



**NATIONAL TALENT SEARCH EXAMINATION
(NTSE_2019-20) STAGE -1
STATE : KERALA (CODE-D) PAPER : SAT**

Date: 17.11.2019

Max. Marks: 100

SOCIAL SCIENCE

1. The head of the Second Backward Classes Commission in India was :

- (1) B.P. Mandal (2) B.R. Ambedkar
(3) Jagjivan Ram (4) Kanshi Ram

Ans. (1)

Sol. 1st backward classes commission setup according to article 340 on 1995 by Kaka Kelkar Second backward commission announced in 1979 by Janata party by P.M Morarji Desai. It's chairman was B.P Mandal

2. 'Right to Property' in India is a:

- (1) Fundamental Right (2) Moral Right
(3) Political Right (4) Constitutional Right

Ans. (4)

Sol. Right to property was deleted from fundamental rights according to 44th amendment now it is a constitutional right only

3. Indian Railways Service comes under:

- (1) Central Services (2) State services
(3) All India Services (4) Private Services

Ans. (1)

Sol. Indian railway services selected from RRB group 'A' so it is a central services

4. Who was the founder leader of Socialist Party of Chile?

- (1) Pinochet (2) Allende
(3) Michelle Bachelet (4) Andrzej Duda

Ans. (2)

Sol. Salvador Allende was the founder of the Socialist Party of Chile in 1933 April 19

5. Name the first Lokpal of India:

- (1) Rajiv Mehrishi (2) Vinod Rai
(3) Pinaki Chandra Ghose (4) Sunil Arora

Ans. (3)

Sol. The current chair person of Lokpal is Pinaki Chandra Ghose found on 19 March 2019. HQ is at New Delhi

6. The non-permanent members of Security Council of UNO are elected for:

- (1) Three years (2) Four years
(3) Five years (4) Two years

Ans. (4)

Sol. Under rule 83 of the rule of procedure, the non permanent members of security council are elected by a two - third majority by general assembly their term is 2 years

7. The first Administrative Reforms Commission of India was chaired by:

- (1) Sardar Patel (2) K. Hanumanthaiah
(3) Veerappa Moily (4) V. Ramachandran

Ans. (2)

Sol. The first ARC was established on 5 January 1966 Commission initially chaired by Morarji Desai and later on K.Hanumanthaiah became its chairman when Desai the dy PM of India

8. Among the following which is not 'Power-sharing' in a democratic society?

- (1) Accommodation of various group interests
(2) Public participation in governance
(3) Empowerment of the backward sections of society
(4) Patronage to the power of majority

Ans. (4)

Sol. Power sharing in Democracy done by all the people not by the power of majority (about their patronage to power of majority)

9. Choose the false pair from the following statements, about globalization:

- (A) Globalization benefitted the small scale producers, largely
(B) Increased market competition
(C) Increased the quality of products
(D) Strengthened job security
- (1) (A) and (B) (2) (B) and (C)
(3) (C) and (D) (4) (A) and (D)

Ans. (4)

Sol. Due to Globalization small scale producers largely perished and job security is very less because of MNCs

10. The Nutritional Level of Adults is measured by using:

- (1) The Calorie intake of food (2) Body Mass Index
(3) Height and weight of a person (4) All the above

Ans. (4)

Sol. By all the above options are saying about the nutrition level of adults

11. The nature of employment in the agriculture sector in India can be characterised as:

- (1) Under employed (2) Seasonally employed
(3) Disguisedly employed (4) All the above

Ans. (4)

Sol. In Agricultural sector we can observe under employe seasonal employed and disguisedly employed

12. Assume that you are born and continuously studying in Bihar. If so, how much of your class mates are not in your class, at present?

- (1) $\frac{1}{3}$ rd (2) $\frac{2}{3}$ rd
(3) $\frac{1}{5}$ th (4) $\frac{1}{2}$

Ans. (1)

13. The average income of Maharashtra is much more than of Kerala. But Kerala's social indices are much above

than Maharashtra. This is reasoned on the fact that:

- (1) The NSDP (Net State Domestic Product) of Kerala is higher
- (2) Foreign remittance is higher in Kerala
- (3) Private goods are cheaper in Kerala
- (4) Collective goods are cheaper in Kerala

Ans. (2)

Sol. The survey conducted by the CDS, Thiruvanthapuram in 2016 was estimated 74,142 crores. So Kerala social indices are much above than Maharashtra

14. Two countries having identical average income and the same can be reasoned on:

- (1) Economic growth of these two countries are the same
- (2) The size of the population is the same
- (3) Growth of population is at the same rate
- (4) None of the above

Ans. (1)

Sol. Two countries having identical average income same and also same of their economical growth of the countries

15. One major factor that stimulated the process of Globalization has been:

- (1) The integration of the trade among the countries of the world
- (2) The removal of trade barriers
- (3) The rapid development of information and communication technology
- (4) The Foreign Direct Investment flows

Ans. (3)

Sol. Due to globalozation rapid development will occur information and technology remaining options showing about WTO

16. Debt trap is case in whcih:

- (1) The amount of repayment is more than the income
- (2) The cost barrowals is higher
- (3) The amount of borrowed money is huge
- (4) There si crop failure due to heavy natural calamity

Ans. (1)

Sol. Debt trap means a situation in which debt is impossible to repay, typically because high interest payments

17. Examine the given statements in the context of Sustainable development:

- (A) Development without damagining the enviornment
 - (B) Development in the present without compromissing the needs of the future generations
 - (C) Development without considering the environment
- (1) (A) is correct, (B) and (C) are wrong
 - (2) (A) and (C) are correct, (B) is wrong
 - (3) (A) and (B) are correct, (C) is wrong
 - (4) (C) alone is correct

Ans. (3)

Sol. According to UNO definition a&b are correct but c is wrong

18. What is the normal time interval between two Neap tides at a particular place?

- (1) 14 days
- (2) 28 days
- (3) 7 days
- (4) 24 hours

Ans. (1)

Sol. Neap tides occur generally twiceina month so time gap at a perticular place is 14 days

19. 5th June is observed as:

- | | |
|---------------|---------------------|
| (1) Earth Day | (2) Environment Day |
| (3) Ozone Day | (4) Watershed Day |

Ans. (2)

Sol. According to UNO every year June 5th celebrated as World Environment Day

20. The core of the Earth is mainly composed of:

- | | |
|-------------------------|--------------------------------|
| (1) Silicon and Alumina | (2) Silicon and Magnesium |
| (3) Nickel and Iron | (4) Mixed metals and Silicates |

Ans. (3)

Sol. According to Chamberlin and Moulton at core NIFE is more mean Nickle and Ferrous

21. Where do the Mid-Oceanic Ridges form?

- | | |
|------------------------|-----------------------|
| (1) Convergent margins | (2) Divergent margins |
| (3) Transform margins | (4) Shear margins |

Ans. (2)

Sol. Divergent margins only created Mid ocean ridges i.e trenches

22. In the Southern hemisphere Westerlies blow from:

- | | |
|----------------|----------------|
| (1) South East | (2) North East |
| (3) North West | (4) South West |

Ans. (3)

Sol. The winds are predominantly blow from the south west in northern hemisphere and from the north west in southern hemisphere

23. What is the Normal Lapse Rate of temperature in the troposphere?

- | | |
|---------------|------------------|
| (1) 1°C/km | (2) 1°C/metre |
| (3) 1°C/6.4km | (4) 1°C/165metre |

Ans. (4)

Sol. Generally according to normal lapse rate of the temperature for every 165m height of ascent temperature drops 1°C

24. Moraines are:

- | | |
|--------------------------------|------------------------------------|
| (1) Erosional features by wind | (2) Erosional features by Glaciers |
| (3) Deposits by Glaciers | (4) Deposits by Sea waves |

Ans. (3)

Sol. The dirt and rocks which was fallen/deposited by the Glaciers are formed moraines

25. Identify the correct statement regarding Kuroshio current:

- | | |
|------------------------------------|-----------------------------------|
| (1) Warm current in Pacific Ocean | (2) Cold current in Pacific Ocean |
| (3) Warm current in Atlantic Ocean | (4) Cold current in Indian Ocean |

Ans. (1)

Sol. Kuroshio ocean currents are warm ocean currents which are lies in pacific ocean near Japan.

26. Categorize the following Towns based on their basic function:

- | | |
|------------------------|--------------------|
| (A) Jamshedpur | (B) New Delhi |
| (C) Allahabad | (D) Mhow |
| (1) (A) Administrative | (B) Defence |
| (C) Cultural | (D) Industrial |
| (2) (A) Industrial | (B) Cultural |
| (C) Defence | (D) Administrative |
| (3) (A) Administrative | (B) Industrial |
| (C) Defence | (D) Cultural |
| (4) (A) Industrial | (B) Administrative |
| (C) Cultural | (D) Defence |

Ans. (4)

Sol. Jamshedpur - Industrial city in Jharkhand
New Delhi - Administrative capital of India
Allahabad - Cultural city in U.P
Mhow - Defence city in Indore

27. The terms Khadar and Bangar are related to:

- | | |
|----------------|-------------------|
| (1) Black soil | (2) Alluvial soil |
| (3) Red soil | (4) Laterite soil |

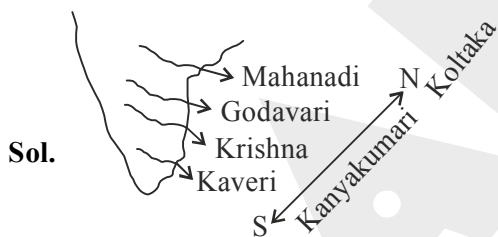
Ans. (2)

Sol. Khadar is a newer Alluvial soil
Bhagar is a older Alluvial soil

28. To travel from Kanyakumari to Kolkata along the East coast, we need to cross the major East flowing rivers. Identify the correct order of rivers that we have to cross:

- | | |
|---|---|
| (1) Godavari, Mahanadi, Kaveri, Krishna | (2) Mahanadi, Godavari, Krishna, Kaveri |
| (3) Kaveri, Krishna, Godavari, Mahanadi | (4) Krishna, Kaveri, Mahanadi, Godavari |

Ans. (3)



29. How many trusted volunteers of Mahatma Gandhi accompanied his famous Salt Satyagraha?

- | | |
|---------|---------|
| (1) 72 | (2) 78 |
| (3) 240 | (4) 120 |

Ans. (2)

Sol. 78 Volunteers participated in salt march on 5th April 1930

30. Before 1789, the Estates General was last summoned in:

- | | |
|----------|----------|
| (1) 1714 | (2) 1784 |
| (3) 1614 | (4) 1689 |

Ans. (3)

Sol. The last estate general summoned in 1614 during the Louis dynasty

31. Consider the following statements and identify the correct response from the options given below:

Statement - (I) :

Majority of the people in Mughal Society were farmers

Statement - (II):

There were two types of farmers called Khud-Kashta and Pahi-Kashta

- (1) Statement - (I) is true and Statement - (II) is false
- (2) Statement-(I) is false and Statement-(II) is true
- (3) Both the Statements are true but Statement - (II) is not the correct explanation of Statement - (I)
- (4) Both the Statements are true and Statement - (II) is the correct explanation of Statement - (I)

Ans. (4)

Sol. At the time of Mughals majority people were workers and farmers and also farmers were divided into Khud Kashta and Pahi Khashta

32. Which among the following is wrongly related?

- (1) The Vienna Congress - Australia
- (2) The Weimar Republic - Germany
- (3) Five Year Plans - Soviet Union
- (4) The Great Economic Depression - United States of America

Ans. (1)

Sol. The congress of Vienna was held in 1815 in Austria capital Vienna chaired by Austrian statesman Klemens Von Metternich

33. The Palestine Liberation Organisation (PLO) was founded by;

- | | |
|-------------------|------------------------|
| (1) Yasser Arafat | (2) Arthur Balfour |
| (3) Hitler | (4) Gamal Abdel Nasser |

Ans. (1)

Sol. PLO was formed by Yasser Arafat in 1964 at Ramallah in West bank

34. The 'Munda Rebellion' is an example of:

- (1) 'Peasant Rebellion'
- (2) 'Rebellion of Sepoys'
- (3) 'Rebellion of Weavers'
- (4) 'Tribal Rebellion'

Ans. (4)

Sol. The Munda Rebellion was a tribal Rebellion from 15 Nov 1875 - 9th June 1900 by Birsa Munda

35. Name the author of the book 'Sevasadan'

- (1) Rabindranath Tagore
- (2) Bankim Chandra Chatterjee
- (3) Dinabandhu Mitra
- (4) Premchand

Ans. (4)

Sol. The book Sevasadan was written by Premchand which was published in 1924

36. Identify the territory in India which was under the control of France

- | | |
|----------|------------|
| (1) Goa | (2) Bombay |
| (3) Mahe | (4) Diu |

Ans. (3)

Sol. Mahe was ruled by French people up to 1963

37. Which among the following is the correct pair?

- | | |
|--------------------|-----------|
| (1) Cordova | - England |
| (2) Bologna | - France |
| (3) Constantinople | - Turkey |
| (4) Al-Azhar | - Spain |

Ans. (3)

Sol. Turkey once upon a time was ruled by constantine so it is a correct pair among all

38. The names of certain social reformers and the related movements are given below:

Match them correctly

Movements

- (A) Prathana Samaj
- (B) Satya Shodak Samaj
- (C) Hitakarini Samaj
- (D) Theosophical Society
- (1) A-III, B-IV, C-I, D-II
- (3) A-II, B-IV, C-I, D-III

Reformers

- (I) Annie Besant
- (II) Viresalingam
- (III) Atmaram Panduranga
- (IV) Jyothiba Phule
- (2) A-III, B-IV, C-II, D-I
- (4) A-II, B-III, C-IV, D-I

Ans. (2)

Sol. Prathana Samaj → Atmaram Panduranga

Satya Shodak Samaj → Jyothibaphule

Hitakarini Samaj → Veeresalingam Pantulu

Theosophical Society → Annie Besant

39. Some events related to India's national movement are given below. Identify the correct chronological order of them.

- (A) Visit of Cripps' Mission
- (B) Formation of Swaraj Party
- (C) Gandhi-Irwin Pact
- (D) Second Round Table Conference
- (1) (B), (D), (C), (A)
- (2) (B), (C), (D), (A)
- (3) (B), (A), (D), (C)
- (4) (B), (A), (C), (D)

Ans. (2)

Sol. Cripps Mission - March

Formation of Swaraj Party - 1923 Jan

Gandhi Irwin pact → March 5 1931

Second round table → 1931 Dec

40. Name the leader of the 'Revolt of 1857' at Arrah in Bihar:

- | | |
|-------------------------|----------------|
| (1) Kunwar Singh | (2) Nana Saheb |
| (3) Maulavi Ahamadullah | (4) Shah Mal |

Ans. (1)

Sol. Kunwar singh was the leader of the Revolt of 1857 at Arrah in Bihar

MATHEMATICS

41. The point on the line passing through (1,2) and (11,8) is:

- (1) (5,-1) (2) (-4,2)
(3) (-4,0) (4) (6,5)

Ans. (4) (6, 5)

Sol. Equation of line passing through point (1, 2) and (11, 8) $\frac{y-2}{x-1} = \frac{8-2}{11-1}$

$$\Rightarrow 3x - 5y + 7 = 0$$

Thus, (6, 5) lies on this line

42. What is the average of the cubes of first five counting numbers?

- (1) 35 (2) 55
(3) 65 (4) 45

Ans. (4)

Sol. Sum of first counting numbers cubes $\left[\frac{n(n+1)}{2} \right]^2 = \left[\frac{5(5+1)}{2} \right]^2 = 225$

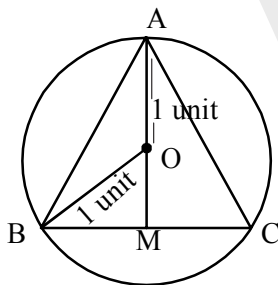
$$\text{Average} = \frac{225}{5} = 45$$

43. What is the area of largest triangle that can be inscribed in a circle of radius one unit?

- (1) $\frac{3\sqrt{3}}{4}$ sq.unit (2) $\frac{\sqrt{3}}{4}$ sq.unit
(3) $\frac{\sqrt{3}}{2}$ sq.unit (4) $3\sqrt{3}$ sq.unit

Ans. (1) $3\sqrt{3}/4$ sq.unit

Sol. Largest triangle that can be inscribed in a circle is always equilateral triangle



The equilateral triangle, circumcentre is same as centroid and orthocentre.

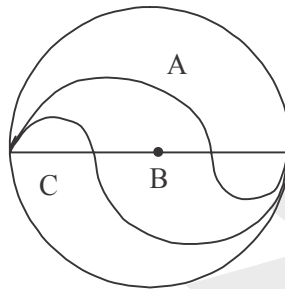
As centroid divides the line 2 : 1

so line $AM = \frac{3}{2}$ units

$$\frac{AM}{AB} = \sin 60, \frac{3}{2 \cdot AB} = \frac{\sqrt{3}}{2}, \boxed{AB = \sqrt{3}}$$

$$\text{Area of } \triangle ABC = \frac{\sqrt{3}}{4} \times AB^2 \Rightarrow \frac{\sqrt{3}}{4} \times (\sqrt{3})^2 \Rightarrow \frac{3\sqrt{3}}{4}$$

44. A circle of radius 3 units is divided into 3 regions using two semicircles of radius 1 unit and 2 units as shown in the figure. What is the ratio of area of the region marked A, B and C?



(1) 1:1:1

(2) 2:1:2

(3) 4:3:4

(4) 1:2:1

Ans. (1)

Sol. Area (region A) = Area(region C)

$$\text{Area (region A)} = \frac{\pi(3)^2}{2} - \frac{\pi(2)^2}{2} + \frac{\pi(1)^2}{2}$$

$$\Rightarrow \frac{9\pi}{2} - \frac{4\pi}{2} + \frac{\pi}{2}$$

$$\Rightarrow \frac{6\pi}{2} \Rightarrow 3\pi$$

$$\text{Area(Region B)} \Rightarrow 2 \times \left[\frac{\pi \times 2^2}{2} - \frac{\pi \times 1^2}{2} \right]$$

$$\Rightarrow 2 \times \left[\frac{4\pi}{2} - \frac{\pi}{2} \right]$$

$$\Rightarrow 2 \times \frac{3\pi}{2} \Rightarrow 3\pi$$

Area (region A) = Area(region B) = Area(region C)

45. $2^{122} + 4^{62} + 8^{42} + 4^{64}$ is divisible by the number:

(1) 3

(2) 11

(3) 7

(4) 17

Ans.(4) 17

Sol. $2^{122} + 4^{62} + 8^{42} + 4^{64}$

$$= 2^{122} + 2^{124} + 2^{216} + 2^{128}$$

$$= 2^{122} [1 + 2^2 + 2^4 + 2^6]$$

$$= 2^{122} \times 85$$

It is divisible by 85

46. A shopkeeper marked 10% excess on an article. Due to decrease in demand he reduced the price by 10%. He will get:

- | | |
|---------------|---------------|
| (1) 1% loss | (2) 1% gain |
| (3) 1.5% loss | (4) 1.5% gain |

Ans. (1) 1% less

Sol. Let the price of article be Rs x
 According to question, it becomes

$$\Rightarrow x + 10\% \text{ of } x$$

$$\Rightarrow x + \frac{10}{100}x \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \text{1st condition}$$

$$\Rightarrow 1.1x$$

$$\Rightarrow 1.1x - 10\% \text{ of } (1.1x)$$

$$\Rightarrow 1.1x - \frac{10}{100} \times 1.1x \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \text{2nd condition}$$

$$\Rightarrow 0.99x$$

$$\text{loss\%} = \frac{x - 0.99x}{x} \times 100 = 1\% \text{ loss}$$

47. How many 5 digit prime numbers are there in the numbers formed using the digits 1,2,3,4,5 without repetition?

- | | |
|---------|--------|
| (1) 0 | (2) 23 |
| (3) 120 | (4) 1 |

Ans. (1) 0

Sol. As sum of 1, 2, 3, 4, 5 digit is 15

so, any number formed by these digit is always divisibe by 3.

Thus, there is no prime number

48. If A can run 48 metres while B runs 42 metres, then in a race of 1 km, A beats B by:

- | | |
|----------------|----------------|
| (1) 140 metres | (2) 110 metres |
| (3) 100 metres | (4) 125 metres |

Ans. (4) 125 meters

Sol. Speed of A = $\frac{48}{t}$, Speed of B = $\frac{42}{t}$

Now, time taken by A for 1km

$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

$$= \frac{1000m}{48/t}$$

$$\text{time} = \frac{1000t}{48}$$

Distance travelled by B

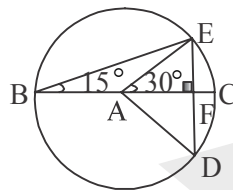
Distance = speed \times time

$$= \frac{42}{t} \times \frac{1000t}{48}$$

$$= 875m$$

Thus, A beats B by = $1000 - 875 = 125$ metres

49. The figure shows a circle of radius one unit with centre A and $\angle ABE = 15^\circ$. Find the length of AF



(1) $\sqrt{3}$ unit

(2) $\frac{\sqrt{3}}{2}$ unit

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

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

Ans. (2)

Sol. $\angle EAC = 2\angle EBC = 2 \times 15 = 30^\circ$

In right angled triangle at C.

$$\frac{AF}{AE} = \cos 30$$

$$AF = AE \cos 30$$

$$= 1 \times \frac{\sqrt{3}}{2}$$

$$\boxed{AF = \frac{\sqrt{3}}{2}}$$

50. There are 8 stations on a railway line. What is the number of different journey tickets that are required by the authorities?

(1) 60

(2) 56

(3) 52

(4) 54

Ans. (2) 56

Sol. Number of different journey ticket

$$= 2 \times {}^8C_2$$

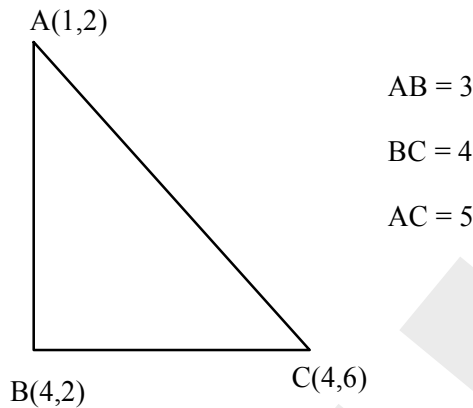
$$= 2 \times 28 = 56$$

51. If the end points of the hypotenseuse of a right triangle are (1,2) and (4,6) , then the thrid vertex of the triangle is:

- (1) (2,6) (2) (-4,2)
(3) (4,2) (4) (1,5)

Ans.(3) (4, 2)

Sol. By checking through option



As these are pythagorean triplet
so option(3) is correct

52. If each side of a cube is decreased by 10%, then its surface area is decreased by;

- (1) 81% (2) 19%
(3) 20% (4) 80%

Ans. (2) 19%

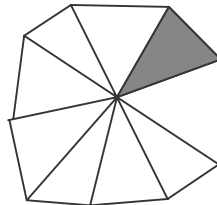
Sol. Let each side of cube is a when it is decreased by 10% = a-10% of a = 0.9a

$$\text{Area of original cube} = 6a^2$$

$$\text{Area after decreased in side } 6(0.9a)^2 = 4.86a^2$$

$$\% \text{ decreased in area} = \frac{6a^2 - 4.86a^2}{6a^2} \times 100 = 19\%$$

53. The figure shows a regualr octagon. Which of the following is the ratio of angles of the shaded triangle?



- (1) 1:3:3 (2) 1:2:2
(3) 2:3:3 (4) 3:4:4

Ans. (3) 2 : 3 : 3

Sol. Angle at centre = $\frac{360}{8} = 45$

As other two angles in shaded region are equal due to isosceles triangle let angles are a, b, c

a : centre angle

b & c: equal angles

$$a + b + c = 180$$

$$45 + 2b = 180$$

$$\boxed{b = 67.5}$$

$$a : b : c \Rightarrow 45 : 67.5 : 67.5$$

54. The last day of 2019 is:

(1) Friday

(2) Wednesday

(3) Monday

(4) Tuesday

Ans.(4) Tuesday

Sol. Last day is 31/12/2019

(1) $\frac{31}{7} = \text{Remainder}(3)$

(2) $\frac{19}{7} = \text{Remainder}(5) \Rightarrow 3 + 5 + 4 + (6)\text{Monthvalue} - 1(\text{leap containing year})$

(3) $\frac{19}{4} = \text{Quotient}(4) \Rightarrow \frac{17}{7} \Rightarrow 3(\text{remainder})$

sum = 1, mon = 2 tue = 3...

∴ Tuesday

55. What is the value of

$$\frac{1}{1 \times 4} + \frac{1}{4 \times 7} + \frac{1}{7 \times 10} + \dots + \frac{1}{16 \times 19} ?$$

(1) $\frac{9}{19}$

(2) $\frac{6}{19}$

(3) $\frac{4}{19}$

(4) $\frac{8}{19}$

Ans. (2) $\frac{6}{19}$

Sol. $\frac{1}{1 \times 4} + \frac{1}{4 \times 7} + \frac{1}{7 \times 10} + \dots + \frac{1}{16 \times 19}$

$$= \frac{1}{3} \left[\frac{4-1}{1 \times 4} \right] + \frac{1}{3} \left[\frac{7-4}{4 \times 7} \right] + \frac{1}{3} \left[\frac{10-7}{7 \times 10} \right] + \dots + \frac{1}{3} \left[\frac{19-16}{16 \times 19} \right]$$

$$\begin{aligned}
 &= \frac{1}{3} \left[\frac{4-1}{1 \times 4} + \frac{7-4}{4 \times 7} + \frac{10-7}{7 \times 10} + \dots + \frac{19-16}{16 \times 19} \right] \\
 &= \frac{1}{3} \left[1 - \frac{1}{4} + \frac{1}{4} - \frac{1}{7} + \frac{1}{7} - \frac{1}{10} + \dots + \frac{1}{16} - \frac{1}{19} \right] \\
 &= \frac{1}{3} \left[1 - \frac{1}{19} \right] \\
 &= \frac{1}{3} \times \frac{18}{19} \Rightarrow \frac{6}{19}
 \end{aligned}$$

56. If a tap can empty a tank in 40 minutes, then how long it will take to empty the full tank when the diameter of the tap is doubled?

- (1) 20 minutes (2) 30 minutes
 (3) 10 minutes (4) 15 minutes

Ans. (3) 10 minutes

Sol. Let the diameter of tap = a

$$\text{Area of cross-section} = \pi \left(\frac{a}{2} \right)^2 = \frac{\pi a^2}{4}$$

when the diameter is doubled

diameter of tap = 2a

area of cross section = πa^2

so, now area of cross section becomes 4 times.

Thus, now tap empty the tank in $\frac{40}{4}$ minutes \Rightarrow 10 minutes

57. Which is the least perfect square exactly divisible by 8,9,12,15?

- (1) 3600 (2) 1600
 (3) 14400 (4) 7200

Ans.(1) 3600

Sol. LCM of 8, 9, 12 and 15 is 360

and the least perfect square and multiple of 360 = 3600

58. In an arithmetic sequence, if 17 is the 3rd term, -25 is the 17th term, then which term is -1?

- (1) 9 (2) 10
 (3) 11 (4) 12

Ans. (1) 9

Sol. $\Rightarrow a + 2d = 17$

$$\Rightarrow a + 16d = -25$$

$$\Rightarrow a = 23, d = -3$$

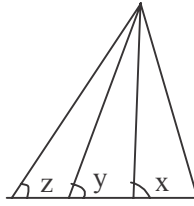
$$a + (n-1)d = -1$$

$$23 + (n-1)(-3) = -1$$

$$\boxed{n = 9}$$

59. The base of a right triangle is trisected as shown in the figure.

What is $\tan x : \tan y : \tan z$?



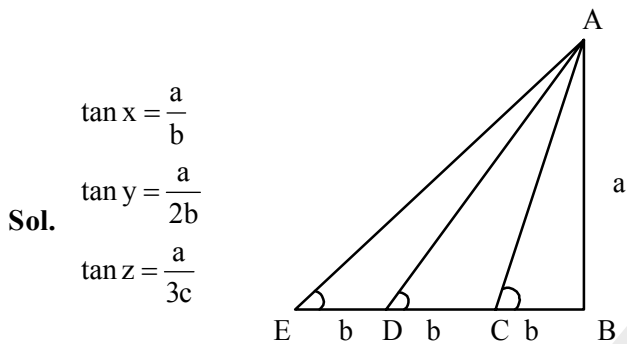
(1) 2 : 3 : 6

(2) 3 : 2 : 1

(3) 1 : 2 : 3

(4) 6 : 3 : 2

Ans. (4) 6 : 3 : 2



Sol.
 $\tan x = \frac{a}{b}$
 $\tan y = \frac{a}{2b}$
 $\tan z = \frac{a}{3b}$

$\tan x : \tan y : \tan z \Rightarrow 6 : 3 : 2$

60. What is the ratio of areas of incircle and circumcircle of an equilateral triangle?

(1) 1 : 2

(2) 1 : 3

(3) 1 : 4

(4) 1 : 5

Ans. (3)

Sol. In equilateral triangle,

Radius of circumcircle = $2 \times$ radius of incircle

Area of circumcircle = $4 \times$ Area of incircle

PHYSICS

61. Distance of the sun from the Earth is about:

(1) 8 light year

(2) 1 astronomical unit

(3) 3×10^8 m

(4) 3,85,000 km

Ans. (2)

Sol. By definition

62. The time interval between the maximum displacement and zero displacement of a point in a travelling wave is 0.0025s. Then its frequency is:

- (1) 400 Hz (2) 800 Hz
 (3) 200 Hz (4) 100 Hz

Ans. (4)

Sol. Given that

$$\frac{T}{4} = 0.0025$$

$$T = 0.01$$

$$f = \frac{1}{T} = \frac{1}{0.010} = 100\text{Hz}$$

- 63.** In which of the following cases, the position and properties of the image formed remain almost the same, independent of the position of the object?
- (1) Convex mirror, Convex lens
 (2) Convex mirror, Concave lens
 (3) Convex lens, Concave mirror
 (4) Convex lens, Concave lens

Ans. (2)

Sol. The image formed by convex mirror is always in between pole and focus. For concave lens the image formed is always in between F_1 and optical centre

- 64.** The potential difference across the ends of a conductor is 2 volt and the current through it is 1A, then:
- (1) Heat developed in it is at the rate of 1J per second
 (2) Heat developed in it is at the rate of 4J per second
 (3) The resistance of the conductor is 1Ω
 (4) The resistance of the conductor is 2Ω

Ans. (4)

Sol. $V = 2$ Volts

$$I = 1 \text{ Amp}$$

$$V = IR$$

$$R = \frac{V}{I} = \frac{2}{1} = 2\Omega$$

- 65.** If the distance between two masses is doubled, the gravitational force will:
- (1) Remain constant (2) Decrease by 50%
 (3) Decrease by 75% (4) Decrease by 25%

Ans. (3)

Sol. $F' = \frac{Gm_1m_2}{4r^2}, F = \frac{Gm_1m_2}{r^2}$

$$F' = \frac{F}{4}$$

$$\% \text{ change} = \frac{F^1 - F}{F} \times 100 = \frac{-3}{4} \times 100$$

$$= -75\%$$

Hence decrease by 75%

66. Which of the following is used for detecting cracks and flaws in metal blocks?

- | | |
|-----------------------|----------------------|
| (1) Ultrasonic waves | (2) Infrasonic waves |
| (3) Ultraviolet waves | (4) Infrared waves |

Ans. (1)

Sol. Application of ultrasonic waves

67. A wire of resistance R connected to a source of constant potential difference produces a heat H in time ' t ' seconds. If the wire is stretched to twice its original length, the heat developed when connected to the same source for the same time will be:

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

Ans. (4)

Sol. $R^1 = n^2 R$

$$R^1 = 4R \text{ (since length is increased 2 times)}$$

$$H = I^2 R t$$

$$= \left(\frac{V}{R}\right)^2 R t$$

$$H^1 = I^2 R^1 t$$

$$= \frac{V^2}{R^1} \cdot R^1 t$$

$$= \frac{V^2}{(4R)^2} \cdot 4R \cdot t$$

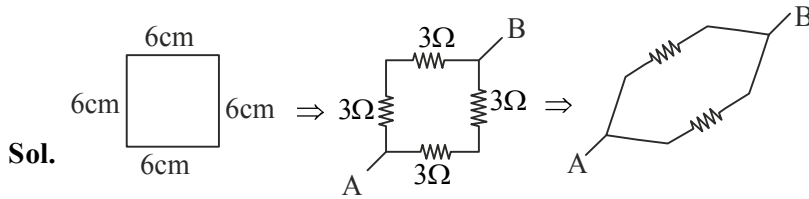
$$= \frac{V^2}{4R^2} \cdot R \cdot t$$

$$H^1 = \frac{H}{4}$$

68. A wire having 24 cm of length and 12Ω resistance is used to make a square. What will be the effective resistance between the diagonally opposite points of this square?

- | | |
|-------------------------|----------------|
| (1) 6Ω | (2) 3Ω |
| (3) $\frac{3}{2}\Omega$ | (4) 12Ω |

Ans. (2)



$$R_{eq} = \frac{6 \times 6}{6 + 6} = \frac{36}{12} = 3\Omega$$

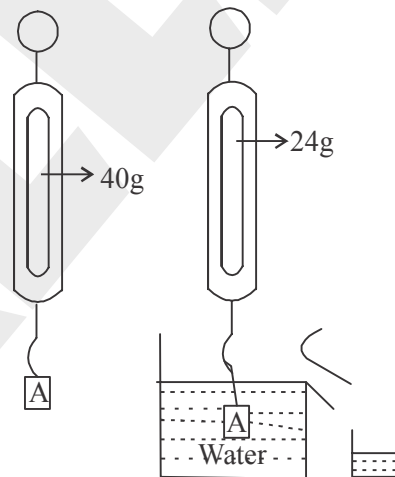
69. By keeping the incident ray fixed, a plane mirror is rotated so as to vary the angle of incidence. When the mirror is turned by 10° , the reflected ray is turned by:

- (1) 10° (2) 5°
(3) 20° (4) 40°

Ans. (3)

Sol. If mirror is rotated by θ , then reflected ray rotated by 2θ

70. Analyse the figure and find out relative density of the solid:



- (1) 1.66 (2) 2.5
(3) 1.33 (4) 0.6

Ans. (2)

Sol. Relative density of solid = $\frac{\text{weight of solid in air}}{\text{Weight of an equal volume of water}} = \frac{W_1}{W_1 - W_2}$

$$= \frac{40}{16} = 2.5$$

71. Imagine that you are travelling in a space vehicle orbiting around the Earth. You are provided with two identical boxes. One is filled with sand and the other is filled with feathers. How can you tell which is which without opening the boxes?

- (1) By weighing using a common balance
- (2) By weighing using a spring balance
- (3) By simply holding the boxes in your hand
- (4) By giving a gentle horizontal push and analysing its motion

Ans. (4)

Sol. For a small push (small impulse) on each of them momentum change in both boxes is same

$$|p_1| = |p_2|$$

$$m_1 v_1 = m_2 v_2$$

For same volume, mass of stone > mass of feathers

Therefore velocity of stone < velocity of feathers

Hence, the box moving with higher speed is feathers

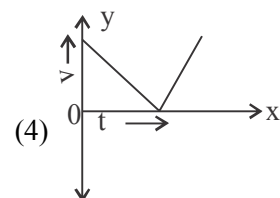
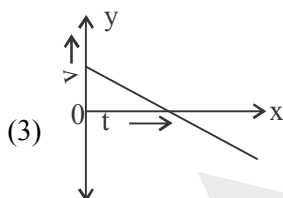
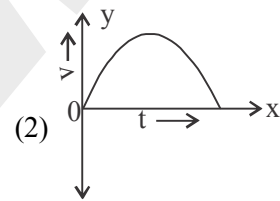
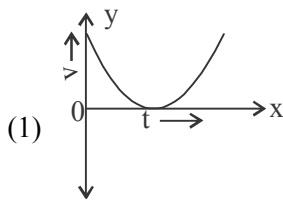
72. When a stone is thrown vertically upwards:

- (1) Its acceleration is zero at the highest point
- (2) Its velocity and acceleration are zero at the highest point
- (3) Its velocity is zero at the highest point
- (4) Neither the velocity nor the acceleration is zero at the highest point

Ans. (3)

Sol. Conceptual

73. Which of the following represents the graph of the motion of a body thrown vertically upwards?



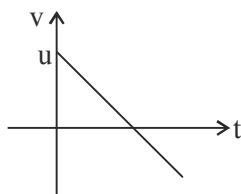
Ans. (3)

Sol. $\vec{v} = \vec{u} + \vec{a}t$

↑ (+) ve

↓ 'g' is acting downward

$$v = u + (-g)t$$



Comparing with $y = mx + c$

Slope = $-g$

y intercept = u

CHEMISTRY

74. Which among the following is/are trivalent ions?

- | | |
|--------------|---------------|
| (A) Nitride | (B) Phosphate |
| (C) Chlorate | (D) Phosphite |
- (1) (A), (B) and (D)
 (2) (A), (B), (C) and (D)
 (3) (A) and (B)
 (4) (B) only

Ans. (3)

Sol. N^{3-} , PO_4^{3-}

75. Calamine is the ore of:

- | | |
|---------------|----------|
| (1) Aluminium | (2) Iron |
| (3) Magnesium | (4) Zinc |

Ans. (4)

Sol. $ZnCO_3$ (Calamine)

76. Which element was given the name Eka-aluminium by Mendeleev in this periodic table?

- | | |
|--------------|---------------|
| (1) Gallium | (2) Germanium |
| (3) Scandium | (4) Silicon |

Ans. (1)

Sol. Gallium

77. The pH value of two solutions P and Q are 3 and 5 respectively. Which of the following statements is correct?

- (1) Solution P is twice as acidic as Q
 (2) Solution Q is twice as acidic as P
 (3) Solution P is 100 times more acidic than Q
 (4) Solution Q is 100 times more acidic than P

Ans. (3)

Sol. Concentration of P = $10^{-3}M$

Concentration of Q = $10^{-5}M$

$$\therefore \frac{P}{Q} = \frac{10^{-3}}{10^{-5}}$$

$$\frac{P}{Q} = 100$$

$$P = 100 \times Q$$

∴ P is 100 times more acidic than Q

78. While anodising aluminium, the gas liberated at the anode is:

- (1) Oxygen (2) Hydrogen
(3) Nitrogen (4) Chlorine

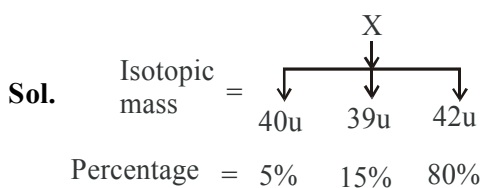
Ans. (1)

Sol. While anodising aluminium, oxygen is liberated at anode

79. An element X exists in nature as three isotop if forms with masses 40 u, 39 u and 42u. If the natural abundance of these isotopes are 5%, 15% and 80% respectively, what would be the average atomic mass of X?

- (1) 41.45 (2) 38.45
(3) 39.95 (4) 42.95

Ans. (1)



$$\therefore \text{Average atomic mass} = \frac{(40 \times 5) + (39 \times 15) + (42 \times 80)}{100} = \frac{200 + 585 + 3360}{100} = 41.45$$

80. How many isomers are possible for the hydrocarbon with molecular formula C_6H_{14} ?

- (1) 4 (2) 5
(3) 6 (4) 7

Ans. (2)



81. Which among the following elements is expected to show the highest metallic character based on its position in the periodic table?

- (1) Boron (2) Cesium
(3) Calcium (4) Iodine

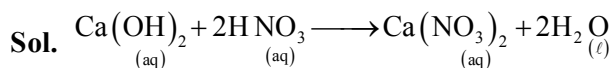
Ans. (2)

Sol. Highest metallic character based on its position in the periodic table is "Cesium"

82. Which among the following is not a redox reaction?

- (1) $2\text{Na}(s) + \text{Cl}_2(g) \rightarrow 2\text{NaCl}(s)$
- (2) $\text{Ca}(\text{OH})_2(aq) + 2\text{HNO}_3(aq) \rightarrow \text{Ca}(\text{NO}_3)_2(aq) + 2\text{H}_2\text{O}(l)$
- (3) $2\text{Pb}(\text{NO}_3)_2(s) \rightarrow 2\text{PbO}(s) + 4\text{NO}_2(g) + \text{O}_2(g)$
- (4) $\text{Cl}_2(g) + \text{H}_2\text{O}(l) \rightarrow \text{HCl}(aq) + \text{HClO}(aq)$

Ans. (2)



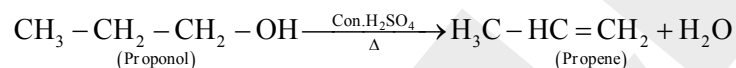
It is simple acid base reaction

83. When propanol is treated with excess hot concentrated sulphuric acid, the resulting product will be:

- (1) Ethane
- (2) Ethene
- (3) Propane
- (4) Propene

Ans. (4)

Sol. CH



Propanol on heating with con. H_2SO_4 undergo dehydration to form propene

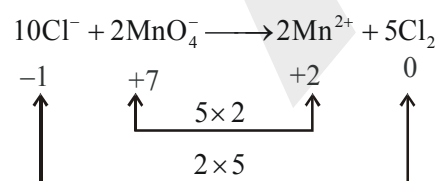
84. Potassium permanganate reacts with concentrated hydrochloric acid based on the equation given below:



The value of 'f' when the above chemical equation is balanced is:

- (1) 3
- (2) 4
- (3) 5
- (4) 6

Ans. (3)



85. Which metal among the following has an oxide that exhibits amphoteric behaviour?

- (1) Lithium
- (2) Sodium
- (3) Thallium
- (4) Zinc

Ans. (4)

Sol. (Zn) Zinc in its oxide form exhibits amphoteric behaviour

86. Which of the following metal is an essential constituent of amalgams?

- (1) Aluminium
- (2) Copper
- (3) Mercury
- (4) Sodium

Ans. (3)

Sol. Mercury (Hg) is an essential constituent of amalgam.

BIOLOGY

87. Anti Diuretic Hormone is

- | | |
|----------------|------------------|
| (1) Oxytocin | (2) Vasopressin |
| (3) Calcitonin | (4) Somatotropin |

Ans. (2)

Sol. ADH prevents diuresis by doing the absorption of water from DCT.

ADH is also known as Vasopressin

88. Yellow spot and blind spot are seen in:

- | | |
|------------|------------|
| (1) Retina | (2) Cornea |
| (3) Sclera | (4) Pupil |

Ans. (1)

Sol. Retina is the innermost layer of eye, yellow spot and blind spot both are present on the retina.

89. Match the items of Column-I with Column -II and select the correct option from those given below:

Column -I

Column -II

- (A) Medulla
oblongata
(B) Thalamus

- (I) Relay station of impulses

(II) Controls
Involuntary action

- (C) Cerebellum
(D) Cerebrum
(1) A-III, B-II, C-IV, D-I
(3) A-II, B-IV, C-I, D-III

- (III) Centre of thought and intelligence
(IV) Maintains equilibrium of the body
(2) A-II, B-I, C-IV, D-III
(4) A-IV, B-I, C-III, D-II

Ans. (2)

Sol. Medulla oblongata controls involuntary action.

Thalamus is relay station of impulses.

Cerebellum maintains equilibrium of the body

Cerebrum is centre of thought and intelligence

90. _____ attach one bone to another bone

- | | |
|---------------|--------------|
| (1) Myofibril | (2) Tendon |
| (3) Cartilage | (4) Ligament |

Ans. (4)

Sol. Ligament is the connective tissue that attach two bones together.

91. Choose the correct option which includes the components of gastric juice:

- | | |
|----------------------------|---------------------------|
| (1) Pepsin, Maltase, Mucus | (2) Amylase, HCl, Trypsin |
| (3) Pepsin, Mucus, HCl | (4) Trypsin, HCl, Mucus |

Ans. (3)

Sol. The wall of stomach contains gastric gland that secretes gastric juice.

Gastric juice consist of pepsin, mucus and HCl

Pepsin - Digest protein

mucus - protect stomach wall from HCl

92. Which one of the following is a phagocyte?

- | | |
|----------------|----------------|
| (1) Neutrophil | (2) Lymphocyte |
| (3) Eosinophil | (4) Basophil |

Ans. (1)

Sol. Both neutrophil and monocytes do the engulfing of microbes. This is called phagocytosis

93. Choose the correct statement regarding AIDS:

- (1) Caused by Human Papilloma virus
- (2) Spread by sharing food
- (3) HIV multiplies using the genetic mechanism of lymphocytes
- (4) Spread through insects like mosquitoes

Ans. (3)

Sol. AIDS is caused by HIV virus. HIV destroys the T-Helper cells of lymphocytes

94. Choose the statement related to Mitosis:

- (1) Four daughter cells are formed
- (2) Helps in the formation of gametes
- (3) Two daughter cells are formed
- (4) Occurs in the germinal cells

Ans. (3)

Sol. Mitosis - Two daughter cells are formed with equal number of chromosomes

Meiosis - Produce 4 daughter cells with haploid number of chromosomes

95. The dead cells of Xylem are:

- (1) Tracheid, Sieve tube
- (2) Tracheid, Vessel
- (3) Vessel, Companion Cell
- (4) Sieve tube, Companion cell

Ans. (2)

Sol. Xylem consist of tracheids, vessels, xylem parenchyma and xylem fibres. Among these, except xylem parenchyma all others are dead cells.

96. Malaria is caused by:

- (1) Bacteria
- (2) Virus
- (3) Protozoa
- (4) Fungus

Ans. (3)

Sol. Causative agent of malaria is Plasmodium. It comes under the class-sporozoa of protozoa

97. Muscle fatigue is due to the accumulation of:

- (1) Pyruvic acid
- (2) Acetic acid
- (3) Citric acid
- (4) Lactic acid

Ans. (4)

Sol. Anaerobic respiration or incomplete oxidation of glucose results in the accumulation of lactic acid in the muscles which leads to muscle fatigue.

98. An indoor plant placed near the window grows towards sunlight. The plant hormone responsible for this kind of growth is:

- (1) Auxin
- (2) Cytokinin
- (3) Ethylene
- (4) Gibberellin

Ans. (1)

Sol. Accumulation of auxin results in root and shoot elongation by promoting cell division. From which direction the sunlight are coming, opposite to that more accumulation of auxin takes place.

99. Choose the event that do not occur during photosynthesis:

- (1) Reduction of carbohydrate
- (2) Release of oxygen
- (3) Splitting of water
- (4) Conversion of light energy to chemical energy

Ans. (1)

Sol. Reduction of CO₂ into carbohydrates takes place during photosynthesis. Glucose is a simple carbohydrate.

100. Which one of the following is a genetic disease?

- (1) Leprosy
- (2) Tuberculosis
- (3) Diabetes
- (4) Haemophilia

Ans. (4)

Sol. Haemophilia is a x-linked recessive disease.

