™ NATIONAL TALENT SEARCH EXAMINATION (NTSE-2017) STAGE -1
ODISHA STATE : SAT

ALLEN
CAREER INSTITUTE
KOTA (RAJASTHAN)
Path to success

Date: 06/11/2016

Max. Marks: 100   **SOLUTIONS**   **Time allowed: 90 mins**

1. In the context of which event we read about the activities of Mensheviks and Bolshevicks ?

(A) French Revolution   (B) World war

(C) Russian Revolution   (D) Indian Nationlist movement

Ans. *(C)*

Sol. Bolshevik, (Russian: "One of the Majority") , plural Bolsheviks, or Bolsheviki, member of a wing of the Russian Social-Democratic Workers' Party, which, led by Lenin, seized control of the government in Russia (October 1917) and became the dominant political power.

The Mensheviks were a faction of the Russian socialist movement that emerged in 1904 after a dispute in the Russian Social-Democratic Labour Party (RSDLP) between Vladimir Lenin and Julius Martov, leading to the party splitting into two factions.

2. Who was the Czar of Russia in 1917 ?

(A) Alexander - I   (B) Alexander - II   (C) Nicholas - I   (D) Nicholas - II

Ans. *(D)*

Sol. During the February Revolution, Czar Nicholas II, ruler of Russia since 1894, is forced to abdicate the throne on this day in 1917, after strikes and general revolts break out in Petrograd (now St. Petersburg).

3. In which country was the Weimar Republic formed after the World War I ?

(A) Germany   (B) Italy   (C) France   (D) England

Ans. *(A)*

Sol. Weimar Republic is an unofficial historical designation for the German state between 1919 and 1933.

4. Find out which statement mentioned below is True.

(A) Hitler came to power in Italy

(B) Hitler deliberately violated the items of the treaty of Versailies

(C) Hitler was a poor orator

(D) Hitler encouraged the jaws

Ans. *(B)*

Sol. In 1936, Hitler introduced conscription, and war-tested his armed forces in the Spanish Civil War. It can be argued that it was not just Hitler who broke the Treaty of Versailles, but also Britain and France, when they allowed him to do what he did.

5. Who has written the Odia novel 'Chhamana Athaguntha' ?

(A) Rama Shankar Ray   (B) Nandakishore Bal

(C) Fakir Mohan Senapati   (D) Surendra Mohanty

Ans. *(C)*

Sol. Chha Maana Atha Guntha, written by Fakir Mohan Senapati, Father of Modern Oriya Literature is a 19th Century's Oriya novel.

6. Where did Mahatma Gandhi start his first Satyagraha movement ?

(A) South Africa   (B) Kheda   (C) Champaran   (D) Nagpur

Ans. *(C)*

Sol. The first Satyagraha movements inspired by Mahatma Gandhi occurred in Champaran district of Bihar in 1917.

7. Whose cause did Mahatma Ghandi champion in organizing a satyagraha movement in Ahemadabad in 1918 ?

(A) Peasants
(B) Agricultural Labourers
(C) Zamindars
(D) Cotton mill workers

Ans. *(D)*

Sol. In February March 1918, there was a situation of conflict between the Gujarat Mill owners and workers on the question of Plague Bonus of 1917. The Mill Owners wanted to withdraw the bonus whole the workers demanded a 50% wage hike. The Mill Owners were willing to give only 20% wage hike. In March 1918, under the leadership of Gandhi, there was a strike in the cotton mills. In this strike Gandhi used the weapon of Hunger strike. If Gandhi were not there as a leader of this revolt, may be the shops were picketed, but it was carried out in pure non-violent disciplined way. The result was that the strike was successful and the workers got a 35% wage increase.

8. What was the date fixed for observing a countrywide hartal in protest against the Rowlatt Act ?

(A) 18 March 1919
(B) 19 March 1919
(C) 6 April 1919
(D) 9 April 1919

Ans. *(C)*

Sol. On the basis of its report the Rowlatt Act was passed in March 1919 by the Central Legislative Council, An all-India hartal was organized on 6 April 1919.

9. Who presided over the Lahore session of the Indian National congress in December 1929 ?

(A) Motilal Nehru
(B) Jawharlal Nehru
(C) Subhas Chandra Bose
(D) Mahatma Gandhi

Ans. *(B)*

Sol. The Lahore session of Indian National Congress took place under the presidentship of Pandit Jawaharlal Nehru.

10. Who was the viceroy of India when the salt Satyagraha began in 1930 ?

(A) Lord Lrwin
(B) Lord Willingdon
(C) Lord Lord Linlithgow
(D) Lord Wavell

Ans. *(A)*

Sol. The Salt Satyagraha started on March 12, 1930, with the undertaking ... with Gandhi's release from jail and negotiations with Viceroy Lord Irwin.

11. How was response of the Indian women towards the Salt Satyagraha ?

(A) They were against the movement
(B) They remainded indifferent
(C) They participated in large number
(D) They were not allowed to participate

Ans. *(C)*

12. Which one is the correct chronological order of the given events ?

(A) Chaurichaura incident, Gandhi-lrwin Pact, Second Round Table conference. Dandi March.

(B) Dandi March, Chaurichaura incident, Second Round Table Conference, Gandhi-lrwin Pact.

(C) Second Round Table conference, Dandi March Gandhi-lrwin Pact, Chaurichaura incident.

(D) Chaurichaura incident, Dandi March, Gandhi-lrwin Pact, Second Round Table Conference.

Ans. *(D)*

Sol. Chauri Chaura- 1922

Dandi March - 1930

Gandhi Irwin Pact - March 1931

Second Round Table Conference - September 1931

13. Which part of the Indian constitution mentions that the 'State shall endeavour to promote international peace and security ?

(A) Part-I
(B) Part-II
(C) Part-III
(D) Part-IV

Ans. *(D)*

Sol. It is a Directive Principle.

14. How many members from the Anglo-Indian Community can be nominated to the State Legislative Assembly by the Governor ?

(A) 1   (B) 2   (C) 3   (D) 4

Ans. *(A)*

Sol. Just as the President has the power to nominate 2 Anglo Indians to the Lok Sabha, similarly, the Governor also has the power to nominate 1 member from Anglo Indian's community as he/she deems fit, if he/she is of the opinion that they are not adequately represented in the Assembly.

15. What happens if there is a disagreement between the Houses of the Parliament regarding a Constitution Amendment Bill ?

(A) Joint sitting of both the Houses is convened.

(B) The Bill is sent to the State Legislative.

(C) There is an end to the Bill.

(D) Advice of the Supreme Court is solicited

Ans. *(A)*

Sol. Amending the Constitution of India is the process of making changes to the nation's ... The Constitution of India vests constituent power upon the Parliament .... The Bill must then be passed in each House by a majority of the total ... There is no provision for a joint sitting in case of disagreement between the two Houses.

16. What can be the maximum number of elected members of a State Legislative Assembly ?

(A) 500   (B) 507   (C) 509   (D) 510

Ans. *(A)*

Sol. Members of a Vidhan Sabha are direct representatives of the people of the particular state as they are directly elected by an electorate consisting of all citizens above the age of 18 of that state. Its maximum size as outlined in the Constitution of India is not more than 500 members and not less than 60 members.

17. Which of the following Amendments converted Right to Property into a Legal Right ?

(A) 44th Amendment   (B) 42nd Amendment   (C) 73rd Amendment   (D) 86th Amendment

Ans. *(A)*

Sol. Fundamental Rights via the Constitution 44th Amendment Act, 1978. It was instead made a constitutional right under Article 300A which states that. " No person can be deprived of his property except by authority of law."

18. How long a Chief Minister of a State holds office ?

(A) For full 5 years.

(B) So long as he remains the leader of the majority party in the State Legislative.

(C) So long as the Governor desires.

(D) None of the above

Ans. *(B)*

19. Who can create or abolish an All-India Service ?

(A) Lok Sabha   (B) Raiya Sabha   (C) President   (D) The Parliament

Ans. *(B)*

Sol. The constitution under Article 312 provides for All India Civil Services branches to be set up by giving the power to the Rajya Sabha (upper house of the Parliament of India) to resolve by a two-thirds majority to establish new all-India services.

20. Which of the Articles says that a Money Bill shall not be introduced in the Council of States ?

(A) Article 107   (B) Article 108   (C) Article 109   (D) Article 110

Ans. *(C)*

Sol. Article 109 in The Constitution Of India 1949- Special procedure in respect of Money Bills i.e A Money Bill shall not be introduced in the Council of States.

21. Rise in Green Net National income implies higher sustainable development in an economy. Green Net National income is the difference between

(A) Difference between Net National income and gross savings

(B) Difference between Net National income and depreciation of natural capital

(C) Difference between Net National income and depreciation of man-made capital

(D) Both (B) and (C)

Ans. (B)

Sol. Green Net National Income is the difference between Net National Income and Depreciation of Natural Capital.

22. Match List-I with List-II and select answer using the appropriate code from among the following alternatives.

	List-I		List-II
(A)	Disparties in income in a developing economy	(i)	Trickle Down theory
(B)	Economic development benefits the poor	(ii)	Change in accupational structure
(C)	Shifting of labour from agricultural to non agricultural sector	(iii)	Less redistribution of income in favour of poor
(D)	Increase in the capabilities of people	(iv)	Human development

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

Ans. (C)

23. If Life Expectancy index for a country is 0.53, Educational Attainment index is 0.67 and Per Capita Real GDP index is 0.42, then HDI for the country will be

(A) 0.93   (B) 0.70   (C) 0.54   (D) 0.68

Ans. (C)

Sol. Sum of all three divided by 3

24. If cash reserve ratio of banks is 20% and currency reserves in the banking system amount to 50 million rupees, the maximum amount of demand deposits which can be created by the banks is

(A) 200 million rupees   (B) 250 million rupees

(C) 500 million rupees   (D) 1000 million rupees

Ans. (D)

25. The Government of India supplies foodgrains and other essential commodities to BPL households through fair price shops. Name of the programme is

(A) ICDS   (B) MDM   (C) PDS   (D) Antodaya

Ans. (C)

Sol. Major commodities distributed include staple food grains, such as wheat, rice, sugar, and kerosene, through a network of fair price shops (also known as ration shops) established in several states across the country. Food Corporation of India, a Government-owned corporation, procures and maintains the PDS.

26. Free trade in goods among nations is called

(A) Privatisation   (B) Liberalisation   (C) Globalisation   (D) Exclusion

Ans. (B)

Sol. Economic liberalization is the lessening of government regulations and restrictions in an economy in exchange for greater participation by private entities; the doctrine is associated with classical liberalism. Thus, liberalization in short is "the removal of controls" in order to encourage economic development.

27. NITI Ayog prepares

(A) Five year plans for the country   (B) Five year plans for the states

(C) Annual plans for the country as well asstates   (D) None of the above

Ans. *(A)*

Sol. NITI Aayog, or the National Institution for Transforming India is a Government of India policy think-tank established by the Narendra Modi government to replace the Planning Commission. Hence will prepare five year plans for the country.

28. Indira Awas Yojana houses are given to the

(A) STs only   (B) SCs only   (C) BPL house holds   (D) Both (A) and (B)

Ans. *(C)*

Sol. The Indira Awaas Yojana (IAY) is a flagship scheme of the Ministry of Rural Development to provide houses to below the poverty line (BPL) families in the rural areas.

29. In which of the following countries the Baluchistan Plateu is located ?

(A) Afghanistan   (B) Pakistan   (C) China   (D) India

Ans. *(B)*

Sol. The Balochistan Plateau is located in the southwest region of Pakistan, and mainly consists altitudes ranging from 600-3000 meters.

30. What is the percentage of surface covered by India ?

(A) 2.4   (B) 3.4   (C) 4.4   (D) 5.4

Ans. *(A)*

Sol. The percentage of the earth's surface covered by India is 2.4%.

31. Which of the following places is known as the "Island of Pearls" ?

(A) Austrialia   (B) Madagascar   (C) Baharain   (D) Srilanka

Ans. *(C)*

Sol. Island of Pearls - Bahrain. Bahrain is one of the smallest nation of Arabian Gulf and Arabian Gulf specially Persian gulf is rich with the animal snail .

32. "Durand Line" is the boundary between :

(A) India and Pakistan   (B) India and China

(C) Pakistan and Afghanistan   (D) India and Afganistan

Ans. *(D)*

Sol. The Durand Line is a frontier boundary between Afghanistan and India. It was established after an 1893 memorandum of understanding (MoU) between Mortimer Durand of British India and Afghan Amir Abdur Rahman Khan.

33. In which of the following countries world's largest reserves of uranium is located ?

(A) Australia   (B) Canada   (C) China   (D) Brazil

Ans. *(A)*

Sol. Australia has the largest reserves opposition to uranium mining has been substantial in Australia.

34. Select the odd one from the following :

(A) Chilika   (B) Pulicat   (C) Vembanad   (D) Kolleru

Ans. *(D)*

Sol. Kolleru is freshwater while all others are brackish water lakes.

35. What is Karewa ?

(A) A type of soil   (B) A type of plant   (C) A type of animal   (D) A type of tribe

Ans. *(A)*

Sol. It is an intermountain valley fill, comprising of unconsolidated gravel and mud. A succession of plateaus is present above the Plains of Jhelum and its tributaries.

36. Which of the following pairs is not correct ?

(A) Berlin-Rhine   (B) London-Thames   (C) New York-Hudson   (D) Viena-Danube

Ans. *(A)*

Sol. Rhine is a valley, whereas Berlin is located on the banks of Spree river.

37. Which of the following groups accounts for over 90% of India's annual coal production ?

(A) Bihar, Odisha, Madhya Pradesh.   (B) Bihar, Madhya Pradesh, Tamil Nadu.

(C) West Bengal, Odisha, Madhya Pradesh.   (D) Bihar, Odisha, West Bengal.

Ans. *(D)*

38. Which National Highway connects Amritsar with Kolkata via Delhi ?

(A) N.H.1   (B) N.H.'2   (C) N.H.4   (D) N.H.8

Ans. *(Bonus)*

Sol. Bonus

Delhi to Amritsar - N.H 1

Delhi to Kolkata - N.H 2

Both options are given , hence it would be a bonus

39. In which state is the Guru Sikhar Peak Located ?

(A) Gujarat   (B) Rajasthan   (C) Maharashtra   (D) Madhya Pradesh

Ans. *(B)*

Sol. Guru Shikhar, a peak in the Arbuda Mountains of Rajasthan, is the highest point of the Aravalli Range. It rises to an elevation of 1,722 metres.

40. Tehri Hydropower Project is located on :

(A) Alakananda River   (B) Bhagirathi River   (C) Mandakini River   (D) Dhauliganga River

Ans. *(B)*

Sol. The Tehri Dam is the tallest dam in India and one of the tallest in the world. It is a multi-purpose rock and earth-fill embankment dam on the Bhagirathi River

41. If $a + 8b = 14$ and $5a - 2b = 16$, then what is the mean of a and b ?

(A) 15   (B) 7.5   (C) 5   (D) 2.5

Ans. *(D)*

Sol. $a + 8b = 14$ ....(1)

$5a - 2b = 16$ ....(2)

Multiplying equation (1) by 5 and subtracting (1) & (2)

$5a - 2b = 16$

$5a + 40b = 70$

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$-42b = -54$

$b = \dfrac{54}{42} = \dfrac{9}{7}$

$a + 8 \times \dfrac{9}{7} = 14$

$a = 14 - \dfrac{72}{7}$

$= \dfrac{98 - 72}{7} = \dfrac{26}{7}$

Mean $= \dfrac{a+b}{2} = \dfrac{\dfrac{26}{7} + \dfrac{9}{7}}{2} = \dfrac{35}{7 \times 2} = \dfrac{5}{2} = 2.5$

42. A letter is chosen at random from the word MATHEMATICS. What is the probability that is will be a vowel ?

(A) $\dfrac{1}{2}$ (B) $\dfrac{3}{8}$ (C) $\dfrac{3}{11}$ (D) $\dfrac{4}{11}$

Ans. **(D)**

Sol. MATHEMATICS

Vowels = A, E, A, I

$P(V) = \dfrac{4}{11}$

43. The line containing the points (c, 8) and (a, 0) is perpendicular to the line containing the points (–c, c) and (3c, a). If a = 10, then what is the value of a + c ?

(A) 22   (B) 12   (C) 10   (D) 6

Ans. **(B)**

Sol. Slope of perpendicular line $= \dfrac{a-c}{3c+c}$

$m_1 = \dfrac{a-c}{4c}$

$y - 8 = \dfrac{0-8}{a-c}(x-c)$

$(y-8)(a-c) = -8x + 8c$

$(a-c)y - 8(a-c) = -8x + 8c$

$(a-c)y = -8x + 8c + 8(a-c)$

$= -8x + 8c + 8a - 8c$

$(a-c)y = 8(a-x)$

$y = \dfrac{-8}{a-c}x + \dfrac{8a}{a-c}$

Slope $(m_2) = \dfrac{-8}{a-c}$

$m_1 . m_2 = -1$

$\dfrac{-8}{a-c} = \dfrac{-4c}{a-c}$

$4c = 8$

$c = 2$

$a + c = 12$

44. Which point in the y-axis is equidistant from the points (3, –2) and (4, 5) ?

(A) (0, 2)   (B) (0, –2)   (C) (0, 3)   (D) (0, –3)

Ans. **(A)**

Sol. Let the point (0, y)

$9 + (y+2)^2 = 16 + (y-5)^2$

$9 + y^2 + 4 + 4y = 16 + y^2 + 25 - 10y$

$14y = 28$

$y = 2$

(0, 2)

45. If A + B + C = 180° and cos B cos C = cos A, then what is the value of tan B tan C ?

(A) –2　　　　　　　(B) –1　　　　　　　(C) +2　　　　　　　(D) +1

Ans. *(C)*

Sol. A + B + C = 180° ⇒ A = 180° – (B + C)

cos B. cosC = cosA

cosB. cosc = cos [180 – (B + C)]

= – cos (B +C)

cos B. cos C = – [cos B cos C – sin B sin C]

2 cos B cos C = sin B sin C

tan B tan C = 2

46. What is the solution of the equation

$3 \times 5^{2x-1} - 2 \times 5^{x-1} = 0.2$?

(A) x = 5　　　　　　　(B) x = 1　　　　　　　(C) x = –1　　　　　　　(D) x = 0

Ans. *(D)*

Sol. $3 \times 5^{2x-1} - 2 \times 5^{x-1} = 0.2$

$\dfrac{3}{5} . 5^2 - \dfrac{2}{5} 5^x = \dfrac{1}{5}$

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

$3t^2 - 2t - 1 = 0$　　　　　(Let $5^x = t$)

$3t^2 - 3t + t - 1 = 0$

$3t (t - 1) + 1 (t - 1) = 0$

$t = \dfrac{-1}{3}, \ t = 1$

$5^x = \dfrac{-1}{3} , 5^x = 1$

$5^x = 5°$

x = 0

47. If α and β are the roots of the quadratic equation $4x^2 - 20x = p^2$, what is the difference between α and β ?

(A) $\sqrt{25 + p^2}$　　　　　(B) $\sqrt{25 - p^2}$　　　　　(C) 5 + p　　　　　(D) 5 – p

Ans. *(A)*

Sol. $4x^2 - 20x - p^2 = 0$

$\alpha + \beta = \dfrac{20}{4} = 5$

$\alpha\beta = \dfrac{-p^2}{4}$

$(\alpha - \beta)^2 = (\alpha + \beta)^2 - 4\alpha\beta.$

$= 25 - 4 \left(-\dfrac{p^2}{4}\right)$

$(\alpha - \beta)^2 = 25 + p^2.$

$\alpha - \beta = \sqrt{25 + p^2}$

48. In $\triangle ABC$, $2(m\angle A + m\angle B) = 3m\angle B = m\angle C$. If O is the circumcentre of $\triangle ABC$ and the diameter of the circumcircle of $\triangle ABC$ is 16 cm, what is the area of $\triangle OAB$?

(A) 8 sqcm   (B) $8\sqrt{3}$ sqcm   (C) 16 sqcm   (D) $16\sqrt{3}$ sqcm

Ans. ***(D)***

Sol. $2 (m\angle A + m\angle B) = 3m \angle B = m\angle C$

Let $\angle C = x$

$\angle B = \dfrac{x}{3}$

$2(m\angle A + \dfrac{x}{3}) = \dfrac{3x}{3}$

$2m\angle A + \dfrac{2x}{3} = x$

$2m\angle A = x - \dfrac{2x}{3}$

$= \dfrac{x}{3}$

$m \angle A = \dfrac{x}{6}$

$\dfrac{x}{6} + \dfrac{x}{3} + x = 180°$

$\dfrac{x + 2x + 6x}{6} = 180°$

$\dfrac{9x}{6} = 180°$

$\angle C = x = 120°$

$\angle B = \dfrac{x}{3} = 40°$

$\angle A = \dfrac{x}{6} = 20°$

$\angle AOB = 2\angle C$

$= 240°$

or $(\triangle OAB) = \dfrac{1}{2} \times 8 \times 8 \times \sin 240° = 32 \sin (180° + 60)$

$= 32 \dfrac{\sqrt{3}}{2} = -16\sqrt{3}$ sqcm

$= 16\sqrt{3}$ sqcm

49. If $a + b = 3$, $ab = 2$ and $a > b$, then what is the value of $2^{a^3-b^3}$?

(A) 32   (B) 64   (C) 128   (D) 256

Ans. *(C)*

Sol. $a + b = 3$

$ab = 2$

$2^{a^3-b^3} = ?$

$(a + b)^2 = 9$

$a^2 + b^2 + 2 \times 2 = 9$

$a^2 + b^2 = 5$

$(a - b)^2 = (a + b)^2 - 4ab$

$= 9 - 8 = 1$

$a - b = 1$

$2^{a^3-b^3} = 2^{(a-b)(a^2+b^2+ab)}$

$= 2^{1(5+2)} = 2^7 = 128$

50. If α, β and γ each is a zero of $x^3 - 6x^2 - x + 30$ and $\alpha \neq \beta \neq \gamma$, then what is the value of $5(\alpha\beta + \beta\gamma + \gamma\alpha)$?

(A) –1   (B) –5   (C) 1   (D) 5

Ans. *(B)*

Sol. $x^3 - 6x^2 - x + 30$

α, β, γ are the zeros of polynomial

So $\alpha\beta + \beta\gamma + \gamma\alpha = \dfrac{c}{a}$

$\alpha\beta + \beta\gamma + \gamma\alpha = \dfrac{-1}{1}$

$\alpha\beta + \beta\gamma + \gamma\alpha = -1$

$5(\alpha\beta + \beta\gamma + \gamma\alpha) = 5(-1)$

$= -5$

51. $\overline{AB}$ is a diameter of the circle shown in the figure and O is the centre of it. If $m\angle A = 30°$ and $m\angle POQ = 60°$, what is the ratio between the areas of $\triangle POQ$ and $\triangle ABC$?

(A) $\sqrt{3} : 2$

(B) $\sqrt{3} : 1$

(C) $3 : 2$

(D) $1 : 2$

Ans. *(D)*

Sol. $\angle POQ = 60°$

so triangle POQ is an equilateral triangle

area of $\triangle POQ = \dfrac{\sqrt{3}}{4} \times r^2$

$\triangle ABC$ is a right angled triangle

and $\angle A = 30°$

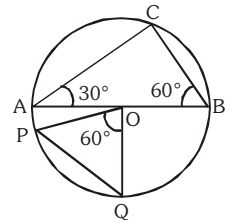so $AC = \sqrt{3}\,r$

$BC = r$

area of $\triangle ABC = \dfrac{1}{2} \times r \times \sqrt{3}\,r$

$= \dfrac{\sqrt{3}}{2}\,r^2$

$\dfrac{\text{area of } \triangle POQ}{\text{area of } \triangle ABC} = \dfrac{\dfrac{\sqrt{3}}{4}r^2}{\dfrac{\sqrt{3}}{2}r^2} = \dfrac{1}{2}$

52. The roots of the quadratic equation $x^2 - 4x - \log_3 a = 0$ are real. Then what is the least value of 'a' ?

(A) 64   (B) $\dfrac{1}{81}$ (C) $\dfrac{1}{64}$ (D) 81

Ans. *(B)*

Sol. $x^2 - 4x - \log_3 a = 0$

$D = 16 + 4\log_3 a$

If roots are real

$D \geq 0$

$16 + 4\log_3 a \geq 0$

$\log_3 a \geq \dfrac{-16}{4}$

$\log_3 a \geq -4$

$\log_3 a = -4$

$3^{-4} = a$

$a = \dfrac{1}{81}$

53. The sum of the lengths of all the edges of a cube is 6 cm, what is the volume of the cube in cubic cm ?

(A) $\dfrac{1}{8}$ (B) $\dfrac{1}{6}$ (C) $\dfrac{1}{4}$ (D) $\dfrac{1}{2}$

Ans. *(A)*

Sol. $12a = 6$

$a = \dfrac{1}{2}$

$v = a^3 = \dfrac{1}{8}$

54. If $\operatorname{cosec}\theta + \cot\theta = m$, then what is the value of $\sec\theta$?

(A) $m^2 + I$ (B) $m^2 - I$ (C) $\dfrac{m^2 - 1}{m^2 + 1}$ (D) $\dfrac{m^2 + 1}{m^2 - 1}$

Ans. *(D)*

Sol. $\operatorname{cosec}\theta + \cot = m$ ....(1)

$\operatorname{cosec}^2\theta - \cot^2\theta = 1$

$(\operatorname{cosec}\theta - \cot\theta)\, m = 1$

$\operatorname{cosec}\theta - \cot\theta = \dfrac{1}{m}$ .... (2)

Adding equation (1) & (2)

$2\operatorname{cosec}\theta = m + \dfrac{1}{m} = \dfrac{m^2 + 1}{m}$
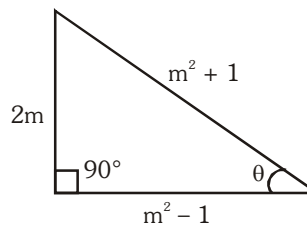
$\operatorname{cosec}\theta = \dfrac{m^2 + 1}{2m}$
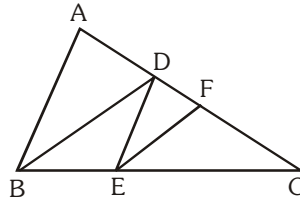
$B^2 = (m^2 + 1)^2 - (2m)^2$

$= m^4 + 1 + 2m^2 - 4m^2$

$B^2 = (m^2 - 1)^2$
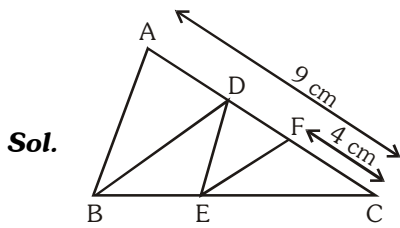
$\sec\theta = \dfrac{H}{B} = \dfrac{m^2 + 1}{m^2 - 1}$

55. In the given figure, ΔABC has points D and F in $\overline{AC}$ and point E in $\overline{BC}$ such that $\overline{DE} \parallel \overline{AB}$ and $\overline{EF} \parallel \overline{BD}$. If CF = 4cm and AC = 9 cm, what is the length of $\overline{DC}$?

(A) 7 cm   (B) 6 cm   (C) 5 cm   (D) 4 cm

Ans. *(B)*

Sol.

DE || AB

$$\frac{CD}{CA} = \frac{CE}{CB} \qquad \text{.......... (1)}$$

EF || BD

$$\frac{CF}{CD} = \frac{CE}{CB} \qquad \text{............ (2)}$$

From equation (1) and (2)

$$\frac{CD}{CA} = \frac{CF}{CD}$$

$CD^2 = CA \times CF$

$CD^2 = 4 \times 9$

$CD = 6$ cm

56. If a : b = 3 : 5 and a : c = 5 : 7, what (b – c) : (b + c) equal to

(A) 4 : 49   (B) 49 : 4   (C) 5 : 48   (D) 48 : 5

Ans. *(NA)*

Sol. $\dfrac{a}{b} = \dfrac{3}{5}, \dfrac{a}{c} = \dfrac{5}{7}$

$$\frac{b}{a} = \frac{5}{3} \times \frac{5}{5} = \frac{25}{15}$$

$$\frac{a}{c} = \frac{5}{7} \times \frac{3}{3} = \frac{15}{21}$$

b : a : c = 25 : 15 : 21

a : b : c = 15 : 25 : 21

$$\frac{b}{c} = \frac{25}{21}$$

$$\frac{b-c}{b+c} = \frac{25-21}{25+21}$$

$$= \frac{4}{46}$$

(b–c) : (b+c) = 4:46

57. If the mth term of an A.P. is $\dfrac{1}{n}$ and the nth term of it is $\dfrac{1}{m}$, then what is its mn^{th} term equal to ?

(A) 1   (B) 2   (C) $\dfrac{m}{n}$ (D) $\dfrac{n}{m}$

Ans. (A)

Sol. $a_m = \dfrac{1}{n}, \ a_n = \dfrac{1}{m}$

$a + (m - 1)\, d = \dfrac{1}{n}$

$a + (n - 1)d = \dfrac{1}{m}$

$\dfrac{\quad - \qquad - \qquad\quad -\quad}{(m - n)d = \dfrac{m - n}{mn}}$

$d = \dfrac{1}{mn}$

$a + (m - 1)\,\dfrac{1}{mn} = \dfrac{1}{n}$

$a + \dfrac{1}{n} - \dfrac{1}{mn} = \dfrac{1}{n}$

$a = \dfrac{1}{mn}$

$a_{mn} = a + (mn - 1)\, d$

$= \dfrac{1}{mn} + (mn - 1)\dfrac{1}{mn} = 1$

58. The area of a circle inscribed in an equilateral triangle is 48π sqcm. What is the perimeter of the triangle ?

(A) 24 cm   (B) 27 cm   (C) 36 cm   (D) 72 cm

Ans. (D)

Sol. Let AD = k

So $(2a)^2 = a^2 + k^2$

$-k = \sqrt{3}\,a$

$\therefore \ \dfrac{1}{3} \times \sqrt{3}\,a = OD = r$

$\therefore r = \dfrac{a}{\sqrt{3}}$

$\because \ \dfrac{\pi a^2}{3} = 48\pi$

$a^2 = 16 \times 3 \times 3$

$\therefore \ a = 12$ cm

$\therefore \ $ Side $= 2a = 24$ cm

$\therefore \ $ Perimeter $= 24 + 24 + 24 = 72$ cm

Equilateral triangle

59. A is the centre of a circle with diameter 8 cm and B is the centre of another circle with radius 8 cm. If the two circles touch each other externally, then what is the area in sqcm of the circle drawn with $\overline{AB}$ as diameter ?

(A) 12π (B) 36π (C) 48π (D) 64π

Ans. *(B)*

Sol. Area of circle $= \pi r^2$

$= \pi (6)^2 = 36\pi$
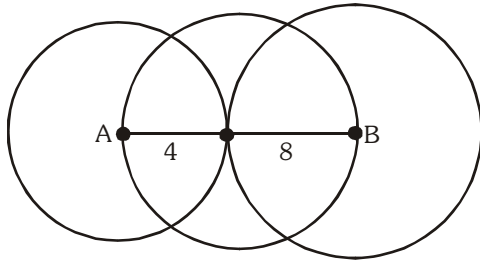
60. Two tangent segments $\overline{BC}$ and $\overline{BD}$ are drawn to a circle with centre O. If $m\angle CBD = 120°$ and $OB = 12$ cm, then what is the length of $\overline{CD}$?

(A) $6\sqrt{3}$ cm   (B) $12\sqrt{3}$ cm   (C) 6 cm   (D) 12 cm

Ans. *(A)*

Sol. In $\Delta BOC \rightarrow \sin 30° =$

$\cos 30° = \dfrac{B}{H}$

$\dfrac{\sqrt{3}}{2} = \dfrac{r}{12} \therefore r = 6\sqrt{3}$

In $\Delta CPO \rightarrow \sin 30° = \dfrac{P}{H}$

$\dfrac{1}{2} = \dfrac{CP}{6\sqrt{3}} \therefore CP = 3\sqrt{3}$

$\therefore \quad CD = 2\,(CP)$

$\quad CD = 6\sqrt{3}$
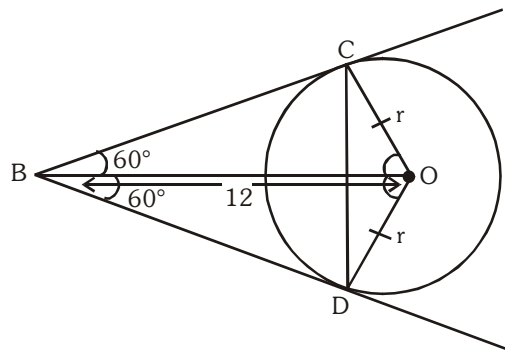
61. First half of the distance between two Places is covered by a car at a speed of 40 km/hr and the second half is covered at a speed of 80km/h. Then what would be the average speed of the car?

(A) 50 km/ hr   (B) 120 km/ hr   (C) 53.3 km/ hr   (D) 40 km/ hr

Ans. *(C)*

Sol. Average speed $= \dfrac{2v_1 v_2}{v_1 + v_2} = \dfrac{2 \times 40 \times 80}{40 + 80} = \dfrac{6400}{120} = 53.3$ km/hr

62. The speed (x) time (v) graph of a body moving along a fixed direction is as shown in the figure below. Then how much distance the body must have travelled time t = 0 to t = 10 sec.?
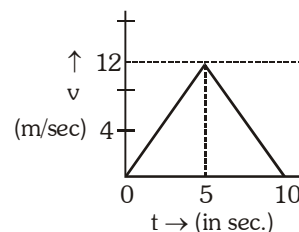
(A) 120 m   (B) 60 m   (C) 50 m   (D) 10 m

Ans. *(B)*

Sol. Area under v–t graph gives distance

$s = \dfrac{1}{2} \times 12 \times 10 = 60$ m.

63. A machine gun of mass 10 kg fires 20 g bullets with speed of 500 m/s at the rate of 10 bullets per second. To hold the gun steady in its position how much force is necessary?

(A) 200 N   (B) 500 N   (C) 100 N   (D) 250 N

Ans. **(C)**

Sol. Momentum of 10 bullets each 20 gm is $\dfrac{20}{1000} \times 500 \times 10$ kg m/s = 100 kg m/s

Momentum of Gun = $10 \times v$

Applying law of conservation of momentum, v = 10 m/s

$\dfrac{\text{Change in momentum of gun}}{\text{time}}$ = Force = $\dfrac{100 - 0}{1}$ = 100 N.

64. The relative density of ice with respect to sea water is 0.90. Then the percentage of the submerged portion of an iceberg would be

(A) 45%   (B) 90%   (C) 60%   (D) 50%

Ans. **(B)**

Sol. Percentage of submerged portion = R. D. $\times$ 100 = 0.90 $\times$ 100 = 90%

65. A man weighing 60 kg climbs up 45 steps stair case of a building in 9 seconds. If height of each step is 10 cm ; then how much power the man has employed? (Take g = 10 m/s^2)

(A) 300 W   (B) 250 W   (C) 500 W   (D) 450 W

Ans. **(A)**

Sol. $P = \dfrac{\text{Work done}}{\text{time}} = \dfrac{\text{mgh}}{E} = \dfrac{60 \times 10 \times 45 \times 10 \text{ cm}}{9}$

$= \dfrac{60 \times 10 \times 45 \times 10}{9 \times 100} = 300$ watt.

66. If the momentum of a body is increased by 3 times of its initial momentum then by how much its kinetic energy will increase above its initial value which was 100 J?

(A) 200 J   (B) 300 J   (C) 900 J   (D) 800 J

Ans. **(C)**

Sol. Initial momentum = P

Final momentum = 3P

Also, $p^2 = 2mK = 2 \times m \times 100$

$m = \dfrac{p^2}{200}$

$(3p)^2 = 2 \times m \times K_f$ (K_f = final kinetic energy)

$9p^2 = 2 \times \dfrac{p^2}{200} \times K_f$

$K_f = 900$ J

increased energy = final energy – initial energy = 900 – 100 = 800 J

67. Velocity of sound in air at 47°C is 360 m/s. What would be this velocity at 17°C?

(A) 336 m/s   (B) 342.7 m/s   (C) 350 m/s   (D) 330 m/s

Ans. **(B)**

Sol. Velocity of sound in air at 47°C 36 m/s

360 = x + 47 $\times$ 0.6

x = 360 – 47 $\times$ 0.6 = 331.8 m/s.

V_{170} = 331.8 + 17 $\times$ 0.6 = 342 m/s

(Because $V_T = V_0 + 0.6$ T)

68. A concave lens of focal length 'f' produces a real image of size m-times the size of the object. Then the object distance is

(A) $\left(\dfrac{m+1}{m}\right)f$ (B) $(m + 1)\,f$ (C) $\dfrac{(m+1)}{f}$ (D) $\dfrac{fm}{(m+1)}$

Ans. (A)

Sol. Convex lens has focal length f

∵ Image is real so magnification is negative

$-m = \dfrac{v}{u}$

$v = -mu$

$\dfrac{1}{v} - \dfrac{1}{u} = \dfrac{1}{f}$

$\dfrac{1}{-mu} - \dfrac{1}{u} = \dfrac{1}{f}$

$-\dfrac{1}{u}\left[\dfrac{1}{m} + 1\right] = \dfrac{1}{f}$

$-\dfrac{1}{u}\left[\dfrac{m+1}{m}\right] = \dfrac{1}{f}$

$u = \left[\dfrac{m+1}{m}\right]f$

69. The absolute refractive index of a medium is 1.5. Then what would be the velocity of light in this medium?

(A) 2×10^8 m/s   (B) 1.5×10^8 m/s   (C) 3.5×10^8 m/s   (D) 2.5×10^8 m/s

Ans. (A)

Sol. $n = \dfrac{c}{v} \Rightarrow v = \dfrac{c}{n}$

$v = \dfrac{3 \times 10^8}{1.5}$

$v = 2 \times 10^8$ m/s

70. Two lenses of power +4 and –6 dioptres are placed in contact with each other. The focal length of the combination will be

(A) 0.5 meter   (B) –0.1 meter   (C) –0.5 meter   (D) 0.1 meter

Ans. (C)

Sol. Power combination formulas

$P = P_1 + P_2 = P = +4 - 6 = -2D$

$f = +\dfrac{1}{P} = -\dfrac{1}{2} = -0.5$ m

71. Two electric bulbs with ratings (100 W, 250 V) are connected in series across a 250 V source. Calculate the output power

(A) 150 W (B) 33.33 W (C) 50 W (D) 250 W

Ans. *(B)*

Sol. (1000 W, 250 V) – Bulb 1 → $R_1 = \dfrac{250 \times 250}{100} = 625\ \Omega$

(50 W, 250 V) – Bulb 2 → $R_2 = \dfrac{250 \times 250}{50} = 1250\ \Omega$

$P_{output} = \dfrac{250 \times 250}{1875} = 33.33\ W$

72. A long straight wire carries 5A current. Find the magnetic field induction produced at a radial distance of 5 cm from its axis.

(A) 0.1×10^{-4} Tesla (B) 0.3×10^{-4} Tesla (C) 0.2×10^{-4} Tesla (D) 0.5×10^{-4} Tesla

Ans. *(C)*

Sol. I = 5A

$\mu_0 = 4\pi \times 10^{-7}\ N/A^2$ $\qquad$ d = 5 cm

$B = \dfrac{\mu_0 I}{2\pi d} = \dfrac{4\pi \times 10^{-7} \times 5}{2\pi \times 5 \times 10^{-2}} = 2 \times 10^{-5}\ T$
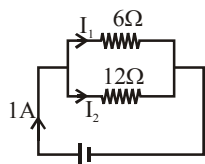
$\qquad\qquad\qquad\qquad = 0.2 \times 10^{-4}\ T$

73. Two resistor $R_1 = 6\ \Omega$ and $R_2 = 12\ \Omega$ are connected in parallel to a source of voltage V and current I A is flowing in the circuit. If Q_1 and Q_2 are the heat produced in R_1 and R_2 repsectively ; what is Q_1/Q_2?

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

Ans. *(D)*

Sol. $R_1 = 62\ \Omega$ $\qquad\qquad\qquad$ $R_2 = 12\ \Omega$ in parallel

$\dfrac{1}{R_{eq}} = \dfrac{1}{6} + \dfrac{1}{12} = \dfrac{2+1}{12}$

$\dfrac{12}{3} = 4\Omega$

V = IR

V = 1 × 4 = 4 volt

$I_1 = \dfrac{V}{R_1} = \dfrac{4}{6} = \dfrac{2}{3}A$

$I_2 = \dfrac{V}{R_2} = \dfrac{4}{12} = \dfrac{1}{3}A$

$Q_1 = I_1^2 R_1 t = \dfrac{2}{3} \times \dfrac{2}{3} \times 6t = \dfrac{8}{3}t\ J$

$Q_2 = I_2^2 R_2 t = \dfrac{1}{3} \times \dfrac{1}{3} \times 12 \times t = \dfrac{4}{3}t\ J$

$\dfrac{Q_1}{Q_2} = \dfrac{8 \times t \times 3}{3 \times 4 \times t} = 2$

74. Copper sulphate solution is electrolysed with platinum electrodes. Which of the following changes does not occur in the process?

(A) The blue colour of the solution gradually fades   (B) $O_2(g)$ is liberated at anode

(C) pH of the solution decreases   (D) H^+ concentration decreases

Ans. *(D)*

Sol. Copper ions are removed from the solution and deposited on the cathode. The electrolyte therefore loses its blue colour and becomes dilute sulphuric acid. When this stage has been reached the action becomes the electrolysis of dil. sulphuric acid. Hence, H^+ ion concentration cannot decrease.

75. Which of the following salts false to give brown gas on heating?

(A) Lead nitrate   (B) Lithium nitrate   (C) Magnesium nitrate   (D) Postassium nitrate

Ans. *(D)*

Sol. $2KNO_3 \xrightarrow{\Delta} 2KNO_2 + O_2$

76. A colourless gas G_1, produced on treating conc. H_2SO_4 with common salt, is introduced into one end of a glass-tube. Through the other end, another pungent smelling colourless gas. G_2, of molecular mass 17 is introduced. A white sublimate, S is a produced inside the tube. Which of the following statement is wrong?

(A) Both the gas G_1 and G_2 are water-soluble

(B) Sublimate S, contains covalent bond and ionic bond

(C) Sublimate, S when treated with caustic soda liberates G_2 gas

(D) Aqueous solution of each G_1 and G_2 gas is acidic in nature

Ans. *(D)*

Sol. $H_2SO_4 + NaCl \rightarrow Na_2SO_4 + HCl(g) \rightarrow G_1$

Gas $G_2 \rightarrow$ molarmass $= 17$ is NH_3

$G_1 = HCl(g)$ $G_2 = NH_3(g)$ $G_1 + G_2 \rightarrow S$

$HCl(g) + NH_3(g) \rightarrow NH_4Cl$

$G_1 \Rightarrow HCl + H_2O \rightarrow HCl(aq) \rightarrow$ Acidic in nature

$G_2 \Rightarrow NH_3 + H_2O \rightarrow NH_4OH \rightarrow$ Basic in nature

77. A metal is strongly heated in presence of air to form a black mass. So the metal is

(A) Potassium   (B) Platinum   (C) Copper   (D) Zinc

Ans. *(C)*

Sol. $2Cu + O_2 \rightarrow 2CuO(black)$

78. Which of the following is not a redox reaction?

(A) $2Mg + O_2 \rightarrow 2MgO$ (B) $CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$

(C) $2CuCl_2 \rightarrow Cu_2Cl_2 + Cl_2$ (D) $SO_2 + I_2 + 2H_2O \rightarrow H_2SO_4 + 2HI$

Ans. *(B)*

Sol. $\overset{+2}{C}\overset{+4}{a}\overset{-2}{C}O_3 + \overset{+1}{H}\overset{-1}{C}l \rightarrow \overset{+2}{C}\overset{-2}{a}Cl_2 + \overset{+4}{C}\overset{-2}{O}_2 + \overset{+1}{H}_2\overset{-2}{O}$

79. Bauxite is an ore of aluminium. It is concentrated suitably on treating with

(A) Conc. NaOH solution   (B) Na_2CO_3 (C) Coke and N_2 (D) Any of the above

Ans. *(A)*

Sol. The Bayer process is the principal industrial means of refining bauxite to produce alumina.

$Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$

$Na_2AlO_2 + 2H_2O \rightarrow Al(OH)_3 + NaOH$

$2Al(OH)_3 \rightarrow Al_2O_3 + 3H_2O$

80. Pick up the incorrect pair of metal-ore from the following

(A) Ag – Galena   (B) Mg – Carnallite   (C) Sn – Cassiterite   (D) Hg – Cinnabar

Ans. **(A)**

Sol. Galena is PbS

81. An element, X has electronic configuration 2, 8, 4. Which of the following is not appropriate for X?

(A) It belong to group 14 and 3rd period of periodic table

(B) It is a chalcogen

(C) Its oxide is a solid

(D) It have can maximum covalency of six

Ans. **(B)**

Sol. Chalcogen is oxygen family i.e. group 16. 2, 8, 4 is the electronic configuration of Si which belongs to group 14.

82. Which of the following organic molecules does not have carbon-carbon double bond

(A) C_3H_4O (B) $C_3H_4O_2$ (C) C_3H_8O (D) C_6H_6O

Ans. **(C)**

Sol. $CH_3 – CH_2 – CH_2OH$–No double bond between any two carbon atoms.

83. Soaps are used to clean clothes. Which one is correct statement in this respect?

(A) Soap is a sodium salt of an aromatic acid

(B) During cleaning micelles are formed

(C) Using soap hard water cannot be distinguished

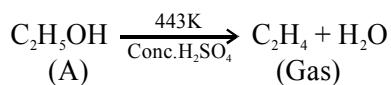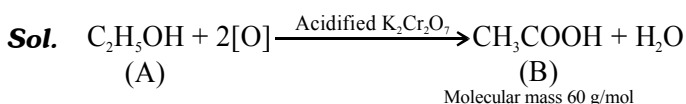(D) Soap can be used in hard water for better cleaning of clothes

Ans. **(B)**

Sol. Cleaning action of soap results in micelle formation.
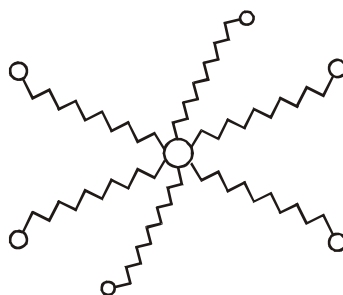
84. An organic compound 'A' on treating with acidified potassium dichromate solution gives 'B' with molecular mass 60 gm/mol. 'A' on heating with conc. H_2SO_4 of 443 K produces a gas that decolourless bromine water. The compound A is

(A) n-propyl alcohol   (B) iso-propyl alcohol   (C) ethyl alcohol   (D) acetaldehyde

Ans. **(C)**

Sol. $C_2H_5OH + 2[O] \xrightarrow{\text{Acidified } K_2Cr_2O_7} CH_3COOH + H_2O$

      (A)   (B)

                              Molecular mass 60 g/mol

$C_2H_5OH \xrightarrow[\text{Conc.} H_2SO_4]{443K} C_2H_4 + H_2O$

      (A)   (Gas)

85. Which of the following does not form salt with alkali but forms with acid?

(A) BeO   (B) ZnO   (C) CaO   (D) SnO

Ans. **(C)**

Sol. CaO forms salt only with acid and not with alkali Rest BeO, Zno and SnO are amphoteric in nature.

86. Aquaregia can dissolve gold because

(A) it contains an oxidant conc. H_2SO_4

(B) It is 3 : 1 mixture of conc. HNO_3 and conc. HCl

(C) It contains a strong reducing agent

(D) It contains nascent Cl

Ans. *(D)*

Sol. Reason for solubility of Au is the liberation of atomic nascent chlorine which forms a soluble compound.

87. Which one of the following is not a factor of respiration?

(A) Oxygen　　　　(B) Carbondioxide　　　　(C) Water　　　　(D) Temperature

Ans. *(C)*

Sol. Water will not directly effect the rate of respiration.

88. Which one of the following does not contain any enzyme?

(A) Bile　　　　(B) Gastric juice　　　　(C) Saliva　　　　(D) Pancreatic juice

Ans. *(A)*

Sol. Bile doesnot contain any digestive enzymes.

89. Mark the tissue in which the starch is stored in the body of plants.

(A) Spongy parenchyma　　(B) Aerenchyma　　(C) Apical meristem　　(D) Stomata

Ans. *(A)*

Sol. Spongy parenchyma stores starch.

90. Which one of the following tissues contains stone cells?

(A) Parenchyma　　(B) Collenchyma　　(C) Sclerenchyma　　(D) Tracheids

Ans. *(C)*

Sol. Sclerenchyma contains stone cells.

91. Which of the following is the correct scientific name of man?

(A) Homo Sapiens　　(B) Homo sapien　　(C) Homosapien　　(D) Homo sapiens

Ans. *(D)*

Sol. Homo sapiens

92. Which one of the following does respire by the tracheal system?

(A) Mollusca　　(B) Arthropoda　　(C) Annelida　　(D) Nematohelminthes

Ans. *(B)*

Sol. Arthropods have tracheal respiratory system.

93. Basing on classification, which of the following is different from the other three?

(A) Pumpkin　　(B) Maize　　(C) Pea　　(D) Groundnut

Ans. *(B)*

Sol. Maize is a monocot and rest all are dicot.

94. Which one of the following is involved in the formation of endosperm?

(A) Antipodal cell   (B) Polar nucleus

(C) Synergids   (D) Eggcell

Ans. *(B)*

Sol. With the fusion of polar nucleus and vegetative nucleus of pollen, endosperm will form.

95. Which one of the following is the crossing over seen ?

(A) Anaphase   (B) Diplotene   (C) Zygotene   (D) Diakinesis

Ans. NA

Sol. Crossing over takes places in pachytene stage of meiosis–I.

96. Which one of the following is attached to the right ventricle?

(A) Pulmonary artery   (B) Pulmonary vein

(C) Superior venacava   (D) Inferior venacava

Ans. *(A)*

Sol. Pulmonary artery originated from right ventricle.

97. Which one of the following is not a function of the kidney ?

(A) Filtration   (B) Oxidation   (C) Absorption   (D) Secretion

Ans. *(B)*

Sol. Oxidation is not the function of kidney.

98. How many spinal nerves are attached to the spinal cord of man ?

(A) 62   (B) 42   (C) 31   (D) 21

Ans. *(A)*

Sol. 31 pairs of spinal nerves are present in man. It means 62 spinal nerves will arise from spinal cord.

99. Which endocrine gland does regulate the level of phosphorus in blood?

(A) Thyroid   (B) Parathyroid   (C) Adrenal   (D) Pituitary

Ans. *(B)*

Sol. Parathyroid gland is responsible for phosphorus balance in blood.

100. Which one of the following pairs do regulate the flowering in plants?

(A) Auxin and Ethylene   (B) Cytokinin and Ethylene

(C) Florigen and Phytochrome   (D) Gibberellin and Ethylene

Ans. *(C)*

Sol. Florigen and phytochrome are responsible for flowering in plants.