

FIITJEE MOCK TEST-1

For NTSE STAGE-2

Scholarship Aptitude Test (SAT)

Time:120 Minutes

Maximum Marks:100

Please read the instructions carefully.

INSTRUCTIONS

A: General :

1. Immediately fill in the particulars on this page of the Test Booklet with Blue/Black Ball point pen.
2. Use **Blue/Black Ball Point Pen only** for writing particulars on **Side-1** and **Side-2** of the Answer Sheet. **Use of pencil is strictly prohibited.**
3. Darken the appropriate bubbles with **Blue/Black Ball Point Pen** only.
4. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed.
5. The answer sheet, a machine-gradable Objective Response Sheet (ORS) is provided separately.
6. Do not Tamper/mutilate the **ORS** or this booklet.
7. No additional sheets will be provided for rough work
8. On completion of this test, the candidate must hand over the Answer Sheet to the Invigilator on duty in the Room/Hall. **However, the candidates are allowed to take away this Test Booklet with them.**

B: Questions paper format and Marking Scheme :

1. The question paper consists of 100 questions.
2. For each question you will be **awarded 1 marks** if you darken the bubble corresponding to the correct answer and zero mark if no bubbles is darkened. No Negative Mark will be awarded.

Enrollment No. :

Batch : _____

Name : _____

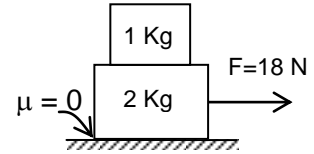
Candidate's Signature _____ Invigilator's Signature: _____

1. A particle is projected vertically upward from a point A on the ground. It takes time t_1 to reach a point B, but it still continues to move up. If it takes further t_2 time to reach the ground from point B. Then height of point B from the ground is

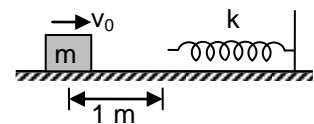
(A) $\frac{1}{2}g(t_1+t_2)^2$ (B) gt_1t_2 (C) $\frac{1}{8}g(t_1+t_2)^2$ (D) $\frac{1}{2}gt_1t_2$

2. In the figure shown, there is no relative motion between two blocks. Force of friction acting on 1kg block is

(A) Zero (B) 3 N
(C) 6 N (D) 8 N



3. A block of mass $m = 2 \text{ Kg}$ is moving with velocity v_0 towards a massless unstretched spring of force constant $k = 10 \text{ N/m}$. Coefficient of friction between the block and the ground is $\mu = \frac{1}{5}$. Find the maximum value of v_0 ,



so that after pressing the spring the block stops there permanently.

(A) 6 m/sec (B) 12 m/s
(C) 8 m/sec (D) 10 m/s

4. A simple pendulum has a time period T_1 when on the earth's surface and T_2 when taken to a height R above the earth's surface, where R is the radius of earth. The value of $\frac{T_2}{T_1}$ is

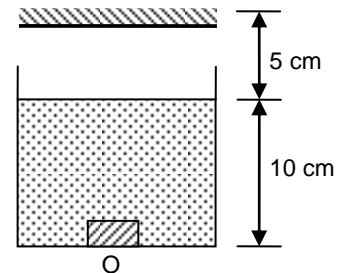
(A) 1 (B) 2 (C) 4 (D) $\sqrt{2}$

5. A solid shell loses half its weight in water. Relative density of shell is 5. What fraction of its volume is hollow?

(A) $\frac{3}{5}$ (B) $\frac{2}{5}$ (C) $\frac{1}{5}$ (D) $\frac{4}{5}$

6. Consider the situation shown in the figure. Water ($\mu = \frac{4}{3}$) is filled in a beaker upto a height of 10 cm. A plane mirror is fixed at a height of 5 cm from the surface of water. Distance of the image from the mirror after reflection from it of an object O at the bottom of the beaker is

(A) 15 cm (B) 12.5 cm
(C) 7.5 cm (D) 10 cm

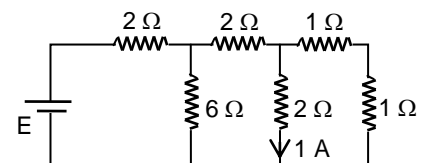


7. An object is placed in front of a concave mirror of focal length f . A virtual image is formed with a magnification of 2. To obtain a real image of same magnification, the object has to moved by a distance:

(A) f (B) $f/2$ (C) $3f/2$ (D) $2f/3$

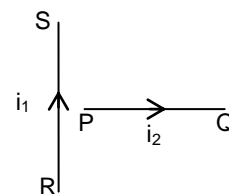
8. What is the emf of the battery shown.

(A) 12 V (B) 16 V
(C) 18 V (D) 15 V



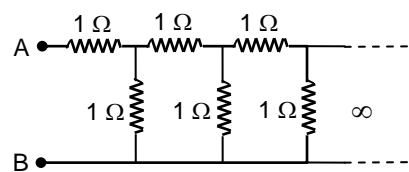
9. The magnetic field at the centre of a equilateral triangular loop of side $2L$ and carrying a current I is
- (A) $\frac{9\mu_0 i}{4\pi L}$ (B) $\frac{3\sqrt{3}\mu_0 I}{4\pi L}$ (C) $\frac{2\sqrt{3}\mu_0 I}{\pi L}$ (D) $\frac{3\mu_0 i}{4\pi L}$

10. A current carrying wire PQ is placed near an another long current carrying wire RS. If PQ is free to move then PQ will have
- (A) Translational motion only
 (B) Rotational motion only
 (C) Translational as well as rotational motion
 (D) None



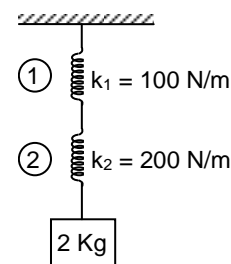
11. What is equivalent resistance of the circuit shown

- (A) $\frac{\sqrt{5}+1}{2}\Omega$ (B) $\frac{\sqrt{5}-1}{2}\Omega$
 (C) $\frac{\sqrt{3}+1}{2}\Omega$ (D) $\frac{\sqrt{3}-1}{2}\Omega$



12. Find the elongation in the spring 1 shown in figure.

- (A) 20 cm (B) 10 cm
 (C) 5 cm (D) 12 cm



13. A proton and an α – particle moving with equal kinetic energies enter perpendicularly into a magnetic field. If

r_p and r_α are the radius of circular path of proton and α – particle. Find $\frac{r_p}{r_\alpha}$.

- (A) 2 (B) 3 (C) 1 (D) 1.5

14. A compound contains atoms A, B, C, The oxidation number of A is +2, B is - 1 and C is +3. The possible formula of the compound is

- (A) $A_2B_2C_3$ (B) A_3BC_2 (C) A_2B_7C (D) A_2BC_7

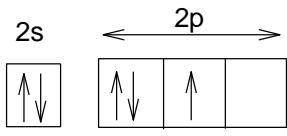


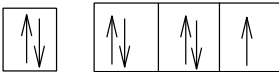
15. Which of the following is a colloidal solution?

- (A) Starch solution (B) Copper sulphate solution
 (C) Chalk powder in water (D) Kerosene oil and water

16. Match the following:

Column I	Column II	Column III
1. Components can be separated by magnet	(i) Suspension	(a) Colloidal solution
2. It can be separated by filtration	(ii) Dust particles in air	(b) Heterogeneous
3. It shows Tyndall effect	(iii) Separating funnel	(c) One of the component is soluble in carbon disulphide
4. Mixture of kerosene oil and water	(iv) Mixture of iron fillings and sulphur powder	(d) Immiscible liquids

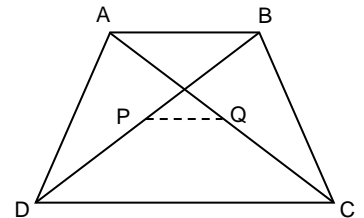
- (A) 1-(iv)-(a), 2-(v)-(c), 3-(ii)-(b); 4-(i)-(d) (B) 1-(iv)-(c), 2-(i)-(b), 3-(ii)-(a); 4-(iii)-(d)
 (C) 1-(i)-(b), 2-(iv)-(c), 3-(iii)-(d); 4-(ii)-(a) (D) 1-(iv)-(c), 2-(i)-(b), 3-(i)-(d); 4-(iii)-(a)

17. Which of the following is three dimensional polymer?
 (A) Nylon (B) PVC (C) Bakelite (D) Teflon
18. Which of the following contains the greatest No. of oxygen atoms?
 (A) 1 gm O (B) 1 gm O₂
 (C) 1 gm O₃ (D) all have the same No. of atoms.
19. What is the term olfactory indicator indicates?
 (A) Indicators giving different colours in acidic and basic medium
 (B) Indicators giving different odours in acidic and basic medium
 (C) Indicators showing acidic nature of the substance.
 (D) Indicators showing basic nature of the substance.
20. At room temperature what is the order of reactivity of metals with acidic solution?
 (A) Zn > Fe > Mg > Cu (B) Fe > Zn > Cu > Mg
 (C) Mg > Zn > Fe > Cu (D) Mg > Zn > Cu > Fe
21. Calculate the pH of a solution obtained by dissolving 0.01 mole of hydrochloric acid in 1 litre of the solution?
 (A) 2 (B) 1 (C) 9 (D) 3
22. "The position and the velocity of a small particle like electron cannot be simultaneously determined." This statement is:
 (A) The Heisenberg uncertainty principle
 (B) Pauli's exclusion principle
 (C) Aufbaus's principle
 (D) de Broglie's wave nature of the electron
23. Which of the following sets of quantum numbers is correct for an electron in 4f – orbital?
 (A) $n = 4, l = 3, m_l = +4, m_s = +1/2$ (B) $n = 4, l = 4, m_l = -4, m_s = -1/2$
 (C) $n = 4, l = 3, m_l = +1, m_s = +1/2$ (D) $n = 3, l = 2, m_l = -2, m_s = +1/2$
24. The orbital diagram in which 'Aufbau principle' is violated, is:
 (A)  (B) 
- (C)  (D) 
25. The formula of chlorapatite is
 (A) $KCl.MgCl_2.6H_2O$ (B) $Ca_3(PO_4)_2.CaCl_2$
 (C) $CaSO_4.2H_2O$ (D) $AgCl$
26. Red phosphorus exists in the form of
 (A) Chains of tetrahedral P₄ units. (B) Isolated tetrahedral P₄ units.
 (C) Chains of tetrahedral P₅ units. (D) Isolated tetrahedral units of P₅ units.
27. Which of the following is an endangered animal
 (A) Hanuman monkey (B) Langur (C) Antelope (D) Lion tailed macaque
28. Lichens are ecologically important as they have
 (A) ability to tolerate extreme xeric conditions and grow on rocks
 (B) ability to absorb pollutants
 (C) association of algae and fungi
 (D) association with mycorrhiza

29. The internal buds of fresh water sponges are otherwise called
(A) choanocyte (B) gemmule (C) osculum (D) blastula
30. The formation of erythrocytes in foetus takes place in
(A) liver and spleen (B) red bone marrow (C) blood plasma (D) sarcoplasm
31. Phospholipids are
(A) Amphipathic (B) Amphibolic (C) Hydrophobic (D) Hydrophilic
32. Which is true according to Chargaff's rule?
(A) $A + G = T + C$ (B) $A = C$ (C) $G = T$ (D) $\frac{A+T}{C+G} = 1$.
33. Meiosis II is meant for
(A) separation of chromatids (B) separation of homologous chromosomes
(C) separation of sex chromosomes (D) synthesis of DNA
34. In photosynthesis photolysis of water is used in
(A) reduction of $NADP^+$ (B) oxidation of $NADP$ (C) oxidation of FAD (D) None of these
35. At the end of citric acid cycle, most of the energy is transferred to
(A) Oxaloacetic acid (B) $NADH+H^+$ and $FADH_2$
(C) ATP (D) Citric acid
36. Plant hormone causing abscission of leaves, senescence and inhibition of cell division is
(A) IAA (B) Ethylene (C) Cytokinins (D) ABA
37. On germination each pollen grain produces
(A) One male gamete (B) Two male gametes
(C) Three male gametes (D) Four male gametes.
38. Subdural space is between
(A) Piamater and arachnoid (B) Arachnoid and duramater
(C) Piamater and grey matter (D) Grey matter and white matter.
39. Callus is
(A) Material that heals injury in phloem (B) Undifferentiated mass of cells
(C) Tissue developed in the region of wound (D) All the above
40. Pyramid of numbers in a forest ecosystem is
(A) upright (B) inverted (C) irregular (D) linear
41. Sarah reads $\frac{2}{5}$ th of a book on the first day. She reads $\frac{1}{3}$ rd more on second day than she reads on the first day. If 15 pages were left for the third day, the numbers of pages in the book are
(A) 100 (B) 105 (C) 225 (D) 250
42. Simplify: $\frac{\sqrt{4-\sqrt{7}}}{\sqrt{8+3\sqrt{7}}-2\sqrt{2}}$
(A) 1 (B) 2 (C) -2 (D) 3
43. If $a^2 + b^2 + 4c^2 = 2(a+b-2c) - 3$ and a, b, c are real such that $(a^{999} + b^{999} + c^2) = k + \frac{1}{4}$, then $k^2 = ?$
(A) 1 (B) 4 (C) 256 (D) cannot be determined

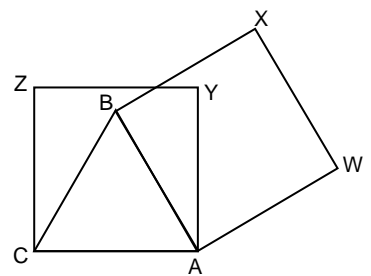
44. If P is a point inside a rectangle ABCD, then
 (A) $AP^2 + PC^2 = BP^2 + PD^2$ (B) $AP^2 + PB^2 = PC^2 + PD^2$
 (C) $AP + PC = BP + PD$ (D) $AP \times PC = BP \times PD$
45. The sum of all angles except one of the convex polygon is 2190° , then the number of sides of the polygon are:
 (A) 19 (B) 17 (C) 15 (D) 13
46. In a $\triangle ABC$, AD, BE and CF are medians intersecting each other at point G such that $AG = BC$, then $\angle BGC = ?$
 (A) 95° (B) 60° (C) 80° (D) 90°
47. In a rectangle ABCD points X and Y are mid-points of AD and DC, respectively. Lines BX and CD when extended intersect at E, lines BY and AD when extended intersect at F. If the area of ABCD is 60 sq. units, then area of $\triangle BEF$ is
 (A) 120 sq. units (B) 90 sq. units (C) 60 sq. units (D) 80 sq. units

48. In the figure, ABCD is a trapezium such that $AB \parallel DC$. P and Q are mid-points of diagonals BD and AC respectively. If $AB = 5$ cm, $DC = 11$ cm, then $PQ = ?$
 (A) 1 cm (B) 2 cm
 (C) 4 cm (D) 3 cm



49. The sum of the digits in $(10^{2n^2+5n+1} + 1)^2$, where n is a positive integer, is
 (A) 4 (B) 6n (C) $6 + n$ (D) $24n$
50. A polynomial $f(x)$ has a property that $3f(x) + 7f\left(\frac{2016}{x}\right) = 2x$. The value of $f(8)$ is
 (A) 79 (B) 67 (C) 91 (D) 87

51. In the given figure, $\triangle ABC$ is equilateral triangle and $\square AWXB$ and $\square AYZC$ are two squares. The value of $\frac{1}{10}(\angle ZXA)$ is



- (A) 3
 (B) 4.5
 (C) 6
 (D) 9

52. What should be value of p if $3x + 2y = 8$ and $6x + 4y = p$ have infinitely many solutions?
 (A) 3 (B) 16 (C) 5 (D) 6
53. The equation whose roots are the squares of the roots of the equation $x^2 - x + 1 = 0$ is
 (A) $x^2 + x + 1 = 0$ (B) $x^2 - x + 1 = 0$ (C) $x^2 - x - 1 = 0$ (D) $x^2 + x - 1 = 0$
54. Find the sum of the series up to 90 terms:
 $1 + 2 + 3 + 3 + 4 + 6 + 5 + 6 + 9 + \dots$
 (A) 1613 (B) 3225 (C) 6450 (D) 9675
55. A circle and a square have same area. If C denotes the circumference of circle and P denotes the perimeter of square, then
 (A) $P = C$ (B) $P = 2C$ (C) $P < C$ (D) $P > C$

56. How many spherical bullets can be made out of a solid cube of lead whose edge measures 44 cm, if each bullet has radius 2 cm?
(A) 1779 (B) 2332 (C) 2541 (D) 3000
57. If (a, b) , (c, d) and $(a - c, b - d)$ are collinear, then
(A) $\frac{a}{b} = \frac{c}{d}$ (B) $\frac{a}{d} = \frac{d}{b}$ (C) $\frac{a}{c} = \frac{d}{b}$ (D) $\frac{a}{b} = \frac{b}{c}$
58. A purse contains 4 copper coins, 3 silver coins, second purse contains 6 copper coins and 2 silver coins. A coin is taken out of any purse, then the probability that it is a copper coin is:
(A) $\frac{4}{7}$ (B) $\frac{3}{4}$ (C) $\frac{3}{7}$ (D) $\frac{37}{56}$
59. Two circles of unit radius touch each other and each of them touches internally a circle of radius two. Find the radius of the circle which touches all the three circles.
(A) $\frac{2}{3}$ (B) $\frac{1}{3}$ (C) 4.5 (D) None of these
60. If $\tan 11x = \tan 34^\circ$, $\tan 19x = \tan 21^\circ$, then value of $\tan 5x$ is
(A) $\sqrt{3}$ (B) $-\sqrt{3}$ (C) 1 (D) None of these
61. The tropic of cancer does not pass through:
(A) Rajasthan (B) Orissa (C) Chhattisgarh (D) Tripura
62. When was the Suez Canal opened?
(A) 1861 (B) 1868 (C) 1870 (D) 1869
63. In which of the following states is the Sambhar Lake situated?
(A) Rajasthan (B) Uttar Pradesh (C) Bihar (D) Jammu and Kashmir
64. Which of the following is the highest peak in Western Ghat?
(A) Mahendragiri (B) Shevory Hills (C) Javadi Hills (D) Anai Mudi
65. Winter rainfall over northern plain is locally known
(A) Kaal Baishkhi (B) Mahawat (C) Chakrawat (D) None of these
66. In which one of the following years was the Wildlife Protection Act implemented in India?
(A) 1990 (B) 1981 (C) 1970 (D) 1972
67. In which one of the following years was the first census conducted in India?
(A) 1881 (B) 1872 (C) 1879 (D) 1870
68. Which of the following is not example of a biotic resource?
(A) Aquatic animals (B) Rocks (C) Fisheries (D) Wood
69. Iron ore mine at Mayurbhanj is an example of
(A) Exhaustible resource (B) Developed resource
(C) National resource (D) All of these
70. How much percentage of plains is there in India?
(A) 41% (B) 45% (C) 43% (D) 47%
71. In which year the Indian Wildlife (Protection) Act was implemented?
(A) 1972 (B) 1962 (C) 1982 (D) 1992

72. Periyar Tiger Reserve is situated in which state of India?
(A) Jammu & Kashmir (B) Kerala (C) Tamil Nadu (D) Madhya Pradesh
73. Sardar Sarovar Dam is constructed on
(A) River Krishna (B) River Mahanadi (C) River Cauvery (D) River Narmada
74. Name any one source of surface water.
(A) Ponds (B) Glaciers (C) Sea Waves (D) Rain Water
75. Which one of the following is a leguminous crop?
(A) Pulses (B) Millets (C) Jowar (D) Sesamum
76. Who devised Spinning Jenny?
(A) James Hargreaves (B) James Watt (C) Richard Arkwright (D) Samuel Luke
77. The first Asian country to be industrialized was
(A) Japan (B) India (C) China (D) Afghanistan
78. Most of indentured labourers in Africa came from
(A) Bihar (B) Central India
(C) Eastern Uttar Pradesh (D) All of these
79. In which year did the great Depression start?
(A) 1929 (B) 1981 (C) 1936 (D) 1928
80. "Edo" was the earlier name of which of the following places?
(A) Shanghai (B) Tokyo (C) Seoul (D) Hong Kong
81. The earliest Indian novels were in which language?
(A) Punjabi (B) Urdu (C) Marathi (D) Telgu
82. Penny magazine was meant only for
(A) old people (B) poor people (C) women (D) children
83. Which one is the novel of Henry fielding?
(A) Tom Jones (B) Pamela (C) Germinal (D) Ramona
84. Bombay at first was under the control of
(A) Portuguese (B) English (C) French (D) Dutch
85. Storming of the Bastille took place on
(A) 14th July, 1789 (B) 14th July 1798 (C) 14th June 1789 (D) 14th June 1798
86. Which of the following believed social position must depend on merit?
(A) Middle class (B) Nobility (C) Workers (D) Peasants
87. Who started "Collectivisation Programme" in Russia?
(A) Lenin (B) Karl Marx (C) Rasputin (D) Stalin
88. The comintern was formed in
(A) 1917 (B) 1918 (C) 1919 (D) 1920
89. The German Parliament was known as
(A) National Parliament (B) German Legislature (C) Reichstag (D) Estates General
90. Nazi killing operations came to be known as
(A) Deadly operation (B) Holocaust (C) Mass Execution (D) Final solution
91. Which one of the following countries was the first to grant universal suffrage?
(A) Russia (B) Germany (C) New Zealand (D) The Netherlands
92. United Nations was established on

- (A) 24th October 1945 (B) 20th October 1946 (C) 20th October 1947 (D) 1st January 1950
93. How many members countries are there in security council of UN?
(A) 25 (B) 20 (C) 15 (D) 10
94. In which part of Belgium, the German speaking people live?
(A) Northern (B) Southern (C) Eastern (D) Central
95. Where is the parliament of European Union?
(A) Belgium (B) Britain (C) Germany (D) France
96. Which state had the least per capita income in 2011-12?
(A) Bihar (B) Rajasthan (C) Kerala (D) Delhi
97. Human Development Report is published by the
(A) UNDP (B) UNHAR (C) UNICEF (D) UNESCO
98. The sector which has grown the most over last 30 years is
(A) Primary sector (B) Secondary sector (C) Tertiary sector (D) Public sector
99. Which is the most important factor of production?
(A) Land (B) Labour (C) Human capital (D) Physical capital
100. Which of the following is not a factor of production?
(A) Land (B) Labour (C) Capital (D) Trading

FIITJEE MOCK TEST-1

For **NTSE STAGE-2**

Scholarship Aptitude Test (SAT)

ANSWERS

1. D	2. C	3. D	4. B
5. A	6. B	7. A	8. A
9. A	10. C	11. A	12. B
13. C	14. C	15. A	16. B
17. C	18. D	19. B	20. C
21. A	22. A	23. C	24. B
25. B	26. A	27. D	28. A
29. B	30. A	31. A	32. A
33. A	34. A	35. B	36. D
37. B	38. B	39. D	40. A
41. C	42. A	43. B	44. A
45. C	46. D	47. B	48. D
49. A	50. D	51. C	52. B
53. A	54. B	55. D	56. C
57. A	58. D	59. A	60. B
61. B	62. D	63. A	64. D
65. B	66. D	67. B	68. B
69. D	70. C	71. A	72. B
73. D	74. A	75. A	76. A
77. A	78. D	79. A	80. B
81. C	82. C	83. A	84. A
85. A	86. A	87. D	88. C
89. C	90. B	91. C	92. A
93. C	94. C	95. A	96. A
97. A	98. C	99. C	100. D

1. D

Sol. Time taken to reach the highest point is $\frac{t_1 + t_2}{2}$

$$u = g \left(\frac{t_1 + t_2}{2} \right)$$

$$h = ut_1 - \frac{1}{2}gt_1^2$$

solving $h = \frac{1}{2}gt_1t_2$

2. C

Sol. $a = \frac{18}{3}$

$$a = 6 \text{ m/sec}^2$$

Force of friction = $1 \times 6 = 6 \text{ N}$

3. D

Sol. Block stops if $kx = \mu mg$

$$x = 4 \text{ m}$$

WET

$$0 - \frac{1}{2}mv_0^2 = -\frac{1}{2}kx^2 - \mu mg(1+x)$$

Solving $v_0 = 10 \text{ m/sec.}$

4. B

Sol. $T \propto \frac{1}{\sqrt{g}}$

$$\frac{T_2}{T_1} = \sqrt{\frac{g_1}{g_2}}$$

5. A

Sol. Let x fraction of its volume is empty

$$\text{weight of shell} = (V - xV) \times 5 \times 1000 \times g$$

$$\text{Bouncy} = V \times 1000 \times g$$

Water displaced = loss in weight

$$V \times 1000 \times g = \frac{1}{2}(V - xV) \times 5000 \times g$$

$$x = \frac{3}{5}$$

6. B

Sol. Image distance = $\frac{10}{4} + 5 = 12.5 \text{ cm}$

7. A

Sol. In the first case. Let x be the distance of object from the mirror. Then

$$u = -x$$

$$v = +2x$$

$$f = -f$$

Using $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

Or $\frac{1}{2x} - \frac{1}{x} = -\frac{1}{f}$

Or $x = \frac{f}{2}$

In the second case, let y be the distance of the object from the mirror. Then

$u = -y, v = -2y$ and $f = -f$

So $\frac{1}{-2y} - \frac{1}{y} = -\frac{1}{f}$

$\therefore y = \frac{3}{2}f$

So, object will have to be moved by a distance of $y - x$ of f .

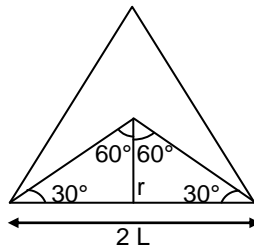
8. A

Sol. Req. = 4Ω

E = 12 V

9. A

Sol. $B = 3 \left[\frac{\mu_0 i}{4\pi r} (\sin 60^\circ + \sin 60^\circ) \right]$
 $= \frac{9\mu_0 i}{4\pi L}$



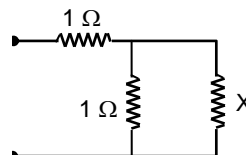
10. C

Sol. Conceptual

11. A

Sol. $X = 1 + \frac{x}{1+x}$

Solving $x = \frac{1 \pm \sqrt{5}}{2} \Omega \Rightarrow x = \frac{\sqrt{5} + 1}{2}$



12. B

Sol. $k_1 x_1 = k_2 x_2$

$x_1 = 2x_2$

$k_1 x_1 + k_2 x_2 = 20$

$x_1 + 2x_2 = \frac{20}{100}$

$x_1 + 2 \cdot \frac{x_1}{2} = \frac{20}{100}$

$2x_1 = \frac{20}{100}$

$x_1 = 10 \text{ cm}$

13. C

Sol. $r = \frac{\sqrt{2mk}}{q_B}$

$$\frac{r_p}{r_\alpha} = \frac{q_\alpha}{q_p} \sqrt{\frac{m_p}{m_\alpha}} = 2\sqrt{\frac{1}{4}} = 1$$

14. C

Sol. A_2B_7C

$$(+2) \times 2 + (-1) \times 7 + (+3) = 0$$

15. A

Sol. Starch solution is a colloidal solution.

16. B

Sol.

- Fe & S can be separated by magnet and S dissolves in CS_2
- Suspensions are homogeneous and can be separated by filtration
- Tyndall effect is a property of colloids
- Kerosene oil and water are immiscible liquids

17. C

Sol. Bakelite is a 3-D cross-linked polymer.

18. D

$$\text{Sol. } 1 \text{ gm } O = \frac{1}{1} \times 6.023 \times 10^{23} \text{ atoms}$$

$$1 \text{ gm } O_2 = \frac{1}{32} \times 6.023 \times 10^{23} \times 2 \text{ atoms}$$

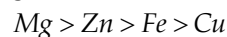
$$1 \text{ gm } O_3 = \frac{1}{48} \times 6.023 \times 10^{23} \times 3 \text{ atoms}$$

All are same

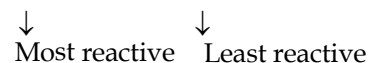
19. B

Sol. Olfactory indicator detect on the basis of smell.

20. C



Sol.



21. A

$$\text{Sol. } [H^+] = \frac{\text{Number of moles}}{\text{Volume (in L)}}$$

$$pH = -\log[H^+] = -\log(10^{-2}) = 2$$

22. A

Sol. The Heisenberg uncertainty principle states that the position and the velocity of a small particle like electron cannot be simultaneously determined with hundred percentage accuracy.

23. C

Sol. For 4f

$$n = 4, l = 3, m_l = -3 \dots 0 \dots +3 \quad m_s = +1/2$$

24. B

Sol. Lower energy sub-shells are filled first.

25. B

Sol. Apatite is a group of phosphate minerals. Chlorapatite is an ore of Ca.

26. A

Sol. Red P is polymeric and consists of chains of P_4 tetrahedra linked together.

27. D

Sol. Lion tailed macaque is an endangered animal. It is an old world monkey endemic to the western ghats of south India.

28. A

Sol. Lichens are said to be the pioneers in establishing vegetation on bare rocky areas (Lithosere).

29. B

Sol. Gemmules are internal buds found in sponges and are involved in asexual reproduction.

30. A
Sol. In foetus, erythropoiesis takes place in the mesodermal cells of the yolk sac, liver and spleen.
31. A
Sol. All of the lipid molecules in cell membranes are amphipathic, they have a hydrophilic or polar end and a hydrophobic or nonpolar end.
32. A
Sol. Chargaff's rules state that DNA from any cell of all organisms should have a 1 : 1 ratio of pyrimidine and purine bases.
33. A
Sol. Separation of sister chromatids occurs in meiosis II and mitosis.
34. A
Sol. In light reaction, light absorbed by chlorophyll derives a transfer of electrons and hydrogen from water to an acceptor called NADP⁺.
35. B
Sol. Most of the energy made available by the oxidative steps of the cycle is transferred as energy-rich electrons to NAD⁺ and FAD to form NADH+H⁺ and FADH₂ respectively.
36. D
Sol. ABA functions in many plant developmental processes, including bud dormancy and can be involved in stress responses.
37. B
Sol. The male gametes of angiosperms consists of two sperm cells within a pollen grain or a pollen tube.
38. B
Sol. It is a potential space between the arachnoid and the dura mater.
39. D
Sol. The callus is the protective tissue, consisting of parenchyma cells that develops over a cut or damaged plant surface.
40. A
Sol. Pyramid of numbers base on herbs is upright but for trees it is spindle-shaped.
41. C
Sol. $\frac{2}{5}x + \left(\frac{2}{5}x + \frac{2}{5} \cdot \frac{x}{3}\right) + 15 = x$
 $x = 225$
42. A
Sol.
$$\frac{\sqrt{4-\sqrt{7}}}{\sqrt{8+3\sqrt{7}-2\sqrt{2}}} = \frac{\sqrt{\frac{8-2\sqrt{7}}{2}}}{\sqrt{\frac{16+2 \times 3\sqrt{7}}{2}-2\sqrt{2}}}$$
$$= \frac{\sqrt{\frac{(\sqrt{7}-1)^2}{2}}}{\sqrt{\frac{(3+\sqrt{7})^2}{2}-2\sqrt{2}}} = \frac{\frac{\sqrt{7}-1}{\sqrt{2}}}{\frac{3+\sqrt{7}-4}{\sqrt{2}}} = \frac{\sqrt{7}-1}{\sqrt{7}-1} = 1$$
43. B
Sol. $a^2 + b^2 + 4c^2 = 2(a+b-2c) - 3$
 $(a^2 - 2a + 1) + (b^2 - 2b + 1) + (4c^2 + 4c + 1) = 0$
 $(a-1)^2 + (b-1)^2 + (2c+1)^2 = 0$

$$\Rightarrow a=1, b=1, c=-\frac{1}{2}$$

$$a^{999} + b^{999} + c^2 = k + \frac{1}{4}$$

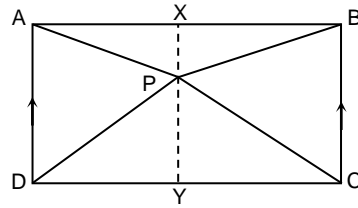
$$\Rightarrow 2 + \frac{1}{4} = k + \frac{1}{4}$$

$$\Rightarrow k=2$$

$$\Rightarrow k^2 = 4$$

44. A

Sol. $PA^2 = PX^2 + AX^2$
 $PB^2 = PX^2 + XB^2$
 $PC^2 = PY^2 + YC^2$
 $PD^2 = PY^2 + DY^2$
 From above equations
 $PA^2 + PC^2 = PB^2 + PD^2$



45. C

Sol. $(n-2)180^\circ = 2190 + x$

$$\Rightarrow n = \frac{2550 + x}{180}$$

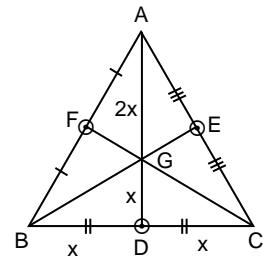
By hit and trial,

$$x=150$$

$$\Rightarrow n=15$$

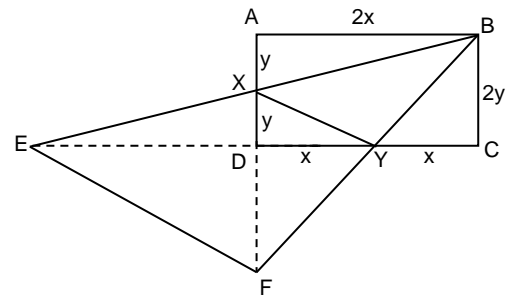
46. D

Sol. $AG = BC = 2x$
 $\frac{AG}{GD} = \frac{2}{1}$
 $\Rightarrow GD = x$
 $\therefore \triangle BDG$ is isosceles
 $\angle DBG = \angle DGB = \alpha$
 $\Rightarrow \angle BDG = 180 - 2\alpha$
 $\therefore \angle GDC = 2\alpha$
 But $\triangle GDC$ is also isosceles
 $\therefore \angle DGC + \angle DCG + \angle GDC = 180$
 $\Rightarrow \angle DGC = 90 - \alpha$
 $\therefore \angle BGC = 90 - \alpha + \alpha = 90^\circ$



47. B

Sol. $2x \cdot 2y = 60$
 $xy = 15$
 $[ABX] = 15; [BYC] = 15; [XDY] = 7.5$
 $[XDE] = 15; [FDY] = 15; [FDE] = 30$
 $\therefore [BEF] = 90$



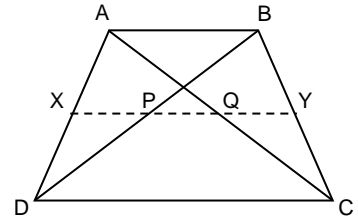
48. D

Sol. Extend QP to X at AD and PQ to Y at BC.

From $\triangle DAB$, $PX = \frac{1}{2} AB = 2.5$

From $\triangle ADC$, $XQ = \frac{1}{2} CD = 5.5$

$PQ = QX - PX = 5.5 - 2.5 = 3 \text{ cm}$



49. A

Sol. $(10^{2n^2+5n+1} + 1)^2 = (10^{2n^2+5n+1})^2 + (1)^2 + 2(1)(10^{2n^2+5n+1})$

\therefore Sum of digits = $1 + 1 + 2 = 4$

50. D

Sol. $3f(x) + 7f\left(\frac{2016}{x}\right) = 2x \dots(i)$

Put $x = \frac{2016}{x}$

$\therefore 3f\left(\frac{2016}{x}\right) + 7f(x) = 2 \times \frac{2016}{x} \dots(ii)$

From (i) and (ii)

$$f(x) = \frac{1}{40} \left[\frac{28224}{x} - 6x \right]$$

$f(8) = 87$

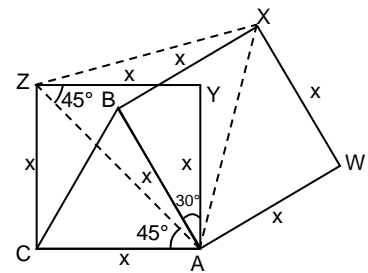
51. C

Sol. From figure,

$\angle BAZ = \angle YAX = 15^\circ$

$\therefore \triangle AZX$ is equilateral triangle

$\therefore \angle ZXA = 60^\circ$



52. B

Sol. $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ should be true to have infinitely many solutions.

$\therefore p = 16$

53. A

Sol. Given equation $x^2 - x + 1 = 0$

$\alpha + \beta = 1; \alpha\beta = 1$

$\therefore \alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta = 1 - 2 = -1$

And $\alpha^2\beta^2 = (\alpha\beta)^2 = 1$

\therefore Required equation is

$$x^2 - (-1)x + 1 = 0$$

$$x^2 + x + 1 = 0$$

54. B

Sol. $(1 + 2 + 3) + (3 + 4 + 6) + (5 + 6 + 9) + \dots$

$\Rightarrow 6 + 13 + 20 + \dots$ (30 terms)

Here, $d = 7; a = 6; n = 30$

55. D

Sol. As per observation.

56. C

Sol. Volume of cube = $n \times$ volume of spherical bullet.

57. A

Sol. If points to be collinear,

$$|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)| = 0$$

58. D

Sol. $P(\text{Copper coin}) = \frac{1}{2} \cdot \frac{4}{7} + \frac{1}{2} \cdot \frac{6}{8} = \frac{37}{56}$

59. A

Sol. $C_1 C_3 = C_2 C_3 = 1$

$$C_3 X = 2$$

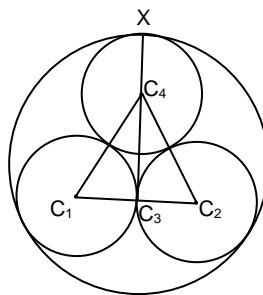
$$C_4 X = r$$

In $\Delta C_3 C_1 C_4$,

$$(C_1 C_4)^2 = (C_4 C_3)^2 + (C_1 C_3)^2$$

$$(1+r)^2 = (2-r)^2 + (1)^2$$

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



60. B

Sol. $\tan 5x = \tan [2(19x) - 3(11x)] = \tan [2(21) - 3(34)] = \tan (42 - 102) = \tan (-60) = -\sqrt{3}$

61. B

Sol. The tropic of cancer does not pass through Orissa.

62. D

Sol. Suez Canal opened in 1869.

63. A

Sol. Sambhar Lake situated in Rajasthan.

64. D

Sol. Anai Mudi is the highest peak in Western Ghat.

65. B

Sol. Winter rainfall over northern plain is locally known as Mahawat.

66. D

Sol. In 1972 the Wildlife Protection Act implemented in India/

67. B

Sol. In 1872 the first census conducted in India.

68. B

Sol. Rocks is not example of a biotic resource.

69. D

Sol. Iron ore mine at Mayurbhanj is an example of all of these.

70. C

Sol. Plains is there in India is 43%.

71. A

Sol. In year 1972 the Indian Wildlife Act was implemented.

72. B

Sol. Periyar Tiger Reserve is situated in Kerala.

73. D

Sol. Sardar Sarovar Dam is constructed on River Narmada.

74. A

- Sol. Ponds are one source of Surface Water.
75. A
Sol. Pulses is leguminous crop.
76. A
Sol. James Hargreaves devised spinning Jenny.
77. A
Sol. The first Asian country was Japan to be industrialized.
78. D
Sol. Most of indentured labourers in Africa came from all of these.
79. A
Sol. In 1929 the great depression start.
80. B
Sol. "Edo" was the earlier name of Tokyo.
81. C
Sol. The earliest Indian novels were in Marathi language.
82. C
Sol. Penny magazine was meant only for women.
83. A
Sol. Tom Jones is the novel of Henry fielding.
84. A
Sol. Bombay at first was under the control of Protuguese.
85. A
Sol. Storming of the Bastille took place on 14th July, 1789.
86. A
Sol. Middle class believed that social position must depend on merit.
87. D
Sol. Stalin started collectivisation programme in Russia.
88. C
Sol. The comintern was formed in 1919.

89. C
Sol. The German Parliament was known as Reichstag.
90. B
Sol. Nazi killing operations came to be known as Holocaust.
91. C
Sol. New Zealand was the first the grant universal suffrage.
92. A
Sol. United Nations was established on 24th October 1945.

93. C
Sol. 15 members countries are there in security council of UN.
94. C
Sol. Eastern part of Belgium where German speaking people live.
95. A
Sol. Parliament of European Union is in Belgium.
96. A
Sol. Bihar had the least per capita income in 2011-12.

97. A
Sol. Human Development Report is published by the UNDP.
98. C
Sol. Tertiary sector has grown the most over last 30 years.

99. C
Sol. Human capital is the most important factor of production.
100. D
Sol. Trading is not a factor of production.