

class 10



TARGET
NTSE
National Talent Search Examination

Solved Paper
2015
Stage 2

Time : 90 Minutes

Max. Marks : 100

Instructions for Candidates

Read the following instructions carefully before you answer the questions :

1. Answers are to be given on a SEPARATE ANSWER-SHEET.
2. Write your eight-digit Roll Number very clearly on the test-booklet and answer-sheet as given in your letter/ admission card.
3. Write down the Booklet Number in the appropriate box on the answer-sheet.
4. There are 100 questions in this test. All are compulsory. The question numbers 1 to 40 belong to Science, 41 to 60 pertain to Mathematics and 61 to 100 are on Social Science subjects.
5. Please follow the instructions given on the answer-sheet for marking the answers.
6. For questions 1-100, put a cross mark (X) on the number of the correct alternative on the answer-sheet against the corresponding question number.
7. If you do not know the answer to any question, do not waste time on it and pass on to the next one. Time permitting, you can come back to the questions, which you have left in the first instance and attempt them.
8. Since the time allotted for this question paper is very limited you should make the best use of it by not spending too much time on any one question.
9. Rough work can be done anywhere in the booklet but not on the answer-sheet/loose paper.
10. Every correct answer will be awarded one mark.
11. Please return the Test-booklet and Answer-sheet to the invigilator after the test.

- A segment of DNA contains 1200 nucleotides, of which 200 have adenine base. How many cytosine bases are present in this segment of DNA?
(1) 100 (2) 200
(3) 400 (4) 800
- You are observing a non-chlorophyllous, eukaryotic organism with chitinous cell wall under a microscope. You shall describe the organism as a
(1) fungus. (2) alga.
(3) protozoas. (4) bacterium.
- Match the items given in Column A and Column B, and identify the correct alternative listed below.

Column A	Column B
(a) Flying fish	(i) Draco
(b) Flying lizard	(ii) Echidna
(c.) Egg laying mammal	(iii) Exocoetus
(d) Flightless bird	(iv) Struthio

- (1) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
(2) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
(3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
(4) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)
- Which one of the following statements about cell organelles and their function is correct?
(1) Mitochondria are associated with anaerobic respiration.
(2) Smooth endoplasmic reticulum is involved in protein synthesis.
(3) Lysosomes are important in membrane biogenesis.
(4) Golgi bodies are involved in packaging and dispatching of materials.
- A leguminous plant grown in an autoclaved, sterilized soil fails to produce root nodules because
(1) autoclaved soil is not good for root growth.
(2) autoclaved soil is devoid of bacteria.
(3) autoclaving reduces N_2 content of soil.
(4) plants cannot form root hairs in such a soil.
- The causative agent of the disease 'sleeping sickness' in human beings is an
(1) intracellular parasite found in RBC.
(2) extracellular parasite found in blood plasma.
(3) intracellular parasite found in WBC.
(4) extracellular parasite found on the surface of platelets.
- The gene for hemophilia is present on X chromosome. If a hemophilic male marries a normal female, the probability of their son being hemophilic is
(1) nil (2) 25%
(3) 50% (4) 100%

- Abundance of coliform bacteria in a water body is indicative of pollution from
(1) petroleum refinery (2) metal smelter
(3) fertilizer factory (4) domestic sewage
- Prolonged exposure to the fumes released by incomplete combustion of coal may cause death of a human because of
(1) inhalation of unburnt carbon particles.
(2) continuous exposure to high temperature.
(3) increased level of carbon monoxide.
(4) increased level of carbon dioxide.
- The phenomenon of normal breathing in a human being comprises.
(1) an active inspiratory and a passive expiratory phase.
(2) a passive inspiratory and an active expiratory phase.
(3) both active inspiratory and expiratory phases.
(4) both passive inspiratory and expiratory phases.
- Which one of the following statements is true with respect to photosynthesis?
(1) Oxygen evolved during photosynthesis comes from CO_2 .
(2) Chlorophyll *a* is the only photosynthetic pigment in plants
(3) Photosynthesis occurs in stem of some plants.
(4) Photosynthesis does not occur in red light.
- The girth of stem increases due to the activity of
(1) lateral meristem. (2) apical meristem.
(3) intercalary meristem.
(4) apical and intercalary meristem.
- Which one of the following represents the correct sequence of reflex action?
(1) Receptor → sensory nerve → motor nerve → spinal cord → muscle
(2) Receptor → motor nerve → spinal cord → sensory nerve → muscle
(3) Receptor → sensory nerve → spinal cord → muscle → motor nerve
(4) Receptor → sensory nerve → spinal cord → motor nerve → muscle
- In human female, immature eggs are for. the first time seen in ovary
(1) at puberty.
(2) before birth, at the fetus stage.
(3) during the first menstrual cycle.
(4) after the first year of birth.
- What happens when a fixed amount of oxygen gas is taken in a cylinder and compressed at constant temperature?
a. Number of collisions of oxygen molecules at per unit area of the wall of the cylinder increase.
b. Oxygen (O_2) gets converted into ozone (O_3).
c. Kinetic energy of the molecules of oxygen gas increases.
(1) (a) and (c) (2) (b) and (c)
(3) (c) only (4) (a) only

16. The solubility of a substance S in water is 28.6% (mass by volume) at 50°C. When 50 mL of its saturated solution at 50°C is cooled to 40°C, 2.4 g of solid S separates out. The solubility of S in water at 40°C (mass by volume) is :
- (1) 2.4% (2) 11.9%
(3) 26.2% (4) 23.8%
17. What mass of CO₂ will be formed when 6 g of carbon is burnt in 32 g of oxygen?
- (1) 38 g (2) 12 g
(3) 26 g (4) 22 g
18. The law of conservation of mass is valid for which of the following?
- a. Reactions involving oxidation.
b. Nuclear reactions.
c. Endothermic reactions.
- (1) (a) and (c) (2) (a) and (b)
(3) (b) and (c) (4) (b) only
19. How many sub-atomic particles are present in an α -particle used in Rutherford's scattering experiment?
- | | No. of Protons | No. of Neutrons | No. of Electrons |
|-----|----------------|-----------------|------------------|
| (1) | 4 | 0 | 0 |
| (2) | 2 | 0 | 2 |
| (3) | 2 | 2 | 0 |
| (4) | 2 | 2 | 1 |
20. A certain sample of element Z contains 60% of ⁶⁹Z and 40% of ⁷¹Z. What is the relative atomic mass of element Z in this sample?
- (1) 69.2 (2) 69.8
(3) 70.0 (4) 70.2
21. Compound A on strong heating in a boiling tube gives off reddish brown fumes and a yellow residue. When the aqueous solution of A is treated with a few drops of sodium hydroxide solution, a white precipitate appeared. Identify the cation and anion present in the compound A.
- (1) Copper (II) and nitrate (2) Lead (II) and chloride
(3) Zinc and sulphate (4) Lead (II) and nitrate
22. A substance A reacts with another substance B to produce the product C and a gas D. If a mixture of the gas D and ammonia is passed through an aqueous solution of C, baking soda is formed. The substances A and B are
- (1) HCl and NaOH (2) HCl and Na₂CO₃
(3) Na and HCl (4) Na₂CO₃ and H₂O
23. A metal occurs in nature as its ore X which on heating in air converts to Y. Y reacts with unreacted X to give the metal. The metal is :
- (1) Hg (2) Cu
(3) Zn (4) Fe
24. **Assertion (A):** Nitrate ores are rarely available.
Reason (R): Bond dissociation energy of nitrogen is very high.
- (1) Both A and R are true and R is the correct explanation of A.
(2) Both A and R are correct but R is not the correct explanation of A.
(3) A is correct and R is false.
(4) Both A and R are false.
25. The number of structural isomers of the compound having molecular formula C₄H₉Br is
- (1) 3 (2) 5
(3) 4 (4) 2
26. The total number of electrons and the number of electrons involved in the formation of various bonds present in one molecule of propanal (C₂H₅CHO) are respectively.
- (1) 32 and 20 (2) 24 and 20
(3) 24 and 18 (4) 32 and 18
27. Consider following as a portion of the periodic table from Group No. 13 to 17. Which of the following statements is/are true about the elements shown in it?
- I. V, W, Y and Z are less electropositive than X.
II. V, W, X and Y are more electronegative than Z.
III. Atomic size of Y is greater than that of W.
IV. Atomic size of W is smaller than that of
- | | | | | |
|---|--|--|---|---|
| | | | V | Z |
| | | | | Y |
| W | | | | |
| | | | | |
| X | | | | |
- (1) I, II and III (2) II and III
(3) I and IV (4) III and IV
28. A man running with a uniform speed 'u' on a straight road observes a stationary bus at a distance 'd' ahead of him. At that instant, the bus starts with an acceleration 'a'. The condition that he would be able to catch the bus is
- (1) $d \leq \frac{u^2}{a}$ (2) $d \leq \frac{u^2}{2a}$
(3) $d \leq \frac{u^2}{3a}$ (4) $d \leq \frac{u^2}{4a}$
29. A ball is thrown vertically upwards with a given velocity 'v' such that it rises for T seconds (T > 1). What is the distance traversed by the ball during the last one second of ascent (in meters)? (Acceleration due to gravity is g m/s².)
- (1) $\frac{1}{2} g T^2$ (2) $vT + \frac{1}{2} g [T^2 - (T-1)^2]$
(3) $\frac{g}{2}$ (4) $\frac{1}{2} g [T^2 - (T-1)^2]$

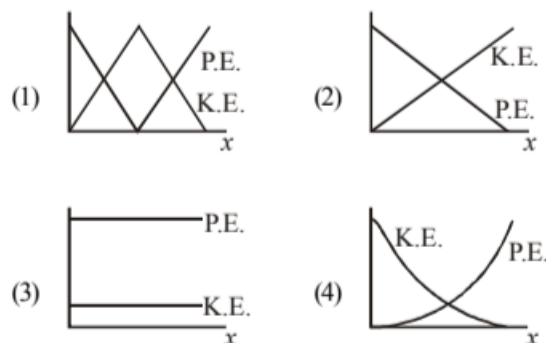
30. The radius of a planet A is twice that of planet B. The average density of the material of planet A is thrice that of planet B. The ratio between the values of acceleration due to gravity on the surface of planet A and that on the surface of planet B is

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

31. A small spherical ball of mass ' m ' is used as the bob of a pendulum. The work done by the force of tension on its displacement is W_1 . The same ball is made to roll on a frictionless table. The work done by the force of normal reaction is W_2 . Again the same ball is given a positive charge ' q ' and made to travel with a velocity v in a magnetic field \mathbf{B} . The work done by the force experienced by the charged ball is W_3 . If the displacements in each case are the same, we have

- (1) $W_1 < W_2 < W_3$ (2) $W_1 > W_2 > W_3$
(3) $W_1 = W_2 = W_3$
(4) that W_1, W_2, W_3 cannot be related by any equation

32. The variation in the kinetic energy (K.E.) and the potential energy (P.E.) of a particle moving along the x -axis are shown in the graphs below. Which one of the following graphs violates the law of conservation of energy?



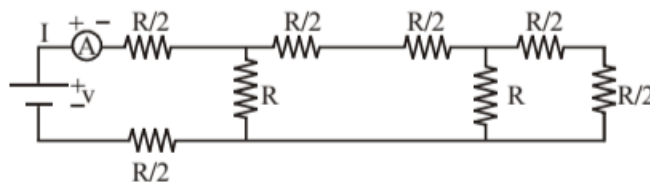
33. The disc of a siren containing 60 holes rotates at a constant speed of 360 rotations per minute. The emitted sound is in unison with a tuning fork of frequency

- (1) 270 Hz (2) 360 Hz
(3) 480 Hz (4) 540 Hz

34. A tuning fork is excited by striking it with a padded hammer. What would be the nature of the vibrations executed by the prongs as well as the stem of the fork respectively? (The reference direction is that of the propagation of the sound wave.)

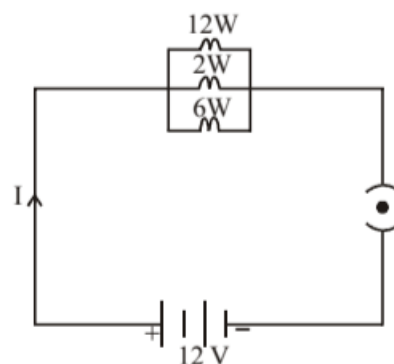
- (1) Both vibrate longitudinally
(2) Both vibrate transversely
(3) The prongs vibrate longitudinally whereas the stem vibrates transversely
(4) The prong vibrate transversely whereas the stem vibrates longitudinally

35. Find the reading of the ammeter in the circuit given below.



- (1) $\frac{V}{2R}$ (2) $\frac{3V}{4R}$
(3) $\frac{2V}{7R}$ (4) $\frac{11V}{R}$

36. Three bulbs with individual power ratings of 12 W, 2 W and 6 W respectively are connected as per the circuit diagram below. Find the amount of heat dissipated by each in 10 seconds.

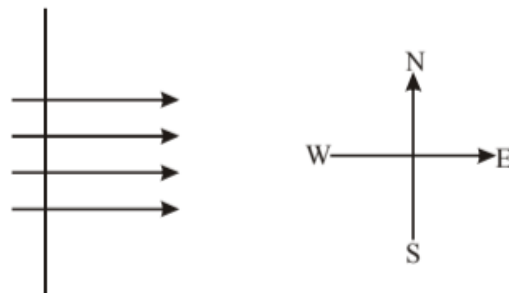


- (1) 8 J, 1.33 J, 4 J (2) 120 J, 20 J, 60 J
(3) 10 J, 0.277 J, 2.5 J (4) 12 J, 1.66 J, 5 J

37. Which of the following can produce a magnetic field?

- (1) Electric charges at rest
(2) Electric charges in motion
(3) Only by permanent magnets
(4) Electric charges whether at rest or in motion

38. A wire is lying horizontally in the north-south direction and there is a horizontal magnetic field pointing towards the east. Some positive charges in the wire move north and an equal number of negative charges move south. The direction of force on the wire will be



- (1) east (2) down, into the page
(3) up, out of the page (4) west

39. Match the following:

Phenomenon		Reason	
(i)	Rainbow	A.	Scattering of light
(ii)	Twinkling of stars	B.	Dispersion of light
(iii)	Blue colour of sky	C.	Fluctuation of the refraction index in atmosphere layers
(iv)	Advancement of sunrise and delay of sunset	D.	Refraction of light

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

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

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

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

40. A person is suffering from both near sightedness and far sightedness. His spectacles would be made of

(1) two convex lenses with the upper lens having a larger focal length than the lower lens.

(2) two concave lenses with the upper lens having a smaller focal length than the lower lens.

(3) a concave lens as the upper lens and a convex lens as the lower lens

(4) a convex lens as the upper lens and a concave lens as the lower lens

41. LCM of two numbers x and y is 720 and the LCM of numbers $12x$ and $5y$ is also 720. The number y is

(1) 180 (2) 144

(3) 120 (4) 90

42. When a natural number x is divided by 5, the remainder is 2. When a natural number y is divided by 5, the remainder is 4. The remainder is z when $x + y$ is divided by 5. The value of

$$\frac{2z-5}{3} \text{ is}$$

(1) -1 (2) 1

(3) -2 (4) 2

43. If the zeroes of the polynomial $64x^3 - 144x^2 + 92x - 15$ are in A.P., then the difference between the largest and the smallest zeroes of the polynomial is

(1) 1 (2) $\frac{7}{8}$

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

44. x and y are two non-negative numbers such that $2x + y = 10$. The sum of the maximum and minimum values of $(x + y)$ is

(1) 6 (2) 9

(3) 10 (4) 15

45. The number of integral solutions of the equation

$$7\left(y + \frac{1}{y}\right) - 2\left(y^2 + \frac{1}{y^2}\right) = 9 \text{ is}$$

(1) 0 (2) 1

(3) 2 (4) 3

46. A circle with area $A \text{ cm}^2$ is contained in the interior of a larger circle with area $(A+B) \text{ cm}^2$ and the radius of the larger circle is 4 cm. If A , B , $A+B$ are in arithmetic progression, then the diameter (in cm) of the smaller circle is

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

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

47. Each of the sides of a triangle is 8 cm less than the sum of its other two sides. Area of the triangle (in cm^2) is

(1) 8 (2) $8\sqrt{3}$

(3) 16 (4) $16\sqrt{3}$

48. If $\operatorname{cosec} x - \cot x = \frac{1}{3}$, where $x \neq 0$, then the value of $\cos^2 x - \sin^2 x$ is

(1) $\frac{16}{25}$ (2) $\frac{9}{25}$

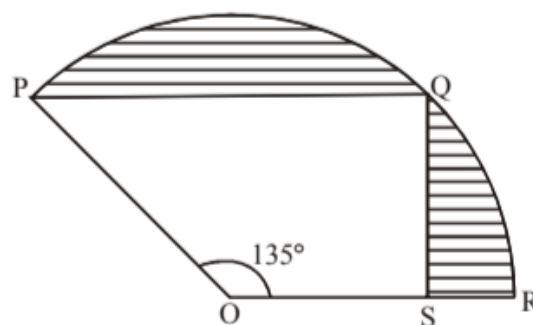
(3) $\frac{8}{25}$ (4) $\frac{7}{25}$

49. A sector with acute central angle θ is cut from a circle of diameter 14 cm. The area (in cm^2) of the circle circumscribing the sector is

(1) $\frac{22}{7} \sec^2 \frac{\theta}{2}$ (2) $\frac{77}{2} \sec^2 \theta$

(3) $\frac{77}{2} \cos^2 \frac{\theta}{2}$ (4) $\frac{77}{2} \sec^2 \frac{\theta}{2}$

50. In the figure, PQSO is a trapezium in which $PQ \parallel OS$, $\angle POS = 135^\circ$ and $\angle OSQ = 90^\circ$. Points P, Q and R lie on a circle with centre O and radius 12 cm. The area of the shaded part, in cm^2 , is



(1) $61\frac{2}{7}$ (2) $61\frac{5}{7}$

(3) $73\frac{5}{7}$ (4) $73\frac{2}{7}$

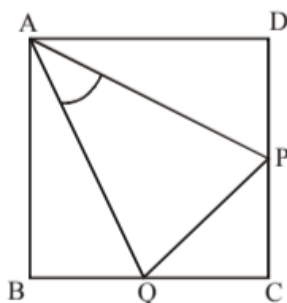
51. A solid sphere is cut into identical pieces by three mutually perpendicular planes passing through its centre. Increase in total surface area of all the pieces with respect to the total surface area of the original sphere is

(1) 250% (2) 175%
(3) 150% (4) 125%

52. A right circular cylinder has its height equal to two times its radius. It is inscribed in a right circular cone having its diameter equal to 10 cm and height 12 cm, and the axes of both the cylinder and the cone coincide. Then, the volume (in cm^3) of the cylinder is approximately

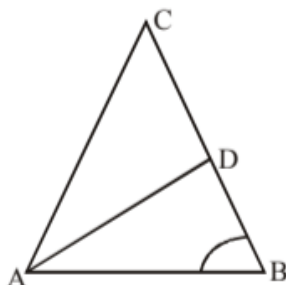
(1) 107.5 (2) 118.6
(3) 127.5 (4) 128.7

53. In the figure, ABCD is a square of side 1 dm and $\angle PAQ = 45^\circ$. The perimeter (in dm) of the triangle PQC is



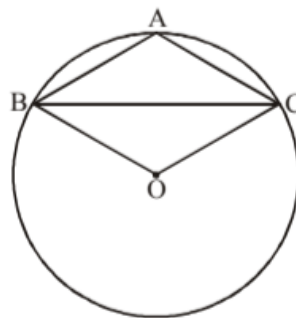
(1) 2 (2) $1 + \sqrt{2}$
(3) $2\sqrt{2} - 1$ (4) $1 + \sqrt{3}$

54. In the figure, ABC is a triangle in which AD bisects $\angle A$, $AC = BC$, $\angle B = 72^\circ$ and $CD = 1$ cm. Length of BD (in cm) is



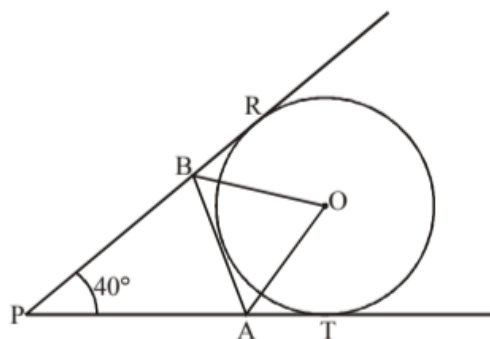
(1) 1 (2) $\frac{1}{2}$
(3) $\frac{\sqrt{5}-1}{2}$ (4) $\frac{\sqrt{3}+1}{2}$

55. In the figure, BC is a chord of the circle with centre O and A is a point on the minor arc BC. Then, $\angle BAC - \angle OBC$ is equal to



(1) 30° (2) 60°
(3) 80° (4) 90°

56. In the figure, $\triangle APB$ is formed by three tangents to the circle with centre O. If $\angle APB = 40^\circ$, then the measure of $\angle BOA$ is



(1) 50° (2) 55°
(3) 60° (4) 70°

57. $(5, -10)$, $(-15, 15)$ and $(5, 5)$ are the coordinates of vertices A, B and C respectively of $\triangle ABC$ and P is a point on median AD such that $AP : PD = 2 : 3$. Ratio of the areas of the triangles PBC and ABC is

(1) $2 : 3$ (2) $3 : 4$
(3) $3 : 5$ (4) $4 : 5$

58. P is a point on the graph of $y = 5x + 3$. The coordinates of a point Q are $(3, -2)$. If M is the mid point of PQ, then M must lie on the line represented by

(1) $y = 5x + 1$ (2) $y = 5x - 7$
(3) $y = \frac{5}{2}x - \frac{7}{2}$ (4) $y = \frac{5}{2}x + \frac{1}{2}$

59. Three - digit numbers formed by using digits 0, 1, 2 and 5 (without repetition) are written on different slips with distinct number on each slip, and put in a bowl. One slip is drawn at random from the bowl. The probability that the slip bears a number divisible by 5 is

(1) $\frac{5}{9}$ (2) $\frac{4}{9}$
(3) $\frac{2}{3}$ (4) $\frac{1}{3}$

60. The mean of fifteen different natural numbers is 13. The maximum value for the second largest of these numbers is
 (1) 46 (2) 51
 (3) 52 (4) 53
61. **Assertion (A) :** During eighteenth century France witnessed the emergence of a middle class.
Reason (R) : The emergence of the middle class happened on account of royal patronage.
 (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.
62. **Assertion (A) :** The lives of pastoralists in India underwent dramatic changes under colonial rule.
Reason (R) : In most areas the lands regularly used by pastoralists for grazing were taken over by the colonial state and given to select individuals for cultivation.
 (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.
63. **Assertion (A) :** By the early twentieth century, America became the biggest supplier of wheat to Europe.
Reason (R) : The expansion of the railways during the period greatly facilitated the transport of grain.
 (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.
64. Match the following table and choose the correct response from the options given thereafter.

Column-I		Column-II	
A.	1910	I.	Establishment of Tonkin Free School.
B.	1930	II.	Formation of French Indo-China.
C.	1907	III.	Completion of the trans-indo-China rail network.
D.	1887	IV.	Formation of the Vietnamese Communist Party.

- (1) A-III, B-IV, C-I, D-II (2) A-IV, B-III, C-II, D-I
 (3) A-III, B-I, C-IV, D-II (4) A-IV, B-I, C-II, D-III
65. Arrange the following Indian novels in accordance with their year of writing/ publication
 a. Indulekha b. Rajasekhara Caritramu
 c. Yamuna Paryatan d. Pariksha-Guru
 (1) c, b, d, a (2) a, d, b, c
 (3) c, d, b, a (4) a, b, d, c

66. The main tenets of *April Theses* during the Bolshevik Revolution were:
 (1) Closing the war, shifting of banks, land pooling by government.
 (2) Formation of labour government, bank nationalisation and land distribution.
 (3) Communist government, land fragmentation and merger of banks.
 (4) Ending the war, bank nationalisation and land transfer.
67. Mahatma Gandhi changed his dressing style from Western to Indian over a period of time. Match those changes as given in Column-I and Column-II and choose the correct response from the options given thereafter.

Column-I		Column-II	
A.	Suit	I.	1915
B.	Lungi-Kurta	II.	1890
C.	Peasant	III.	1921
D.	Short Dhoti	IV.	1913

- (1) A-II, B-IV, C-I, D-III (2) A-II, B-I, C-IV, D-III
 (3) A-III, B-IV, C-I, D-II (4) A-IV, B-III, C-I, D-II
68. In late 19th and early 20th centuries, nationalism captured the imagination of the Indian people through a variety of cultural processes. Which of the following was not a part of those processes?
 (1) Rewriting history to show India's continuous progress from the ancient to the modern times.
 (2) Creation of different images of Bharat Mata.
 (3) Recording, collection and publication of folk tales and folk songs.
 (4) Designing flags as inspiring symbols of nationalism.
69. Choose the correct response from the given options.
 Nomadic people move over long distances because
 (1) By temperament they do not like to settle down in any one place.
 (2) They constantly look for good pastureland for their cattle.
 (3) They follow a life style which is very different from the settled communities.
 (4) Economically they are too poor to own land.
70. Choose the correct response from the given options.
 In 19th century England grain production grew as quickly as the population because
 (1) Farmers used simple agricultural technology to greater effect.
 (2) Radical innovations were made in agricultural technology.
 (3) Larger and larger areas were brought under cultivation.
 (4) Increasing number of poor people found work as agricultural labourers.

71. Choose the correct response from the given options.
By the late 19th century Indians began searching for a national dress because they wanted to
- (1) Show that in terms of dress they were not inferior to the British.
 - (2) Get rid of the blame of blindly aping the West.
 - (3) Define the cultural identity of the nation.
 - (4) Culturally synthesize the traditions of the East and the West.
72. Choose the correct response from the given options.
The unification of Germany in 1871, for a change, demonstrated
- (1) The triumph of the democratic aspirations of the German middle-class.
 - (2) The fulfilment of the liberal initiative to nation-building.
 - (3) The power of the common people, *das volk*.
 - (4) The dominance of the state power and conservatives' success in mobilising nationalist sentiments.
73. Choose the correct response from the given options.
The formation of the 'United Kingdom of Great Britain' in 1707 meant, in effect,
- (1) Equal representation of all the British Isles in the British Parliament.
 - (2) Recognition to the ethnic identities of the Welsh, the Scot and the Irish.
 - (3) The cessation of conflicts between the Catholics and the Protestants.
 - (4) The dominance of England on Scotland through the English supremacy in Parliament.
74. Choose the correct response from the given options.
Many within the Congress were initially opposed to the idea of non-cooperation because
- (1) They did not think that British rule in India would collapse if Indians refused to cooperate.
 - (2) They were not yet sure of Gandhiji's ability to successfully lead a nationwide movement.
 - (3) They were reluctant to boycott the council election scheduled for November 1920.
 - (4) They did not agree with Gandhiji's proposal to carry the movement forward in stages.
75. Choose the correct response from the given options.
The main reason why the Society of Revolutionary and Republican Women was set up during the French Revolution was because
- (1) Women wanted laws that would help improve their lives.
 - (2) Women wanted the same political rights as men.
 - (3) Women wanted their interests to be properly represented in the new government.
 - (4) Women wanted access to education, training for jobs, and wages on par with men.

76. **Assertion (A):** The El Nino, a cold ocean current flows along the coast of Peru during Christmas.

Reason (R): The presence of the El Nino leads to an increase in sea-surface temperatures and weakening of the trade winds in the region.

- (1) Both A and R are true and R explains A.
- (2) Both A and R are true but R does not explain A.
- (3) A is true and R is false.
- (4) A is false and R is true.

77. **Assertion (A):** Air temperature decreases from the equator towards the poles.

Reason (R): As one move from the sea level to higher altitudes, the atmosphere becomes less dense and temperature decreases.

- (1) Both A and R are true and R explains A.
- (2) Both A and R are true but R does not explain A.
- (3) A is true and R is false.
- (4) A is false and R is true.

78. Match List-I (local name of shifting cultivation) with List-II (States/Region) and select the correct answer using the code given below:

List-I (local name of shifting cultivation)		List-II (States/Region)	
A.	Dahiya	I.	Jharkhand
B.	Kumari	II.	Madhya Pradesh
C.	Bringa	III.	Odisha
D.	Kuruwa	IV.	Western Ghats

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

79. **Assertion (A):** Most nuclear power stations in India have been constructed near sources of water.

Reason (R): Nuclear power stations require a great quantity of water for cooling purposes.

- (1) Both A and R are true and R explains A.
- (2) Both A and R are true but R does not explain A.
- (3) A is true and R is false.
- (4) A is false and R is true.

80. **Assertion (A):** Peninsular rocks contain many reserves of coal, metallic minerals, mica and many other non-metallic minerals.

Reason (R): Sedimentary rocks on the western and eastern flanks of the peninsula, in Gujarat and Assam have most of the ferrous minerals.

- (1) Both A and R are true and R explains A.
- (2) Both A and R are true but R does not explain A.
- (3) A is true and R is false.
- (4) A is false and R is true.

81. Which one of the following states has common borders with the least number of countries?

- (1) Uttarakhand
- (2) West Bengal
- (3) Arunachal Pradesh
- (4) Sikkim

82. Match List-I (Rivers) with List-II (National Waterways) and select the correct answer using the code given below:

List-I (Rivers)		List-II (National Waterways)	
A.	Ganga	I.	National Waterways No. 4
B.	Brahmaputra	II.	National Waterways No. 1
C.	Godavari and Krishna	III.	National waterway No. 5
D.	Mahanadi and Brahmani	IV.	National waterway No. 2

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

83. Match List-I (Rivers) with List-II (Tributaries) and select the correct answer using the codes given below:

List-I (Rivers)		List-II (Tributaries)	
A.	Godavari	I.	Lohit
B.	Ganga	II.	Koyana
C.	Krishna	III.	Wainganga
D.	Brahmaputra	IV.	Son

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

84. Arrange these hills/ranges from north to south direction

- I. Zaskar Range II. Shiwalik Range
III. Karakoram Range IV. Ladakh Range
(1) III, IV, I, II (2) III, I, IV, II
(3) I, II, III, IV (4) IV, III, I, II

85. Match List-I (Rivers) with List-II (Origin) and select the correct answer using the codes given below:

List-I (Rivers)		List-II (Origin)	
A.	Godavari	I.	Cardamom Hills
B.	Krishna	II.	Amarkantak Hills
C.	Narmada	III.	Nasik Hills
D.	Vaigai	IV.	Mahabaleshwar

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

86. **Assertion (A):** In India, most migrations have been from rural to urban areas.

Reason (R): The urban areas offer greater employment opportunities and better living conditions.

- (1) Both A and R are true and R explains A.
(2) Both A and R are true but R does not explain A.
(3) A is true and R is false.
(4) A is false and R is true.

87. Arrange these hills from west to east direction.

- A. Khasi hills B. Garo hills
C. Naga hills D. Jaintia Range
(1) C, A, B, D (2) D, B, A, C
(3) A, B, C, D (4) B, A, D, C

88. **Assertion (A):** The Earth does not receive an equal amount of solar energy at all latitudes.

Reason (R): As one goes from low altitude to high altitude temperature decreases because atmosphere becomes less dense.

- (1) Both A and R are true and R explains A.
(2) Both A and R are true but R does not explain A.
(3) A is true and R is false.
(4) A is false and R is true.

89. Match the vegetation zones in Column-I with the associated mean annual average temperature (in degree Celsius) in Column-II.

Column-I		Column-II	
A.	Tropical	I.	17°C to 24°C
B.	Sub-tropical	II.	Above 24°C
C.	Temperate	III.	7°C to 17°C
D.	Alpine	IV.	Below 7°C

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

90. Match the given crops with their major producing areas shown on the map of India.



- A. Wheat B. Coffee
C. Rice D. Tea

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

91. Which of the following statements is/are true about federal systems?
- All federations have a similar scheme of distribution of powers.
 - The origins of different federations are dissimilar.
 - Federalism promotes unity at the cost of diversity.
 - Federalism promotes unity in diversity.
- Only b
 - a and c
 - b and d
 - a, b and c
92. I do not contest elections, but I try to influence the political process. I have a specific policy agenda. I have no interest in seeking political power. Who am I?
- Bureaucracy
 - Court
 - Pressure group
 - Media
93. Which of the following statements is/are true?
- India is among the bottom group of nations in the world when it comes to the representation of women in legislatures.
 - Women in the Arab countries are most active in public life.
 - India has lesser representation of women in legislatures as compared to Sub-Saharan Africa.
 - The share of women in legislative assemblies in India is lower than that of their representation in Parliament.
- a and b
 - b and c
 - a, b and d
 - a, c and d
94. Which of the following issues has been most successfully addressed by the Indian democracy?
- Social inequality
 - Economic inequality
 - Political inequality
 - Natural inequality
95. Match List I (Leaders) with List II (Political parties) and select the answer using the codes given below.

List I		List II	
I.	E.M.S. Namboodiripad	a.	Bahujan Samaj Party
II.	Sheikh Abdullah	b.	Telugu Desam
III.	N.T. Rama Rao	c.	Communist Party of India (Marxist)
IV.	Kanshi Ram	d.	Jammu & Kashmir National Conference

- Ic
 - Ib
 - Ib
 - Ic
- IId
 - IId
 - IId
 - IId
- IIIa
 - IIIc
 - IIIa
 - IIIb
- IVb
 - IVa
 - IVd
 - IVa
96. Economic growth is growth in _____
- value of total output.
 - value of total investment.
 - value of industrial output.
 - value added of all sectors.
97. Mahatma Gandhi National Rural Employment Guarantee Act aims at providing
- employment to rural people in government offices.
 - 200 days of work/year in rural areas.
 - 100 days of wage employment in a year to rural households.
 - 365 days work in rural areas.
98. A landless worker in a village takes a kind loan of two bags of rice from the village landlord. The condition is that she will repay the loan in two and half bags of rice at the end of one year. The interest paid equals _____
- the difference between the money value of rice between now and at the end of the year.
 - 31.25 percent of the original amount of loan.
 - 25 percent of the original amount of loan.
 - the difference between the rates of interest charged by banks between now and at the end of the year.
99. Non-market activity is _____
- a state of unemployment.
 - producing for self consumption.
 - selling the products nearby temples.
 - selling the products through the Regulated Market.
100. A typical farmer's capital includes tractor, turbines, plough, seeds, fertilisers, pesticides and cash in hand. Which of these combinations can be classified as working capital?
- Tractor, turbines and plough
 - Seeds, fertilisers, pesticides and cash in hand
 - Plough, seeds, fertilisers and pesticides
 - Plough, seeds, fertilisers, pesticides and cash in hand

ANSWER KEY

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

Hints & Explanations

1. (3) There are 1200 nucleotides in DNA. In DNA adenine binds with double hydrogen bond to thymine and cytosine binds with triple hydrogen bond to guanine.



Since in this DNA there are 1200 nucleotides, it means the sum of Adenine, guanine thymine and cytosine is 1200. And the amount of thymine is also 200 [equal to the amount Adenine]

Adenine + Guanine = Thymine + Cytosine

$$\text{Adenine} + \text{Guanine} = \frac{1200}{2} = 600$$

$$\begin{aligned} \text{Guanine} &= 600 - \text{Adenine} \\ &= 600 - 200 \\ &= 400 \end{aligned}$$

Thus, there will be 400 guanine and 400 cytosine in the DNA.

2. (1) Fungus have eukaryotic cellular organisation with cell wall made up of chitin. They are heterotrophic because of absence of chlorophyll

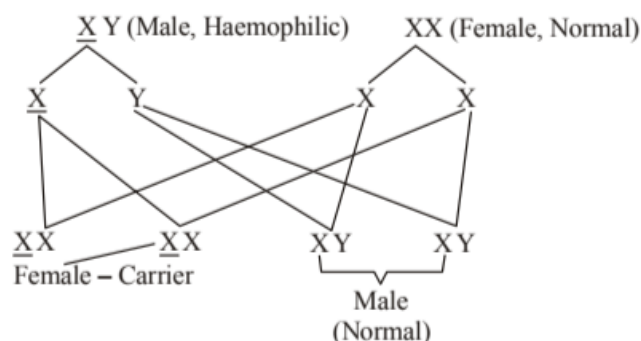
Column A	Column B
(a) Flying fish	(iii) Exocoetus
(b) Flying lizard	(i) Draco
(c) Egg laying mammal	(ii) Echidna
(d) Flightless bird	(iv) Struthio

4. (4) Golgibodies are involved in packaging and dispatching of materials. Mitochondria are the sites of aerobic respiration. Rough endoplasmic reticulum is involved in protein synthesis. Lysosomes contain hydrolytic enzymes.

5. (2) Autoclaving is a method of sterilisation which kills all the organisms. Since the soil is autoclaved, it will not have the bacteria *Rhizobium* which is essential for nodule formation, and hence the plant will fail to produce root nodules.

6. (2) Sleeping sickness is caused by *Trypanosoma sp.* which is an extracellular parasite found in blood plasma.

7. (1)



Since all the male progeny will get the X chromosome from their mother, they will all be normal.

8. (4) Domestic sewage contains faecal matter, having coliform bacteria *E. coli*. If a water body has coliform bacteria, it indicates pollution from domestic sewage.
9. (3) Incomplete combustion of coal produces carbon monoxide which is highly toxic and can cause death of human.
10. (1) During breathing, inhalation is done by contraction of muscles of ribs and diaphragm, and hence is an active process. Whereas during exhalation muscles of ribs and diaphragm relaxes. So it is a passive process.

11. (3) In some plants, stems become green and are adapted to carry out photosynthesis, for example cactus which is a xerophytic plant. The leaves of this plant are reduced to spines so as to reduce transpiration (water loss) and stem carries out the process of photosynthesis.

12. (1) The diameter (girth) of stem increases due to the activity of lateral meristem.

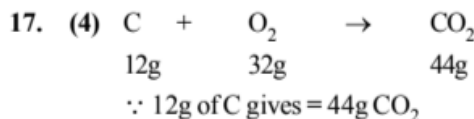
13. (4) Firstly the receptor organ receives the signal which is transported to the spinal cord through the spinal nerve. The motor nerve then carries the information to the effector muscle to take the appropriate action.

14. (2) In human female, egg development starts at foetus stage. Thus when a girl is born thousands of immature eggs can be seen in her ovary.

15. (4) On compressing the gas, pressure increases and volume decreases therefore number of collision of molecules at per unit area of the wall of the cylinder increases.

16. (4) Solubility of S = 28.6% at 50°C
i.e. 100 ml of solution contains solute = 28.6g
At 50°C, 50 ml of saturated solution contains solute = 14.3g
On cooling at 40°C amount of S separates out from 50 ml solution = 2.4g
Therefore remaining solute = 14.3 – 2.4 = 11.9g

$$\text{Solubility of S at } 40^\circ\text{C} = \frac{11.9}{50} \times 100 = 23.8\% \text{ m/v}$$



$$\therefore 1\text{g of C gives} = \frac{44}{12} \text{ g CO}_2$$

$$\therefore 6\text{g of C gives}$$

$$= \frac{44}{12} \times 6 = 22\text{g CO}_2$$

18. (1) Law of conservation of mass is only valid for chemical reactions (oxidation and endothermic reactions). As these reactions involves only change in energy keeping the mass constant.

19. (3) α -particle is helium ion ${}^4_2\text{He}^{2+}$

No. of protons = 2

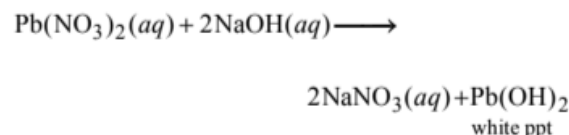
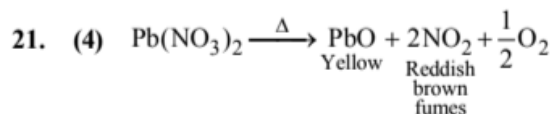
No. of neutrons = 4 – 2 = 2

No. of electrons = zero

20. (2) Relative atomic mass =

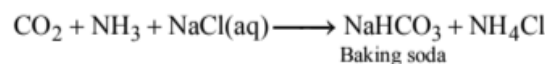
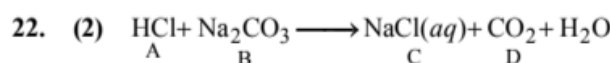
$$\begin{aligned} &= \text{Mass of first isotope} \times \% \text{ of first isotope} \\ &+ \text{Mass of second isotope} \times \% \text{ of second isotope} \\ &= \frac{\quad}{100} \end{aligned}$$

$$= \frac{60 \times 69 + 71 \times 40}{100} = 69.8$$

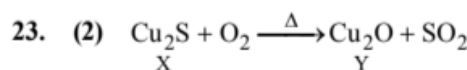


\therefore Compound is $\text{Pb(NO}_3)_2$

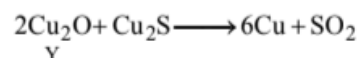
Ions present are Pb^{2+} and NO_3^-



Hence A & B are HCl & Na_2CO_3



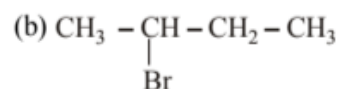
Copper glance Cuprous oxide



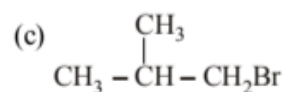
24. (2) The bond dissociation energy of N_2 is very high due to presence of triple bond between two nitrogen atoms. That's why nitrate ores are rarely available.

25. (3) (a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$

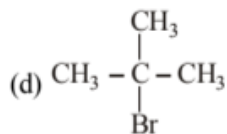
1 – Bromobutane



2 - Bromo butane

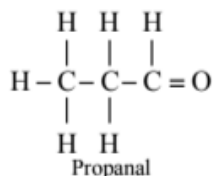


1-Bromo 2 methyl propane



2-Bromo-2-methylpropane

26. (1)



Total no. of electrons of C atoms = $3 \times 6 = 18$

Total no. of electrons of O atoms = $1 \times 8 = 8$

Total no. of electrons of H atoms = $6 \times 1 = 6$

Total no. of electrons in one molecule

= $18 + 8 + 6 = 32$ electrons

Total no. of bonds = 10

Each bond contains $2e^-$. Therefore no. of electrons involved in bonding.

= $2 \times 10 = 20$ electrons.

27. (3) Electropositive nature increases from top to bottom in a group and decrease along a period. Therefore X is most electropositive.

Atomic size decreases along a period and increases down the group. Therefore $W < X$.

28. (2) Let man will meet the bus at time t . At that time

Velocity of man $u \geq at$ or, $t \leq u/a$

Distance travelled by man = distance travelled by bus

$$ut = \frac{1}{2}at^2 + d \Rightarrow d = ut - \frac{1}{2}at^2$$

$$\Rightarrow d \leq u(u/a) - \frac{1}{2}a \frac{u^2}{a^2}$$

$$\text{Required condition } d \leq \frac{u^2}{2a}$$

29. (3) As we know

Distance travelled in last one second of ascent = distance travelled in first one second of descent

Distance travelled in one second of descent

$$s = ut + \frac{1}{2}gt^2 = \frac{1}{2}g(1)^2$$

$$= g/2$$

30. (4) From question,

$$R_A = 2R_B$$

$$\text{and } \rho_A = 3\rho_B$$

Acceleration due to gravity.

$$g = \frac{4}{3}\pi\rho Rg$$

$$\frac{g_A}{g_B} = \frac{\rho_A}{\rho_B} \times \frac{R_A}{R_B}$$

$$= 3 \times 2 = 6$$

31. (3) In all three cases

$$F \perp d$$

therefore, work done

$$W_1 = W_2 = W_3 = 0$$

32. (4) According to law of conservation of energy at all positions K.E. + P.E. = constant.

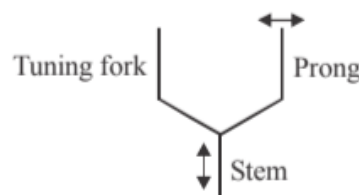
Graph (4) violates the law of conservation of energy.

$$33. (2) f_{\text{disc}} = 360 \text{ r.p.m.} = \frac{360}{60} = 6 \frac{\text{rev}}{\text{sec}}$$

$$f_{\text{sound}} = 60 \times f_{\text{disc}} \\ = 360 \text{ Hz}$$

i.e., the emitted sound is in unison with tuning fork of frequency = 360 Hz.

34. (3) Vibrations executed by prongs are longitudinal whereas by stem of tuning fork transverse.



$$35. (2) \text{ Here, } R_{\text{eq}} = \frac{R}{2} + \frac{R}{3} + \frac{R}{2}$$

$$= R + \frac{R}{3} = \frac{4}{3}R$$

Therefore current read by ammeter

$$I = \frac{V}{R} = \frac{3V}{4R}$$

36. (2) Bulbs are connected in parallel

so V is same for all three bulbs.

Heat produced by first bulb $H_1 = P_1 \times t_1 = 12 \times 10 = 120 \text{ J}$

Similarity, $H_2 = 2 \times 10 = 20 \text{ J}$

and for third bulb $H_3 = 6 \times 10 = 60 \text{ J}$

37. (2) Magnetic field (B) is produced by moving charge.
38. (2) According to Fleming's left hand rule
the direction of force on the wire will be down into the page.
39. (2) (i) Rainbow due to the phenomenon of dispersion of light.
(ii) Twinkling of stars is due to atmospheric refraction.
(iii) Blue colour of sky is due to scattering of light.

$$\text{Scattering} \propto \frac{1}{\lambda^4}$$

40. (3) **Bifocal lens**—Convex lens (lower part) is used to read books and concave lens (upper part) for viewing distant object.

41. (2) $12x = 2^2 \times 3^1 \times x$

$$5y = 5 \times y$$

$$720 = 2^4 \times 3^2 \times 5^1$$

From the above factorizations it is clear that y is not a multiple of 5.

so, from option, we get clearly y is 144.

42. (1) Since, x is divided by 5, the remainder is 2
therefore

$$x = 5m + 2$$

similarly, $y = 5n + 4$

$$\text{consider } x + y = 5(m + n) + 6$$

$$= 5(m + n) + 5 + 1$$

$$= 5(m + n + 1) + 1$$

But given that when x + y is divided by 5, the remainder is z

$$\therefore z = 1$$

$$\text{Now, } \frac{2z - 5}{3} = \frac{2(1) - 5}{3} = -1$$

43. (1) Let zeroes of given polynomial be

$$a - d, a, a + d,$$

so sum of roots

$$= 3a = \frac{144}{64} \Rightarrow a = \frac{48}{64} = \frac{3}{4}$$

$$\text{product of roots} = a(a^2 - d^2) = \frac{15}{64}$$

$$= \frac{3}{4} \left[\frac{9}{16} - d^2 \right] = \frac{15}{64}$$

$$\Rightarrow \frac{9}{16} - d^2 = \frac{5}{16}$$

$$\Rightarrow d^2 = \frac{4}{16} \Rightarrow d = \pm \frac{1}{2}$$

So zeroes are

$$\frac{3}{4} - \frac{1}{2}, \frac{3}{4}, \frac{3}{4} + \frac{1}{2}$$

$$= \frac{1}{4}, \frac{3}{4}, \frac{5}{4} \text{ and the required difference}$$

$$= \frac{5}{4} - \frac{1}{4} = \frac{4}{4} = 1$$

44. (4) Given $2x + y = 10$

on adding y both sides, we get

$$2x + y + y = 10 + y$$

$$\Rightarrow 2(x + y) = 10 + y$$

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

Now, $(x + y)_{\max}$ when y is maximum & maximum value of y will be 10. ($\because y = 10 - 2x$)

$$\text{So } (x + y)_{\max} = 5 + 5 = 10$$

$$\& (x + y)_{\min} \text{ when } y = 0$$

$$\therefore \text{minimum value of } x + y = 5$$

$$\text{So, sum of } (x + y)_{\max} \& (x + y)_{\min} = 15$$

45. (2) Given expression can be written as

$$7\left(y + \frac{1}{y}\right) - 2\left(y^2 + \frac{1}{y^2}\right) - 9 = 0$$

$$\Rightarrow 7\left(y + \frac{1}{y}\right) - 2\left[\left(y + \frac{1}{y}\right)^2 - 2\right] - 9 = 0$$

$$\Rightarrow 7\left(y + \frac{1}{y}\right) - 2\left(y + \frac{1}{y}\right)^2 + 4 - 9 = 0$$

$$\Rightarrow 7\left(y + \frac{1}{y}\right) - 2\left(y + \frac{1}{y}\right)^2 - 5 = 0$$

$$\Rightarrow 2\left(y + \frac{1}{y}\right)^2 - 7\left(y + \frac{1}{y}\right) + 5 = 0$$

$$\text{Let } y + \frac{1}{y} = a$$

$$\Rightarrow 2a^2 - 7a + 5 = 0$$

$$\Rightarrow 2a^2 - 5a - 2a + 5 = 0$$

$$\Rightarrow (2a - 5)(a - 1) = 0$$

$$\Rightarrow a = \frac{5}{2}, a = 1$$

$$\text{Now, } y + \frac{1}{y} = \frac{5}{2} \quad y + \frac{1}{y} = 1$$

$$\Rightarrow 2y^2 - 5y + 2 = 0 \quad \Rightarrow y^2 - y + 1 = 0$$

$$\Rightarrow 2y^2 - 4y - y + 2 = 0 \Rightarrow y = \frac{1 \pm \sqrt{1 - 4(1)(1)}}{2(1)}$$

$$\Rightarrow (y - 2)(2y - 1) = 0 \Rightarrow y = \frac{1 \pm \sqrt{-3}}{2}$$

$$\Rightarrow y = 2, y = \frac{1}{2} \Rightarrow y \text{ is not real.}$$

So, $y = 2$ is only integral solution.

46. (3) Let radius of the smaller circle be r cm.

$$\therefore A = \pi r^2$$

Given, radius of larger circle = 4 cm

$$\therefore \text{Area} = \pi(4)^2 \text{ cm}^2 = 16\pi \text{ cm}^2$$

But given, area of larger circle = $A + B$

$$\therefore A + B = 16\pi$$

$$\Rightarrow B = 16\pi - \pi r^2$$

Given that $A, B, A + B$ are in A.P.

$$\therefore (A) + (A + B) = 2B$$

$$\Rightarrow B = 2A$$

$$\Rightarrow 16\pi - \pi r^2 = 2(\pi r^2)$$

$$\Rightarrow r^2 = \frac{16}{3}$$

$$\Rightarrow r = \frac{4\sqrt{3}}{3} \Rightarrow \text{Diameter} = \frac{8\sqrt{3}}{3}$$

47. (4) Let the sides of a triangle be x, y and z .

According to the question, we have

$$x + y - 8 = z$$

$$y + z - 8 = x$$

$$x + z - 8 = y$$

On solving these equation we get $x = y = z = 8$

this gives that triangle is an equilateral triangle

$$\therefore \text{Area} = \frac{\sqrt{3}}{4} (8)^2 = 16\sqrt{3}$$

48. (4) Let $\operatorname{cosec} x - \cot x = \frac{1}{3}$

$$\Rightarrow \frac{1}{\sin x} - \frac{\cos x}{\sin x} = \frac{1}{3}$$

$$\Rightarrow \frac{1 - \cos x}{\sin x} = \frac{1}{3} \Rightarrow \frac{2 \sin^2 \frac{x}{2}}{2 \sin \frac{x}{2} \cos \frac{x}{2}} = \frac{1}{3}$$

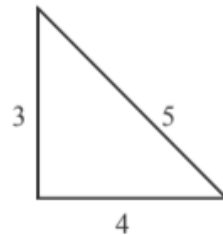
$$\Rightarrow \tan \frac{x}{2} = \frac{1}{3}$$

$$\text{Thus, } \sin \frac{x}{2} = \frac{1}{2\sqrt{2}}, \cos \frac{x}{2} = \frac{3}{2\sqrt{2}}$$

Consider

$$\tan x = \frac{2 \tan \frac{x}{2}}{1 - \tan^2 \frac{x}{2}} = \frac{\frac{2}{3}}{1 - \frac{1}{9}} = \frac{3}{4}$$

$$\therefore \cos^2 x - \sin^2 x = \frac{16}{25} - \frac{9}{25} = \frac{7}{25}$$



49. (4)

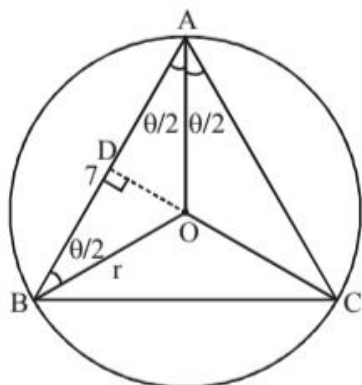
$$\text{Now from } \Delta BOD, \cos \frac{\theta}{2} = \frac{7}{2(r)}$$

$$\Rightarrow r = \frac{7}{2} \sec \frac{\theta}{2}$$

$$\text{Area of circle} = \pi r^2$$

$$= \frac{22}{7} \left(\frac{49}{4} \right) \sec^2 \frac{\theta}{2}$$

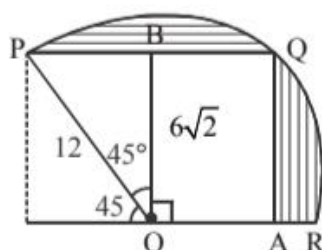
$$= \frac{77}{2} \sec^2 \frac{\theta}{2}$$



50. (2) In ΔPOB , $\cos 45^\circ = \frac{BO}{12}$

$$\Rightarrow BO = \frac{12}{\sqrt{2}} = 6\sqrt{2}$$

$$\sin 45^\circ = \frac{PB}{12} \Rightarrow PB = \frac{12}{\sqrt{2}} = 6\sqrt{2}$$



and $PQ = 12\sqrt{2}$

Area of shaded region = Area of PQAO - Area of OPQRO

$$= \left(\frac{135^\circ}{360^\circ} \right) \pi (12)^2 - \frac{1}{2} 18\sqrt{2} \times 6\sqrt{2}$$

$$= \frac{45}{120} \times \frac{22}{7} \times 12 \times 12 - 108$$

$$= \frac{9}{2} \times \frac{22}{7} \times 12 - 108 = \frac{1188}{7} - 108 = \frac{432}{7}$$

$$= 61\frac{5}{7} \text{ cm}^2$$

51. (3) Three mutually perpendicular planes will cut sphere into eight identical pieces

Now surface area of one identical piece

$$= \frac{3}{4} \pi r^2 + \frac{\pi r^2}{2}$$

Total new surface area

$$= 8 \times \frac{5}{4} \pi r^2 = 10\pi r^2$$

and original surface area = $4\pi r^2$

$$\text{Required ratio \%} = \frac{6\pi r^2}{4\pi r^2} \times 100 \% = 150\%$$

52. (3) Let h be the height and r be the radius of the cylinder.

Given $h = 2r$

Since, $\Delta PSC \sim \Delta AOC$

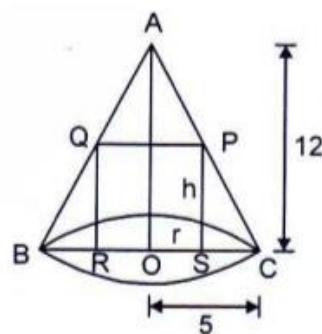
\therefore By similarity of two triangles, we have

$$\frac{PS}{AO} = \frac{SC}{OC} = \frac{PC}{AC}$$

$$\Rightarrow \frac{h}{12} = \frac{5-r}{5} = \frac{PC}{AC}$$

$$\Rightarrow \frac{h}{12} = \frac{5-r}{5} \Rightarrow \frac{2r}{12} = \frac{5-r}{5}$$

$$\Rightarrow 10r = 60 - 12r$$



$$\Rightarrow r = \frac{30}{11} \text{ and } h = \frac{60}{11}$$

Volume of cylinder = $\pi r^2 h$

$$= \frac{22}{7} \left(\frac{900}{121} \right) \frac{60}{11} \approx 127.50$$

53. (1)

Let $\angle DAQ = x^\circ$

Now, in ΔADQ ,

$$\tan x = \frac{DQ}{AD}$$

$$\Rightarrow \tan x = \frac{DQ}{1} \quad (\because \text{side of square} = 1)$$

$$\tan x = \frac{DQ}{OQ}$$

Now, $QC = 1 - DQ$

$$= 1 - \tan x$$

Now, in $\triangle ABP$

$$\tan(45 - x) = \frac{BP}{BA} = \frac{BP}{1}$$

$$\frac{\tan 45^\circ - \tan x}{1 + \tan 45^\circ \tan x} = \text{BP}$$

$$\Rightarrow \frac{1 - \tan x}{1 + \tan x} = \text{PB} \quad (\because \tan 45^\circ = 1)$$

Now, $PC = 1 - PB$

$$= 1 - \left[\frac{1 - \tan x}{1 + \tan x} \right] = \frac{1 + \tan x - 1 + \tan x}{1 + \tan x}$$

$$\Rightarrow PC = \frac{2 \tan x}{1 + \tan x}$$

$$\text{Now } PQ^2 = QC^2 + PC^2$$

$$= (1 - \tan x)^2 + \frac{(2 \tan x)^2}{(1 + \tan x)^2}$$

$$PQ^2 = \frac{(1 - \tan^2 x)^2 + 4 \tan^2 x}{(1 + \tan^2 x)^2} = \frac{(1 + \tan^2 x)^2}{(1 + \tan^2 x)^2}$$

$$PQ = \frac{1 + \tan^2 x}{1 + \tan x}$$

Now Required Perimeter = PQ + QC + PC

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

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

- 54. (3)** Let $BD = x$ cm

Since $AC = BC$, therefore $\triangle ABC$ is an isosceles triangle.

$$\Rightarrow \angle B = \angle CAB = 72^\circ$$

Since AD bisects $\angle A$

$\therefore \angle DAB = 36^\circ$ so, In $\triangle ADB$, $\angle ADB = 72^\circ$

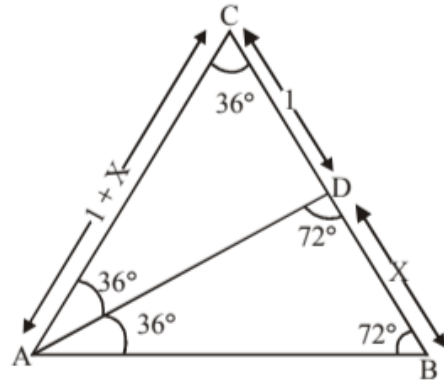
$\Rightarrow \triangle ADB$ is an isosceles triangle

$$\therefore AB = AD = 1 \text{ cm}$$

$$\Rightarrow AB = 1 \text{ cm}$$

Similarly, $\triangle ADC$ is also an isosceles triangle.

$$\therefore AD = CD \Rightarrow AD = 1 \text{ cm}$$



Now $\frac{AC}{AB} = \frac{CD}{BD}$

$$\Rightarrow \frac{1+x}{1} = \frac{1}{x}$$

$$\Rightarrow x + x^2 - 1 = 0$$

$$\Rightarrow x = \frac{-1 \pm \sqrt{(1)^2 - 4(1)(-1)}}{2} = \frac{-1 \pm \sqrt{5}}{2}$$

$$BD = \frac{\sqrt{5}-1}{2}$$

55. (4) Let $\angle BOC = 2x$

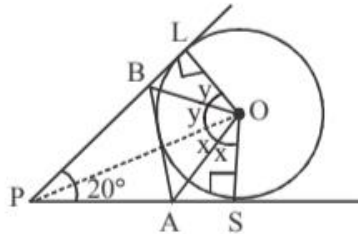
then $\angle BAC = 180^\circ - x$

and $\angle OBC = 90^\circ - x$

$$\begin{aligned}\text{Now } \angle BAC - \angle OBC &= 180^\circ - x - 90^\circ + x \\ &= 90^\circ\end{aligned}$$

56. (4) We redraw the figure, In $\triangle OPS$, $\angle POS = 70^\circ$

and In $\triangle POL$, $\angle POL = 70^\circ$



From figure $2x + 2y = 140^\circ$

$$\angle BOA = x + y = 70^\circ$$

- 57. (3)** Area of $\triangle ABC$

$$= \frac{1}{2} |(-75-75) - 5(5-15) - 10(5+15)|$$

$$= \frac{1}{2} |-300| = 150$$

Co-ordinates of D = (-5, 10) (By mid-point formula)

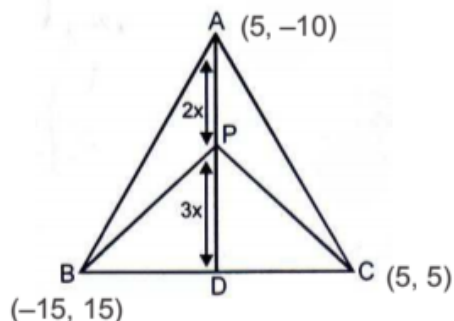
Co-ordinates of P = (1, -2) (By section formula)

Now, area of $\triangle PBC$

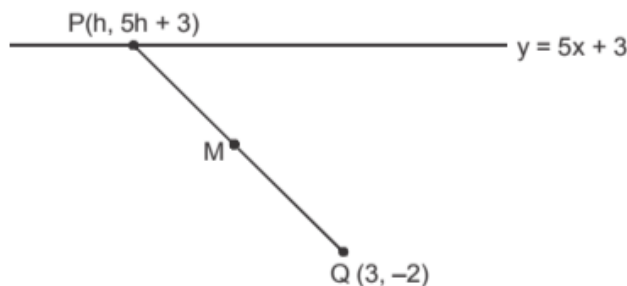
$$= \frac{1}{2} [(-75 - 75) - 1(5 - 15) - 2(5 + 15)]$$

$$= \frac{1}{2} [|-150 + 10 - 40|] = \left| \frac{-180}{2} \right| = 90$$

$$\text{Required ratio} = \frac{90}{150} = \frac{3}{5} = 3:5$$



58. (2) Let co-ordinate of point p be (h, 5h + 3)



Since, M is the mid-point of PQ, therefore by

$$\text{mid-point formula, we have } M = \left(\frac{h+3}{2}, \frac{5h+3-2}{2} \right)$$

Clearly by observing the options, we can say that M must lie on the line

$$y = 5x - 7$$

59. (1) Total three digit number are : $3 \times 3 \times 2 = 18$

Now, numbers divisible by 5 are :

$$2 \times 3 \times 1 + 2 \times 2 \times 1 = 10$$

So, probability that the slip bears a number divisible by 5

$$= \frac{10}{18} = \frac{5}{9}$$

60. (2) Given, $\frac{x_1 + \dots + x_{15}}{15}$

$$x_1 + x_2 + x_3 + \dots + x_{15} = 15 \times 13 = 195$$

In order to set the second largest and largest, first thirteen natural numbers are

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13

$$\text{So, } x_{14} + x_{15} = 195 - \frac{13 \times 14}{2}$$

$$\Rightarrow x_{14} + x_{15} = 195 - 91 = 104$$

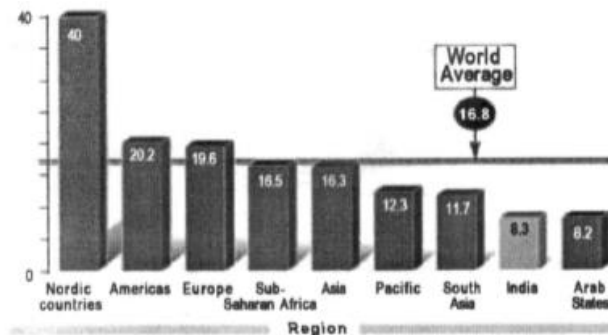
Now, from the options, we have

$$x_{14} = 51 \text{ and } x_{15} = 53$$

Now, second largest is 51.

61. (1) The emergence of the middle class happened because industrial revolution.
62. (4) The lives of pastoralists in India underwent dramatic changes under colonial rule because in most areas of lands regularly used by pastoralists for grazing were taken over by the colonial state and given to select individuals for cultivation.
63. (4) By the early twentieth century. America became the biggest supplier of wheat to Europe. because the spread of railways made it easy to transport the grain from the wheat growing regions to the eastern coast for export.
64. (1)
65. (1) Indian Novels and their year of writing/publication
Yamuna Paryatan (1857)
Rajasekhara Caritramu (1875)
Pariksha-guru - (1882)
Indulekha - (1889)
66. (4) During the Balshevik Revolution the three tenets of April thesis were.
(1) Bank be Nationalised
(2) World was first be brought to close.
(3) Land to be transferred to the Peasants.
67. (1) When Gandhiji went to London to study law in 1888, he dressed in western suit.
in Durban in 1913, Gandhiji first appeared in a lungi and kurta. After coming back to India in 1915 he decided to dress like Kathiawadi peasants. he adopted short dhoti. Only in 1921.
68. (1) The correct answer is rewriting history to show India's continuous progress from the ancient to the modern times.
69. (2) Nomadic people move over long distance because by temperament they don't like to settle down in any one place.
70. (3) England grain production grew as quickly as the population in 19th century because larger areas were brought under cultivation.

71. (3) They wanted to define the cultural identity of the nation.
72. (4) It demonstrated the dominance of the state power and conservatives success in mobilising nationalist sentiments.
73. (4) It means the dominance of England on Scotland through the English supremacy in Parliament.
74. (4) They were reluctant to boycott the council election scheduled for November 1920.
75. (2) It was because they wanted the same political rights as men.
76. (4) Statement A is false and statement R is true because the El Nino, a warm ocean current flows along the coast of Peru during Christmas.
77. (2) Both A and R are true but R don't explain (A) because both are different things; air temperature decreases from the equator towards the poles because of varying insolation. Insolation is different at different areas because of inclination of earth from its vertical axis.
78. (2) These are slash and burn farming in India, '**Jhum cultivation**' is commonly used in this context.
Dahiys – Madhya Pradesh
Kumari – Western Ghats
Brings – Odisha
Kuruwa – Jharkhand
79. (1) Both (A) and R are true and R explains A because nuclear power stations require a great quantity of water for cooling purposes.
80. (3) A is true and R is false because ferrous mineals are found in igneous rocks.
81. (1) Uttarakhand has common borders with the least number of countries.
82. (4) Gangs – National water way No. 1
Brahmaputra – National water way No. 2
Godavari and Krishna – National water way No. 4
Mahanadi and Brahmani – National water way No. 5
83. (3) Godavari – Wainganga
Ganga – Son
Krishna – Koyna
Brahmaputra – Lihit
84. (1)
85. (2)
86. (1) In India, the cause of most migrations has been from Rural to Urban Areas.
87. (4) Garo hills – Khasi hills – Jaintia Range – Naga hills.
88. (2) Both (A) and (R) are true but (R) does not explain (A) because the earth does not receive an equal amount of solar energy because of varied latitude, not because of altitude's position.
89. (1) **Tropical** : Hot and Humid weather, abundant rainfall. (Ex.-Amazon Basin, Brazil)
Sub-tropical : Between tropical and Temperate zone, Temperature (20 to 35°C), Climate (Tropic summer, Non-tropic winter), Evergreen forest.
Temperate : Between tropic and polar region, summer warm, winter long cold and snowy.
Alpine : Plants grow at high elevations, mosses and lichens (plant types).
90. (2) Wheat – Himachal Pradesh
Coffee – Karnataka
Rice – West Bengal
Tea – Assam
91. (4) The origins of differnt federations not similar because it is decided by some historical, cultural and political factors of a country. Federalism promotes unity in diversity '1' is not true as federation have different scheme of distribution of power. For example, US & India. '3' is totally wrong. India is a typical example where diversity is not sacrificed at any cost.
92. (3) A pressure group is an organised group that seeks to influence government policy or protest or advance a particular cause or interest. They are not part of government. Some examples are trade union congress, law society etc.
93. (4) Women in National parliaments in different regions of the world (in %)



94. (3) Women's reservation bill in India aims to establish political equality.
95. (4) I. EMS Namboodiripad was Chief Minister of Kerala who belonged to Communist Party of India (Marxist).
II. Sheikh Abdullah was Chief minister of Jammu & Kashmir who belonged to Jammu & Kashmir National Conference.

III. N.T. Rama Rao belonged to Telugu Desam Party.

IV. Kanshi Ram was founder of Bahujan Samaj Party.

96. (4) Economic growth is growth in value added of all sectors.
97. (3) MGNREGA aims at provides 100 days of wage employment in a financial year to rural households. Through this scheme all the adult members (at least 18 years of age) of the any family in rural part of the country are given non-skilled work.
98. (3) Principal = 2 bags of rice

$$\text{Amount} = 2\frac{1}{2} \text{ bags of Rice}$$

$$\text{Interest} = \text{Amount} - \text{Principal}$$

$$= \frac{1}{2} \text{ bags of Rice}$$

= 25 percent of the original amount (two bags) of loan.

99. (2) Self consumption is not a market activity. Non market activity means the performer of this type of economic activity produces primarily for self consumption.
100. (2) Seeds, fertilisers, pesticides and cash in hand, can be classified as working capital. Tools, machines and buildings are used up in production.