) (a) Shahijahanpur (b) Aonla

(c) Auraiya (d) Jagdishpur

Sol. (1)

82. The euqations $x^2 + rx + 64 = 0$ and $x^2 - 8x + r = 0$, where $r > 0$, have real roots. Then r satisfies the equation :

(1) $r^2 - 15r + 8 = 0$ (2) $r^2 - 14r - 30 = 0$ (3) $r^2 - 13r - 48 = 0$ (4) $r^2 - 12r - 56=0$

Sol. (3)

$x^2 + rx + 64 = 0$

$r > 0$

Equation have real roots then

$D \geq 0$

$r^2 - 4 \times 64 = 0$

$r^2 = 256$

$r = \pm 16$

$r = 16$

then r satisfies the equation – (3)

$r^2 - 13r - 48 = 0$

$(16)^2 - 13 \times 16 = 48 = 0$

$256 - 208 - 48 = 0$

$\Rightarrow 256 - 256 = 0$

$x^2 - 8x + r = 0$

$D = 0$

$(-8)^2 - 4r = 0$

$r = \frac{64}{4}$

$r = 16$

83. Radha works in an office from 9 am to 5 pm. She gets her salary regularly every month and also she gets provident found, medical and other allowances as per the rules laid down by the govt. Sunday is a paid holiday for her. She was given an appointment letter stating all the terms and conditions of work at the time of joining.

Here cousin Ram is a daily wages labourer in a cloth shop. He goes to shop at 8 am and works till 8 pm in the evening. He does not get any type of allowances apart from his wages. He is not paid for days he does not work i.e. He does not get paid holidays. Also, he did not get any appointment letter.

In which sectors, Both Radha and Ram work?

(1) Both are in organized sectors (2) Both are in unrganised sectors.

(3) Radha work in organized sector while Ram work in unorganized sector.

(4) Radha works in unorganized sector while Ram works in organized sector.

Sol. (3)

84. Select the correct set of statements regarding change in properties, as we move left to right in the second period of periodic table:

I. Atomic size decreases.

II. Valency remains same

III. Electronegativity increases.

IV. Metallic character decreases.

(1) I, II and III (2) II, III and IV (3) I, II and IV (4) I, III and IV

Sol. (4)

85. A person has a rectangular sheet of metal. He has to make cylindrical vessel whose both circular end are closed. When he minimize the wastage of the sheet, then what is the ratio of the wasted sheet to the utilised sheet? $\left(\pi = \frac{22}{7}\right)$

(1) $\frac{1}{22}$ (2) $\frac{3}{11}$ (3) $\frac{1}{11}$ (4) $\frac{5}{22}$

Sol. (3)

86. The nature of a solution obtained by dissolving soluble metal oxide in water is:

(1) Acidic (2) Neutral (3) Basic (4) Amphoteric

Sol. (3)

87. Shivasamundram fall is found on which river?

(1) Mahanadi (2) Chenab (3) Cavery (4) Krishna

Sol. (3)

88. A normal bar magnet is 6 cm long. It's north pole will be away from its mid point at a distance of:

(1) 6 cm (2) 3 cm

(3) Slightly more than 3 cm (4) Slightly less than 3 cm

Sol. (4)

89. If Samir withdraws Rs. 25,000 from his blank account by submitting a self cheque in bank for making payments and he also gave a account Payee cheque of Rs. 52,000 issued by his employer in his favour. Now what happens to the Balance in his account.

(1) Samir's bank balance will increase by Rs. 77,000

(2) Samir's bank balance will decrease by Rs. 77,000.

(3) Samir's bank balance will increase by Rs. 27,000

(4) Samir's bank balance will decrease by Rs. 27,000.

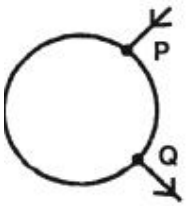
Arrange the following household is ascending order of per capita income.

Name of Household	Total Income of Household	Size of the Household
Rajat	6000	5
Raman	5000	5
Suman	3200	4
Priya	8400	6

(1) Suman > Raman > Rajat < Priya (2) Priya < Rajat < Raman < Suman

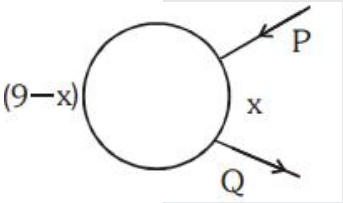
(3) Raman < Rajat < Suman < Priya (4) Suman < Rajat < Raman < Priya

91. A uniform wire of resistance 9Ω having resistance 1Ω/m is bent in the form of a circle as shown in figure. If the equivalent resistance between P & Q is 2Ω, what is the length of shorter section?



(1) 4 cm (2) 3 m (3) 6 m (4) 2m

Sol. (2)



Total Resistance $\frac{(x)(9-x)}{9} = 2$

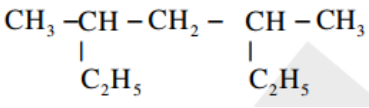
$9x - x^2 = 18$

$(x-3)(x-6) = 0$

$x = 3, x = 6$

$= x = 3$ m

92. The I.U.P.A.C. name of following compound is.



(1) 2,4,- Diethyl pantane (2) 2,4 – Diethyl butane

(3) 3,5 Diemethyl hexane (4) 3,5 – Dimethyl heptane

Sol. (4)

93. Which has maximum number of atoms?

(1) 24 g of C (12) (2) 56 g of Fe (56)

(3) 27g of Al (27) (4) 108 g of Ag (108)

Sol. (1)

(i) $\frac{24g}{12g} = 2\text{mole} \times N_A = 2N_A$ atoms

(ii) $\frac{56g}{56g} = 1$ mole × N_A = N_A atoms

(iii) $\frac{27g}{27g} = 1$ Mole × N_A = N_A atoms

(iv) $\frac{108g}{108g} = 1$ mole × N_A = N_A atoms

94. When a cell is placed in strong salt solution. It shrinks, because:

(1) Salt solution enters in cell

(2) Cytoplasm of the cell begins to decompose

(3) Water came out of the cell to develop equilibrium

(4) Water enters inside the cell to develop equilibrium.

Sol. (3)

95. Which of the following statements is **incorrect** about honey bees?

(1) Queen bee is the largest in size (2) Worker bees outnumber the others

(3) Drone keep the hive clean (4) Bees have no sense of direction.

Sol. (3)

96. A pulse crop is grown in the time interval between two cereal crops to compensate for the :

(1) Loss of phosphate (2) Loss of sulphur (3) Loss of potassium (4)Loss of nitrogen

Sol. (4)

97. When $x^{100} - 2x^{51} + 1$ is divided by $x^2 - 1$, the remainder is r(x). The value of r (–2) + r(2) is:

(1) 0 (2) 4 (3) 6 (4) 8

Sol. (2)

$x^{100} - 2x^{51} + 1$

Put $x^2 = 1$

r(x) = 1 – 2x + 1

r (x) = 1 – 2x + 1

r(x) = 2 –2x

r (–2) + r(2) = 2 –2(–2) + 2 –2(2)

$\Rightarrow$ 8 ×4 = 4

98. The coordinates of vertices A and B of a triangle ABC are (0,0) and (36,15), respectively. If the coordinates of C are integers, then what is the minimum area (in sq. units) that Δ ABC can have?

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

Sol. (2)

A (0,10)

B (36,15)

C (x , y)

Area = $\frac{1}{2}|0 + 36(y - 0) + x(0 - 15)|$

$\Rightarrow \frac{1}{2}|36y-15x|$

Area $\Rightarrow \frac{3}{2}|12y-5x|$

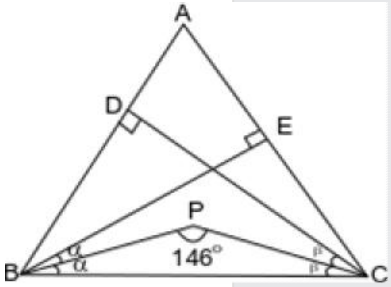
$|12y-5x|$ Min. at x = 5 y = 2

Area = 3/2

99. In Δ ABC, BE and CD are the perpendiculars on side AC and AB, respectively and intersect each other at O. The bisectors of $\angle OBC$ and $\angle OCB$ meet at P. If $\angle BPC = 146^\circ$, then what is the measure of $\angle A$?

(1) 34° (2) 68° (3) 73° (4) 36.5°

Sol. (2)



$\alpha + \beta = 180^\circ - 146^\circ$

$\Rightarrow 34^\circ$

$\angle BOC = 180^\circ - 2(\alpha+\beta)$

$\Rightarrow 180 - 68^\circ$

$\angle BOC \Rightarrow 112^\circ$

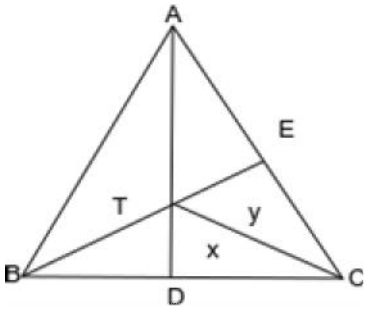
$\angle DOE = 112^\circ$

$\angle A = 180^\circ - 112^\circ$ = 68°

100. D and E are the point on sides BC and AC, respectively of ΔABC. AD and BE intersect each other at T. If AT/TD = 5 and BT/ET = 7, then CD : BD =

(1) 1 : 7 (2) 5 : 7 (3) 5 : 17 (4) 3 : 17

Sol. (4)



Let area Δ CDT = x and area Δ CTE = Y

$\frac{\text{area}\Delta ATC}{\text{area}\Delta DTC} = 5$

Area $\Delta ATE \Rightarrow 5x - y$

$$\frac{\text{area}\Delta ABT}{\text{area}\Delta ATE} = 7$$

Area $\Delta ABT = 7\,(5x - y)$

$$\frac{\text{area}\Delta BCT}{\text{area}\Delta CTE} = 7$$

Area $\Delta BTD \Rightarrow 7y - x$

Let $\frac{CD}{BD} = K$

$$\frac{\text{area}\Delta ADC}{\text{area}\Delta ABD} = K$$

$$\frac{5x - y + y + x}{7y - x + 7(5x - y)} = k$$

$$k = \frac{3}{17}$$