NTSE STAGE 2, 2021
Conducted on 24 October, 2021
FIITJEE ANSWER KEYS and SOLUTIONS
(SCHOLASTIC APTITUDE TEST)

1. The plasma membrane (pm) forms the boundary of lung cells.
Which of the following statements is true for the pm?
A. pm is a semipermeable membrane
B. Water moves across the pm by Osmosis.
C. O_2 and CO_2 can cross the pm by diffusion.
D. Na+ and K+ ions can pass the pm by diffusion.
1. A, B, C & D
2. A, B & D
3. B, C & D only
4. A, B & C only

2. Eukaryotic cells contain several membrane bound subcellular structures called Organelles. The vacuole is one such organelle found in both animal and plant cells.
Which of the following statement are true for vacuoles?
A. Contain cell sap.
B. Provide turgidity to the plant cell.
C. Plant cell vacuoles are smaller than animals cell vacuoles.
D. Vacuoles store amino acids, sugar, acids and contain protein.
1. A, B, C & D
2. A, B & C only
3. A, B & D
4. B, C & D only

3. What is the reason for the Cardiac muscles not getting fatigued?
1. Presence of Single nucleus in cells of Cardiac muscles
2. Cylindrical cells protect the cardiac muscles from wear and tear
3. Because of branching in the cells
4. Presence of large number of mitochondria

4. Grafting is possible among dicot plants but not in monocot plants. This is due to presence of one of the following conditions in dicot plant.
1. Presence of open vascular bundles
2. Presence of chollenchyma tissues
3. Presence of intercalary meristem
4. Larger diameter of stem

5. Parenchyma, collenchymas and sclerenchyma are kinds of simple permanent tissues in plants. Which of the following statement is true for collenchymas?
A. Made up of dead cells.
B. Have very little interecellular space
C. Cells are irregularly thickened at the corners
D. Cell wall contains lignin
1. A, B, C & D
2. B & C only
3. A, B & C only
4. B, C & D only

6. Trees of the genus *Pinus* are placed in higher groups compared to those of *Marsilea* genus because of the presence of one of the following features.
1. Differentiated plant body
2. Presence of seed
3. Presence of conducting tissue
4. Presence of flowers

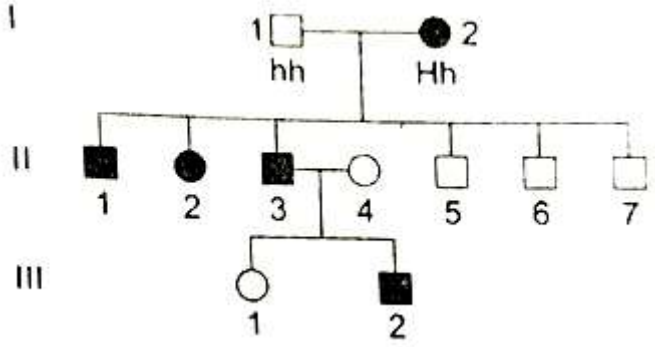
7. Earth has vast diversity of animals. Each animals is unique in it-self and possesses certain distinguishing features. Match the animals listed in column A with their characteristic featurs given in column B and column C and identify the correct match.

Column 'A'	Column 'B'	Column 'C'
A. Pheretima	(a) Book gills	(i) Coxal gland
B. Palaemon	(b) Colleterial gland	(ii) Chloragogen cells
C. Palacmnaeus	(c) Book lungs	(iii) Green gland
D. Periplaneta	(d) Calciferous glands	(iv) Unicose glands

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

8. What will happen to cells of cyanobacteria if they are placed in purified water?
1. They will swell and burst
2. They will shrink
3. They will swell but will not burst
4. They will not show any change

9. Hutington's disease is an autosomal disorder characterized by movement, cognitive and psychiatric disorders. Study the given pedigree and identify the genotype of II - 3 and II - 4.
[Note : Solid squares/circles represent affected individuals and empty squares / circles denote unaffected normal individuals.]

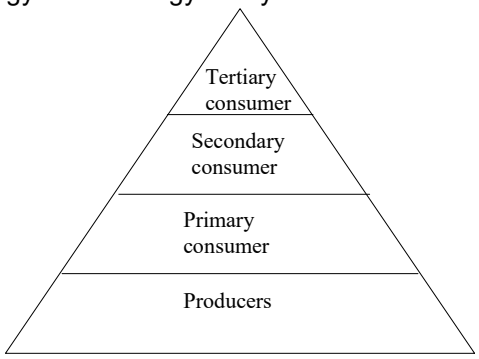


1. II-3 : Hh; II-4 : hh
2. II-3 : HH; II-4 : Hh
3. II-3 : HH; II-4 : hh
4. II-3 : Hh; II-4 : HH

10. When a tall plant with round seeds was hybridized with a dwarf plant with wrinkled seeds; all offspring in F1 generation were tall plants that produced round seeds. As per Mendel's law of independent assortement, what percent of offspring will produce wrinkled seeds if F1 is crossed with tall plant producing wrinkled seeds?
1. 10
2. 20
3. 50
4. 100

11. What would happen to earth if carbondioxide was absent from its atmosphere?
1. The earth would be a pleasant place.
2. Absence of carbon dioxide would not make any difference to earth.
3. Earth would be devoid of life
4. Earth would have only animal life.

12. The following figure represents the flow of energy in a pyramid of food. If this ecosystem receives 100000 kcal of sunlight energy of the energy finally available to Tertiary Consumer (TC) is:



1. 1000 kcal
2. 100 kcal
3. 10 kcal
4. 1 kcal

13. Pollen grains of a fruiting plants species are deposited on the female flower by a pollinator. However, the female flower does not get fertilized. Which of the following observation is true?
1. Fruit will not be formed
2. Only seed set will not occur
3. Normal fruit and seeds will be formed
4. Only fruit wall will be formed

14. The values of stoichiometirc coefficients *m*, *x*, *y* and *z* in the following reaction after balancing are, respectively:

$$m(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} xCr_2O_3 + yN_2 + zH_2O$$

1. 2, 1, 1, 2
2. 2, 2, 2, 4
3. 1, 1, 1, 4
4. 2, 2, 1, 2

15. Identify the incorrect statement for the reaction $2H_2S + SO_2 \rightarrow 3S + 2H_2O$ is :
(Atomic mass of S = 32)
1. 1 mol H_2O is produced per mole of H_2S consumed.
2. 3 g of S is produced for every gram of SO_2 consumed
3. two-thirds of the S produced comes from H_2S.
4. the number of moles of various atoms present before and after the reaction is the same.

16. You are provided with aqueous solutions of three salts A, B and C. 2 -3 drops of blue litmus solution, red litmus solution and phenolphinalein were added to each of these solutions in separate experiments. The change in colour of different indicators were recorded in the following table:

Sample	With blue litmus solution	With red litmus solution	With phenolphi nalein
A	No change	Turns blue	Turns pink
B	No change	No change	No change
C	Turns red	No change	No change

On the basis of above observations, identify A, B and C from the following options:
1. A = NaCl, B = CH_3COONa, C = $FeCl_3$
2. A = CH_3COONa, B = NaCl, C = $FeCl_3$
3. A = $FeCl_3$, B = NaCl, C = CH_3COONa
4. A = $FeCl_3$, B = CH_3COONa, C = NaCl

17. Which of the following are NOT correct methods for separating the components of given mixtures?
I. The mixture of Iodine and sodium chloride by sublimation.
II. Plant pigments by chromatography.
III. Mixture of acetic acid and water by separating funnel.
IV. Oxygen, argon and nitrogen from air by fractional distillation.
1. I only
2. III only
3. II and III
4. II, III and IV

18. The compound 'A' when treated with alkaline potassium permanganate gives 'B', and with conc. sulphuric acid gives 'C' and 'D'. The compunds A, B, C and D are respectively.
1. C_2H_4, CH_3COONa, C_2H_5OH, H_2O
2. CH_3COOH, C_2H_4, CH_3OH, H_2O
3. C_2H_5OH, CH_3COOH, C_2H_4, H_2O
4. CH_3OH, $HCOOH$, H_2O, CH_4

19. Match the chemical reaction given in the List-I with type of chemical reactions given in the List-II and select the correct answer from the options given below:

List-I (Chemical reactions)	List-II (Type of Chemical reactions)
I. $CH_3-CH_2-OH \xrightarrow{\text{acidified/}K_2Cr_2O_7}$	A. Addition
II. $C_2H_4+H_2 \xrightarrow{\text{Ni catalyst}}$	B. Elimination
III. $CH_4(g)+Cl_2(g) \xrightarrow{\text{Sunlight}}$	C. Redox
IV. $CH_3-CH_2-OH \xrightarrow{\text{Heat,conc}H_2SO_4}$	D. Substitution

1. I-C, II-D, III-A, IV-B
2. I-B, II-A, III-D, IV-C
3. I-C, II-A, III-D, IV-B
4. I-B, II-D, III-A, IV-C

20. Two beakers A and B contain iron (II) sulphate solution. In the beakers A and B, small pieces of copper and zinc are placed respectively. It is found that a grey deposit forms on the zinc but not on the copper. From these observations, it can be concluded that:
1. zinc is most active metal followed by iron and then copper.
2. zinc is most active metal followed by copper and then iron.
3. iron is most active metal followed by zinc and then copper.
4. iron is most active metal followed by copper and then zinc.

21. Sulphur powder is heated on a spatula. A piece of both, moist blue and red litmus papers are brought one by one near the gas evolved during heating. The action of gas on the moist litmus papers will be :
1. No change in colour in both the litmus papers.
2. Blue litmus paper becomes red.
3. Red litmus paper becomes blue.
4. Blue litmus paper turns black.

22. Two samples A and B of a pure substance containing elements Y and Z are obtained from two different sources. 5g of sample A contains 1.25 g of Z. Sample B is made of 75% of Y by weight. This is an illustration of which of the following laws?
1. Law of constant proportion
2. Law of multiple proportion
3. Law of mass conservation
4. Avagadro's Law

23. An element X with atomic number 13 combines with another element Y of atomic number 17. The formula of the compound formed and nature of bond will be:
1. XY_3, ionic
2. XY_3, covalent
3. X_3Y, ionic
4. X_3Y, covalent

24. Select the correct options from the following statements:

I $^{12}_{6}C$ and $^{14}_{6}C$ are isobars of each other.

II $^{12}_{6}C$ reacts with $^{16}_{8}O$ to form a product which contains ionic bonds.

III. $^{40}_{20}Ca$ and $^{40}_{18}Ar$ are isobars of each other.

IV. $^{40}_{20}Ca$ reacts with $^{16}_{8}O$ to form a compound whose aqueous solution is known as lime water.

1. I and II
2. I and III
3. III and IV
4. I and IV

25. Identify the correct order of atomic radii of following elements:

1. Na < Li < Rb < Cs
2. Li < K < Rb < Cs
3. Li < Na < Cs < K
4. Na < K < Cs < Rb

26. Which of the following statements are true?

I. On heating the kinetic energy of particles in solids does not change because they have a fixed position.

II. Sublimation is the change of gaseous state directly to solid state without going through liquid state and vice versa.

III. The movement of particles from an area of higher concentration to lower concentration is called diffusion.

IV. The rate of evaporation is not affected by increasing the temperature.

1. I, II and III
2. II and IV
3. II, III and IV
4. II and III

27. A train moving at uniform 90 km/h is approaching a flag station whose platform is 500 m long. Station master is standing at the centre of the platform. Train starts blowing whistle when engine is 1 km away from near end of the platform and continues blowing whistle till engine crosses of the platform without stopping. If the speed of the sound is assumed to be 300 m/s, then the duration for which station master hears the whistle is?

1. 55.80 sec
2. 56.67 sec
3. 60.00 sec
4. 60.30 sec

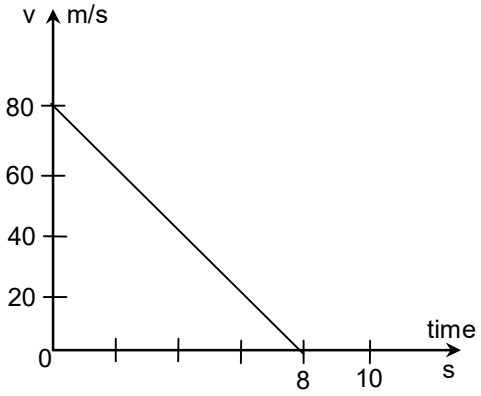
28. A swimmer can swim in still water at a speed of 15 km/h. A river is flowing at 5 km/h. The swimmer starts from a point and swim 1 km upstream and then returns by swimming downstream back to original position. During this, the average speed of his/her swimming is :

1. 20/3 km/h
2. 10 km/h
3. 40/3 km/h
4. 20 km/h

29. A car P is moving with a uniform speed of 72 km/h towards another car Q at rest on a straight level road. At a particular instant when the distance between P and Q is 525 m the car Q started accelerating at 2 m/s^2 towards P. Find the distance traveled by Q, when both the cars meet.

1. 300 m
2. 225 m
3. 100 m
4. 30 m

30. Figure shows the velocity versus time graph for a block of mass 50 g sliding on a rough floor. The average rate at which energy dissipates (in J/s) due to the force of friction is :



1. 5.0 J/s
2. 10.0 J/s
3. 20.0 J/s
4. 40.0 J/s

31. A ball of mass 100 g is dropped from a height of 1 m. It loses 10% of its energy every time when it bounces off the floor. After 3 bounces, it can reach the half-way to maximum height, its kinetic energy (upto two decimal points) would be (take g = 10 m/s^2).
1. 0.35 J
2. 0.36 J
3. 0.70 J
4. 0.73 J

32. A block of mass 3 kg and density ρ, suspended from a spring balance is immersed in a liquid of density $\rho/3$. Then the balance would read weight as:
1. 0
2. 2/3 kg
3. 1 kg
4. 2 kg

33. Cost of coal is Rs. 5 per kg and can produce energy of 20 MJ/kg. If a power station uses coal to produce electricity with 25% efficiency, then the cost of coal for producing 1 unit (1 kw/h) of electricity in Rs.
1. 0.9
2. 3.6
3. 9.0
4. 36.0

34. Two different instruments (say, guitar and harmonium), playing same music, their sound appears different though they play same frequency, because:
1. they have different loudness.
2. they are played by different persons and hence difference in tuning.
3. they have different quality.
4. they create different pitch.

35. Sound travels at a speed of 1450 ms^{-1} through water. A submarine detects objects around it by sending sound waves and detecting echo (reflected sound) heard after 4 seconds. Then the object must be at a distance of:
1. 1.450 km
2. 2.900 km
3. 4.350 km
4. 5.800 km

36. A small pencil of length 10 cm is kept along the axis of a concave mirror of radius of curvature 40 cm with its tip touching the mirror. The size of pencil's image would appears to be:
1. 5 cm
2. 10 cm
3. 20 cm
4. infinite

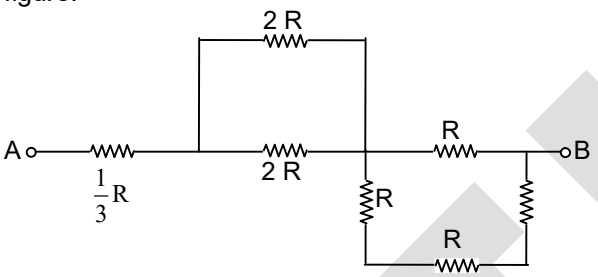
37. A 10 V battery is connected to a series combination of two resistances of 4000 Ω and 6000 Ω. A non-ideal voltmeter of resistance 10,000 Ω connected across 4000 Ω reads 3.226 V. What would be the value if the same voltmeter connected across 6000 Ω?

1. 3.326 V
2. 4.326 V
3. 3.238 V
4. 4.838 V

38. Consider two circuits:
(i) A: in which N identical bulbs are connected in series across a battery of emf E.
(ii) B: in which N bulbs identical to those in A are connected in parallel across similar battery of emf E.
P_A : Power dissipating in each bulb in A.
P_B : Power dissipating in each bulb in B.
P_{AT} : Total power delivered by battery in circuit A.
P_{BT} : Total power delivered by battery in circuit B.
Choose the correct option:

1. $P_A = N.P_{BT}$
2. $P_{BT} = N^2.P_A$
3. $P_{BT} = N.P_{AT}$
4. $P_B = N^2.P_A$

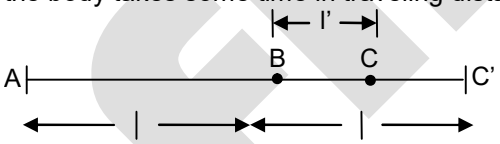
39. Six resistances, each of value given R value are connected between two points A and B as shown in the figure.



The combined value of resistance between poins A and B.

1. 2 R
2. R
3. $\frac{4}{3}$R
4. $\frac{5}{3}$R

40. A body travels the distance AB = l with a speed 2 m/s. Thereafter, it travels BC = l' with speed 1.5 m/s and the remaining CC' = (l – l') with 0.5 m/s. Calculate the average speed for this journey assuming that the body takes some time in traveling distances BC a CC'.



1. 2 m/s
2. 1.33 m/s
3. 0.66 m/s
4. 0.8 m/s

41. For real numbers p, q and a, if the polynomial $x^3 – 3px + 2q$ is divisible by the polynomial $x^2 + 2ax + a^2$, then which of the following is correct?

1. $3p = 2q$
2. $p^2 = q^3$
3. $p^3 = q^2$
4. $27p^3 = 4q^2$

42. The value of $\left(3^{\frac{1}{2}}-1\right)\left(3^{\frac{1}{2}}+3^{\frac{1}{4}}+1\right)\left(3^{\frac{1}{2}}-3^{\frac{1}{4}}+1\right)$ is

1. 1
2. $3\sqrt{3}$
3. $3\sqrt{3}-1$
4. $3\sqrt{3}+1$

43. Given that the system of equations mx + 2y = 10; 3x – 2y = 0 have the integer solution. Then the possible values of m are

1. 2 and 8
2. 2 and – 8
3. – 2 and – 8
4. – 2 and 8

44. Consider an arithmetic progression with n terms. If the common difference is increased by 1, then n^{th} term increases by 19. If the 5^{th} term of the progression is 28 and the average of the first and last terms is 61, then the 10^{th} term of the progression is:

1. 54
2. 56
3. 58
4. 60

45. The ages of the members of a club are in arithmetic progression with common difference 3 months. The sum of ages of all the members is 300 years and the youngest member is a child of age 9 years. Then, the age of the eldest member is

1. 16 years
2. 15 years
3. 14 years
4. 13 years

46. A sum of Rs 27000 was divided equally among a certain number of persons. Had there been 20 more persons, each would have got Rs 480 less. The number of persons, initially, was

1. 24
2. 25
3. 45
4. 48

47. In ΔABC, A is (0, 0) B is (18, 21) and C has integer co-ordinates. The minimum non-zero area of ΔABC, in square units, is

1. $\frac{3}{2}$
2. $\frac{5}{2}$
3. $\frac{7}{2}$
4. $\frac{9}{2}$

48. If $\frac{1-\cos\theta}{\sin\theta}=\frac{1}{5}, 0^\circ \le \theta \le 90^\circ$, then the value of 1 + tanθ is

1. $\frac{17}{13}$
2. $\frac{17}{12}$
3. $\frac{15}{13}$
4. $\frac{15}{12}$

49. The angle of elevation of the top of a ladder leaning against a wall measured from a distance of 7.3 meters from the foot of the ladder is 45°. Suppose that the vertical height of the top of the ladder is 17.3 metres. Then, the best approximation of the angle of inclination of the ladder with the wall is:

1. 15°
2. 30°
3. 45°
4. 60°

50. If both the roots of the equation $x^2 – 2mx + m^2 – 1 = 0$ are greater than – 2 but less than 4, then

1. – 1 < m < 3
2. 1 < m < 4
3. – 2 < m < 0
4. 1 < m < 3

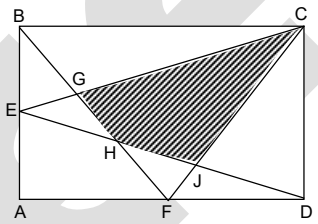
51. Consider the collection of points (a, b) in the coordinate plane such that a and b are integers such that $-5 \le a \le 5$ and $-5 \le b \le 5$. A point is selected at random from the collection. What is the probability that the selected point is at a distance of atmost 2 units from the origin?

1. $\frac{11}{100}$
2. $\frac{13}{100}$
3. $\frac{11}{121}$
4. $\frac{13}{121}$

52. In the parallelogram ABCD, M and N are respectively the midpoints of AB and AD. The points M and N are joined to form the triangle AMN. The area of the triangle AMN and the area of the parallelogram ABCD are in the ratio

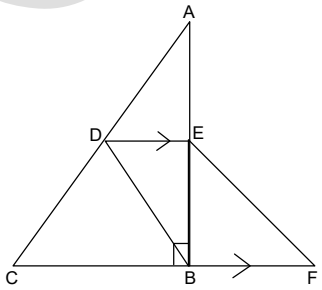
1. 1 : 4
2. 1 : 6
3. 1 : 8
4. 1 : 9

53. In the adjoining figure, ABCD is a rectangle. The area of ΔBEG = 503 cm^2, the area of ΔJFD = 408 cm^2 and the area of quadrilateral EHFA = 1113 cm^2. The area (in cm^2) of the shaded region is



1. 2021
2. 2019
3. 1208
4. 1018

54. In the adjoining figure, ABC is right angled at B. The point D is on AC such that BD = BC and BDEF is a parallelogram. If $\angle BEF = 10°$, then $\angle ADE$ is equal to



1. 50°
2. 40°
3. 25°
4. 20°

55. ABCD is a quadrilateral in which AB = AC, AD = CD = 13 cm, $\angle BAC = 20°$ and $\angle ADC = 100°$. If BC = 12 cm, then AB is equal to

1. 20 cm
2. 25 cm
3. 23 cm
4. 21 cm

56. In quadrilateral ABCD, $\angle ABC + \angle DCB = 90°$ and ADEF is a square constructed on side AD in the exterior of the quadrilateral ABCD. If BC = 10 cm, AC = 9 cm and BD = 8 cm, then the area (in cm^2) of the square ADEF lies between

1. 70 and 80
2. 60 and 70
3. 50 and 60
4. 40 and 50

57. Let G be the centroid of ΔABC in which the angle C is obtuse. Let AD and CF are the medians from A and C on the sides BC and AB respectively. If the four points B, D, G and F are concyclic, then $\frac{BC}{AC}$

1. $> \frac{1}{2}$
2. $< \frac{1}{\sqrt{2}}$
3. $> \frac{1}{\sqrt{2}}$
4. $< \frac{1}{2}$

58. For the distinct real numbers a, b, c and $a \neq 0$, consider the quadratic equation $ax^2 + bx + c = 0$. If a + b + c = 0; then the solutions of the quadratic equation are:

1. $\frac{a}{b}$ and $\frac{b}{a}$
2. $\frac{a}{b}$ and $\frac{b}{c}$
3. 1 and $\frac{b}{a}$
4. 1 and $\frac{c}{a}$

59. A rectangular plot is of length 28 m and width 14 m. A conical pit of diameter 7 m and depth 3 m with its flat surface upward and vertex downward is dug at one corner of the plot. The soil dug out is spread uniformly over the remaining area of the plot. The best approximation value of the increment in the level of the remaining plot is (take $\pi = \frac{22}{7}$)

1. 10.5 cm
2. 10.9 cm
3. 9.9 cm
4. 9.5 cm

60. The sum of deviations from 50 of n values $x_1, x_2, \ldots..x_n$ is – 10 and the sum of deviations from 46 of $x_1, x_2, \ldots. x_n$ is 70. Then the deviation of the mean of the given values from 48 is

1. 1.5
2. – 1.5
3. 2
4. – 2.5

61. In modern deomicracies, political power is distributed. The power sharing arrangements can take many forms. In the context of India, which statement/s is/are NOT true?

I. Arrangement of distribution of power between different organs of the government
II. Arrangement of sharing of power among two or more political parties
III. Arrangement of the division of power between different religious communities
IV. Arrangement of the division of power between different levels of the government

1. I and II
2. I, II and IV
3. II only
4. III only

62. When no party of coalition gets a majority in the Lok Sabha, the President exercise his/her discretion in the appointment of the Prime Minister. Which of the following statement conveys the correct use of discretion of the President under constitutional provisions?

1. The President may appoint the leader of largest majority party in the Lok Sabha as Prime Minister.
2. The President appoints a leader who in his/her opinion can muster majority support in the Lok Sabha and can prove majority support in the Lok Sabha.
3. The President may appoint the senior-most member of Lok Sabha as Prime Minister.
4. The President may appoint the leader of largest majority party in the Rajya Sabha as Prime Minister

63. Which two among the following are NOT presenting true picture of the implementation of Panchayati Raj system in India?

A. Panchayati Raj has increased women's representation and voice in Indian democracy.
B. State governments have transferred significant powers to Panchayati Raj institutions.
C. Panchayati Raj institution have been given adequate resources.
D. Panchayati Raj has helped to deepen democracy in our country.

1. A and B
2. B and C
3. C and D
4. D and A

64. Caste in politics have both positive and negative aspects. Which among the following is negative effect of caste in Indian democracy?
1. caste politics has helped people from Dalits and OBC castes to gain better access to decision making.
2. each caste group tries to become bigger by incorporating within it neighbouring castes or sub-castes which were earlier excluded from it.
3. some marginal caste groups have come up in the political arena.
4. in some cases caste division leads to tensions, conflict and even violence.

65. Michelle Bachelet, who was elected as President in 2006, became the first woman to be a Defence Minister in Latin American country Chile. Before being appointed as Defence Minister, she was
1. a member of the Solidarity Party of Poland.
2. a cabinet minister in Pinochet Dictatorship.
3. an air force officer during President Pinochet's Military rule.
4. a political prisoner during Pinochet Dictatorship.

66. Freedom mean absence of constraints. In practical life it means absence of interference in our affairs by others be it other individuals or the government. Under the Indian Constitution citizens do not have one of the following freedoms.
1. Freedoms of speech and expressions.
2. Freedoms to move freely throughout the country.
3. Freedoms of assembly in a peaceful manner.
4. Freedom to acquire, hold and dispose any property anywhere in the country.

67. There are serious challenges the democracy faces throughout the world. Given below are some of the major challenges in Group – I and the respective implications in Group – II in jumbled up manner. Correctly match the challenges and their implications.

Group – I	Group – II
A. Foundational challenge	E. Strengthening of institutions
B. Challenge of expansion	F. Free and fair elections
C. Challenge of deepening of democracy	G. Establishing a sovereign and functional state
D. Procedural challenges	H. Ensuring greater power to local government

1. (A-E), (B-F), (C-G), (D-H)
2. (AG), (B-H), (C-E), (D-F)
3. (A-H), (B-G), (C-F), (D-E)
4. (A-F), (B-G), (C-E), (D-H)

68. Constitution is the supreme law that determines the relationship among people living in a territory (called citizens) and also the relationship between the people and government. Which of the following statements is correct:
1. It lays down limits on the power of the government and tells us what the rights of the citizen are
2. It generates a degree of conflict and diversity that is necessary for different kind of people to live together.
3. It does not specify formation of the government and decision making process.
4. It will not provide an opportunity to express the aspirations of the people about creating a good society.

69. Hannah is attaining the voting age and is happy that she can vote. In her country, citizens can elect representatives but cannot share any observations about the leader of the country. Which of the following democratic rights is restricted for Hannah?
1. Right to equality
2. Right to be treated fairly
3. Right to freedom
4. Right to information

70. Which of the following sets of items are included in the Concurrent List of the Indian Constitution?
A. Forest trade unions, marriage, adoption and succession.
B. Foreign affairs, banking communications and currency.
C. Census, railways and space research.
D. Population control, labour welfare and protection of wild animals.
1. A and B
2. A and C
3. A and D
4. B and D

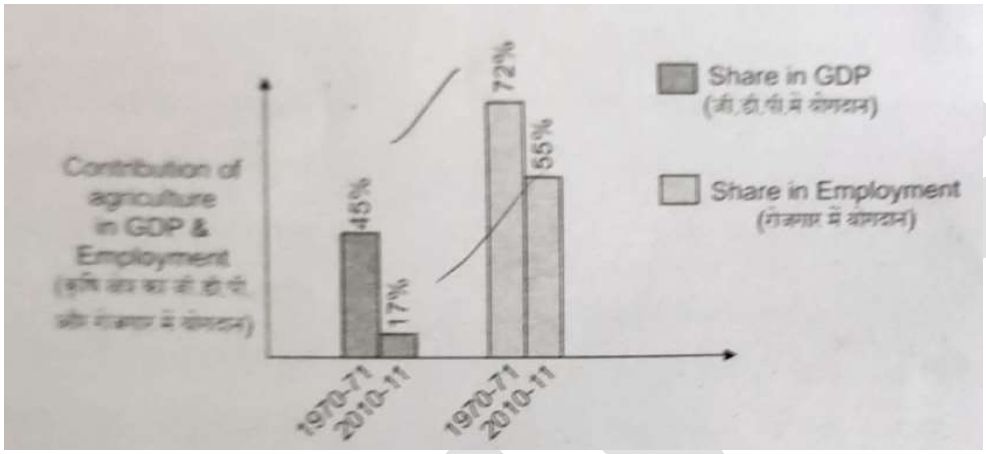
71. A family of four members in Delhi was settled in a slum and earning enough income to lead a subsistence life. They were migrants from a Bihar village in search of employment. During the COVID lockdown they managed to be in Delhi with the support of Philanthropists and local government. However, they decided to go back to Bihar. They had enough money to buy food for another 10 days. The family decided to travel to Bihar by walk or through whatever transport service they could get. During that travel the family had to stop in various towns and villages for food and shelter. The family could not get enough food in most of the places because (a) restaurants were closed. (b) in some places the distribution of food was made only for the local residents. (c) after nearly 10 days to travel, the family did not have enough money to pay for food. How do you classify these reasons as food insecurity?
1. (a) inaccessibility, (b) non-availability, (c) non-affordability
2. (a) non-affordability, (b) non-availability, (c) inaccessibility
3. (a) non-availability, (b) inaccessibility, (c) non-affordability
4. (a) non-availability, (b) non-affordability, (c) inaccessibility

72. I purchased gold jewellery weighing 8 grams from a jeweller. He offered to reduce GST on the jewel if I did not insist on a bill and that I should pay in cash. I agreed. After one year, when I wanted to sell the jewel, at that time. I found that the jewel was not made of 22 carat gold. Which of the following conclusions are correct?
A. I have no proof of purchase; hence I may not get my grievance addressed.
B. My statement that I purchase the jewel from a particular seller is enough to get my grievance addressed in a consumer court.
C. I should not have avoided payment of GST and I should have insisted on getting a bill.
D. I have facilitated the jeweller to indulge in a series of tax avoidance such as non-payment of input tax and income tax.
1. A, B and C
2. A, C and D
3. B and D only
4. A and B only

73. We have given some effects of globalization on developing countries. Classify the positive effects.
(a) Consumers have more choice of commodities, as imports from other countries are easy to access.
(b) Access to foreign direct investments increases economic activities in sectors wherein the investment flows.
(c) The unrestricted exposure to western culture is a threat to maintain our cultural objects.
(d) The native cultures and cuisines are taken to other parts of the world, so our culture spreads to other countries easily.
(e) We have easy access to foreign markets to market our products.
(f) Cheap labour in developing countries attracts foreign companies to start production in developing countries.
(g) Some domestic industries are adversely affected as they could not meet the competition form foreign companies and imported products.
1. (c), (d), (e), (g)
2. (a), (b), (g), (c)
3. (a), (c), (d), (e), (f)
4. (a), (b), (d), (e), (f)

74. There are two statements given below marked as Assertion (A) and Reason (R). Read the statements and choose the correct option.
Assertion (A): Terms of credit vary substantially from one credit arrangement to another.
Reason (R): Terms of credit vary depending on the nature of lender and the borrower.
1. Both A and R are True and R is the correct explanation of A.
2. Both A and R are True but R is not the correct explanatory of A.
3. A is true and R is False
4. A is False and R is True

75. The below graph shows falling share of agricultural sector towards both GDP and employment. Which one is the correct alternative?



1. Fall in productivity of the agricultural workers.
2. Rise in productivity of the agricultural workers.
3. No change in productivity of the agricultural workers.
4. None of the above

76. Sustainable development can be promoted if:
1. Rate of extraction of renewable resources is less than rate of its regeneration.
2. Rate of extraction of non-renewable resources is less than rate of creation of its substitutes.
3. Rate of extraction of renewable resources is less than rate of extraction of non-renewable resources.
4. Rate of extraction of all resources is less than rate of its regeneration and creation.

77. Arrange the following persons in terms of ascending order of vulnerability to poverty that is from the least vulnerable to the most vulnerable.
(a) Rahul completed 8th standard, and is working as a bus driver in private bus transport company with proper employment order and labour security cover.
(b) Rithish is graduate and a musician. He earns living through concerts in larger towns and cities all over the country.
(c) Ramu is an illiterate and agricultural labourer in a village with only dry lands.
(d) Ramesh can read and write and he is a construction worker employed on daily wage basis by a contractor in a big town.
1. Rahul, Ramu, Ramesh, Rithish
2. Rithish, Rahul, Ramesh, Ramu
3. Ramu, Ramesh, Rahul, Rithish
4. Ramu, Ramesh, Rithish, Rahul

78. A carpenter has workshop near a market place in a small town. He employed two persons A and B on a daily wage. The carpenter is not happy with these two workers. A is irregular, mostly either he comes late or goes home early for some reason, but completes his assigned jobs on time. B is regular but takes double the time as A to complete the job. The carpenter pays same daily wage rate to both. Which of the following suggestion you would recommend to the carpenter?
1. Let the carpenter pay the worker based on the piece job.
2. Let the carpenter pay on the basis of hours of work so that he can make person A more regular.
3. Let the carpenter pay only half the salary to person B as he is not as efficient as person A.
4. Let the carpenter suspend person B and keep person A.

79. In a farmer's household in West Bengal, all the adult members were involved in the activities of the household's won farm. The household could earn enough to income to lead a life with basic necessities of life and a little savings to meet emergency expenditures. Last year, the eldest son, aged 40 years, was bed-ridden for almost a year due to a serious illness. Hence he could not participate in the household's farming activities. However, the income of the household from agriculture did not decline. How do you call generally the employment of the eldest son on the household's farm:
1. Seasonal unemployment
2. Under-employment
3. Disguised unemployment
4. Gainful employment

80. When a mobile service customer wants to port out from operator X to operator Y and the former denies permission, then which right is violated?
1. Right to safety
2. Right to choose
3. Right to inform
4. Right to seek redressal

81. Chhatisgarh shares boundaries with six states of India. Which one of the following is correct sequence of the bordering states in clock wise direction starting from Jharkhand?
1. Jharkhand – Odisha – Telangana – Andhra Pradesh – Maharashtra – Madhya Pradesh
2. Jharkhand – Bihar – Madhya Pradesh – Maharashtra – Odisha – Telangana
3. Jharkhand – Odisha – Andhra Pradesh – Telangana – Maharashtra – Madhya Pradesh
4. Jharkhand – Odisha – Telangana – Maharashtra – Madhya Pradesh – Uttar Pradesh

82. If you are travelling along 80°E longitude from Uttar Pradesh to Tamil Nadu. You will come across many river basins on you way. Which one of the following is the proper sequence of river basins?
1. Ganga – Narmada – Mahanadi – Godavari – Krishna – Palar
2. Ganga – Mahanadi – Narmada – Godavari – Kaveri – Penneru
3. Ganga – Narmada – Mahanadi – Krishna – Penneru – Palar
4. Ganga – Narmada – Godavari – Krishna – Penneru – Palar

83. Which one of the following is NOT true about understanding the Indian Monsoon?
1. Low pressure over the Indian land mass and relatively high pressure over the sea.
2. Shift of Monsoon trough during summer.
3. Formation of high pressure over Tibetan Plateau.
4. The presence of easterly jet stream over Indian Peninsula.

84. Cement Industry uses raw materials like limestone, coal and gypsum. Which one of the following state provides suitable environment due to availability of these raw materials along with sufficient electricity for the production of cement?
1. Mizoram
2. Meghalaya
3. Manipur
4. Nagaland

85. Read the given statements and select the correct answer:
Statement 1: Laterite soils are formed under the environmental condition of high temperature and heavy rainfall.
Statement 2: Intense leaching results into loss of humus content and lesser presence of micro-organisms in the soil.
1. Statement 1 is true, statement 2 is false
2. Statement 1 is false, statement 2 is true
3. Both statements are true and statement 1 provides explanations for statement 2
4. Both statements are true and statement 1 does not provides explanations for statement 2

86. Which of the following is NOT true about sea ports of India?
1. Vishakhapatnam is the deepest land locked and well developed port.
2. Chennai is an inland riverine port.
3. Mumbai is the biggest port with spacious natural and well developed harbour.
4. Tuticorin port in Tamil Nadu has a natural harbour and rich hinterland.

87. If the opening time for the central schools in India is 7:30 am IST, what will be local time at Ziro 94° East longitude and Sihor at 72° East Longitude, respectively?
1. 8:26 am – 6.54 am
2. 8:20 am – 6:50 am
3. 8:16 am – 6:48 am
4. 8:10 am – 6:40 am

88. Read the given statements and select the correct answer:
Statement 1: Expansion of railways, plantation agriculture, commercial and scientific forestry and mining activities were largely responsible for the depletion of forests and wildlife during colonial period.
Statement 2: Unequal access, inequitable, consumption of resources and differential sharing of responsibility for environmental wellbeing are the cause for the depletion of biodiversity.
1. Statement 1 is true, statement 2 is false
2. Statement 1 is false, statement 2 is true
3. Both statements are true and statement 2 provides explanations for statement 1
4. Both statements are true and statement 2 does not provides explanations for statement 1

89. What is common factor among Wular Lake, Harike, Sambhar Lake and Keibul Lamjao?
1. Wild life sanctuary
2. Wetland
3. National Park
4. Biosphere reserve

90. Column – I in the following table indicates the states of India and Column – II the sex ratio (females/per 1000 males) in 2011 census. Which one of the following is proper combination?

Column – I (States)	Column – II (Sex Ratio 2011)
A. Tamil Nadu	1. 950
B. West Bengal	2. 931
C. Maharashtra	3. 996
D. Madhya Pradesh	4. 929

1. A2, B4, C1, D3
2. A1, B3, C2, D4
3. A4, B2, C3, D1
4. A3, B1, C4, D2

91. Which of the following changes were brought about by the Bolsheviks immediately after the October Revolution?
I. Most industries and banks were nationalised in November 1917.
II. Land was declared social property and peasants were allowed to seize the land of the nobility.
III. In villages, Bolsheviks enforced the integration of large houses with no regard for family requirements.
IV. New uniforms were designed for the army and officials.
1. I, II and III
2. I, III and IV
3. II, III and IV
4. I, II and IV

92. Which of the following statements is incorrect about the portrayal of Marianne and Germania?
I. France' female allegory, Marianne, underlined the idea of a people's nation.
II. Marianne's characteristics were drawn from those of Liberty and the Republic – the red cap the tricolour, the cockade.
III. Germania became the allegory of the German nation.
IV. Germania wears a dress of oak leaves, as these leaves stand for peace.
1. I
2. II
3. III
4. IV

93. From the following, identify the correct statements relating to indentured labour migration form India.
I. In the nineteenth century, thousands of Indian labourers went to work in plantations, mines, and road and railway construction projects around the world.
II. Most of the indentured labour came from present day regions of northern and western India such as Punjab, Haryana, Gujarat and Rajashtan.
III. The indentured network which has often been described as a 'new system of slavery' for the labourers found the most pathetic and terrible conditions of living and working on their arrival in places like the Caribbean Islands, Mauritius, Fiji, Ceylon and Malaya.
IV. Some indentured labourers found innovative ways of expressing themselves by blending their own cultural ethos with that of the new place.
1. II, III and IV
2. I, II and III
3. I, III and IV
4. I, II and IV

94. Which of the following statements about the lives of workers in early nineteenth century England are true?
I. Not all of them had access to jobs in the city as urban employment still depended on social and familial connections
II. Work was largely seasonal which meant the poor had to return to the streets or to the countryside whenever the busy season was over.
III. They welcomed the introduction of new technology such as Spinning Jenny as they thought that their work would become easier with the new device.
IV. Even as daily wages increased the impact was mitigated on account of small number of days for which most of them were employed.
1. I, II and III
2. I, III and IV
3. II, III and IV
4. I, II and IV

95. With regard to the relationship between print culture and the French Revolution, which of the following statements are true?
I. Print culture caused the ideas of the Enlightenment –reason and rationality – to reach a large number of people which weakened the authority of the Church and the power of the state.
II. By the 1780s, there was an outpouring of literature that mocked the royality and criticised their morality.
III. Print created a new culture of dialogue and debate that made people re-evaluate their long-held views, beliefs and assumptions.
IV. Print culture spread in a way that it did not at all become the means for the expression of monarchical and Church propaganda.
1. I, III and IV
2. I, II and III
3. II, III and IV
4. I, II and IV

96. Which of the following were associated with Non-Cooperation Movement?
I. It was the first movement started by Mahatma Gandhi.
II. Indian institutions were created in replace British administration.
III. It called for total boycott of all arms of British administration by the Indians.
IV. Khilafat movement also began with this movement.
1. I and II
2. II and IV
3. III and IV
4. I, III and IV

97. Assertion (A): Civil Disobedience Movement could not get the support of all sections of the society.
Reason (R): 'Untouchables' were not moved by the concept of Swaraj.
1. A is true, R is false
2. A is false, R is true
3. Both A and R are true, but R is not the correct explanation of A.
4. Both A and R are true and R is the correct explanation of A.

98. The First World War was an unusual war because:
I. It involved the world's leading industrial nations.
II. Weapons of mass destruction were used at a large scale.
III. British policies were responsible for the outbreak of the war.
IV. The world was divided into two power blocks.
1. I and II
2. II, III and IV
3. III and IV
4. I, II and IV

99. The concept of 'Lebensraum' as propounded by Nazism was related to:
I. Enunciation of the principles of social superiority of the Aryans.
II. Throwing away of the 'undesirable children' out of schools.
III. Treating mothers as the most important citizen.
IV. Acquiring new territories to enhance the area of the mother country.
1. I
2. II
3. III
4. IV

100. Which of the following statements related to the ideas of Liberalism in nineteenth century Europe are correct?
I. Freedom for the individual and equality of all before the law.
II. Concept of Government by consent.
III. Universal suffrage.
IV. Freedom of markets.
1. I, II and III
2. I, II and IV
3. I, III and IV
4. II, III and IV

ANSWER KEYS

1.	**4**	2.	**3**	3.	**4**	4.	**1**
5.	**2**	6.	**2**				
7.	**no option correct (according to given information)**					8.	**3**
9.	**1**	10.	**3**	11.	**3**	12.	**4**
13.	**1**	14.	**3**	15.	**2**	16.	**2**
17.	**2**	18.	**3**	19.	**3**	20.	**1**
21.	**2**	22.	**1**	23.	**2**	24.	**3**
25.	**2**	26.	**4**	27.	**2**	28.	**3**
29.	**2**	30.	**3**	31.	**2**	32.	**4**
33.	**2**	34.	**3**	35.	**2**	36.	**3**
37.	**4**	38.	**4**	39.	**1**	40.	**2**
41.	**3**	42.	**3**	43.	**2 and 3**	44.	**3**
45.	**2**	46.	**2**	47.	**1**	48.	**2**
49.	**2**	50.	**1**	51.	**4**	52.	**3**
53.	**option incorrect**						
54.	**1**	55.	**wrong information**			56.	**4**
57.	**2**	58.	**4**	59.	**2**	60.	**1**
61.	**4**	62	**2**	63.	**2**	64.	**4**
65.	**4**	66.	**4**	67.	**2**	68.	**1**
69.	**3**	70.	**3**	71.	**3**	72.	**2**
73.	**4**	74.	**1**	75.	**1**	76.	**4**
77.	**2**	78.	**2**	79.	**3**	80.	**2**
81.	**3**	82.	**4**	83.	**3**	84.	**2**
85.	**3**	86.	**2**	87.	**3**	88.	**4**
89.	**2**	90.	**4**	91.	**4**	92.	**4**
93.	**3**	94.	**4**	95.	**2**	96.	**3**
97.	**4**	98.	**4**	99.	**4**	100.	**2**

HINTS & SOLUTIONS

1. **4**
1. Plasma membrane is a semipermeable membrane, water can move by osmosis and gases can cross by diffusion.

2. **3**
2. Vacuole in plant cell is larger than animal cell.

3. **4**
3. Mitochondria are more in cardiac muscles to generate more energy.

4. **1**
4. Grafting is possible among dicot plants due to presence of cambium.

5. **2**
5. Collenchyma have thickened wall at the corners & have either very little intercellular spaces or absent.

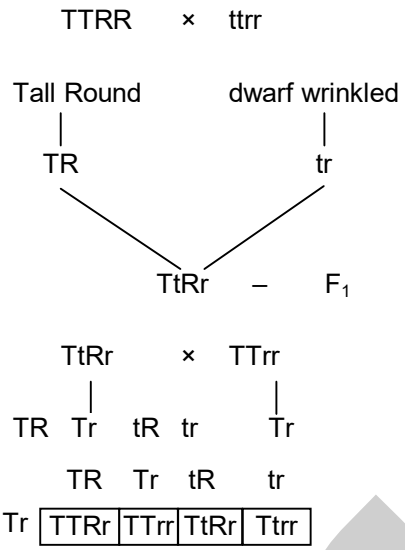
6. **2**
6. The *Marsilea* do not produce seed but *pinus* produces.

7. **no option correct (according to given information)**
7. No option is correct (according to given information in the question).

8. **3**
8. Cyanobacteria (Blue green algae) if placed in pure water they will swell but not burst due to presence of cell wall.

9. **1**
9. The genotype of II-3 should be Hh and II-4 should be hh as these are formed by the cross of Hh $\times$ hh.

10. **3**
10. 50% plants will produce wrinkled seeds.



50% of plants will have wrinkled seeds.

11. **3**

11. If no CO_2 then no photosynthesis and no oxygen & earth would be devoid of life.

12. **4**

12. Producers will gate 1% of 100000 kcal

Producers	→	Primary consumers	→	Secondary consumers	→	Tertiary consumers
1000 kcal		100 kcal		10 kcal		1 kcal

(According to 10% law)

13. **1**

13. No fertilisation will be there so no fruit formation.

14. **3**

14. $m(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} xCr_2O_3 + yN_2 + zH_2O$

After Balancing

$1(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} 1Cr_2O_3 + 1N_2 + 4H_2O$

$\therefore$ The stoichiometric coefficients m, x, y and z are respectively 1, 1, 1, 4.

15. **2**

15. $2H_2S + 1SO_2 \longrightarrow 3S + 2H_2O$

As per balanced chemical equation,

1 mole of SO_2 produces $\longrightarrow$ 3 mole of sulphur

$\Rightarrow$ 64 g SO_2 produces $\longrightarrow$ 96 grams Sulphur

$\therefore$ 1 gram SO_2 produces $\longrightarrow \frac{96}{64}$ grams sulphur

= 1.5 g sulphur.

Hence statement 2 is wrong.

16. **2**

16.

Sample	With blue litmus	With red litmus	With phenolphi nalein
A	–	Turns blue	Turns pink
B	–	–	–
C	Turns red	–	–

The data provided in the above table indicates that the pH of the following solutions will be as follows:

pH of solution A > 7
pH of solution B = 7
pH of solution C < 7

Now as per options provided,

pH of $CH_3COO\,Na_{(aq)}$ > 7 (salt of strong base and weak acid)
pH of $NaCl_{(aq)}$ = 7 (salt of strong acid and strong base)
pH of $FeCl_3$ < 7 (salt of strong acid and weak base)
$\therefore$ A = CH_3COONa; B = NaCl; C = $FeCl_3$.

17. **2**

17. Acetic acid and water are miscible with each other, so separating funnel method can't be useful. The correct method of separation of miscible liquids is distillation.
Hence statement III is wrong.

18. **3**

18. $A \xrightarrow{alk.KMnO_4} B$ (I)

$A \xrightarrow{conc.H_2SO_4} C \text{ and } D$ (II)

The reactions (I) and (II) are as follows

$\underset{(A)}{C_2H_5OH} \xrightarrow{alk.KMnO_4} \underset{(B)}{CH_3COOH}$ {Oxidation of alcohol}

And,

$C_2H_5OH \xrightarrow{conc.H_2SO_4} \underset{(C)}{C_2H_4} + \underset{(D)}{H_2O}$ {Dehydration of alcohol}

$\therefore$ A = C_2H_5OH
B = CH_3COOH
C = C_2H_4
D = H_2O

19. **3**

19. The reactions are as follows:

(I) $C_2H_5OH \xrightarrow{acd.K_2Cr_2O_7} CH_3COOH$

This is a redox reaction (Oxidation of alcohols)

(II) $C_2H_4 + H_2 \xrightarrow{NiCatalyst} C_2H_6$

This is an addition reaction (Hydrogenation of alkenes)

(III) $CH_4 + Cl_2 \xrightarrow{hv} CH_3Cl + HCl$

This is a substitution reaction (chlorination of methane)

(IV) $C_2H_5OH \xrightarrow{conc.H_2SO_4} C_2H_4 + H_2O$

This is an elimination reaction (Dehydration of alcohol)

20. **1**

20. Beaker A

$FeSO_4 + Cu \longrightarrow$ No Reaction

Beaker B

$FeSO_4 + Zn \longrightarrow ZnSO_4 + Fe$

The above observations indicate that Zinc is most reactive and copper is least reactive.
Hence the order of reactivity will be

Zn > Fe > Cu

21. **2**

21. Sulphur upon heating in a spatula in presence of air forms,

$$S + O_2 \xrightarrow{\Delta} \underset{\text{acidic oxide}}{SO_2}$$

SO_2 being an acidic oxide when comes in contact with moist Blue litmus paper, turns the litmus paper red, due to the formation of sulphurous acid.

22. **1**

22. In sample A,
5 g of sample contains 1.25 g Z
$\Rightarrow$ Weight of Y = 5 – 1.25 = 3.75 g
In sample B,
75% of y is present by weight
$\Rightarrow$ 100 g $\Rightarrow$ 75 g of Y
$\therefore$ 5 g of sample will weigh

$$= \frac{75}{100} \times 5 = 3.75 \text{ g}$$

$\therefore$ Given Data illustrates law of constant proportion.

23. **2**

23. Element $_{13}X - 2, 8, 3$
Element $_{17}Y - 2, 8, 7$
$\therefore$ According to their electronic configuration,
Valency of x = 3
Valency of y = 1
$\therefore$ Compound formed = XY_3
The nature of the compound is covalent due to high polarization [Fajan's Rule],
Therefore Bond formed between X and Y is covalent.

24. **3**

24. (I) C – 12 and C – 14 are isotopes of each other.
(II) Carbon reacts with oxygen to form carbon dioxide/carbon monoxide which is a covalent compound
(III) Ca – 40 and Ar – 40 are isobars of each other.
(IV) $2Ca + O_2 \longrightarrow 2CaO$

$$CaO + H_2O \longrightarrow \underset{\text{(Lime Water)}}{Ca(OH)_2}$$

Therefore, statements (III) and (IV) are correct.

25. **2**

25. The atomic size increases in a group from top to bottom due to addition of new shells with each period.
So correct order of atomic radii will be,
Li < K < Rb < Cs

26. **4**

26. (I) Kinetic energy is directly proportional to temperature. So with an increase in temperature, kinetic energy also increases.

(II) $\underset{\text{State}}{\text{Solid}} \underset{\text{Sublimation}}{\overset{\text{Sublimation}}{\rightleftharpoons}} \underset{\text{State}}{\text{Gaseous}}$

(III) Movement of particles from higher concentration to lower concentration is called diffusion.
(IV) Rate of evaporation is directly proportional to temperature. Therefore with an increase in temperature, rate of evaporation also increases.

27. **2**

27. Speed of train = $90 \times \frac{5}{18} = 25\ m/sec$

$$T = \left[\frac{1500}{25} - \frac{1250}{300}\right] + \frac{250}{300}$$

T = 56.67 sec

28. **3**

28. Speed during upstream = 10 km/hr
Speed during downstream = 20 km/hr

$$\text{Average speed} = \frac{2v_1v_2}{v_1 + v_2} = \frac{2(10)(20)}{10+20}$$

$$= \frac{40}{3} km/hr\ .$$

29. **2**

29. Let Q travels x and P travels (525 – x)m

$$\therefore\ x = \frac{1}{2}(2)t^2 = t^2 \qquad (1)$$

and 525 – x = 20t (2)
From (1) and (2)
$t^2 + 20t - 525 = 0$
t = 15 sec
and $x = t^2 = 225$ m

30. **3**

30. Rate of energy dissipation

$$\Rightarrow \frac{\frac{1}{2}mv^2}{t} = \frac{\frac{1}{2}\left(50\times10^{-3}\right)(80)^2}{8}$$

$\Rightarrow$ 20 J/sec.

31. **2**

31. After 3 bounces total energy will be

$$\Rightarrow \left(\frac{9}{10}\right)^3 mgh \Rightarrow \left(\frac{9}{10}\right)^3 (0.1)(10)(1)$$

$$= \left(\frac{9}{10}\right)^3 J$$

at half the maximum height

$$K.E = \frac{\left(\frac{9}{10}\right)^3}{2} = 0.36\ J$$

32. **4**

32. T = true weight – B.Force

$$T = (3g) - \frac{\rho}{3}\left(\frac{3}{\rho}\right)(g) = 2g$$

$\therefore$ Spring balance reads 2 kg

33. **2**

33. 1 Kg coal produces $20\times10^6 \times \frac{25}{100}$

$$\Rightarrow 5\times10^6\ J/kg$$

1 Kwh = 3.6×10^6 J.

$\therefore$ for 1 kwh coal required

$$= \frac{3.6\times10^6}{5\times10^6} = \frac{3.6}{5} kg$$

Cost will be $= \frac{3.6}{5}\times5 = Rs.3.6$

34. **3**

34. Option is self explanatory.

35. **2**

35. $2d = v \times t$

$$d = \frac{v\times t}{2}$$

$$d = \frac{1450\times4}{2}$$

= 2.900 km.

36. **3**

36. Image of tip will form at pole itself for image of other point

u = –10 cm; $f = \frac{-40}{2} = -20$ cm

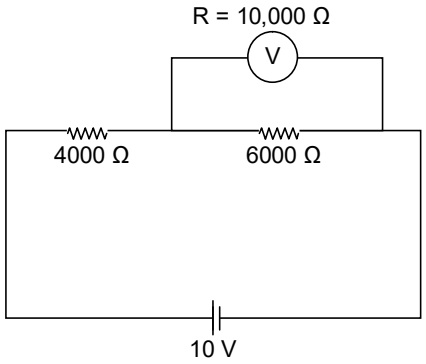
as $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

we get v = + 20 cm

$\therefore$ Size of image will be 20 cm.

37. **4**

37.



$R_{eq} = \frac{10,000 \times 6,000}{(10,000 + 6,000)} + 4000$

R_{eq} = 7750 Ω

$i = \frac{10}{7750}$

$v_1 = \frac{10}{7750} \times 4000 = 5.16$

So v_2 = 10 – 5.16

v_2 = 4.838.

38. **4**

38. $P_A = \frac{E^2}{N^2R}$; $P_B = \frac{E^2}{R}$

$P_{AT} = \frac{E^2}{NR}$; $P_{BT} = \frac{NE^2}{R}$

$\therefore$ We get $P_B = N^2P_A$

39. **1**

39. $\frac{1}{3}R$ in series with $(2R \| 2R)$ in series with $(2R \| R)$

We get R_{AB} as 2 R

40. **2**

40. $\text{Average Speed} = \frac{\text{total distance}}{\text{total time}}$

Average Speed = $\dfrac{\ell+\ell'+(\ell-\ell')}{\frac{\ell}{2}+\frac{\ell'}{1.5}+\frac{(\ell-\ell')}{0.5}}$ (1)

Given $\dfrac{\ell'}{1.5}=\dfrac{\ell-\ell'}{0.5}$ $\therefore$ $\ell'=\dfrac{3\ell}{4}$ (2)

From (1) and (2)

We get average speed = 1.33 m/sec

41. **3**

41.

$$x^2+2ax+a^2 \overline{)\, x^3-3px+2q}\ \big(\, x-2a$$

$$x^3+a^2x+2ax^2$$

$$-2ax^2+x(-3p-a^2)+2q$$

$$-2ax^2-4a^2x-2a^3$$

$$x(-3p+3a^2)+(2q+2a^3)$$

$-3p + 3a^2 = 0$ …(i)

$2q + 2a^3 = 0$ …(ii)

$\Rightarrow a^2 = p \Rightarrow a = \sqrt{p}$

Put in (ii)

$\Rightarrow 2q + 2\left(\sqrt{p}\right)^3 = 0$

$\Rightarrow q = -\left(\sqrt{p}\right)^3$

$q = -p\sqrt{p}$

$q^2 = p^3$

42. **3**

42. $\left(3^{\frac{1}{2}}-1\right)\left(3^{\frac{1}{2}}+3^{\frac{1}{4}}+1\right)\left(3^{\frac{1}{2}}-3^{\frac{1}{4}}+1\right)$

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

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

$= \left(\sqrt{3}-1\right)\left[3+1+2\sqrt{3}-\sqrt{3}\right]$

$= \left(\sqrt{3}-1\right)\left[4+\sqrt{3}\right]$

$= 3\sqrt{3}-1$

43. **2 and 3**

43. $mx + 2y = 10$ …(i)

$3x - 2y = 0$

$\Rightarrow 3x = 2y$ …(ii)

Put in equation (i)

$(m + 3)x = 10$

$x = \frac{10}{m+3}$

$y = \frac{3}{2} \times \frac{10}{m+3} = \frac{15}{m+3}$

$\because$ x and y and integers

$\therefore$ m = – 2, 2, – 8

Option (2) or (3) correct.

44. **3**

44. $a_n = a + (n - 1)d$

If d increased to d + 1

$a_n^{'} = a_n + 19$

$a + (n - 1)(d + 1) = a + (n - 1)d + 19$

$(n - 1)d + n - 1 = (n - 1)d + 19$

$n = 20$

$a_5 = 28$

$a + 4d = 28$ …(i)

$\frac{a + a + (n-1)d}{2} = 61$

$2a + 19d = 122$ …(ii)

From equation (i) and (ii)

$2a + 19d = 122$

$2a + 8d = 56$

$11d = 66$

$d = 6$

$a = 4$

$a_{10} = a + 9d$

$= 4 + 54$

$= 58$

45. **2**

45. $s_n = 300$ years

$a = 9$ years

$d = \frac{1}{4}$ year

$\frac{n}{2}\{2a + (n-1)d\} = 300$

$\frac{n}{2}\left\{18 + (n-1) \times \frac{1}{4}\right\} = 300$

$n\{72 + n - 1\} = 300 \times 8$

$n^2 + 71n - 2400 = 0$

$(n + 96)(n - 25) = 0$

$n = 25$

$a_{25} = 9 + 24 \times \frac{1}{4}$

$= (9 + 6)$ year

$= 15$ years

46. **2**

46. let number of persons = n

Indivisual share = $\frac{27000}{n}$

$\frac{27000}{n+20} = \frac{27000}{n} - 480$

$\Rightarrow 480 = 27000\left[\frac{1}{n} - \frac{1}{n+20}\right]$

$\Rightarrow n(n + 20) = \frac{27000 \times 20}{480}$

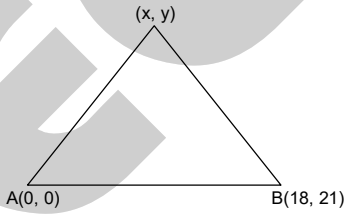
$\Rightarrow n^2 + 20n - 1125 = 0$

$\Rightarrow (n + 45)(n - 25) = 0$

$\Rightarrow n = 25$

47. **1**

47. area of $\Delta ABC = \frac{1}{2}\left|0(y-21) + x(21-0) + 18(0-y)\right|$



$= \frac{1}{2}|21x - 18y|$

$= \frac{3}{2}|7x - 6y|$

$\because$ x and y are integer

$\therefore$ it will be minimum at x = y = 1

$\therefore$ minimum integral value of |7x – 6y| = 1

$\therefore$ minimum non zero area of $\Delta ABC = \frac{3}{2} \times 1 = \frac{3}{2}$ sq. unit

48. **2**

48. $\frac{1-\cos\theta}{\sin\theta} = \frac{1}{5}$, 0° < θ < 90°

$\Rightarrow 5 - 5\cos\theta = \sin\theta$

$\Rightarrow 5\sec\theta - 5 = \tan\theta$

$\Rightarrow 5\sqrt{1+\tan^2\theta} = 5 + \tan\theta$

$\Rightarrow 25(1 + \tan^2\theta) = 25 + 10\tan\theta + \tan^2\theta$

$\Rightarrow 24\tan^2\theta - 10\tan\theta = 0$

$12\tan^2\theta - 5\tan\theta = 0$

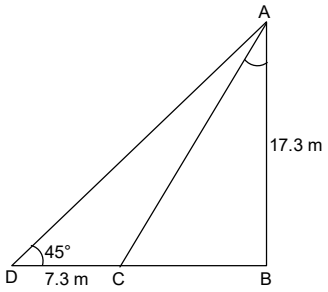
$\tan\theta(12\tan\theta - 5) = 0$

$\tan\theta = 0$ or $\tan\theta = \frac{5}{12}$

$1 + \tan\theta = 1$ or $\frac{17}{12}$

49. **2**

49. let BC = x m
DB = x + 7.3m
AB = DB
BC = 10m
let $\angle BAC = \theta$
$\tan\theta = \frac{BC}{AB}$
$= \frac{10}{17.3}$
= 0.578
θ = 30°

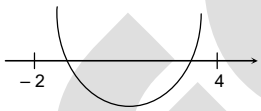


50. **1**

50. $x^2 - 2mx + m^2 - 1 = 0$
$\alpha + \beta = 2m$
$\alpha\beta = m^2 - 1$
$\therefore -2 < \frac{2m}{2} < 4$
– 2 < m < 4

f(– 2) > 0	f(4) > 0
$m^2 + 4m + 3 > 0$	$m^2 - 8m + 15 > 0$
(m + 3)(m + 1) > 0	(m – 3)(m – 5) > 0
m < 3 or m > – 1	m < 3 or m > 5

$\therefore$ – 1 < m < 3

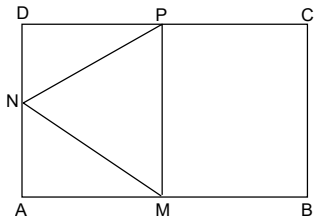


51. **4**

51. n(s) = 11 × 11 = 121
$p(E) = \frac{13}{121}$
E = {(0, 0), (1, 0), (1, 1), (2, 0), (– 1, 0), (– 2, 0), (0, 2), (0, 1), (0, – 1), (0, – 2), (– 1, 1), (1, – 1), (– 1, – 1)}

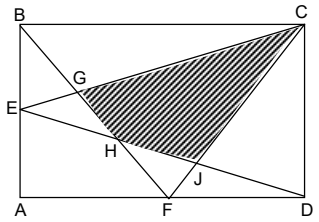
52. **3**

52. P is mid point of CD.
$ar(ANM) = \frac{1}{4} ar(AMPD)$
$= \frac{1}{8} ar(ABCD)$
$\therefore \frac{ar(ANM)}{ar(ABCD)} = \frac{1}{8}$



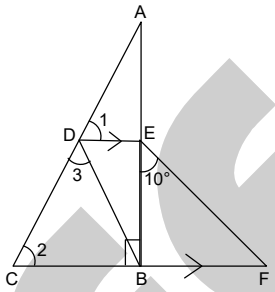
53. **option incorrect**

53. by carpet law
area(GHJC) = ar(BGE) + ar(AEHF) + ar(FJD)
= 503 + 1113 + 408
= 2024



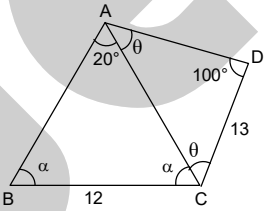
54. **1**

54. BD = BC
$\angle BEF = 10°$
$\because$ DE || BC
$\therefore \angle 1 = \angle 2 = \angle 3 = \theta$ (let)
but $\angle DBC = 90 - 10 = 80°$
$\therefore 2\theta = 100°$
$\therefore \theta = 50°$



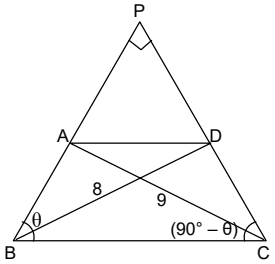
55. **wrong information**

55. AD = DC
In $\triangle ADC$
$2\theta = 80°$
$\therefore \theta = 40°$
In $\triangle ABC$
AB = AC
$\therefore 2\alpha = 160°$
$\alpha = 80°$
In $\square ABCD$
$\angle ABC + \angle ADC = 180°$
$\therefore$ ABCD is a cyclic $\square$
$\therefore$ length of DC will be double of length CB
$\because$ Angle opposite to chord CD is double of angle opposite to chord BC.
$\therefore$ the given information is wrong



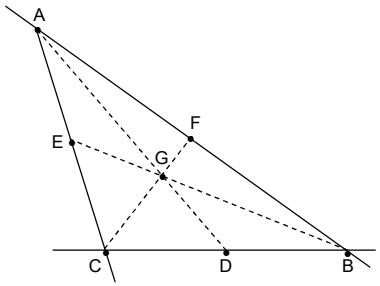
56. **4**

56. In $\triangle PBD = BP^2 + PD^2 = BD^2$ …(i)
In $\triangle PAD = PA^2 + PC^2 = AC^2$ …(ii)
from equation (i) and (ii)
$BP^2 + PA^2 + PD^2 + PC^2 = BD^2 + AC^2$
$(BP^2 + PC^2) + (PA^2 + PD^2) = BD^2 + AC^2$
$BC^2 + AD^2 = 9^2 + 8^2$
$AD = \sqrt{81 + 64 - 100}$
$AD = 3\sqrt{5}$
$ar\square ADEF = (AD)^2 = 45$



57. **2**

57. using power of point for the circle w.r.t. point 'C'



CD.CB = CG.CF

$$\frac{a}{2}.a = \frac{2}{3}CF^2 = \frac{2}{3}\left(\frac{a^2}{2}+\frac{b^2}{2}-\frac{c^2}{4}\right)$$

$$\frac{a^2}{2} = \frac{a^2}{3}+\frac{b^2}{3}-\frac{c^2}{6}$$

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

also, 'C' is obtuse $\Rightarrow \cos C < 0$

$a^2 + b^2 < c^2$

$\Rightarrow a^2 + b^2 < 2b^2 - a^2$

$\Rightarrow 2a^2 < b^2$

$$\Rightarrow \frac{a^2}{b^2} < \frac{1}{2}$$

$$\Rightarrow \frac{a}{b} < \frac{1}{\sqrt{2}}$$

58. **4**

58. $ax^2 + bx + c = 0$

$\because$ a + b + c = 0

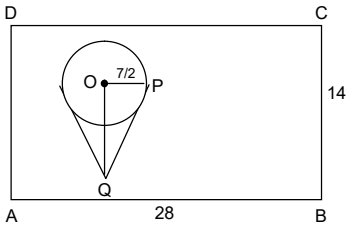
$1 + \beta = -\frac{b}{a}$, $1.\ \beta = \frac{c}{a}$

$$\beta = \frac{c}{a}$$

Roots are 1, $\frac{c}{a}$

59. **2**

59. $OP = r = \frac{7}{2}$



OQ = 3

area of top circular surface of pit = $\pi\left(\frac{7}{2}\right)^2 = \frac{22}{7}\times\frac{7}{2}\times\frac{7}{2} = \frac{77}{2}$

= 38.5 m^2

area of the plot on which dug soil is spreaded = 28 × 14 – 38.5

= 353.5 m^2

volume of dug soil = $\frac{1}{3}\times\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}\times 3$ = 38.5 m^3

$\therefore$ value of increment in the level of remaining plot = $\frac{38.5}{353.5} \simeq 10.9$ cm

60. **1**

60. $\sum x_i - 50n = -10$

$\sum x_i = 50n - 10$ …(i)

$\sum x_i - 46n = 70$

$\sum x_i = 46n + 70$ …(ii)

From (i) and (ii)

$50n - 10 = 46n + 70$
$4n = 80$
$n = 20$
$\sum x_i = 990$
$\bar{x} = \frac{990}{20} = 49.5$
$\therefore \bar{x} - 48 = 49.5 - 48 = 1.5$

61. **4**
61. Arrangement of the division of power between different religious communities is not true.

62 **2**
62. The president appoints a leader who can muster majority support in the Lok Sabha and can prove majority support in the Lok Sabha.

63. **2**
63. B and C options are not presenting true picture.

64. **4**
64. In some cases caste division leads to tensions, conflict and even violence.

65. **4**
65. A political prisoner during Pinochet dictatorship.

66. **4**
66. Freedom to acquire, hold and dispose any property any where in country.

67. **2**
67. A – G, B – H, C – E, D – F.

68. **1**
68. It lays down limits on the powers of the govt. And tells us what the rights of the citizens are.

69. **3**
69. Right to freedom.

70. **3**
70. Both option A and D

71. **3**
71. Non-availability, inaccessibility, non-affordability.

72. **2**
72. Option A, C and D

73. **4**
73. Options a, b, d, e, f

74. **1**
74. Both A and R are true and R is the correct explanations of A.

75. **1**
75. Fall in productivity of the agricultural workers.

76. **4**
76. Rate of extraction of all resources is less than rate of its regeneration and creation.

77. **2**
77. Rithish, Rahul, Ramesh, Ramu

78. **2**
78. Let the carpenter pay on the basis of hours of work.

79. **3**
79. Disguised unemployment.

80. **2**
80. Right to choose

81. **3**
81. Jharkhand – Odisha – Andhra Pradesh – Telangana – Maharashtra – Madhya Pradesh

82. **4**
82. Ganga – Narmada – Godabari – Krishna – Penneru – Palar

83. **3**
83. Formation of high pressure over Tibetan plateau.

84. **2**
84. Meghalaya

85. **3**
85. Both are true and statement 1 provides explanations for statement 2.

86. **2**
86. Chennai is not an inland riverine port.

87. **3**
87. 8:16 am – 6:48 am

88. **4**
88. Both are true and Statement 2 does not provide explanation of statement 1.

89. **2**
89. Wetlands

90. **4**
90. A3, B1, C4, D2

91. **4**
91. I, II, and IV

92. **4**
92. Oak leaves stand for heroism.

93. **3**
93. I, III and IV

94. **4**
94. I, II and IV

95. **2**
95. I, II and III

96. **3**
96. III and IV

97. **4**
97. Both are true and R is the correct explanation of A.

98. **4**
98. I, II and IV

99. **4**
99. Acquiring new territories to enhance the area of the mother country.

100. **2**
100. I, II and IV