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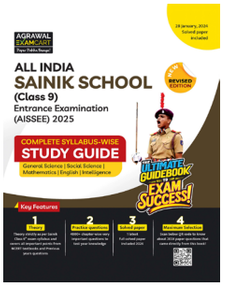

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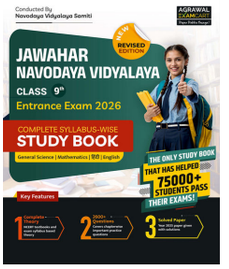

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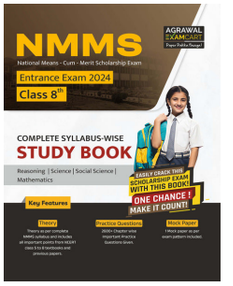

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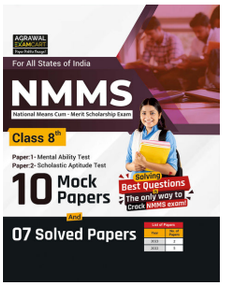


NMMS (Mock Papers)

Central Hindu School Entrance Exam (Class 9th), 2025
Solved Paper

Exam Date : 11-05-2025

हिंदी

भाषा, बोली, लिपि और व्याकरण

1. 'ब्रज' किस क्षेत्र के आस-पास बोली जाती है?
(A) प्रयागराज (B) मेरठ
(C) गाजीपुर (D) मथुरा

2. 'अवधी' किस क्षेत्र के आस-पास बोली जाती है?
(A) प्रयागराज (B) मेरठ
(C) दिल्ली (D) मथुरा

वर्ण विचार व वर्तनी विवेक

3. शुद्ध वर्तनी वाला शब्द है–
(A) संन्यासी (B) सन्यासी
(C) सन्नयासी (D) सनयासी

4. शुद्ध वर्तनी वाला शब्द है–
(A) उज्ज्वल (B) उज्जवल
(C) ऊज्ज्वल (D) ऊज्जवल

शब्द भेद: संज्ञा, सर्वनाम, विशेषण, क्रिया अव्यय एवं निपात

5. यह लड़का हमारे विद्यालय का है– वाक्य में 'यह' क्या है ?
(A) संबंधवाचक सर्वनाम
(B) निजवाचक सर्वनाम
(C) परिमाणवाचक विशेषण
(D) सार्वनामिक विशेषण

उपसर्ग–प्रत्यय

6. 'पुनर्मुद्रण' में उपसर्ग है–
(A) पुन (B) मुद्रण
(C) पुनः (D) द्रण

7. 'बैठक' में प्रत्यय है–
(A) बै (B) ठक
(C) क (D) बैठ

लिंग, वचन, कारक एवं काल

8. कारक के भेद होते हैं–
(A) तीन (B) आठ
(C) पाँच (D) दो

9. 'करण कारक' का उदाहरण है–
(A) स्नेहा कलम से लिखती है।
(B) रेलगाड़ी प्लेटफार्म से जा चुकी है।
(C) सवार घोड़े से गिरा।
(D) वृक्ष से पत्ता गिरा।

संधि

10. 'मनोहर' का सही संधि-विच्छेद है–
(A) मानो + हर (B) मन + हर
(C) मनः + हर (D) म + नोहर

समास

11. 'वनवास' में समास है–
(A) कर्म तत्पुरुष (B) करण तपुरुष
(C) संबंध तत्पुरुष (D) अधिकरण तत्पुरुष

12. 'गंगाजल' में समास है–
(A) कर्म तत्पुरुष (B) करण तत्पुरुष
(C) संबंध तत्पुरुष (D) अधिकरण तत्पुरुष

अलंकार, रस एवं छन्द

13. 'शान्त रस' का स्थायी भाव है–
(A) शोक (B) उत्साह
(C) भय (D) निर्वेद

14. 'करुण रस' का स्थायी भाव है–
(A) शोक (B) उत्साह
(C) भय (D) निर्वेद

पर्यायवाची शब्द

15. बादल का पर्यायवाची नहीं है–
(A) मेघ (B) जलधर
(C) नीरद (D) जलधि

विलोमार्थी शब्द

16. 'क्षणिक' का विलोम शब्द है–
(A) सूक्ष्म (B) कालातीत
(C) शाश्वत (D) अंत

मुहावरे एवं लोकोक्तियाँ

17. 'टोपी उछालना' मुहावरे का अर्थ है–
(A) बेइज्जती करना (B) सत्ता पलटना
(C) सम्मान करना (D) मुसीबत मोल लेना

हिंदी गद्य-पद्य, रचनाएँ और रचनाकार

18. 'विनयपत्रिका' के रचनाकार हैं–
(A) तुलसीदास (B) सूरदास
(C) कबीर (D) जायसी

19. 'पानी की कहानी' के लेखक हैं–
(A) रामचन्द्र शुक्ल (B) निर्मल वर्मा
(C) डॉ. नगेंद्र (D) रामचन्द्र तिवारी

20. 'सूरसागर' के रचनाकार है–
(A) तुलसीदास (B) सूरदास
(C) कबीर (D) जायसी

English Language

Subject Verb Agreement

21. Read the following sentence to find out whether there is any error in any underlined part and indicate your response. if you find no error, your response should be indicated as no error.
He said to him, (A) "Athletics are (B)
my favourite sport." (C) No error (D)

Adjective

22. Fill in the blank with appropriate forms of the words given in bracket.
Her argument was so ..... (convince) that even her opponents agreed with her point of view.
(A) convincing (B) convinced
(C) convincingly (D) convince

23. Read the following sentence to find out whether there is any error in any underlined part and indicate your response. if you find no error, your response should be indicated as no error.
He does not (A) have any idea (B)
about the meeting (C) No error (D)

Adverb

24. Fill in the blank with appropriate forms of the words given in bracket.
The team performed ……. (exception) in the finals, winning the championship.
(A) exception (B) exceptionally
(C) exceptional (D) except

Preposition

25. Read the following sentence to find out whether there is any error in any underlined part and indicate your response. if you find no error, your response should be indicated as no error.
My boss (A) prefers tea (B) than coffee. (C)
No error (D)

Articles

Direction (Q. No. 26 to 28)

Fill in the blanks with Appropriate articles (a, an, the)

26. I have …… cat and .... dog.
(A) a, the (B) an, a
(C) the, a (D) a, a

27. …… Earth revolves around …….. Sun.
(A) An, the (B) The, a
(C) The, the (D) A, the

28. She has …….. unique way of solving problems that makes her stand out.
(A) a (B) an
(C) the (D) no article

Tense

29. Fill in the blank with appropriate forms of the words given in bracket.
The professor …….. (impress) the students with the detailed and engaging lecture that he delivered.
(A) impresses (B) impressing
(C) impressed (D) impressively

Synonyms

Direction (Q. No. 30 to 32)

Select the word which is nearest in the meaning to the underlined word.

30. His <u>ardent</u> support for the cause made him a well-known figure in the community.
(A) Mild (B) Passionate
(C) Indifferent (D) Weak

31. The <u>serene</u> lake was the perfect spot for spending a peaceful afternoon.
(A) Noisy (B) Chaotic
(C) Calm (D) Polluted

32. She had an <u>incessant</u> need to check her phone, even during meetings.
(A) Rare (B) Constant
(C) Temporary (D) Unimportant

Antonyms

Direction (Q. No. 33 and 34)

Select the word which is opposite in the meaning to the underlined word

33. His attitude was <u>arrogant</u>, which made it difficult to work with him.
(A) Humble (B) Proud
(C) Confident (D) Rude

34. The professor's explanation was <u>obscure</u>, and left the students confused.
(A) Clear (B) Confusing
(C) Complicated (D) Vague

Cloze Test

Direction (Q. No. 35 to 38)

Choose the appropriate option after reading the following conversation :

Teacher: Good morning, Sarah. Did you complete your homework?

Student: Yes, I did, Ma'am. Here it is.

Teacher: Great! Let me check it. What part did you find difficult?

Student: I struggled with the last question about fractions.

Teacher: No worries, we'll go over that in class.

The teacher greeted Sarah and asked her if she 35) …… her homework. Sarah replied that she 36) …… it and handed it over.

The teacher asked Sarah which part she 37) …… difficult. Sarah explained that she 38) …… with the last question about fractions.

35. (A) had completed (B) complete
(C) is completing (D) completes

36. (A) did (B) had done
(C) has done (D) does

37. (A) had found (B) finds
(C) find (D) finding

38. (A) struggle (B) had struggled
(C) is struggling (D) struggles

Miscellaneous

Direction (Q. No. 39 and 40)

In these questions, a particular relationship is given. A similar relationship has to be identified from among the given alternatives :

39. Miser : Wealth :: Glutton : ?
(A) Food (B) Pleasure
(C) Energy (D) Greed

40. Benevolent : Kind :: Malevolent :
(A) Angry (B) Good
(C) Evil (D) Generous

General Science

Heat, Fossil fuel (Coal and Petroleum) Calorific Value and Flame Fuel

41. Magnesium ribbon on burning in air produces :
(A) Magnesium oxide, water and light
(B) Magnesium oxide and heat
(C) Magnesium oxide, heat and light
(D) Magnesium oxide, water and heat

42. Which among the following is considered as the cleanest fuel ?
(A) Wood (B) Petrol
(C) Kerosene (D) Hydrogen gas

43. Choose the correct statement about the inflammable substances :
(A) Low ignition temperature and can not catch fire easily.
(B) High ignition temperature and can catch fire easily.
(C) Low ignition temperature and can catch fire easily.
(D) High ignition temperature and cannot catch fire easily.

44. Exhaustible natural resources are :
(A) Unlimited in quantity
(B) Not dependent on nature
(C) Limited in quantity
(D) Not exhausted by human

45. Which of the following is not a constituent of petroleum ?
(A) Paraffin wax (B) Petrol
(C) Lubricating oil (D) Coke

Life Process of Plants and Animals

46. The belief that the mother is completely responsible for the sex of the child is wrong, because the child :
(A) Gets sex chromosome only from the mother
(B) Develops in the body of the mother
(C) Gets one sex chromosome from the mother and the other from the father
(D) Gets sex chromosome from the father

47. In the list of animals given below, hen is the odd one out. Select the reason for this :

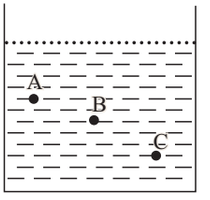
Human being, cow, dog, hen

(A) It undergoes internal fertilization.
(B) It is oviparous.
(C) It is viviparous.
(D) It undergoes external fertilization.

Motion, Force, Friction (Relation between different types of Friction) and Pressure

48. A toy car released with the same initial speed will travel farthest on :
(A) Muddy surface
(B) Polished marble surface
(C) Cemented surface
(D) Bricks surface

49. Figure shows a container filled with water. Which of the following statements is correct about pressure of water ?



(A) Pressure at A > Pressure at B > Pressure at C
(B) Pressure at A = Pressure at B = Pressure at C
(C) Pressure at A < Pressure at B > Pressure at C
(D) Pressure at A < Pressure at B < Pressure at C

50. Two objects repel each other. This repulsion could be due :
(A) Frictional force only
(B) Electrostatic force only
(C) Magnetic force only
(D) Either a magnetic or an electrostatic force

Sound and Its Basics

51. Which of the following statement is incorrect ?
(A) Sound is produced by vibrations
(B) Sound requires a medium for propagation
(C) Light and sound both require a medium for propagation
(D) The speed of sound is lesser than the speed of light

52. The loudness of sound depends on :
(A) It's amplitude (B) It's frequency
(C) It's time period (D) It's speed

Micro-organisms and Food

53. Boojho's uncle has set up an electroplating factory near the village. He should dispose off the waste of the factory :
(A) In the nearby river
(B) In the nearby pond
(C) In the nearby corn field
(D) According to the disposal guidelines of the local authority

54. Growing different crops alternately on the same land is technically called :
(A) Crop alternation
(B) Crop rotation
(C) Crop revolution
(D) Crop change

55. AIDS can spread from an infected person to another person through :
(A) Sharing food
(B) Blood transfusion
(C) Sharing comb
(D) Mosquito bite

56. Reproduction by budding takes place in :
(A) hydra (B) amoeba
(C) paramecium (D) Snakes

57. The two micro-organisms which live in symbiotic association in lichens are :
(A) Fungus and protozoa
(B) Bacteria and protozoa
(C) Alga and bacteria
(D) Alga and fungus

58. The disease caused by a protozoan and spread by an insect is :
(A) Dengue (B) Malaria
(C) Polio (D) Measles

Crop Production, Cropping Seasons and Agricultural Practices

59. Which of the following statements is not true for organic manure ?
(A) It enhances water holding capacity of soil.
(B) It has a balance of all plant nutrients.
(C) It provides humus to soil.
(D) It improves texture of soil.

Conservation of Plants and Animals (Biosphere Reserves, National Parks and Sanctuaries)

60. The place meant for conservation of biodiversity in their natural habitat is :
(i) zoological garden
(ii) botanical garden
(iii) wildlife sanctuary
(iv) national park
(A) (i) and (ii) (B) (ii) and (iii)
(C) (iii) and (iv) (D) (i) and (iv)

Social Science

Administrative and Economic Effects of the British Empire in India

61. What was the system under which peasants were forced to grow indigo on their land ?
(A) Permanent settlement
(B) Mahalwari settlement
(C) Ryotwari settlement
(D) Nij and Ryoti system

Revolt of 1857

62. Who decided that Bahadur Shah Zafar would be the last Mughal King ?
(A) Lord Dalhousie
(B) Thomas Munro
(C) Lord Ripon
(D) Lord Canning

63. Which of the following is correctly matched ?
(A) 1855 – Santhal Rebel
(B) 1940 – Bastar Rebel
(C) 1920 – Kols Rebel
(D) 1948 –Warli Rebel

Educational Social & Caste Reforms in India

64. Who was founder of 'Khudai Khidmatgar' ?
(A) Mahatma Gandhi
(B) Muhammad Ali Jinnah
(C) Khan Abdul Ghaffar Khan
(D) Syed Ahmad Khan

65. "Oru jati, oru matam, Oru daivam manushyanu" famous statement was given by :
(A) Shri Narayan Guru
(B) Ghasidas
(C) Haridas Thakur
(D) Jyotirao Phule

66. The English Education Act was introduced in which year ?
(A) 1835 (B) 1854
(C) 1864 (D) 1913

Indian Constitution and Secularism

67. Which part of the Constitution deals with Fundamental Rights?
(A) Part I (B) Part II
(C) Part III (D) Part IV

68. Which Fundamental Right was removed by 44th Amendment ?
(A) Right to Property
(B) Right to Education
(C) Right to Equality
(D) Right to Freedom

69. What was the main feature of 'Government of India Act,1935' ?
(A) Complete Independence
(B) Abolition of British Rule
(C) Establishment of Indian Republic
(D) Provincial Autonomy

Parliament

70. Who presides over the Rajya Sabha ?
(A) President
(B) Prime Minister
(C) Vice-President
(D) Chief Minister

Law and Social Justice

71. The 'Right to Education Act' provides free education for children of which of the following age group ?
(A) 0-6 years (B) 6-14 years
(C) 14-18 years (D) 18-25 years

Resources and Sustainable Development

72. What is Sustainable development ?
(A) Overuse of resources
(B) Development without conservation
(C) Meeting present needs without harming future generations
(D) Ignoring environmental concerns

73. Which of these is a non-renewable resource ?
(A) Natural Gas (B) Solar Energy
(C) Wind Energy (D) Tidal Energy

Land, Soil, Water Resources, Natural Vegetation and Wild life

74. Which soil is best suited for growing cotton' ?
(A) Desert Soil (B) Red Soil
(C) Sandy Soil (D) Black Soil

Agriculture

75. Viticulture is related with cultivation of..... .
(A) Silkworms
(B) Vegetable, flowers
(C) Grapes
(D) Breeding of fish

Industries

76. Which industry is called the "Sunrise Industry" ?
(A) Information Technology
(B) Textile Industry
(C) Coal Industry
(D) Cement Industry

77. Which of the following is a small-scale industry ?
(A) Cement Industry
(B) Handicraft Industry
(C) Petroleum Refinery
(D) Automobile Industry

Human Resources

78. Which of the following is an example of country that has experienced a loss of population number due to emigration ?
(A) United States of America
(B) Australia
(C) India
(D) Sudan

Miscellaneous

79. Who was James Mill ?
(A) A Scottish economist and political Philosopher
(B) A linguist appointed as junior Judge at the Supreme Court
(C) President of the Board of control of the Company
(D) Scottish Missionary

80. Which European country banned students from wearing religious symbols in public schools ?
(A) Germany (B) France
(C) U. K. (D) Spain

Mathematics

Number System

81. The sum of first 21 odd numbers is :
(A) 440 (B) 441
(C) 430 (D) 442

Square and Square Root

82. What least number must be added to 15370 to make it a perfect square ?
(A) 6 (B) 4
(C) 5 (D) 9

Indices and Surds

83. The simplified value of $\left(\frac{1}{27}\right)^{-\frac{2}{3}}$ is :
(A) $\frac{1}{9}$ (B) $-\frac{1}{9}$
(C) 9 (D) 27

84. The value of $\frac{3^{-5}\times10^{-5}\times125}{5^{-7}\times6^{-5}}$ is :
(A) 5^{-5} (B) 5^{3}
(C) 3^{-5} (D) 5^{5}

85. If $(2^{3x-1}+10)\div7=6$, then the value of 'x' is :
(A) $x=3$ (B) $x=2$
(C) $x=-3$ (D) $x=-1$

Fraction and Decimal Numbers

86. If $\frac{3}{5}$ of a number exceeds its $\frac{2}{7}$ by 44, then the number is :
(A) 70 (B) 280
(C) 140 (D) 160

Ratio and Proportional

87. Number of boys and girls in a class are in ratio 7 : 5. The number of boys is 8 more than the number of girls. The total class strength is :
(A) 50 (B) 38
(C) 52 (D) 48

Profit-Loss and Discount

88. By selling a radio for ₹ 950, a man loses 5%. What percent shall he gain by selling it for ₹ 1040 ?
(A) 5% (B) 4%
(C) 6% (D) 8%

89. After 20% discount Arun brought a shirt in ₹ 1600. What is its marked price ?
(A) ₹ 2000 (B) ₹ 1800
(C) ₹ 2200 (D) ₹ 2400

Time and Work

90. A works twice as fast as B. If both of them can together finish a piece of work in 12 days, then B alone can do it in :
(A) 36 days (B) 24 days
(C) 18 days (D) 20 days

Compound Interest

91. The compound interest on ₹ 4000 at 10% per annum for 2 years is :
(A) ₹ 480 (B) ₹ 800
(C) ₹ 900 (D) ₹ 840

Algebra

92. If $x+\frac{1}{x}=4$ then the value of $x^4+\frac{1}{x^4}$ is :
(A) 196 (B) 194
(C) 198 (D) 192

93. If the algebraic expression $7\sqrt{2}x^2-10x-4\sqrt{2}$ has two factors, then the factors are :
(A) $\left(4-7\sqrt{2}x\right)^2$
(B) $\left(7\sqrt{2}x-\sqrt{3}\right)\left(x-\sqrt{2}\right)$
(C) $\left(x+\sqrt{2}\right)\left(7\sqrt{2}x-4\right)$
(D) $\left(x-\sqrt{2}\right)\left(7\sqrt{2}x+4\right)$

94. The ages of A and B are in ratio 5 : 7. Four years from now the ratio of their ages will be 3 : 4. The present age of B is :
(A) 28 Yrs (B) 30 Yrs
(C) 40 Yrs (D) 32 Yrs

95. For the given equation :
$\frac{3x-2}{4}-\frac{2x+3}{3}=\frac{2}{3}-x$ the value of 'x' is :
(A) $x=2$ (B) $x=-2$
(C) $x=3$ (D) $x=4$

Geometry

96. The measures of two adjacent angles of a parallelogram are in the ratio 3 : 2. The largest angle is :
(A) 75° (B) 120°
(C) 108° (D) 60°

Area of Plane Figures

97. If the area of equilateral triangle is $4\sqrt{3}$ cm^2, then each side of the equilateral triangle is :

(A) $\frac{4}{\sqrt{3}}$ cm

(B) 4 cm

(C) $\frac{2}{\sqrt{3}}$ cm

(D) 2 cm

Surface Area and Volume

98. How many diagonals are there in a polygon having 12 sides ?

(A) 60 (B) 54

(C) 30 (D) 27

99. The ratio between the radius of the base and the height of a cylinder is 2 : 3. Find the total surface area of the cylinder, if its volume is 1617 cm^3 :

(A) 770 cm^2 (B) 780 cm^2

(C) 800 cm^2 (D) 880 cm^2

100. If the surface area of a cube is 600 cm^2, then the length of its one side is :

(A) 10 cm (B) 20 cm

(C) 100 cm (D) $10\sqrt{6}$ cm

Solutions

1. (D) 'ब्रज' भाषा मुख्यतः मथुरा और उसके आस-पास के क्षेत्र में बोली जाती है।

- इसका विकास **शौरसेनी अपभ्रंश** से हुआ है। ब्रजभाषा को **'ब्रजबुलि'** नाम से भी जाना जाता है **'ब्रज'** का आशय पशुओं के समूह या चरागाह से लिया जाता है।

2. (A) 'अवधी' प्रयागराज और उसके आस-पास के क्षेत्र में बोली जाती है।

- इसे नाम कौशली से भी जाना जाता है। उत्तर प्रदेश के अवध क्षेत्र निम्नलखित हैं–
  - लखनऊ, रायबरेली, सुल्तानपुर, बाराबंकी, उन्नाव, हरदोई, सीतापुर, लखीमपुर, अयोध्या, जौनपुर, प्रतापगढ़, प्रयागराज, कौशाम्बी, अम्बेडकर नगर, गोंडा,बस्ती, बहराइच, बलरामपुर, सिद्धार्थनगर, श्रावस्ती तथा फतेहपुर।

3. (A) शुद्ध वर्तनी है– संन्यासी [इस शब्द का अर्थ है–'त्यागी और विरक्त व्यक्ति']।

4. (A) शुद्ध वर्तनी है– उज्ज्वल [वर्तनी को उर्दू में हिज्जे तथा अंग्रेजी में spelling कहते हैं]

5. (D) दिए गए वाक्य में प्रयुक्त शब्द **'यह'** संज्ञापद **लड़का** की पहचान करा रहा है। इसलिए यह एक **सार्वनामिक विशेषण** है।

- वे सर्वनाम शब्द जो संज्ञा से पहले आकर विशेषण की तरह संज्ञा शब्द की विशेषता बताते हैं।

6. (C) **'पुनर्मुद्रण'** शब्द में **'पुनः'** उपसर्ग है, जिसका आशय है "फिर से" या "दोबारा"।

- उपसर्ग मूल शब्द के आरंभ में जुड़ने वाले शब्दांश होते हैं, अर्थात् ऐसे शब्दांश जो मूल शब्द के आगे जुड़कर उसके अर्थ में विशेषता या परिवर्तन कर देते हैं, उसे **उपसर्ग** कहते हैं।

7. (C) शब्द बैठक में 'क' प्रत्यय है।

- प्रत्यय– वे शब्द हैं जो दूसरे शब्दों के अन्त में जुड़कर, अपनी प्रकृति के अनुसार, शब्द के अर्थ में परिवर्तन कर देते हैं। प्रत्यय शब्द दो शब्दों से मिलकर बना है– प्रति + अय।

8. (B) कारक के आठ भेद होते हैं– कर्ता, कर्म, करण, सम्प्रदान, अपादान, संबंध, अधिकरण और सम्बोधन।

- जो शब्द वाक्य में क्रिया का संज्ञा और सर्वनाम शब्दों के साथ संबंध बनाए, उसे **कारक** कहते हैं।

9. (A) स्नेहा कलम से लिखती है – करण कारक का उदाहरण है।

- जिस वस्तु की सहायता से या जिसके द्वारा कोई काम किया जाता है, उसे **करण कारक** कहते हैं। इसकी विभक्ति 'से' है। जैसे – हम आँखों से देखते हैं।

10. (C) शब्द 'मनोहर' का संधि-विच्छेद है– मनः + हर = मनोहर'। इसमें विसर्ग संधि है।

- विसर्ग के साथ स्वर या व्यंजन मेल से जो विकार होता है, उसे विसर्ग संधि कहते हैं।

11. (D) शब्द वनवास में **अधिकरण तत्पुरुष समास** है।

- वनवास = वन में वास, इसमें अधिकरण कारक की विभक्ति **'में, पर, पे'** का लोप हो जाता है। जैसे– पेड़ पर चिड़िया बैठी है, छत पर मत जाओ।

12. (C) शब्द 'गंगाजल [गंगा का जल] इसमें सम्बन्ध तत्पुरुष समास है और 'का' विभक्ति का लोप हो रहा है।

- पहचान : समास को विग्रह करने पर "का/के/की" आता है। जैसे– राजपुत्र = राजा का पुत्र, राजधर्म = राजा का धर्म।

13. (D) **निर्वेद**, शांत रस का स्थाई भाव है।

- काव्य को देखने या सुनने से जिस आनन्द की अनुभूति होती है, उसे रस कहते हैं।

14. (A) 'करुण रस' का स्थाई भाव शोक है।

- जब किसी काव्य या रचना को पढ़कर, सुनकर या देखकर हृदय में दुःख, शोक या करुणा की भावना उत्पन्न हो, तो वहाँ **'करुण रस'** की अनुभूति होती है।

15. (D) बादल शब्द का पर्यायवाची नहीं है– जलधि।

- जलधि शब्द समुद्र का पर्यायवाची है। इसके अन्य पर्यायवाची हैं– सागर, सिंधु, अर्णव, जलनिधि इत्यादि।

16. (C) क्षणिक का विलोम शब्द है– शाश्वत

- **शाश्वत–** जो सदैव रहने वाला हो, जो नित्य, अपरिवर्तनीय और स्थायी हो। जैसे–आत्मा शाश्वत है, न कभी जन्म लेती है, न मरती है।
- **क्षणिक–** अस्थायी और जल्दी नष्ट होने वाला, जैसे– क्रोध एक क्षणिक भावना है।

17. (A) **"टोपी उछालना"** मुहावरे का अर्थ है– बेइज्जती करना। यह मुहावरा तब प्रयोग किया जाता है जब कोई किसी की प्रतिष्ठा को नुकसान पहुँचाता है।

18. (A) विनय पत्रिका के रचनाकार हैं–तुलसीदास। यह ग्रंथ ब्रज भाषा में रचित है।

- तुलसीदास की अन्य रचनाएँ हैं– रामचरितमानस, गीतावली , दोहावली, कवितावली और जानकी मंगल इत्यादि।

19. (D) पानी की कहानी के लेखक हैं – रामचन्द्र तिवारी।

20. (B) सूरसागर के रचनाकार हैं– सूरदास। सूरदास की अन्य रचनाएँ हैं– साहित्यलहरी, सूरसारावली।

21. (B) The error lies in part (B), replace 'athletics are' with athletics is because the word' athletics is singular. There are some nouns which look plural but are in fact singular, *e.g.*, Billiards, draughts, news, mathematics, physics, mumps, rickets, etc.

22. (A) Convincing is the most appropriate word to fill in the blank. The word Convincing means able to cause someone to believe something or to do something.

23. (A) The error lies in part (A), replace He does not with He did not because the sentence indicates the past, *i.e.*, he had no idea.

24. (B) Exceptionally is the most appropriate word to fill in the blank.

- The verb **"performed"** needs to be modified by an **adverb**, because it describes how the team performed.

25. (C) The error lies in part (C), replace than coffee with to coffee because prefer is followed by to, not than.

26. (D) Indefinite articles "a", "a" are correct to fill in the blanks. "A" is used before the word that begins with a consonant sound.

27. (C) Definite articles "the', 'the' are the most appropriate article to make the sentence meaningful. We use 'the' before the names of things unique of their kind, *e.g.*, the sun, the moon, the ocean, the sea, etc.

28. (A) Indefinite articles "a" correct to fill in the blank, because the word 'unique' begins with a consonant.

29. (C) Impressed is the correct verb to make the sentence meaningful. Because "he delivered" indicates past tense, so the verb must also be in the past tense.

30. (B) The word 'passionate' is nearest in meaning to the underlined word 'ardent', which means showing strong feelings.

31. (C) The word 'calm' is nearest in meaning to the underlined word 'serene', which means peaceful and calm, worried by nothing.

32. (B) The word 'constant' is nearest in meaning to the underlined word 'incessant', which means never stopping, especially in an annoying or unpleasant way.

33. (A) The word 'Humble' is the opposite in meaning to the underlined word 'Arrogant', which means unpleasantly proud and behaving as if you are more important than, or know more than, other people.

34. (A) The word 'Clear' is the opposite in meaning to the underlined word 'Obscure', which means not known to many people.

35. (A) 'had completed' is correct to fill in the blank.

36. (B) 'had done' is correct to fill in the blank.

37. (A) 'had found' is correct to fill in the blank.

38. (B) 'had struggled' is correct to fill in the blank.

39. (A) A 'miser' loves 'money' too much. A 'glutton' loves 'food' too much. So, glutton is to food as miser is to wealth.

40. (C) Benevolent means kind-hearted, so it matches with kind. Malevolent means someone who wishes harm or evil. So, malevolent is to evil as benevolent is to kind.

41. (C) Magnesium ribbon reacts with oxygen in the air and produces a white powdery compound named magnesium oxide. It is an exothermic reaction that releases energy into its surroundings, usually in the form of heat and light.

$2Mg(s) + O_2 \rightarrow 2MgO(s) + \text{heat}$

42. (D) Hydrogen gas is the cleanest fuel among the given options because when it's burned it produces only water vapor as a byproduct. It does not produce any harmful pollutants and it doesn't contribute to greenhouse gas emissions and climate change.

- **Wood, Kerosene and petrol releases** carbon dioxide and other pollutants into the atmosphere while burning so they are not considered as clean fuel.

43. (C) Inflammable objects have low ignition temperature and they can catch fire easily due to their specific chemical properties like they contain molecules that are highly reactive and easily undergo combustion which allows them to ignite and burn with minimal heat. Examples of inflammable substances include petrol, alcohol and Liquified Petroleum Gas (LPG).

44. (C) Exhaustible natural resources are limited in quantity. They are also known as non-renewable resources because they are getting depleted with continuous usage by humans with time. Some of their examples include fossil fuels like coal, petroleum, natural gas, minerals, and forests.

45. (D) Petroleum's main constituents are a mixture of hydrocarbons, primarily alkanes, cycloalkanes, and aromatic hydrocarbons. These hydrocarbons are separated into various products like gasoline, diesel, kerosene, lubricating oil, and paraffin wax but Coke is a solid carbon fuel which is obtained from coal.

46. (C) The belief that the mother is completely responsible for the sex of the child is wrong, because the child Gets sex chromosome only from the father. Humans contain 23 pairs of chromosomes out of which 22 pairs are autosomes and one pair of sex chromosomes. Females have XX chromosomes and males have one X and one Y chromosomes so it the sperm of the father which is responsible for the determination of sex of the child.

47. (B) The hen is the odd one out because it is oviparous which means it lays eggs that develop outside the mother's body, while the other animals namely Human beings, cows and dogs are viviparous as they give birth to live young. Examples of oviparous animals include birds, many fish, turtles, snakes, frogs and some mammals like the duck-billed platypus and echidna.

48. (B) A toy car released with the same initial speed will travel farthest on Polished marble surface because a polished marble surface provides the least friction to the toy car because it a regular surface with least number of irregularities on it while the other given options like Muddy surface, Cemented surface and Bricks surface have a large number of irregularities which provides more fiction than a polished marble surface.

49. (D) We know that pressure of the liquid is directly proportional to the depth. The formula for pressure in a fluid is $P = \rho gh$, where ρ is the density, g is the acceleration due to gravity and h is the depth.

And In the given figure. Point C is the deepest point, Point B is at an intermediate depth and Point A is the shallowest point.

So, Accordingly,

Pressure will be highest at C, than at B and it will lowest at A.

So, option (D) is correct that

Pressure at A < pressure at B < pressure at C.

50. (D) Two objects repel each other. This repulsion could be due Either a

magnetic or an electrostatic force because In electrostatics-like charges repel each other and in magnetism like poles repel each other.

51. (C) Statement C is incorrect because Light does not require a medium for propagation; it can travel through a vacuum because light is an electromagnetic wave which can propagate even in the absence of a material medium also whereas sound indeed requires a medium for propagation. other given statements are correct that Sound is produced by vibrations and The speed of sound is lesser than the speed of light.

52. (A) The loudness of sound depends on its amplitude. Loudness is directly proportional to the amplitude of the sound wave so a sound wave with a large amplitude will be louder than a sound wave with a smaller amplitude. Time period, frequency and speed of sound has no effect on the loudness of the sound.

53. (D) Boojho's uncle has set up an electroplating factory. He should dispose of the waste of the factory according to the disposal guidelines of the local authority because electroplating waste contains hazardous chemicals and heavy metals that can cause severe water and soil pollution.

54. (B) Growing different crops alternately on the same land is technically called Crop rotation. It is the process of growing different varieties of crops in different seasons in the same agricultural area. It's important because it helps in maintaining soil health, optimizes nutrients in the soil and improves overall agricultural efficiency.

55. (B) AIDS can spread from an infected person to another person through Blood transfusion because an infected person's blood carries the HIV virus when it is transfused into the other person's body. AIDS can be transmitted through contact with certain bodily fluids like blood, semen, vaginal fluids and breast milk. This Transmission primarily occurs during sexual activity, through sharing needles for drug use, from mother to child during pregnancy or breastfeeding.

56. (A) Reproduction by budding takes place in hydra.It is a type of asexual reproduction where a new individual develops from a small outgrowth or bud on the parent body. Budding in hydra involves a small bud which is developed from its parent hydra through the repeated mitotic division of its cells.

57. (D) The two micro-organisms which live in symbiotic association in lichens are Alga and fungus where the alga provides food through photosynthesis and the fungus provides protection and a suitable environment so, it is mutually beneficial for the both.

58. (B) The disease caused by a protozoan and spread by an insect is Malaria. It is caused by a protozoan called Plasmodium and is transmitted through the bite of an infected female Anopheles mosquito.

- Dengue fever is caused by a virus which is transmitted to humans through the bites of infected Aedes mosquitoes.
- Polio is caused the poliovirus
- Measles is caused by the measles virus and It's a highly contagious disease that spreads through respiratory droplets.

59. (B) Statement (B) is not true regarding manure because manure does not have a perfect balance of all the nutrients a plant needs and it's also not a guaranteed source of all essential elements and availability of these nutrients can vary significantly. Other statements regarding manure are correct that It enhances water holding capacity of soil, It provides humus to soil and It improves texture of soil.

60. (C) The place meant for conservation of biodiversity in their natural habitat are wildlife sanctuaries and national parks. Wildlife sanctuaries focus on protecting specific animal populations and their habitats and a national park is a protected area established by the government to preserve the natural environment, including its flora, fauna, and landscapes.

61. (D) The system under which peasants were forced to grow indigo on their land was the Nij and Ryoti system. In nij cultivation, the planters produced indigo in lands that he directly controlled. The planters either bought the land or rented it from other zamindars and produced indigo by directly employing hired labourers. In the Ryotwari system, revenues were collected by the Company directly from the ryots (farmers).

62. (D) Lord Canning decided that Bahadur Shah Zafar would be the last Mughal king. He was the last governor general of India and the first viceroy of India after the 1857 revolt, during his tenure the East India Company's rule was replaced by direct British Crown control. Major William Hodson arrested Bahadur Shah Zafar on 20 September, 1857 and his two sons and a grandson were shot and killed in public by Hodson and Zafar was deported to Burma after trial. This ended the mughal dynasty and its rule.

63. (A) Option (A) is correctly matched because the santhan revolt took place in the year 1855. It was Led by Sidhu and Kanhu Murmu against the exploitation and oppression faced by the Santhals at the hands of the British authorities and their moneylenders (mahajans), landlords (zamindars), and corrupt officials

- The Bastar Rebellion took place in 1910
- The Kols Rebellion took place in 1831-1832
- The Warli Revolt took place in 1945

64. (C) The founder of 'Khudai Khidmatgar' was Khan Abdul Ghaffar Khan. He is also known as "Frontier Gandhi". He got inspired from Gandhi ji and his satyagraha and established the Khudai Khidmatgar movement, a non-violent resistance group against British rule in the North-West Frontier Province (present day-Afghanistan). He was the first non-Indian to receive the Bharat Ratna in 1987.

65. (A) "Oru jati, oru matam, Oru, daivam, manushyanu" famous statement was given by Shri Narayan Guru which translates to "one caste, one religion, one god for all mankind" in Malayalam. Shri Narayan Guru was a philosopher, spiritual leader and social reformer in India who led a reformist movement against casteism.

66. (A) The English Education Act was introduced in 1835 by the then Governor-General of India Lord William Bentinck and sir Thomas Babington Macaulay played a significant role in articulating and implementing this policy that's why It is also known as Macaulay's Minute on Indian Education and it has three important policies :

- English should be used as a medium of instruction in higher education.
- To stop promoting oriental schools like the Calcutta Madrasa and the Benaras Sanskrit College.
- Incorporate English textbooks into the school curriculum.

67. (C) Part III of the Indian constitution deals with Fundamental Rights. Which are enshrined from Articles 12 to 35. It is also known as the "Magna Carta of India" of the constitution and it guarantees and protects certain rights to all citizens, irrespective of race, place of birth, religion, caste, or gender.

68. (A) The Right to Property was removed by the 44th Constitutional Amendment Act of 1978. This amendment repealed Article 31, which guaranteed the right to property under fundamental right, and Article 19(1)(f), which dealt with the right to acquire, hold, and dispose of property. While the right to property is no longer a fundamental right, it is still recognized as a constitutional right under Article 300A.

69. (D) The main feature of the Government of India Act, 1935 was Provincial Autonomy. This act abolished dyarchy in provinces and greater autonomy was granted directly from the Crown. This act also brought other important reforms like The communal award of separate electorates for minorities was implemented, Bicameral Legislatures were established at Six provinces—Assam, Bengal, Bombay, Bihar, Madras, and the United Provinces.

70. (C) Vice-President presides over the Rajya Sabha and Vice-President is the ex-officio chairman of the Rajya Sabha. Article 63 of the Constitution of India provides that there shall be a Vice-President of India and Articles 64 and 89 (A) provide that the Vice-President of India shall be ex- officio Chairman of the Council of States *i.e.*, Rajya Sabha.

71. (B) The 'Right to Education Act' provides free education for children between the ages of 6 and 14 years. This act was passed in 2009 in response to the Supreme Court's 1993 judgment in the case of Unni Krishnan v. State of Andhra Pradesh. This landmark judgment established the right to education as a fundamental right under Article 21 of the Indian Constitution, ensuring free and compulsory education for children aged 6 to 14 years.

72. (C) Sustainable development refers to the usage of resources in such a manner where present day needs are fulfilled without harming future generations' needs. The United Nations adopted the Sustainable Development Goals (SDGs) in 2015 and The 2030 Agenda for Sustainable Development, which includes the 17 SDGs, came into effect on January 1, 2016.

73. (A) Natural Gas is a non-renewable resource. Which means that with time and its usage the quantity of natural gas available to us will deplete so we need to manage the usage of such non-renewable resources. Solar energy, wind energy and tidal energy are the examples of renewable non-conventional resources whose quantity is unlimited and they don't deplete with time and usage.

74. (B) Black soil is best suitable for cotton crop farming because Cotton cultivation requires high moisture retention and black soil is clayey in nature so it has high water retention capacity also it contains a high proportion of calcium and magnesium carbonates which are essential nutrient requirements in cotton growing soil.

75. (C) Viticulture is the cultivation of Grapes.

- Sericulture is the process of cultivating silkworms and extracting silk from them.
- The cultivation of vegetables is called Olericulture.
- The cultivation of flowers is called Floriculture.
- Pisciculture is the practice of rearing fish.

76. (A) Information Technology is called the "Sunrise Industry" because it represents a new growing sector with significant future potential. It encompasses a wide range of activities, from IT services and IT-enabled services to e-commerce and the development of software and hardware.

77. (B) Handicraft Industry is a small-scale industry. It still works upon traditional techniques and manual labour. It require low investment and so its output is not very large but due to its cultural, historical and artistic value it is still able to produce some employment.

78. (D) Sudan is an example of a country that has experienced a loss in population numbers due to emigration which is the process of people leaving one country to reside in another. Over 7.1 million persons have been internally displaced since 15 April, 2023 in sudan due to its internal conflicts and economic hardship.

79. (A) James Mill was a Scottish economist and political philosopher. He wrote The History of British India in 1817 which was divided into three parts: Hindu, Muslim and British.

80. (B) The European country that banned students from wearing religious symbols in public schools was France. France prohibits the wearing of abayas (loose, robe-like garments) in public schools. A 2004 law prohibits the wearing of religious symbols or clothing in schools, such as Jewish kippas, Christian crosses, or Islamic headscarves etc to protect the state's secular nature. In western nations the concept of secularism is defined as the separation of state from the influence and functioning of all religious institutions.

81. (B) Sum of first n odd numbers = n^2

Sum of first 21 odd numbers = 21^2 = 21 × 21 = 441

Second method :

First 21 odd numbers =

1,3,5,7,9,11,13,15,17,21,23,25,27, 29,31,33,35,37,39,41,43

Sum of first 21 odd numbers =
1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23 + 25 + 27 + 29 + 31 + 33 + 35 + 37 + 39 + 41 = 441

82. (A) Let the added number = x

On taking the square root of 15370,

	124
1	$1\overline{53}\overline{70}$
+1	− 1
22	53
+2	− 44
244	970
+ 4	− 976

6 must be added to 15370 to make it a perfect square.

15370 + 6 = 15376

6 must be added to 15370 to make it a perfect square.

83. (C) Simplest form of $\left(\frac{1}{27}\right)^{-\frac{2}{3}} = (27)^{\frac{2}{3}}$

$= (3\times3\times3)^{\frac{2}{3}}$

$= (3)^{3\times\frac{2}{3}} = 3^2 = 9$

84. (D) $\frac{\left(3^{-5}\times10^{-5}\times125\right)}{5^{-7}\times6^{-5}}$

$= \frac{\left(3^{-5}\times2^{-5}\times5^{-5}\times125\right)}{\left(5^{-7}\times2^{-5}\times3^{-5}\right)}$

$= \frac{\left(5^{-5}\times5^{3}\right)}{\left(5^{-7}\right)}$

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

85. (B) $\frac{(2^{3x-1}+10)}{7} = 6$

$2^{3x-1} + 10 = 42$

$2^{3x-1} = 42 - 10$

$2^{3x-1} = 32$

$2^{3x-1} = 2\times2\times2\times2\times2$

$2^{3x-1} = 2^5$

$3x - 1 = 5$

$3x = 5 + 1$

$3x = 6$

$x = \frac{6}{3}$

$x = 2$

Hence, the option (B) is correct.

86. (C) $\left(\frac{3x}{5}\right) = \left(\frac{2x}{7}\right) + 44$

$\left(\frac{3x}{5}\right) - \left(\frac{2x}{7}\right) = 44$

$\frac{(21x-10x)}{35} = 44$

$11x = 44\times35$

$x = \frac{(44\times35)}{11}$

$x = 140$

Hence, the option (C) is correct.

87. (D) Let the number of boys = $7x$

and number of girls = $5x$

According to the question,

$7x - 5x = 8$

$2x = 8$

$x = 4$

Number of boys = $7x = 7\times4 = 28$

Number of girls = $5x = 5\times4 = 20$

Total number of students in the class = Number of boys + Number of girls

Total number of students = 28 + 20 = 48

88. (B) Selling price of radio = 950

Loss = 5%

Cost price × (100 - Loss)% = Selling price

Cost price = 950 × (100/95)

Cost price = 1000

New selling price of radio = 1040

Then, profit = Selling price – Cost price

= 1040 – 1000 = 40

Profit % = (Profit/Cost price) × 100

= (40/1000) × 100 = 4%

89. (A) Cost price of shirt = 1600

Discount = 20%

Marked price × Discount % = Cost price

Marked price × (100 – 20)% = 1600

Marked price = 1600 × (100/80)

Marked price = 2000

90. (A) A works twice as fast as B

Ratio of efficiencies of A and B = 2 : 1

Let A's work in 1 day = $2x$

And B's work in 1 day = $1x$

When A + B work together,

A + B = $2x + 1x = 3x$

Total work = Days × Total efficiencies

= $12\times3x = 36x$

Time taken by B to do the work

= $36x/1x$ = 36 days.

91. (D) Given,

Principal = 4000

Rate = 10%

Time = 2 years

Amount = Principal × $(1 + \text{Rate}/100)^n$

= $4000\times(1 + 10/100)^2$

= $4000\times(11/10)^2$

= $4000\times121/100$

= $40\times121 = 4840$

Compound interest = Amount – Principal = 4840 – 4000 = 840

92. (B) $x + \frac{1}{x} = 4$

On squaring both sides,

$\left(x + \frac{1}{x}\right)^2 = (4)^2$

$x^2 + \frac{1}{x^2} + 2\times x\times\frac{1}{x} = 16$

$x^2 + \frac{1}{x^2} = 16 - 2$

$x^2 + \frac{1}{x^2} = 14$

Again on squaring both sides,

$\left(x^2 + \frac{1}{x^2}\right)^2 = (14)^2$

$x^4 + \frac{1}{x^4} + 2\times x^2\times\frac{1}{x^2} = 196$

$x^4 + \frac{1}{x^4} = 196 - 2$

$x^4 + \frac{1}{x^4} = 194$

93. (D) $7\sqrt{2}\,x^2 - 10x - 4\sqrt{2}$

$7\sqrt{2}\times4\sqrt{2} = 7\times4\times2 = 14\times4$

$7\sqrt{2}\,x^2 - (14-4)x - 4\sqrt{2}$

$7\sqrt{2}\,x^2 - 14x + 4x - 4\sqrt{2}$

$7\sqrt{2}\,x(x - \sqrt{2}) + 4(x - \sqrt{2})$

$(x - \sqrt{2})(7\sqrt{2}\,x + 4)$

Hence, the option (D) is correct.

94. (A) Let, present age of A = $5x$

Present age of B = $7x$

After four years,

A's age = $5x + 4$

And B's age = $7x + 4$

According to the question,

$$\frac{(5x+4)}{(7x+4)} = \frac{3}{4}$$

$$4(5x + 4) = 3(7x + 4)$$

$$20x + 16 = 21x + 12$$

$$21x - 20x = 16 - 12$$

$$x = 4$$

Present age of A $= 5x = 5 \times 4 = 20$ years

And B's present age $= 7x = 7 \times 4$

$= 28$ years

Hence, the present age of B is 28 years.

95. (A) $$\frac{3x-2}{4} - \frac{2x+3}{3} = \frac{2}{3} - x$$

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

$$\frac{9x-6-8x-12+12x}{12} = \frac{2}{3}$$

$$13x - 18 = 8$$

$$13x = 26$$

$$x = 2$$

96. (C) Given,

The ratio of adjacent angles of a parallelogram is 3 : 2.

Let the angles of a parallelogram are $3x$ and $2x$ respectively.

We know that the sum of the measures of adjacent angles is 180º.

$$\angle A + \angle B = 180^\circ$$

$$3x + 2x = 180^\circ$$

$$5x = 180^\circ$$

$$x = \frac{180^\circ}{5}$$

$$x = 36^\circ$$

Hence, the largest angle $= 3x$

$= 3(36°) = 108°$

97. (B) Given,

Area of equilateral triangle $= 4\sqrt{3}$ cm^2

Let side of equilateral triangle $= a$

Area of equilateral triangle $= \frac{\sqrt{3}}{4} a^2$

$$\frac{\sqrt{3}}{4} a^2 = 4\sqrt{3}$$

$$a^2 = 16$$

$$a = 4 \text{ cm}$$

Hence, the side of the equilateral triangle is 4 cm.

98. (B) Let the number of sides of the polygon $= n = 12$

Number of diagonals $= \frac{n(n-3)}{2}$

$$= \frac{12(12-3)}{2}$$

$$= \frac{12(9)}{2}$$

$$= \frac{108}{2}$$

$= 54.$

Thus, a polygon with 12 sides has 54 diagonals.

99. (A) Ratio of radius of base of cylinder and its height = 2 : 3

Let, radius of base of cylinder (r) $= 2x$

and height $(h) = 3x$

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

$$1617 = \left(\frac{22}{7}\right) \times (2x)^2 \times (3x)$$

$$1617 = \left(\frac{22}{7}\right) \times 4x^2 \times 3x$$

$$1617 = \left(\frac{22}{7}\right) \times 12x^3$$

$$147 = \frac{2}{7} \times 12x^3$$

$$x^3 = \frac{147 \times 7}{2 \times 12} = \frac{7 \times 7 \times 7}{2 \times 2 \times 2}$$

$$x^3 = \frac{7^3}{2^3}$$

$$x = \frac{7}{2}$$

Then radius of base of cylinder (r)

$= 2x = 2 \times \frac{7}{2} = 7$ cm

and height (h) $= 3x = 3 \times \frac{7}{2} = 10.5$ cm

Total surface area of cylinder $= 2\pi r(r + h)$

$$= 2 \times \left(\frac{22}{7}\right) \times 7 \times (7 + 10.5)$$

$$= 44 \times 17.5$$

$= 770$ cm^2

Total surface area = 770 cm^2

Hence, the total surface area of the cylinder is 770 cm^2.

100. (A) Let the side of the cube $= a$

Total surface area of the cube $= 6a^2$

$= 600$ cm^2

$$6a^2 = 600$$

$$a^2 = \frac{600}{6}$$

$$a^2 = 100$$

$$a = \sqrt{100}$$

$$a = 10 \text{ cm}$$

So, the length of the side of the cube will be 10 cm.

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अध्याय
1
भाषा, बोली, लिपि और व्याकरण

भाषा शब्द 'भाष्' धातु से बना है। जिसका तात्पर्य है– बोलना। मनुष्य जिन ध्वनियों को बोलकर अपनी बात कहता है, उसे भाषा कहते हैं। अतः कहा जा सकता है कि, भाषा वह साधन है, जिसके द्वारा मनुष्य बोलकर, लिखकर, पढ़कर व सुनकर अपने मन के विचारों तथा भावों का आदान-प्रदान करता है।

1. भाषा के रूप

भाषा का प्रयोग मुख्यतः बोलकर और लिखकर किया जाता है । इस प्रकार प्रयोग के आधार पर भाषा के दो रूप होते हैं– मौखिक, लिखित

मौखिक भाषा–जब हम बोलकर और सुनकर अपने विचार एक-दूसरे तक पहुँचाते हैं, तो यह भाषा का मौखिक रूप कहलाता है।

लिखित भाषा–जब मनुष्य अपने मन के भावों को लिखकर और पढ़कर व्यक्त करता है, तो यह भाषा का लिखित रूप कहलाता है।

मातृभाषा–भाषा का वह रूप जिसे बालक अपने परिवार में रहकर सीखता है वह मातृभाषा कहलाती है।

14 सितंबर, 1949 को भारत सरकार ने हिंदी को राजभाषा घोषित किया। भारतीय संविधान में 22 भाषाओं को मान्यता प्रदान की गई है। जो निम्नलिखित हैं–

हिंदी, असमिया, बंगाली, गुजराती, बोडो, डोगरी, कन्नड़, कश्मीरी, कोंकणी, पंजाबी, उर्दू, मैथिली, मलयालम, मणिपुरी, मराठी, नेपाली, उड़िया, संस्कृत, तमिल, तेलुगू, संथाली तथा सिंधी।

राजभाषा–राजभाषा अर्थात् काम-काज की भाषा। वह भाषा जिसका प्रयोग देश-प्रदेश के कार्यालयों में काम-काज के लिए किया जाता है, राजभाषा कहलाती है।

2. लिपि

बोली जाने वाली हर ध्वनि को लिखने के लिए कुछ चिह्न निश्चित किए गए हैं। इन्हीं चिह्नों के लिखने के तरीके को लिपि कहते हैं।

कुछ प्रमुख लिपियों और भाषाओं को देखिए–

लिपि	भाषा
गुरुमुखी	पंजाबी
तमिल	तमिल
देवनागरी	हिंदी, संस्कृत, मराठी
रोमन	अंग्रेजी, जर्मन
फारसी	उर्दू
शारदा	कश्मीरी
फ्रांसीसी	रोमन
बोडो	देवनागरी
बंगाली	बंगला

3. बोली

सीमित क्षेत्रों में बोली जाने वाली भाषा के रूप को बोली कहा जाता है अर्थात् स्थानीय व्यवहार में, अल्पविकसित रूप में प्रयुक्त होने वाली भाषा बोली कहलाती है। बोली का कोई लिखित रूप नहीं होता।

4. हिंदी की बोलियाँ

हिंदी की बोलियों को 5 वर्गों में विभाजित किया जा सकता है–

पश्चिमी हिंदी–ब्रज, खड़ी बोली, हरियाणवी (बांगरू) बुंदेली और कन्नौजी।

पूर्वी हिंदी–अवधी, बघेली, छत्तीसगढ़ी।

राजस्थानी–मेवाती, मारवाड़ी, हाड़ोती, मेवाड़ी।

बिहारी–मैथिली, मगधी, भोजपुरी।

पहाड़ी–गढ़वाली, कुमाऊँगी, मैडियाली।

5. व्याकरण

जो शास्त्र हमें वर्णों, शब्दों और वाक्यों के शुद्ध प्रयोग की जानकारी देता है, वह व्याकरण कहलाता है।

6. व्याकरण के अंग

व्याकरण के चार अंग हैं–

वर्ण विचार–इसके अंतर्गत वर्णों के उच्चारण, वर्गीकरण, लेखन, संयोजन में चर्चा की जाती है।

शब्द विचार–इसके अंतर्गत शब्दों के भेद व्युत्पत्ति और रचना आदि से संबंधित नियमों की जानकारी होती है।

पद विचार–इसके अंतर्गत संज्ञा, सर्वनाम, क्रिया, विशेषण अव्यय आदि पदों के स्वरूप तथा प्रयोग पर विचार किया जाता है।

वाक्य विचार–व्याकरण के इस विभाग में वाक्यों के भेद, उसके संबंध, वाक्य विश्लेषण, विराम–चिह्नों आदि के बारे में विचार किया जाता है।

महत्वपूर्ण अभ्यास प्रश्न

1. भाषा कहते हैं–
(A) मन के भावों को बोलकर या लिखकर बताना
(B) मन के भावों को संकेत द्वारा बताना
(C) मन के भावों को केवल बोलकर बताना
(D) मन के भावों को केवल संकेत के द्वारा बताना

2. भाषा के मुख्य रूप हैं–
(A) एक (B) दो
(C) तीन (D) चार

3. हम प्रतिवर्ष 'हिंदी दिवस' मनाते हैं–
(A) 14 जनवरी (B) 14 मई
(C) 14 सितंबर (D) 14 अगस्त

4. भाषा का क्षेत्रीय रूप जो स्थान-स्थान पर बदलता रहता है–
(A) लिपि (B) भाषा
(C) बोली (D) व्याकरण

5. संविधान के किस अनुच्छेद में हिंदी को राजभाषा का स्थान मिला?
(A) 253 वें (B) 243 वें
(C) 313 वें (D) 343 वें

6. भाषा के नियमों की जानकारी देने वाला शास्त्र है–
(A) लिपि (B) व्याकरण
(C) बोली (D) भाषा

7. 'परिनिष्ठित भाषा' किससे नियन्त्रित होती है ?
(A) ज्योतिष से (B) विज्ञान से
(C) व्याकरण से (D) दर्शन से

8. बनारस की स्थानीय बोली का नाम है–
(A) अवधी (B) ब्रजभाषा
(C) भोजपुरी (D) मैथिली

9. लिपि कहते हैं?
(A) भाषा के शुद्ध प्रयोग को
(B) मौखिक भाषा को
(C) भाषा के लिखने की विधि को
(D) इन सभी को

10. बोलकर भाव एवं विचार व्यक्त करने वाली भाषा को _____ कहते हैं?
(A) सांकेतिक भाषा (B) लिखित भाषा
(C) मौखिक भाषा (D) वैदिक भाषा

11. लिखित भाषा का अर्थ है–
(A) लिपि को समझना
(B) विचारों का लिखित रूप
(C) किसी के समक्ष लिखकर विचार देना
(D) विचारों को बोल–बोलकर लिखना

12. हिंदी भाषा की उत्पत्ति किस भाषा से हुई है?
(A) अंग्रेजी (B) फ्रेंच
(C) उर्दू (D) संस्कृत

13. संविधान में कितनी भाषाओं को मान्यता प्राप्त है–
(A) बीस (B) इक्कीस
(C) बाईस (D) पच्चीस

14. हिंदी भाषा की _____ उपभाषाएँ हैं–
(A) दो (B) चार
(C) पाँच (D) सात

15. भाषा का उद्‌गम हुआ है–
(A) विचारों के आधार पर
(B) लिपि के आधार पर
(C) ध्वनियों के आधार पर
(D) आवश्यकताओं के आधार पर

16. भाषा के कितने अंग होते हैं?
(A) तीन (B) चार
(C) दो (D) पाँच

17. राजकाज की भाषा या सरकारी काम-काज की भाषा है–
(A) राष्ट्रभाषा (B) मातृभाषा
(C) राजभाषा (D) कोई नहीं

18. जिस भाषा में शिशु पलता-बढ़ता है, उसे क्या कहते हैं?
(A) राष्ट्रभाषा (B) मातृभाषा
(C) राजभाषा (D) क्षेत्रीय भाषा

19. सम्पूर्ण राष्ट्र जिस भाषा में बातचीत करता है, उसे क्या कहते हैं?
(A) राष्ट्रभाषा (B) मातृभाषा
(C) क्षेत्रीय भाषा (D) राजभाषा

20. व्याकरण के कितने विभाग होते हैं?
(A) दो (B) चार
(C) तीन (D) सात

21. हिंदी भाषा की लिपि है–
(A) हिंदी (B) देवनागरी
(C) खरोष्ठी (D) शौरसेनी

22. संस्कृत के किस धातु से 'भाषा' शब्द बना?
(A) भाष् (B) भष
(C) भास (D) भाश

23. भाषा का मूल रूप है–
(A) मौखिक (B) लिखित
(C) सांकेतिक (D) कोई नहीं

उत्तरमाला

1. (A)	**2.** (C)	**3.** (C)	**4.** (C)	**5.** (B)
6. (B)	**7.** (C)	**8.** (C)	**9.** (C)	**10.** (C)
11. (B)	**12.** (D)	**13.** (C)	**14.** (C)	**15.** (C)
16. (B)	**17.** (C)	**18.** (B)	**19.** (A)	**20.** (C)
21. (B)	**22.** (A)	**23.** (A)		

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Chapter

1 The Sentence

English

1. Definition

A sentence is a group of words that are arranged in a way to convey a complete and meaningful sense. *i.e.*, The boys fly kites A group of words like this which conveys complete sense is called sentence.

2. Kinds of Sentences

Sentences are of four kinds :

I. Assertive/Statement/Declarative sentence.

II. Interrogative sentence.

III. Imperative sentence.

IV. Exclamatory sentence.

I. Assertive/Statement/Declarative sentence

[Subject + Verb + Object]

A sentence that makes only a statement or assertion and ends with a full stop. It may be affirmative or negative.

Examples :

- Vijayshree is playing in the garden.
- He may win the prize.
- I have no money.
- Shubham is not living in Noida these days.
- They never come in time.

II. Interrogative sentence

[Helping verb + Subject + Main verb + Object [Not necessary]

[Wh-word + Helping verb + Subject + Main verb + obj.]

A sentence that asks a question is called an **interrogative** question.

Note :

An interrogative sentence ends with a mark of interrogation [?].

Examples :

- Is that your book ?
- Do you read any newspaper ?
- Does he smoke ?
- Will she pass the examination ?
- What is your favourite colour ?
- How are you ?

III. Imperative sentence

[Verb Ist form/donot/always/Never/Please + Verb Ist form + ...]

A sentence that expresses a command, request, order or invitation is called an **imperative sentence.**

Note :

The subject 'you' is understood.

Examples :

- Shut the door. (Command)
- Please pass the salt. (Request)
- Do not waste food. (Advice)
- Do not pluck that flowers. (Prohibition)
- Come in time. (Order)

IV. Exclamatory sentence

A sentence that expresses some strong and sudden feeling. The feelings can be of joy, sorrow, wonder or surprise etc.

Usually it begins with an interjection *i.e.* Alas! how! what! oh Hurrah, God etc.

Note :

The mark of exclamation [!] is put at the end of either the exclamatory word or the exclamatory sentence.

Examples :

- How beautiful ! (Joy)
- How dare you ! (Anger)
- Alas! I am undone. (Sorrow)
- What a nice case ! (Surprise)
- What a tragic end ! (Regret)

Usually it begins with an interjection *i.e.*, alas! how! what! oh, Hurrah, God etc.

In English Grammar, subject and predicate are the parts of sentences. Only the combination of these two elements can complete a sentence.

Subject : The subject of the sentence is the part that names the person or things we are speaking about. *eg*.

"The dog is sleeping in the sun," **the word dog is the subject.**

Predicate: The Predicate is the part of the sentence that tells something about the subject. *eg*. "The child threw the ball," the word "threw the ball" is the predicate.

Types of Subject: There are three types of subjects, these are:

1. Simple Subject
2. Complete Subject
3. Compound Subject

Types of Subject

Types	Meaning	Example
Simple subject	Part of the sentence which has only subject	Jhanvi is playing the guitar and singing at the part
Complete Subject	Part of the sentence has a subject with a modifier.	The old man took a deep breath and then started the story.
Compound	Part of the sentence has two or more subjects	Cricket and Football are my favourite sports.
Subject	joined with the help of a conjunction	

Types of Predicate: There are three types of Predicate, these are :

1. Simple predicate
2. Complete predicate
3. Compound Predicate

Types of Predicate

Types	Meaning	Example
Simple Predicate	Part of the sentence has only a verb.	The dog is running through the empty field.
Complete Predicate	Part of the sentence has verbs with a modifier.	Rohan and his sister Suzanne never wanted costly gifts but preferred simple things.
Compound Predicate	Part of the with a conjunction sentence has two or more verbs	I love the way he plays the guitar, but his singing makes may ears bleed.

Note :

In Imperative sentences the ***Subject*** is left out, *e.g.*

Sit down. Be quite.

In the above sentences the subject 'You' is understood.

Important Questions

1. Which of the following is a declarative sentence ?
(A) You are clever
(B) Are you busy
(C) Be careful
(D) How clever he is ?

2. Choose the correct options to fill in the blanks.
Which of the following is an Imperative sentence ?
(A) May God bless you my friend!
(B) They were not invited to the party
(C) Open the windows
(D) Creativity is allowing yourself to make mistakes

3. Identify the predicate in the following sentence.
He thinks that he has finished the course
(A) He
(B) thinks
(C) that he has finished the course
(D) things that he has finished the course

Direction (Q. No. 4 to 5)
Find the 'correct subject' from the following sentences :

4. The girl ate the mango.
(A) the girl (B) ate
(C) the mango (D) None

5. Last month my grandfather came from Delhi.
(A) my grandfather (B) last month
(C) Delhi (D) None

Direction (Q. No.6 to 8)
Find the 'correct predicate' from the following sentences :

6. A glacier is a river of ice moving slowly down a mountain.
(A) A glacier
(B) is a river of ice moving slowly down
(C) a mountain
(D) None

7. A student and the bus driver were injured in the crash.
(A) were injured in the crash
(B) a student
(C) the bus driver
(D) None

8. My mom and I went shopping.
(A) my mom (B) I
(C) went shopping (D) and

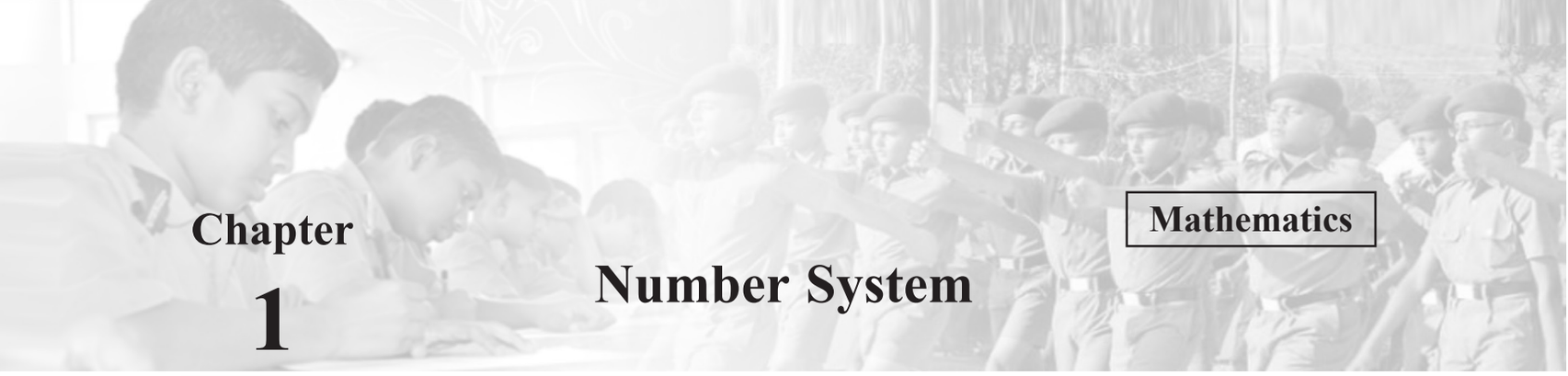
9. Which of the following sentences is an exclamatory one?
(A) You are really very kind.
(B) She is small creature.
(C) He cannot speak well.
(D) How beautiful is the morning today!

10. What is the subject of the following sentence?
No man can serve two masters.
(A) No man can
(B) Can serve two masters
(C) Two masters
(D) No man

11. I need help with this math problem I is.
(A) subject
(B) predicates 'I' is
(C) Both 'A' & 'B'
(D) None of above

Answer Key

1. (A) **2.** (C) **3.** (B) **4.** (A) **5.** (B)
6. (A) **7.** (C) **8.** (D) **9.** (D) **10.** (A)
11. (A)



Chapter

1 Number System

Mathematics

1. IMPORTANT TERMINOLOGY

1.1 Digits : 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 are defined as digits in Mathematics. We can create many numbers by using these digits. For example : 10, 123, 456, 789 etc.

1.2 Number System : There are mainly two types defined in the number system. These are :

I. Decimal Number System : It contains 0 to 9 digits. That's why it is called *decimal number system*. In this system, the numbers is read and written in two ways : Indian number system and International number system.

In the Indian number system or Hindi-Arabic system, the numbers are read and written as per their place values. These numbers are read as per the following table.

Periods	Crores		Lakhs		Thousands		Ones		
Value	10,00,00,000 (Ten Crores)	1,00,00,000 (Crore)	10,00,000 (Ten Lakhs)	1,00,000 (Lakh)	10,000 (Ten Thousands)	1,000 (Thousand)	100 (Hundred)	10 (Ten)	1 (One)
	10^8	10^7	10^6	10^5	10^4	10^3	10^2	10^1	10^0

Example : Number 51,45,42,786 can be read as Fifty-one Crores Forty-five Lakhs Forty-two Thousands Seven Hundred and Eighty-six. It is also called number name.

Unit Conversions :

- 1 tens = 10 units
- 1 Hundred = 10 tens = 100 units
- 1 Thousand = 10 Hundreds = 100 tens = 1000 units
- 1 Lakh = 10 Thousands = 100 Hundreds = 1000 tens
- 1 Crore = 10 Lakhs = 100 Thousands = 1000 Hundreds

In International number system, the numbers are read and written as per the following table.

Periods	Millions			Thousands			Ones		
Value	100,000,000 (Hundred Millions)	10,000,000 (Ten Millions)	10,00,000 (Millions)	100,000 (Hundred Thousand)	10,000 (Ten Thousand)	1,000 (Thousand)	100 (Hundred)	10 (Ten)	1 (One)
	10^8	10^7	10^6	10^5	10^4	10^3	10^2	10^1	10^0

Example : Number 14,542,786 can be read as Fourteen Millions Five Hundred Forty-two Thousand Seven Hundred Eighty-six.

2. DIGITS OF NUMBER

- **Units** : Digit 0 to 9 are called Unit digits. The smallest and the largest number of 1-digit are 0 and 9 respectively.
- **Tens** : The numbers from 10 to 99 are called ten numbers. The smallest and the largest number of 2-digits are 10 and 99 respectively.
- **Hundreds** : The numbers from 100 to 999 are called hundred numbers. The smallest and the largest number of 3-digits are 100 and 999 respectively.
- **Thousands :** The numbers from 1,000 to 9,999 are called thousand numbers. The smallest and the largest number of 4-digits are 1000 and 9999 respectively.
- **Ten thousands :** The numbers from 10,000 to 99,999 are called ten thousand numbers. The smallest and the largest number of 5-digits are 10,000 and 99,999 respectively.
- **Lakhs :** The numbers from 1,00,000 to 9,99,999 are called lakh numbers. The smallest and the largest number of 6-digits are 1,00,000 and 9,99,999 respectively.
- **Ten Lakhs :** The numbers from 10,00,000 to 99,99,999 are called ten lakh numbers. The smallest and the largest number of 7-digits are 10,00,000 and 99,99,999 respectively.
- **Crores :** The numbers from 1,00,00,000 to 9,99,99,999 are called crore numbers. The smallest and the largest number of 8-digits are 1,00,00,000 and 9,99,99,999 respectively.

3. VALUE OF DIGITS

- **Place Value**–Place value helps us determine the value of numbers. Our (base-10) number system contains numerals or digits only from 0 to 9, but we often need to use numbers greater than 9. We show numbers greater than 9 by using place value. Place value refers to the value of each digit in a number.

  Example : In a number 489765, place value of 7 will be 7×100 units, *i.e.*, 700. Similarly, the place value of 8 will be $8 \times 10{,}000 = 80{,}000$.

- **Face Value**–The actual value of a digit in a number is the digit itself. The place value of the digit is ignored in the number.

  Example : In a number 59,438, the face value of 4 is 4, face value of 9 is 9 etc.

Note

If x and y be the tens digit and unit digit respectively, then the 2-digit number formed by these digits will be $10x + y$.

4. COMPARISON OF NUMBERS

- **When both numbers have unequal number of digits**

  The number having more digits is greater. It means

  ..... 5-digit number > 4-digit number > 3-digit number .....

  Example : Find out which is greater 5429683 or 65245893 ?

  Solution : Since, the first number 5429683 is of 7-digit number whether the second number 65245893 is of 8-digit. Therefore, the second number is greater than the first number.

- **When both numbers have equal number of digits**

  In case of the equal number of digits, we have to check the place value of the left-most digit of both numbers. If the digits of both numbers are also equal, then we move to its next digit placed on the right side and repeat the process until we get the desired result.

  Example : Arrange the following numbers in ascending order.

  5403100, 5460860, 5458087, 5420378

  Solution : At first, we check the place value of the leftmost digit of each number. Then repeat the same process until we get the answer. Here, in each number, two leftmost digits are equal. After that, we check ten thousand place values and then arrange the digits in ascending order. Hence, we get

  5403100 < 5420378 < 5458087 < 5460860

5. CLASSIFICATION OF NUMBERS

There are several types of numbers exist in the number system for different purposes. These numbers are classified into different groups according to their properties. These are :

- **Natural Numbers** : Counting numbers starting from 1, 2, 3…, etc., are called natural numbers. It is represented by capital letter **N**. Its set is shown as

  $$\mathbf{N} = \{1, 2, 3, 4, 5\ldots\}$$

- **Whole Numbers** : All natural numbers along with 0 is known as whole numbers. It is represented by capital letter **W**. Its set is shown as

  $$\mathbf{W} = \{0, 1, 2, 3, 4\ldots\}$$

- **Even and Odd Numbers** : A number is even if it is a multiple of two, and is odd otherwise. Even numbers are denoted by capital letter **E** and odd numbers are denoted by capital letter **O**.

  $\mathbf{E} = \{2, 4, 6, 8\ldots\}$ and $\mathbf{O} = \{1, 3, 5, 7\ldots\}$

- **Integers** : Positive and negative counting numbers, as well as zero are called integers. Integers are denoted by capital letter Z.

  $$\mathbf{Z} = \{\ldots\text{—}3, \text{—}2, \text{—}1, 0, 1, 2, 3\ldots\}$$

- **Prime Numbers** : An integer with exactly two positive divisors : itself and 1, is called prime number. For example : 2, 3, 5, 7, 11, 13…etc. are few prime numbers. 2 is the smallest prime number.

- **Composite Numbers** : All those numbers greater than 1 that are not prime are called composite numbers. For example : 4, 6, 8, 9, 10 etc. are few composite numbers.

- **Rational Numbers** : Numbers that can be expressed as a ratio of an integer to a non-zero integer. Rational numbers are denoted by capital letter **Q**. All integers are rational, but the converse is not true.

  $$\mathbf{Q} = \left\{\ldots\frac{2}{3}, -1, 0, \frac{1}{4}\ldots\right\}$$

- **Irrational Numbers** : All the real numbers that are not rational are called irrational numbers. Irrational numbers are denoted by **I**.

  $$\mathbf{I} = \left\{\ldots\frac{2}{3}, \sqrt{2}, \sqrt{3}\ldots\right\}$$

- **Real Numbers**–They can be positive, negative or zero. All rational numbers are real, but the converse is not true.

6. APPROXIMATE VALUES OF NUMBERS

Place values are considered to be the base to find approximation values in numbers. Approximation value of few place values is determined by the following methods.

- **Approximate value nearest tens place**–If the number at units place is less than 5 then it is rounded of zero otherwise add 1 to the tens place and keeps unit place as zero.

  Example : 73 can be rounded off to 70, 156 can be rounded off to 160 and 4265 can be rounded off to 4270.

- **Approximate value nearest hundred place**–If the number at tens place is less than 5 then it is rounded of zero otherwise add 1 to the hundred place and keeps tens place and unit place as zero.

  Example : 510 can be rounded off to 500, 9573 can be rounded off to 9600 and 53650 can be rounded off to 53700.

- **Approximate value nearest thousand place**–If the number at hundred place is less than 5 then it is rounded of zero otherwise add 1 to the thousand place and keeps hundred place, tens place and unit place as zero.

  Example : 6240 can be rounded off to 6000, 17573 can be rounded off to 18000 and 553650 can be rounded off to 554000.

7. DIVISIBILITY TEST OF NUMBERS

- **Divisibility by 2 :**

  If the unit digit of a number is any of 0, 2, 4, 6, 8, then the given number is divisible by 2.

  Example : 84, 786, 282, 1008, 5000….., etc., are divisible by 2.

- **Divisibility by 3 :**

  A number is divisible by 3, if the sum of all digits of the number is divisible by 3.

  Example : 786, here 7 + 8 + 6 = 21 (completely divisible by 3)

  So, the number 786 will be divisible by 3.

- **Divisibility by 4 :**

  A number is divisible by 4, if the last two-digits of the number is divisible by 4.

  Example : 3464, here 64 is the last two-digit number which is divisible by 4.

  So, the number 3464 will be divisible by 4.

- **Divisibility by 5 :**

  A number is divisible by 5, if the unit digit of the number is either 0 or 5.

  Example : 3125, 2010, 2015, 6580……, etc., are divisible by 5.

- **Divisibility by 6 :**

  A number is divisible by 6, if the number is divisible by the numbers 2 and 3.

  Example : Test whether number 8202 is divisible by 6.

  Solution : (i) the unit digit of the number is 2 which is divisible by 2.

  (ii) the sum of digits of the number = 8 + 2 + 0 + 2 = 12 (divisible by 3)

  Since, it is clear from (i) and (ii) that the number 8202 is divisible by both 2 and 3. So, the number will be divisible by 6.

- **Divisibility by 7 :**

  Take the last digit of the given number and double it. Subtract this number from the rest of the digits in the original number. If this new number is either 0 or if it is a number that is divisible by 7, then the given number is also divisible by 7.

  Example : Test whether number 2492 is divisible by 7.

  Solution : Here, the unit digit of the number = 2

  249 – 2 × 2 = 245 (divisible by 7). So, the number will be divisible by 7.

- **Divisibility by 8 :**

  A number is divisible by 8, if the last three-digits of the number is divisible by 8.

  Example : Test whether number 6288 is divisible by 8.

  Solution : Here, in the given number, 288 is the last three-digit number which is completely divisible by 8.

  So, the number 6288 will be divisible by 8.

- **Divisibility by 9 :**

  A number is divisible by 9, if the sum of its digits is divisible by 9.

  Example : Test whether number 7074 is divisible by 9.

  Solution : Sum of all digits of the number = 7 + 0 + 7 + 4 = 18 (divisible by 9).

  So, the number 7074 will be divisible by 9.

- **Divisibility by 11 :**

  A number is divisible by 11, if difference between the sum of digits at odd places and the sum of digits at even places, is divisible by 11.

  Example : Test whether number 86460 is divisible by 11.

  Solution : Sum of the all digits at even places in the number = 6 + 6 = 12

  Sum of the all digits at odd places in the number = 8 + 4 + 0 = 12

  Their difference = 12 – 12 = 0. So, the number 86460 will be divisible by 11.

8. DIVISION ALGORITHM

The number which we divide is called the dividend. The number by which we divide is called the divisor. The result obtained is called the quotient. The number left over is called the remainder. Some formulae are given below for Division based questions.

- Dividend = Divisor × Quotient + Remainder
- $\text{Divisor} = \frac{\text{Dividend} - \text{Remainder}}{\text{Quotient}}$
- $\text{Quotient} = \frac{\text{Dividend} - \text{Remainder}}{\text{Divisor}}$

Example : In a question, the divisor is 4 times the quotient and 2 times the remainder. If the remainder is 20, then find the value of dividend.

Solution : According to Question,

$$\text{Divisor} = 2 \times \text{Remainder} = 2 \times 20 = 40 \quad \ldots(1)$$

And, $\text{Divisor} = 4 \times \text{Quotient}$

$\Rightarrow 4 \times \text{Quotient} = 40$ [from eq.(1)]

$\Rightarrow \text{Quotient} = 40/4 = 10$

$\therefore$ $\text{Dividend} = 40 \times 10 + 20 = 400 + 20 = 420$

9. WHOLE NUMBERS

We start counting from the number 1. Hence 1 is the first natural number and the next natural number is 2 which is obtained by adding 1 to the first number. Hence, numbers are represented in two ways according to their orderliness :

- **Predecessor** : The natural number immediately preceding a natural number is its predecessor.

  Example : Predecessor number of 65 = 65 – 1 = 64

  Predecessor number of 127 = 127 – 1 = 126

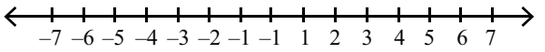
- **Successor** : The natural number immediately next to any natural number is its successor.

  Example : Successor number of 785 = 785 + 1 = 786

  Successor number of 109 = 109 + 1 = 110

10. INTEGERS

The set of all negative numbers and positive numbers on either side of the zero marked on the number line is called an integer. –5, – 4, – 3, –2, –1, 0, 1, 2, 3, 4, and 5 all are the integers. On the number line, integers are represented as follows :



$= \frac{795}{13} = 53$

11. TO FIND UNIT'S DIGIT

Following is the method to find the unit digit in product of numbers and in power form of number :

I. In product of numbers–We find the product of unit digits of all numbers to find the unit digit in the product of numbers. The unit digit of obtained product is equal to the unit digit in product of given numbers.

Ex. : Find the unit digit in product of 786 × 78 × 687

(A) 4 (B) 5 (C) 6 (D) 2

Sol. (C) : Here, we multiply the unit digits of all numbers in 786 × 78 × 687.

= Unit digit in 6 × 8 × 7

= Unit digit in 336 = 6

So, 6 will be the unit digit in the given product.

II. In Exponential number :

(i) For odd numbers : When unit digit is an odd number excluding 5, then

$(\times\times\times\times 1)^n = (\times\times\times 1)$

$(\times\times\times 3)^{4n} = (\times\times\times 1)$

$(\times\times\times 7)^{4n} = (\times\times\times 1)$

$(\times\times\times 9)^n = (\times\times\times 1)$, if n is an even number

$= (\times\times\times 9)$, if n is an odd number.

Ex. : Find the unit digit in $(27)^{43}$

(A) 3 (B) 4 (C) 5 (D) 6

Sol. (A) : Unit digit in $(27)^{43}$

= Unit digit in $(7)^{43}$

= Unit digit in $(7)^{4 \times 10 + 3}$

= Unit digit in $(7)^3$

= 3

(ii) For Even numbers :

$(\times\times\times 2)^{4n} = (\times\times\times 6)$

$(\times\times\times 4)^{2n} = (\times\times\times 6)$

$(\times\times\times 6)^n = (\times\times\times 6)$

$(\times\times\times 8)^{4n} = (\times\times\times 6)$

Ex. : Find the unit digit in $(44)^{69}$

(A) 5 (B) 4 (C) 6 (D) 2

Sol. (B) : Unit digit in $(44)^{69}$

= Unit digit in $(4)^{69}$

= Unit digit in $(4)^{2 \times 34 + 1}$

= Unit digit in (6 × 4) = 4

Note : If unit digits of a number is 0, 1, 5 and 6, then the unit digit in exponent of that number will also be 0, 1, 5 and 6 respectively.

- Sum of natural number from 1 to $n = \frac{n(n+1)}{2}$

Ex. : Find the sum of first 25 natural numbers.

Sol. : Required sum $= \frac{n(n+1)}{2}$

$= \frac{25(25+1)}{2}$

$(\because n = 25)$ $= 25 \times 13 = 325$

- Sum of first n even numbers = $n(n + 1)$

Ex. : Find the sum of first 10 even numbers.

Sol. : Required sum = $n(n + 1)$

= 10(10 + 1)

= 10 × 11 = 110

- The sum of first n odd numbers = n^2

Ex. : Find the sum of first 7 odd numbers.

Sol. : Required sum = n^2

= $(7)^2 = 49$

- Sum of squares of first n natural numbers

$$(s) = \frac{n(n+1)(2n+1)}{6}$$

Ex. : What will be the sum of squares of first 12 natural numbers ?

Sol. : Required sum $= \frac{n(n+1)(2n+1)}{6}$

$= \frac{12(12+1)(2\times12+1)}{6}$

= 2 × 13 × 25 = 650

- **Type 11 :** Sum of squares of even numbers from 1 to n

$$= \frac{n(n+1)(n+2)}{6}$$

Ex. : What will be the value of $2^2 + 4^2 + 6^2 + ... + 18^2 + 20^2$?

Sol. : $n = 20$

$$\text{Required Sum} = \frac{20(20+1)(20+2)}{6}$$

$$= \frac{20 \times 21 \times 22}{6} = 1540$$

- Sum of squares of odd numbers from 1 to n.

$$= \frac{n(n+1)(n+2)}{6}$$

Ex. : What will be the value of $1^2 + 3^2 + 5^2 + ... + 19^2 + 21^2$.

Sol. : $n = 21$

$$\text{Required sum} = \frac{n(n+1)(n+2)}{6}$$

$$= \frac{21 \times 22 \times 23}{6} = 1771$$

- Sum of cubes of first n natural numbers

$$(s) = \left[\frac{n(n+1)}{2}\right]^2$$

Ex. : What will be the sum of cubes of first 5 natural numbers ?

Sol. : $$\text{Required sum} = \left[\frac{n(n+1)}{2}\right]^2$$

$$= \left[\frac{5 \times (5+1)}{2}\right]^2$$

$$= (5 \times 3)^2 = (15)^2 = 225$$

- Total No., of n digit $= 9 \times 10^{n-1}$

Ex. : Find the total number of two digit number between 1 to 100.

Sol. : Required numbers $= 9 \times 10^{n-1}$

$\because$ Here $n = 2$,

$\therefore$ Numbers $= 9 \times 10^{(2-1)}$

$= 9 \times 10 = 90$

Note

- The sum and the difference of two odd numbers is always on even number.
- The sum and the difference of two even numbers is always an even numbers.
- The sum and the difference of an even number and an odd number is always an odd number.
- The multiplication of two even numbers is always an even number.
- The multiplication of an even number and an odd numbers is always an even number.
- The sum, difference and multiplication of two rational numbers is a rational number.
- The sum, difference multiplication and division of a rational and an irrational is always an irrational.
- Infinitely many rational numbers can be found between two rational numbers or integers or whole numbers or natural numbers.

Important Questions

1. The additive identify for integers is :

(A) 0 (B) 1

(C) –1 (D) does not exist

2. Associative property of multiplication of integers :

(A) exists (B) does not exist

(C) holds without 0 (D) None of these

3. 'If a number when divided by 4 leaves remainder 2 or 3', then which one is the correct statement ?

(A) The number is not a perfect square

(B) The number is a perfect square

(C) The number is a prime number

(D) None of the above

4. If $\overline{148101a095}$ is a multiple of 11, where a is a digit, the value of a is :

(A) 0 (B) 4

(C) 1 (D) 2

5. Find the value of Z for which the number 471Z8 is divisible by 9.

(A) 4 (B) 5

(C) 7 (D) 8

6. If [1X2Y6Z] is a number divisible by 9, then the least value of X + Y + Z is :

(A) 0 (B) 1

(C) 6 (D) 9

7. Which of the following is the multiplicative identity for rational numbers ?

(A) 1 (B) – 1

(C) 0 (D) None of these

8. If a number 573xy is divisible by 90, then what is the value of $x + y$?

(A) 6 (B) 9

(C) 3 (D) 8

9. Find the values of A, B, C in the following :

9) 4AB (5C

– 45

3B

–36

0

Then what is the value of ?

(A) 10 (B) 14

(C) 16 (D) 18

10. If y denotes the digit at hundreds place of the number 67 y 19, such that the number is divisible by 11. The value of y is–

(A) 3 (B) 5

(C) 4 (D) 7

11. In a division question, the denominator is 10 times its quotient and 5 times the remainder. Accordingly, if the remainder is 46, what will be the dividend ?

(A) 4236 (B) 4306

(C) 4336 (D) 5336

12. The product of all prime numbers between 80 and 90 is :

(A) 83 (B) 89

(C) 7387 (D) 7200

13. Which statement among the following is not true ?

(A) Every natural number is an integer.

(B) Every natural number is a real number.

(C) Every real number is a rational number.

(D) Every integer in a rational number.

14. Find the sum of all those prime numbers that are not larger than 17.

(A) 59 (B) 58

(C) 41 (D) 42

15. Find the unit digit in the product $(122)^{173}$

(A) 2 (B) 4

(C) 6 (D) 8

16. Find the unit digit in the sum of $(124)^{372} + (124)^{373}$.

(A) 5 (B) 4

(C) 2 (D) 0

17. The product of a non zero rational number and its reciprocal is _____.

(A) 1

(B) 0

(C) rational number itself

(D) reciprocal of rational number

18. Which one of the following rational number is additive identity for rational numbers ?

(A) 0 (B) 1

(C) 2 (D) 3

19. Multiplicative inverse of $\frac{0}{1}$ is—

(A) 1 (B) – 1

(C) 0 (D) undefined

20. The nature of $(-5+2\sqrt{5}-\sqrt{5})$ is :

(A) natural (B) integer

(C) rational (D) irrational

21. A negative integer and a positive integer whose difference is + 2, are :

(A) – 1, 3 (B) – 2, 4

(C) – 1, 1 (D) – 4, 6

22. The difference between the largest 4-digit number and the smallest 4-digit number which starting from 3 and ending with 5 is :

(A) 900 (B) 909

(C) 999 (D) 990

23. A spider is climbing a wall. It climbs up 5 cm, falls back 3 cm, climbs up another 4 cm, falls back 6 cm and climbs up another 5 cm. How far the spider has climbed from its starting point ?

(A) 5 cm (B) 6 cm

(C) 4 cm (D) 23 cm

24. The one's digit of the cube of the number 242 is:

(A) 2 (B) 4

(C) 6 (D) 8

25. If $X = (-1) \times (-1) \times (-1) \times$ ..... 25 Times, $Y = (-3) \times (-3) \times (-3)$, then $XY =$

(A) – 27 (B) 27

(C) 26 (D) – 26

26. The whole number nearest to 452 and divisible by 11 is :

(A) 450 (B) 451

(C) 460 (D) 462

27. If 5A + 3B = 65, then the value of A and B is :

(A) A = 2, B = 3 (B) A = 3, B = 2

(C) A = 2, B = 1 (D) A = 1, B = 2

28. Which is the irrational number from the following ?

(A) $\frac{3}{5}$ (B) $3.\overline{142857}$

(C) $\sqrt{4}$ (D) $\sqrt{7}$

29. The unit digit of 9^{10} is:

(A) 1 (B) 9

(C) 0 (D) 8

30. Divisible by $(2^{71} + 2 + 2^{73} + 2^{74})$ is

(A) 9 (B) 10

(C) 11 (D) 13

Solutions

1. (B) The additive identity for integer is always zero.

e.g., $5 + 0 = 5$ or $0 + 1 = 1$

2. (A) Associative properties of multiplication of integer exists.

e.g., $(3 \times 4) \times 2 = 3 \times (4 \times 2)$

3. (A) The number is not a perfect square because perfect square never have their one's digit as 2, 3, 7 or 8.

4. (B) Given, number $\overline{148101a095}$

Divisibility rule of 11 : A number is divisible by 11 if the sum of the digits in the odd places and the sum of the digits in the even places difference is a multiple of 11 or zero, then result is divisible by 11.

Taking odd places terms :

$S_1 = 1 + 8 + 0 + a + 9 = 18 + a$

Taking even places terms :

$S_2 = 4 + 1 + 1 + 0 + 5 = 11$

Now, $S_1 - S_2 = 18 + a - 11 = 7 + a$

To divisible $(7 + a)$ by 11 possible value of a is 4.

5. (C) Given number : 471Z8

Divisibility test of 9 : The sum of the digits should be divisible by 9.

then, $4 + 7 + 1 + Z + 8 = 20 + Z$

$\therefore$ minimum value of Z for which number becomes divisible by 9 is 7.

Hence, Z = 7

6. (A) According to the question,

Given number = 1X2Y6Z

If it is divisible by 9, then its sum must be divisible by 9.

= 1+X+2+Y+6+Z

= 9 + X + Y + Z

So, for the least value, X + Y + Z must be 0, so that sum is divisible by 9.

$\therefore$ X + Y + Z = 0

7. (A) Let 'e' be the multiplicative identity of any rational number 'a', then

$a \times e = a = e \times a$

$\therefore$ $e = 1$

8. (C) Since, the number 573xy is divisible by 90 (*i.e.,* 9 × 10). Therefore the last digit of the given number will be 0 *i.e.* $y = 0$.

Also it is divisible by 9. Therefore, the sum of digits is divisible by 9.

Now, sum of digits = $5 + 7 + 3 + x + y$

$= 5 + 7 + 3 + x + 0$

$= 15 + x$

Here, we consider $x = 3$.

$\therefore$ Sum of digits = 15 + 3 = 18, which is divisible by 9.

Hence, $x + y = 3 + 0 = 3$

9. (D) In the given division method,

$A - 5 = 3 \Rightarrow A = 8$

$B - 6 = 0 \Rightarrow B = 6$

and $36 = 9C \Rightarrow C = 4$

$\therefore$ A + B + C = 8 + 6 + 4 = 18

10. (C) Given number is 67y19.

Sum of odd digits = $6 + y + 9 = 15 + y$

Sum of even digits = 7 + 1 = 8

Now difference = $15 + y - 8 = 7 + y$

Since, above difference will be multiple of 11.

$\therefore$ $7 + y = 11$ (say)

$y = 4$

11. (D) According to the question,

Divisor = Quotient × 10

Divisor = Remainder × 5

Divisor = 46 × 5 = 230

$$\text{Quotient} = \frac{\text{Divisor}}{10} = \frac{230}{10} = 23$$

Dividend = Divisor × Quotient + Remainder

= 230 × 23 + 46

= 5290 + 46 = 5336

12. (C) Prime numbers between 80 and 90 = 83 and 89

∴ Required product = 83 × 89 = 7387

13. (C) Every real number is a rational number.

14. (B) Prime numbers up to 17

= 2, 3, 5, 7, 11, 13, 17

∴ Required sum

= 2 + 3 + 5 + 7 + 11 + 13 + 17

= 58

15. (A) Unit digit in $(122)^{173}$

= Unit digit in $(2)^{173}$

= Unit digit in $(2)^{172+1}$

= Unit digit in $(2)^1 = 2$

16. (D) $(124)^{372} + (124)^{373}$

$= (124)^{372}[1 + 124]$

$= (124)^{372} \times 125 = [(124^4]^{93} \times 125$

∴ Required Unit digit

= Unit digit in $(4)^4 \times 125$

= 6 × 5 = 30

∴ Required Unit digit = 0

17. (A) Let, non-zero rational number $= \frac{m}{n}$

So, its reciprocal will be $= \frac{n}{m}$

(According to question),

$\frac{m}{n} \times \frac{n}{m} = 1$

⇒ option (A) is correct.

18. (A) Zero (0)

19. (D) Multiplicative inverse of 0

$= \infty$

20. (D) Since $\sqrt{5}$ is a irrational number so, Irrational number.

21. (C) From option (C)

1 – (– 1) = 1 + 1 = 2

So, option (C) is correct.

22. (D) According to question,

Largest 4-digit number = 3995,

Smallest 4-digit number = 3005

Required number = 3995 – 3005

= 990

23. (A) Let a spider started climbing from point O.

In first instance, a spider climbed 5 cm and falls back 3 cm.

Total distance covered = 5 – 3 = 2

Again climbed 4 cm and falls 6 cm

Total distance covered = 2 + 4 – 6

= 0 [at starting point]

Now, spider climbed another 5 cm.

At last, a spider is 5 cm from the starting point.

24. (D) $(242)^3$

= 242 × 242 × 242

= 2 × 2 × 2

= 8

[We have to take only unit- digits]

25. (A) $x = (-1) \times (-1) \times (-1)$ 25

$$x = -\begin{bmatrix} -x- = + \\ +x- = - \end{bmatrix}$$

$x = (-3) \times (-3) \times (-3)$

$x = -27$ $[-x - x - = -]$

$xy = (-1) \times (-27)$

$= 27$ $(-x- = +)$

26. (B)

11)452(41

44

12

11

–1

= 452

–1

= 451

27. (C) 5A + B3 = 65

5 × 10 + A + = 65

5 × 10 + 2 + B × 10 + 3 = 65

50 + 2 + 13 = 65

65 = 65

A = 2

B = 1

28. (A)

$\sqrt{7}$ is irrational number, because

$\sqrt{7}$ can not be written in the from $\frac{p}{q}$,

Where p and q are integers and q ↑ 0.

29. (A) For unit digit

$9^{10} = 9^{4 \times 2 + 2} = 9^2$

= 81

↓

Unit digit = $\boxed{1}$

30. (B) $2^{71} + 2^{72} + 2^{73} + 2^{74}$

$= 2^{71}(2^0 + 2^1 + 2^2 + 2^3)$

(taking 2^{71} common)

$= 2^{71}(1 + 2 + 4 + 8) = 2^{71} \times 15$

$= 2^{70} \times 30$

Hence, $(2^{71} + 2^{72} + 2^{73} + 2^{74})$ is divisible by 10

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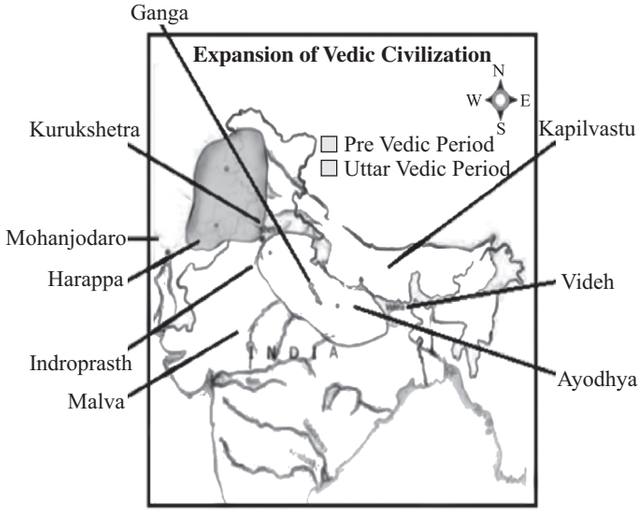
Chapter

1 The Vedic Age

1. The Vedic Age

- The first phase of urbanization in India came to an end with the decline of Indus Civilisation. A new era, called Vedic Age, began with the arrival of Aryans. It is a period in the History of India between 1500 BC (BCE) to 600 BC (BCE). It gets its name from four 'Vedas'. It has been classified into two sub-phases :
  - Early Vedic Age (1500 to 1000 BC)
  - Later Vedic Age (1000 to 600 BC)
- **Aryans :** The Aryans were Indo–Aryan language speaking, semi nomadic pastoralists. They came from Central Asia in several waves of migration through Khyber Pass of Hindu Kush Mountains. Though cattle rearing was their main occupation, they also practiced slash and burn agriculture.



The Extent of Vedic Culture

Time, Spread and Sources	
Geographical range	North India
Period	Iron Age
Time	1500 BC (BCE) to 600 BC (BCE)
Sources	Vedic Literature
Nature of Civilisation	Rural

2. Sources

- **Vedic literature :** Vedic literature can be classified into two broad categories.
  - **Shrutis :** The Shrutis comprise the four Vedas, the Brahmanas, the Aranyakas and the Upanishads. They are considered sacred, eternal, and an unquestionable truth. 'Shruti' means listening (or unwritten) ones that were transmitted orally through generations. There are 4 types of Vedas :
    - **The Rigveda :**

      The Rigveda includes more than a thousand hymns, called sukta or "well-said". These hymns are in praise of various gods and goddesses. Three gods are especially important, which are :
      - The Agni, the god of fire
      - Indra, a warrior god
      - Soma, a plant from which a special drink was prepared

      These hymns were composed by sages (rishis). Priests taught students to recite and memorise each syllable, word, and sentence, bit by bit, with great care.

      Most of the hymns were composed, taught and learnt by men. A few were composed by women. The Rigveda is in old or Vedic Sanskrit.

      The Rigveda was recited and heard rather than read. It was written down several centuries after it was first composed and printed less than 200 years ago.
      - **Samveda :** It is the earliest reference for singing.
      - **Yajurveda :** It is also called the book of prayers.
      - **Atharvaveda :** The book of magic and charms.
  - **Smritis :** A body of texts containing teachings on religion such as Ithihasas, Puranas, Tantras and Agamas. Smritis are not eternal. They are constantly revised. 'Smriti' means definite and written literature.

Important Questions

1. At one stage in the Vedic Age, the king was called 'gopati' which ment '.....'.

(A) lord of the universe
(B) lord of the people
(C) lord of land
(D) lord of cattle

2. What is the Rigvedic name of the river Ravi ?

(A) Vitasa (B) Asikini
(C) Shutudri (D) Parushni

3. The total numbers of Vedas are :

(A) Four (B) Seven

(C) Five (D) Three

4. The Rigveda is an ancient Indian collection of Vedic Sanskrit hymns. It has ..... mandals.

(A) 15 (B) 25

(C) 10 (D) 20

5. Which of the following Vedas is known as the 'Veda of Songs and Music'?

(A) Yajur (B) Saam

(C) Atharva (D) Rig

6. The verses of which of the following ancient texts were set into music ?

(A) Meghdoota

(B) Kamasutra

(C) Sangeet Ratnakara

(D) Samveda

7. What was the basic unit of the Rig Vedic polity?

(A) Grama (B) Kula

(C) Vis (D) Jana

8. Who was the head of the Grama (village) in the Rig Vedic polity?

(A) Rajan

(B) Gramani

(C) Vishayapati

(D) Kulapati

9. What was the main responsibility of the Rajan in the Rig Vedic period?

(A) Collecting taxes

(B) Performing rituals and sacrifices

(C) Protecting his tribe

(D) Assisting the purohit

10. What was the voluntary contribution of the people to the king called in the Rig Vedic period?

(A) Vidhata

(B) Sabha

(C) Bali

(D) Samiti

11. What was the social division named in the early Vedic society that included the warrior class?

(A) Vis

(B) Brahmanas

(C) Kshatriyas

(D) Vysyas

Answer Key

1. (D) **2.** (D) **3.** (A) **4.** (C) **5.** (B)

6. (D) **7.** (B) **8.** (B) **9.** (C) **10.** (C)

11. (C)

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Chapter 1 Heat, Fossil Fuel (Coal and Petroleum)

I. Heat and Temperature

We experience cold and heat every day. Having less or more heat causes us to feel cold and heat. When heat flows out of our body we feel cold. If the heat flows into our body from the outer environment then we feel hot.

- Heat is a type of energy that is related to the motion of the molecules of a substance.
- The degree of hotness or coldness is called temperature.

The higher the temperature of the substance, the faster the movement of its molecules, thus, more energy exists in the form of heat. Heat always flows from a body at a higher temperature to a body temperature, therefore, during the summer when the temperature of the environment is more than our body, we feel hot, and in the winter the temperature outside is less than the temperature of the body, hence we feel cold.

The direction of heat flow between two objects depends on their temperature.

II. Effect of Heat as an Energy

Heat is a form of energy that is associated with the motion of the molecule of a substance.

Application of Heat in Daily Life :

- Steam is formed due to heat.
- Clothes dry up in the sun due to the heat.
- Salt is obtained from seawater with the help of heat.

III. Conversion Of different Energies into Heat

There are many other types of energies transformed into heat.

- Burning candles causes chemical energy to change into heat.
- The electric energy in the electric furnace is converted into heat.
- In an electric heater electric energy is also changed into heat.

IV. Effects of Heat

The higher the speed of the molecules of a substance, the higher its temperature and by providing heat the speed of its molecules increases. When any object is heated, one or more of the following effects may appear.

(i) Change in size - Metals like iron, mercury etc. expand on heating.

(ii) Rise in temperature - When a body is heated, it becomes hot.

(iii) Change of state - Solid substances change to liquid and gases. Water in a liquid state changes to a solid, liquid and gaseous state. For example, liquid water from ice and steam from water. The heat used to convert ice into water is called the latent heat of fusion.

(iv) Change in physical and chemical properties of a substance - Iron when heated, becomes red hot.

(v) Damage to living cells etc. - If the leaf is lying in the sun, then it becomes dry. If the person remains in the sun for a long time, then the colour becomes black.

V. Measurement of Temperature

The measurement of the hotness or coldness of a body is known as its temperature.

To find out how hot or cold an object is we use a special device known as a thermometer.

Thermometer (Clinical Thermometer)

- The thermometer that measures our body temperature is called a clinical thermometer. A clinical thermometer consists of a long, narrow, uniform glass tube. It has a bulb at one end. This bulb contains mercury.
- Outside the bulb, a small shining thread of mercury can be seen. You can see a kink near the bulb.
- This kink prevents mercury levels from falling on its own when the thermometer is taken out of the mouth and we can read the thermometer easily.
- You will also find a scale on the thermometer. The scale we use is the Celsius scale, indicated by °C. A clinical thermometer reads temperature from 35°C to 42°C only.

In a thermometer, another scale is also used to measure temperature which is known as the Fahrenheit scale (°F). On the Fahrenheit scale thermometer reads from 94°F to 108°F only.

The normal temperature of a healthy person is 37°C or 98.6°F.

VI. Laboratory Thermometer

To measure the temperature of other objects, there are other thermometers. One such thermometer is known as the laboratory thermometer.

A Laboratory thermometer consists of a long, narrow glass tube. The lower end of this tube is like a bulb. This tube contains mercury or alcohol. Its upper end is sealed. The glass tube is kept in ice cubes. The point in the tube where mercury becomes steady after getting cooled is marked as 0°C.

Now the tube is kept in the steam of boiling water. The mercury starts to expand inside the tube. The point in the tube where mercury becomes steady is marked as 100 °C. The intervening space between the two points is divided into

100 equal parts. Thus, the measure of each small division is 1°C. Generally, the range of this thermometer is -10°C to 110°C.

VII. Propagation of Heat

The process of transfer or displacement of heat is called propagation of heat.

Conduction : The heat reaches the end of less temperature from the end of the higher temperature, and after some time the other end of the metal becomes hot. This method of heat transfer is called **conduction**.

Convection : The materials which allow heat to pass through them easily are conductors of heat. For example, aluminium, iron and copper. The materials which do not allow heat to pass through them easily are poor conductors or insulators of heat such as plastic and wood.

When water is heated, the water near the flame gets shot. Hot water rises. The cold water from the sides comes in to take its place. This water also gets hot and rises and water from the sides moves down. This process continues till the whole water gets heated. This mode of heat transfer is known as convection.

The air near the heat source gets hot and rises. The air from the sides comes in to take its place. In this way, the air gets heated. This air also gets hot. Thus, the process continues to take place.

Radiation : There is no medium such as air in most parts of the space between the earth and the sun, hence, from the sun the heat comes to us through another process known as **radiation.** The transfer of heat by radiation does not require any medium. When we sit in front of a room heater, we get heat from this process.

Our body too gives heat to the surroundings and receives heat from it through radiation.

A hot utensil kept away from the flame cools down as it transfers heat to the surroundings by radiation. It means that all hot bodies radiate heat. When this heat falls on some object, a part of it is absorbed and a part is reflected.

1. Resources and its Types

We use various materials for our basic needs. Some of them are found in nature and some have been made by human efforts. These have been classified as under :

I. Natural Resources

The resources which are obtained from nature are called natural resources. These are of two types :

(i) Inexhaustible Natural Resources

These resources are present in unlimited quantities in nature and are not likely to be exhausted by human activities. Examples : Sunlight, air, etc.

(ii) Exhaustible Natural Resources

The amount of these resources in nature is limited and thus these can be exhausted by excessive human usage. Examples : Forests, coal, petroleum, minerals, wild life, natural gas, etc.

II. Man-Made Resources

- When a natural resource undergoes drastic change by human intervention, it becomes human-made resource. For example; iron ore is processed to make steel and hence steel is a man-made resource, Buildings, bridges, railways, machines, etc. are examples of human-made resources. Technology is also a human-made resource.
- Exhaustible natural resources like coal, petroleum and natural gas were formed from the dead remains of living organisms (fossils), therefore, they are called **fossil fuels**. Wood is not a fossil fuel.
- The study of fossils is called paleontology.

2. Coal

- Coal is a complex mixture of free carbon and compounds of carbon containing hydrogen, oxygen, nitrogen and sulphur.
- It is believed that millions of years ago, the forests got buried under the surface of earth and had no contact with oxygen. They slowly started to decompose and formed dense sponge like material called peat. Over millions of years, due to tremendous pressure and heat, finally these got transformed into coal.
- As coal mainly contains carbon, the slow process of conversion of dead vegetation into coal is called **carbonization**. Upon heating in air, coal burns and produces mainly carbon dioxide. Diamond is an allotrope of carbon.
- Coal is used as a fuel in large furnaces and industries, production of bricks, thermal power stations, making food and other domestic purposes. For obtaining coal large and deep mines are made in the earth's crust. Pure coal is obtained from relatively deep and dangerous mines.
- Charcoal is produced from the wood of trees. Like coal it also has the capability of radiating energy continuously.
- Coal is classified into five main categories based on the amount of carbon it contains and the heat energy it can produce :
  - **(i) Peat :** It is the first stage of coal and contains 10-15% of carbon. It is the poorest variety of coal.
  - **(ii) Lignite :** The carbon content is 25-35%.
  - **(iii) Subbituminous coal :** It contains 35-44% carbon
  - **(iv) Bituminous coal :** It contains 45-86% carbon. It is common household fuel and industrial fuel.
  - **(v) Anthracite coal :** It contains 86-97% carbon
- **Destructive/Fractional Distillation of Coal :** The process of heating coal in the absence of air is called the destructive distillation of coal. When coal is heated in the absence of air, a number of products are obtained such as Coke, Coal tar and Coal gas. On destructive distillation, 1000 kg of coal gives 700kg of coke, 100 liters of ammonia, 50 litres of coal tar and 400 m^3 of coal gas.

(i) **Coke :** It contains 98 % carbon. It is porous and the purest form of coal. It is a good fuel and burns without smoke. It is largely used as a reducing agent in the extraction of metals from their ores. It is also used in making fuel gases like water gas and producer gas.

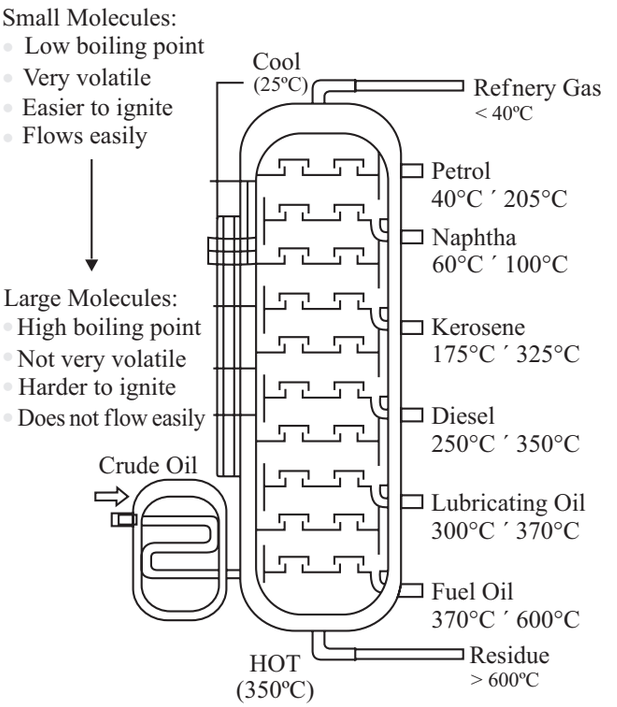
(ii) **Coal Tar (Liquid) :** It is a mixture of different carbon compounds. Its fractional distillation gives many chemical substances (Benzene, Toluene, Phenol and Aniline) which are further used in the preparation of dyes, explosives, paints, synthetics fibers, drugs, photographic materials, roofing materials and pesticides.
Naphthalene balls (also obtained from coal tar) are used to repel moths and other insects.Initially coal tar was used in metalling the roads but these days bitumen, a petroleum product is used. **Bitumen** is a sticky, black, highly viscous liquid or semi-solid form of petroleum.

(iii) **Coal Gas :** Coal gas is mainly a mixture of hydrogen, methane and carbon monoxide. It is obtained during the processing of coal to get coke. It is an excellent fuel. It was earlier used for lighting houses, factories and streets in Mumbai until 1950. Now it is mainly used as a source of heat.

(iv) **Liquid Ammonia :** It is used to make fertilizers.

3. Petroleum

- It is dark brownish to green coloured viscous liquid. It is also a fossil fuel. It has a strong foul smell due to the presence of sulphur containing compounds in it. It is generally referred to as crude oil and black gold.
- Its name is derived from Latin words Petra (meaning rock) and Oleum (meaning oil). Thus, petroleum literally means "Rock Oil". Petroleum is a complex mixture of solid, liquid and hydrocarbons, mixed with salt water and earthy particles. It is always found trapped between two impervious rocks.
- Iran, Iraq, Kuwait and other Arab countries are the major petroleum-producing countries in the world.
- **Formation of Petroleum :** It is believed that petroleum is formed by the anaerobic (in the absence of oxygen) decomposition of extremely small sea animals and plants which got buried in the sea bed millions of years ago.
- **Occurrence of Petroleum :** Petroleum occurs at a moderate depth (500 m to 200 m) between the 2 layers of impervious rocks. The petroleum is lighter than water and thus it can float over it. Above petroleum, natural gas is found and it is found trapped between the rock cap and petroleum layer.
- **The Drilling of Oil Wells to get Petroleum :** To get petroleum, a hole is drilled in the Earth's crust & when it reaches the rock cap, the natural gas comes out first with a great pressure. When the pressure of gas subsides, petroleum starts flowing out due to the pressure of natural gas.
- **Refining of Petroleum :** Petroleum being a mixture of several hydrocarbons cannot be used in natural form. Before being put to use, it has to be purified or refined. The process of separating the various components of petroleum from one another is known as the refining of petroleum and is carried out in petroleum refineries. This is done by a process called "Fractional Distillation" in which, on heating the crude oil, its different components get separated on their respective boiling points.



- **Uses of Petroleum :** Many useful substances are obtained from petroleum and natural gas. These are termed as 'Petrochemicals'. These are used in the manufacture of detergents, fibres (polyester, nylon, acrylic etc.), polythene and other man-made plastics.
- **Below are the various constituents of petroleum and their uses**

S. No.	Constituents of petroleum	Uses
1.	Petroleum Gas in Liquid form (LPG)	Fuel for home and industry
2.	Petrol	Motor fuel, aviation fuel, solvent for dry cleaning.
3.	Kerosene	Fuel for stoves, lamps and for jet aircrafts.
4.	Diesel	Fuel for heavy motor vehicles, electric generators.
5.	Lubricating oil	Lubrication
6.	Paraffin wax	Ointments, candles, vaseline etc.
7.	Bitumen	Paints, road surfacing.

Do you know?

- ⋆ The world's first petroleum well was drilled in Pennsylvania, USA in 1859.
- ⋆ In 1867, oil was stuck at Makum in Assam. In India, oil is found in Assam, Gujarat, Mumbai High and in the river basins of Godavari and Krishna.

4. Natural Gas

- Natural gas was formed millions of years ago along with petroleum when small sea plants & animals died & got buried under the earth. Further due to anaerobic conditions these got changed to gas.
- It also occurs in coal mines and petroleum wells. It mainly contains 90% methane.
- **Composition of Natural Gas :** It consists mainly of methane (about 85%), ethane (about 10%) propane (about 3%) and butane. The way of using natural gas is in form of CNG (Compressed Natural Gas) or LNG (Liquified Natural Gas).
- **CNG :** When natural gas is compressed at high pressure then it is called CNG. CNG is used for power generation and nowadays auto, buses and cars run on it, because it is less polluting. The great advantage of CNG is that it can be supplied through pipes and hence used in burning in homes and industries. Such a network of pipelines exists in Vadodara (Gujarat), some parts of Delhi and other places.
- **Occurrence :** It is generally found trapped between impervious rocks, sometimes along with petroleum & sometimes without petroleum. In our country, Tripura, Rajasthan, Maharashtra and in the Krishna Godavari Delta are the reserves of natural gas.
- **Liquefied Petroleum Gas (LPG) :** It is an important product of natural gas. LPG is the abbreviation or short form for liquefied petroleum gas. Main components of LPG are propane, butane and small quantities of methane. Like all fossil fuels, it is a non-renewable source of energy.

  It is extracted from crude oil and natural gas. Normally, the gas is stored in liquid form under pressure in a steel container, cylinder or tank. LPG is highly inflammable and must therefore be stored away from sources of ignition and in a well-ventilated area, so that any leak can disperse safely. It is used for standard heating and cooking purposes. Hydrogen gas obtained from natural gas, is used in the production of fertilisers (urea). Propane and butane are the two major components of LPG in the ratio 40:60.

Do you know?

- ⋆ Burning of fuels causes air pollution which leads to global warming. So we need to use fuels only when it is necessary. In India, the Petroleum Conservation Research Association (PCRA) advises people how to save petrol/diesel while driving.
- ⋆ Sunlight is a renewable natural resource.

5. Alternative Sources of Energy

- **Biodiesel :** It is a fuel obtained from vegetable oils such as Soyabean oil, Jatropha oil, Cornoil, Sunflower Oil, Cotton seed oil, Rice bran oil and Rubber seed oil.
- **Wind Mills :** When wind blows, they rotate and current is produced in the dynamo.
- **Solar Energy :** Sun is the foremost energy source that makes life possible on our earth.Solar energy is harnessed using (i) solar cookers (ii) solar water heaters (iii) solar cells.
- **Gobar Gas :** It is obtained by the fermentation of cow dung in the absence of air (anaerobic conditions). It mainly contains methane and a little ethane. It is widely used in rural areas for cooking and operating engines.

Do you know?

- ⋆ Hydrogen could be the best alternative fuel. It is a clean fuel as it gives out only water while burning. Moreover, it has the highest energy content. It does not pollute the air.
- ⋆ Sewage sludge can be decomposed by microorganisms to produce methane gas along with impurities like carbon dioxide and hydrogen sulphide. After removing these impurities, methane gas can be used as an efficient fuel.
- ⋆ Sails in boats and ships are used to harness wind energy.

6. Combustion

- A chemical process in which a substance reacts with oxygen to give off heat is called **combustion**.
- The substances such as paper and fuel etc., which undergo combustion are known as **combustible substances**. Sometimes, heat is accompanied by light, either as a flame or as a glow, during combustion.
- Combustion is a chemical process. Some materials burn with flame like a candle while some materials burn without flame-like coal.
- A combustion reaction may be written as :

  (i) Charcoal burns in air to give carbon dioxide and heat.

  $$C + O_2 \rightarrow CO_2 + \text{Heat}$$

  (ii) Methane burns in air forming carbon dioxide, water and heat.

  $$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + \text{Heat}$$

- It is important to note that different substances burn at different temperatures. For a substance to burn, some minimum temperature is required and this minimum temperature is known as **"Ignition Temperature"**. For example, the Ignition temperature of phosphorus is 35°C. So, unless phosphorus is heated to 35°C, it will not catch fire.
- Substances which have very low ignition temperature or can easily catch fire are called **Inflammable Substances.** eg. Petrol, Alcohol, LPG, etc.

- **Necessary conditions for combustion :**
  1. The heat-ignition temperature must be within access.
  2. Fuel- Fuel should be combustible.
  3. Oxygen- a suitable amount of oxygen must be available there.
- **Ignition Temperature of Different Materials**

Material	Ignition Temperature
White Phosphorus	35 degree Celsius
Petrol	246 degree Celsius
Kerosene	220 degree Celsius
Diesel	210 degree Celsius
Wood	300 degree Celsius
Coal	454 degree Celsius
Piece of paper	233 degree Celsius
Alcohol	365 degree Celsius

Do you know?

- ⋆ In the sun, heat and light are produced by nuclear reactions.

- Nuclear fusion takes place inside the sun's nucleus, where hydrozen nuclei (protons) combine to form helium nuclei. Protons - This process, known as the proton chain, involves a series of nuclear reactions that release vast amounts of energy in the form of light and heat.
- Combustion is an oxidation process.
- **Controlling Fire :** There are 3 conditions necessary for producing and sustaining combustion.
  (i) Presence of a combustible substance (Fuel)
  (ii) Presence of a supporter of combustion. (Air for oxygen)
  (iii) Attainment of ignition or kindling temperature.(Heat)
  Thus, fire can be controlled by removing one or more of these requirements for producing and sustaining combustion. The fire extinguisher also tries to cut off the supply of air or bring down the temperature of the fuel or both, to control the fire.

Fire Fighting

News of fire breaking out in homes, shops and factories due to carelessness and faulty equipment is common. But what is more important is to timely control it.

Combustion or Fire sustain due to the presence of all the necessary conditions of Fire. So, it can be controlled by removing one or more of these.

It is quite difficult to remove fuel from the site of the fire, So, the fire is extinguished by the following two factors.

1. By cutting off the supply of air: The supply of air can be stopped by covering the burning solid fuel with soil, sand and a blanket.
2. By cooling the combustible material below its ignition temperature: Water is the most common fire extinguisher. Water cools the combustible material below its ignition temperature. This prevents the fire from spreading. Water vapours also surround the combustible material, helping in cutting off the supply of air. But water works only when things like wood and paper are on fire.

If electrical equipment is on fire, water may conduct electricity and harm those trying to douse the fire.

Water is also not suitable for fires involving oil and petrol. Water is heavier than oil. So, it sinks below the oil, and the oil keeps burning on top.

For fires involving electrical equipment and inflammable materials like petrol, carbon dioxide is the best extinguisher. Carbon dioxide covers the fire like a blanket. Since the contact between the fuel and oxygen is cut off, the fire is controlled.

- **Fire Extinguishers :** For fires involving electrical equipment and inflammable materials like petrol, carbon dioxide (CO_2) is the best fire extinguisher and not water. CO_2, being heavier than oxygen, covers the fire like a blanket, hence cutting off the contact of fuel with oxygen and bringing down the temperature.

  Dry powder of chemicals like sodium bicarbonate (baking soda) or potassium bicarbonate release CO_2 near fire. Hence, are another good source to extinguish fire.
- CO_2 extinguishers are the type of extinguishers that can withstand up to 1000 volts.
- Fire extinguishers contain chemicals such as sulphuric acid H_2SO_4 and sodium bicarbonate $NaHCO_3$
- When a fire extinguisher is turned on, sulfuric acid reacts with sodium bicarbonate to produce corbon dioxide (CO_2) gas.

Do you know?

- ⋆ These days the head of the safety match contains only antimony trisulphide and potassium chlorate. The rubbing surface has powdered glass and a little red phosphorus (which is much less dangerous).When the match is struck against the rubbing surface, some red phosphorus gets converted into white phosphorus. This immediately reacts with potassium chlorate in the matchstick head to produce enough heat to ignite antimony trisulphide and start the combustion.
- ⋆ Limestone is mainly composed of calcium carbonate ($CaCO_3$)] which is a chemical compound. when limestone undergoes a chemical reaction such as combustion or decomposition, it releases energy in the form of heat. This energy is stored within the chemical bonds of limestore and when these bonds are broken, the energy is released in the form of chemical energy. therefore, the energy released form limestore is classified as chemical energy.
- ⋆ Solid carbon dioxide is called dry ice.

- **Types of Combustion :** Combustion is mainly of three types–
  (i) Rapid combustion : The combustion in which the gas burns rapidly and produces heat and light is called rapid combustion.
  For example : When a burning matchstick is brought near a gas burner and the gas tap is opened, the gas immediately starts burning with the production of heat and light. Magnesium ribbon burns to form magnesium oxide and produces heat and light

(ii) Spontaneous combustion : The combustion in which no external heat is given is known as spontaneous combustion. For example: Forest fires are the result of spontaneous combustion due to heat of sun or lightning strike. Burning of white phosphorus in air at room temperature.

(iii) Explosion : The combustion in which large amount of gases are evolved with the production of a tremendous amount of heat, light and sound is called explosion. For example : When a cracker is ignited, a sudden reaction, takes place in which at high speed large amount of gas is evolved with the production of tremendous amount of heat, light and sound.

- **Difference between Rapid and Spontaneous Combustion**

Rapid combustion	Spontaneous combustion
It is to be initiated once	It takes place by itself.
External heat is required	No external heat is required to start it
Large amount of heat is	Small amount of heat and light
evolved in a short time	is evolved
Example : Burning of	Burning of white phosphorous
domestic cooking gas	on its own when kept in air for
exposed in a gas burner	some time

7. Flame

- A region of burning gases is called flame. A substance will burn with a flame, only if some gaseous substance is there to burn.
- The substances which vapourise during burning, give flames. For example, kerosene oil and molten wax rise through the wick and are vapourised during burning and form flames. Charcoal, on the other hand, does not vapourise and so does not produce a flame.
- **Structure of a flame :** In order to understand the structure of a flame, light a wax candle and watch its flame. There are different coloured zones in the flame. Starting from the base of the flame, a flame has **three zones**.

(i) Outermost non-luminous zone of complete combustion (Blue)
This zone is poorly visible and is slightly blue. It is the hottest part of the flame where complete oxidation (burning) of the fuel is taking place. Goldsmiths blow the outermost zone of a flame with a metallic blow-pipe for melting gold and silver.

(ii) Luminous zone of partial combustion (Yellow)
In this region of the flame, hydrogen burns with a brilliant **yellow luminous flame**. Burning hydrogen combines with oxygen to form water vapour. Carbon also burns in this zone giving some luminosity to the flame and producing carbon dioxide. Some unburnt carbon particles are left which give rise to soot.

(iii) Dark innermost zone of unburnt wax vapours (Black) Surrounding the wick is the dark zone. There is no burning in this zone. If we pass a wooden splinter through the dark zone of the flame, it comes out unscratched (unburnt) showing that there is no 'burning' in this zone. However, some burnt wax vapours are present in this zone.

8. Fuel

- Any substance which is easily available and burns in air at a moderate rate, producing a large amount of heat energy, without leaving behind any undesirable residue is called **fuel**. For *e.g.,* Wood, charcoal, petrol, kerosene, etc.
- If a fuel is present in its natural state then it is known as a natural fuel, while a fuel is known as a derived fuel if it is processed to improve its quality. It can be classified into natural (primary) fuels and derived (secondary) fuels.
- **Characteristics of a Good Fuel**

(i) It should be cheap and readily available.

(ii) It should be easy to store.

(iii) It should burn at a slow rate and its rate of combustion should be controllable

(iv) It should have low ignition temperature. Substances which have low ingition temperature burn easily.

(v) It should produce a very small amount of residues such as ash.

(vi) It should have large calorific value.

(vii) It should not produce gases which pollute the air.

(viii) It should not produce any hazards during transportation.

- **Classification of fuels :** On the basis of physical state, fuels are classified into three types :

(i) Solid fuels : The fuels which occur in a solid state at room temperature are called solid fuels. Example : Wood, agricultural residues, charcoal, coal, coke, etc.

Do you know?
★ Uranium is used as fuil in nuclear reaction.

(ii) Liquid fuels : The fuels which occur in a liquid state at room temperature are called liquid fuels. Example : Liquefied hydrogen, petrol, oil, kerosene, diesel, etc.

(iii) Gaseous fuels : The fuels which occur in a gaseous state at room temperature are called gaseous fuels. Example : Water gas, producer gas, coal gas, compressed natural gas (CNG) and gobar gas, etc.

- **Fuel efficiency :** Any fuel contains carbon as its main constituent. During the combustion of fuel carbon combines with oxygen and liberates large amounts of heat. It is expected that a fuel liberates maximum amount of heat in a short time. The efficiency of a fuel can be understood from the following terms :

(i) Specific Energy : Specific energy is the amount of energy produced by the **unit mass of a fuel**. It is defined as the **energy per unit mass**. It is used to measure the stored energy in certain substances. Its unit is **J/kg**.

(ii) Calorific Value : It is the quantity of heat produced by the complete combustion of 1 kg of fuel at constant pressure and normal conditions. In case of liquid or gaseous fuels to measure the calorific value, their volumes are taken into consideration while for solid

fuels their masses are taken into account. It is measured in **Kilo Joule per Kilogram (kJ/Kg)**. **The more the calorific value of a fuel, the more is the efficiency of the fuel**.

$$\text{Calorific Value} = \frac{\text{Amount of heat liberated}}{\text{Total mass or volume of fule}}$$

Examples for understanding Calorific Value :

- Calorific value of some fuels is given in the following table :

Fuel	Calorific Value (KJ/kg)
Cow dung cake	6000 — 8000
Wood	17000 — 22000
Coal	25000 — 33000
Petrol	45000
Kerosene	45000
Diesel	45000
Methane	50000
CNG	50000
LPG	550000
Biogas	35000 — 40000
Hydrogen	150000

- **Ideal Fuel :** An ideal fuel is one which :
  (i) Has high calorific value.
  (ii) Do not cause any pollution or produce harmful gases on combustion.
  (iii) Is easily available at low cost.
  (iv) Is easy to handle, store and transport.
  (v) Has moderate ignition temperature.
  (vi) Has moderate rate of combustion.

- **Harmful effects of burning fuels :** The increasing fuel consumption has harmful effects on the environment. The main products formed during the fuel combustion which produce harmful effect are :
  (i) **Carbon fuels** like wood, coal, petroleum release unburnt carbon particles. These fine particles are dangerous pollutants causing respiratory disease, such as asthma.
  (ii) **Incomplete combustion** forms carbon monoxide gas. It is a very poisonous gas. It is dangerous to burn coal in a closed room. The carbon monoxide gas produced can kill persons sleeping in that room.
  (iii) Combustion of most fuels releases carbon dioxide in the environment. Increased percentage of carbon dioxide in the air causes **global warming**. Global warming is the rise in temperature of the earth. This results in melting of polar glaciers which leads to rise in sea level and floods in the sea coast.
  (iv) Burning of coal and diesel releases sulphur dioxide gas. It is an extremely suffocating and corrosive gas. Sulphur dioxide and nitrogen oxide dissolve in rain water to form acid. Such rain is called **acid rain**. It is very harmful for crops, buildings and soil.
  (v) Wood is also used as a fuel. Burning of wood gives a lot of smoke which causes **air pollution** and is also very harmful for humans. It may lead to many respiratory problems. Cutting of trees for obtaining wood leads to deforestation which is quite harmful to the environment. Therefore, wood is replaced by coal or other fuels such as LPG.
  (vi) Carbon particles of smoke or ash get suspended in the air. Excessive amounts of them in the air causes **breathing problems**.

Important Questions

1. In Fire extinguishers, a concentrated acid is used to form carbondioxide. Name the acid which participated in that reaction :
(A) conc. H2SO4 (B) Conc. HCl
(C) conc. HNO3 (D) All of these

2. Which one is the main source of energy?
(A) Wind (B) Petrol
(C) Coal (D) Sun

3. Which type of energy is released from limestone?
(A) Chemical energy
(B) Potential energy
(C) Kinetic energy
(D) Mechanical energy

4. For Combustion air required
(A) Oxygen
(B) Nitrogen
(C) Chlorine
(D) Carbon-dioxide

5. Combustion is a process
(A) Oxidation (B) Reduction
(C) Decomposition (D) Combination

6. Renewable source of Energy is :
(A) Petrol (B) Diesel
(C) Coal (D) Wind

7. Which of the following is having highest calorific value of a fuel ?
(A) Wood (B) Petrol
(C) L.P.G. (D) Hydrogen

8. Which fuel is used in Nuclear reactions ?
(A) Oxygen (B) Uranium
(C) Calcium (D) Iron

9. The Calorific value of "CNG" fuel is—
(A) 45,000 KJ/Kg
(B) 35,000 KJ/Kg
(C) 50,000 KJ/Kg
(D) 55,000 KJ/Kg

10. The gas used in homes is—
(A) L.P.G. (B) C.N.G.
(C) CO_2 (D) O_2

11. Which of the following products is not obtained from the refining of petroleum?
(A) Diesel (B) lubricating oil
(C) Petroleum gas (D) Natural gas

12. The least polluting fuel is :
(A) Wood (B) Hydrogen
(C) Methane (D) Butane

13. Which of the following does not produce CO_2 ?
(A) Wind Energy
(B) Hydroelectric
(C) Geothermal Energy
(D) Solar Energy

14. The substance which have very low ignition temperature?
(A) Burns easily
(B) Burns very slowly
(C) Both A and B
(D) None

Answer key

1. (A) **2.** (D) **3.** (A) **4.** (A) **5.** (A)
6. (D) **7.** (D) **8.** (B) **9.** (C) **10.** (A)
11. (D) **12.** (B) **13.** (A) **14.** (D)

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