

ENGLISH – HINDI

13-15

CODE

Roll No.

रोल नंबर

Booklet Number

पुस्तिका संख्या

152547

SCHOLASTIC APTITUDE TEST

(For Students of Class X)

Time: 120 Minutes

Max. Marks: 100

समय: 120 मिनट

अधिकतम अंक: 100

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you open the test-booklet.

1. Answers are to be given on a separate OMR sheet.
2. There are 100 questions in this test. All are compulsory. The question numbers 1 to 40 belong to Social Sciences, 41 to 60 pertain to Mathematics and 61 to 100 are on Science subjects.
3. Please follow the instructions given on the OMR sheet for marking the answers.
4. Write your eight-digit roll number as allotted to you in the admission card clearly on the test-booklet and darken the appropriate circles on the OMR sheet as per instructions given.
5. Write down and darken test-booklet number in the appropriate circles on the OMR sheet as per instructions given.
6. Since the time allotted for this question paper is very limited and all questions carry equal marks, you should make the best use of it by not spending too much time on any one question.
7. Rough work can be done anywhere in the booklet but not on the OMR sheet.
8. Each correct answer will be awarded one mark.
9. THERE WILL BE NO NEGATIVE MARKING.
10. Please return only the OMR sheet to the invigilator after the test.
11. English version of the question paper will be considered as final in case of any dispute arising out of variation in translation.
Please turn over the page and start answering immediately after you are asked to do so.

शैक्षिक अभिव्यक्ति परीक्षा

(कक्षा X के विद्यार्थियों के लिए)

परीक्षार्थियों के लिए अनुदेश

प्रश्न-पुस्तिका खोलने से पहले, निम्नलिखित अनुदेशों को ध्यान से पढ़िए।

1. उत्तर एक अलग ओएमआर-पत्र पर देने हैं।
2. इस परीक्षा में 100 प्रश्न हैं। सभी प्रश्न अनिवार्य हैं। प्रश्न 1 से 40 सामाजिक विज्ञान, 41 से 60 गणित और 61 से 100 विज्ञान के विषयों पर आधारित हैं।
3. कृपया उत्तर चिह्नित करने के लिए ओएमआर-पत्र पर दिए गए निर्देशों का अनुपालन कीजिए।
4. दिए गए निर्देशों के अनुसार आपके प्रवेश-पत्र पर दिए गए अपने आठ-अंकीय रोल नंबर को प्रश्न-पुस्तिका और ओएमआर-पत्र पर बिलकुल स्पष्ट रूप से लिखिए और उपयुक्त गोलों को काला कीजिए।
5. दिए गए निर्देशों के अनुसार ओएमआर-पत्र पर प्रश्न-पुस्तिका संख्या लिखिए और उपयुक्त गोलों को काला कीजिए।
6. चूंकि इस प्रश्न-पत्र के लिए निर्धारित समय बहुत सीमित है, और सभी प्रश्नों के समान अंक हैं, इसलिए समय का अधिकतम उपयोग कीजिए और किसी प्रश्न पर बहुत अधिक समय न लगाइए।
7. रफ कार्य पुस्तिका में कहीं भी किया जा सकता है, किंतु ओएमआर-पत्र / अलग कागज पर नहीं।
8. प्रत्येक सही उत्तर के लिए एक अंक प्रदान किया जाएगा।
9. गलत उत्तर के लिए कोई अंक नहीं काटा जाएगा।
10. कृपया परीक्षा के पश्चात केवल ओएमआर-पत्र ही निरीक्षक को वापस कीजिए।
11. अनुवादित संस्करण में अंतर से उठे किसी भी विवाद की स्थिति में, प्रश्न-पत्र के अंग्रेजी संस्करण को निर्णायक माना जाएगा।
कृपया पृष्ठ पलटिए और अपना कार्य आरंभ कीजिए।

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13-15-SAT-ENG-HIN

S/07 TRE/19-SAT-Eng-Hin-1A

1. A set of guidelines called a model code of conduct is enforced during Parliamentary election in India to avert corrupt practices. This is applied to _____.
 1. Political parties only
 2. Political parties and voters
 3. Political parties and candidates
 4. Candidates contesting elections only

2. A Country has the ultimate rights and power to make decisions on internal and external matters. Also it is not dictated by any external power on its decisions relating to its relation with other country. Which feature is reflected in these statements ?
 1. Republic
 2. Socialism
 3. Sovereignty
 4. Authoritarian

3. Anti-defection law is an important feature of Indian party system. The final authority to decide on the disqualification of a member of the parliament with respect to anti-deflection lies with the _____.
 1. President
 2. Prime Minister
 3. Chief Justice the Supreme Court of India
 4. Speaker of the **Lok Sabha** or the Chairman of the **Rajya Sabha**

4. Which of the following statements exemplify the Independence of judiciary in India ?
 - I. Judiciary is not under the control of executive and legislature.
 - II. There is less scope for interference in the working of judiciary by the political executive
 - III. A judge of higher judiciary can be removed only through a resolution which requires 2/3rd majority of both the houses of parliament.Choose the correct option.
 1. I and II
 2. I and III
 3. I, II and III
 4. II and III

5. Rajya Sabha is also called the upper house, elders house and permanent house. Which of the statement/s given below is/are true about it ?
 - I. Rajya Sabha has more power related to financial matters.
 - II. Rajya Sabha members continue to be in the office till the next general election.
 - III. Resolution for removing the Vice-president and the president originates in Rajya Sabha.
 - IV. Number of seats allotted to a state in Rajya Sabha is directly proportionate to its population
 1. I, II, and III
 2. III and IV
 3. I and IV
 4. IV only

6. In the context of Indian elections, the parties which fail to gain majority in the parliament play the role of opposition. Consider the following statements and choose which statement/s is/are is not true.
 - I. Opposition parties in India play an important role in building public opinion.
 - II. Opposition parties are not constitutionally recognized.
 - III. Opposition immediately assumes power of government, if the majority party loses its vote of confidence in the Parliament.
 - IV. Opposition parties keep a close check on the activities of the government.
 1. I and II only
 2. II and III only
 3. III only
 4. IV only

7. Consider the following statements :
Statement I : All countries that are democratic have written constitution,
Statement II : All countries that have written constitution are not necessarily democratic.
Which of the above statement/s is/ are correct ?
 1. I only
 2. II only
 3. Both I and II
 4. Neither I nor II

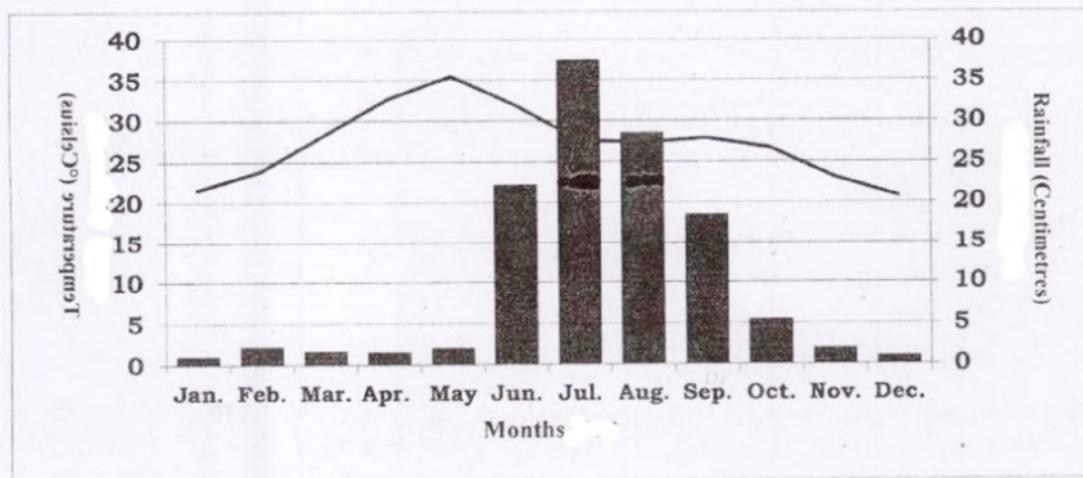
8. China exports a toy to India at ₹ 150, Whereas the same toy is manufactured and available in India for ₹ 250. When China continues to export this toy to India, this trade practice is known as _____.
 1. Dumping
 2. Export Promotion
 3. Import Substitution
 4. Export Subsidisation

9. Shruti and Gautami were discussing about India's GDP and Kerala's SDP. Some of the observation made were :
- I. Kerala's per capita SDP is India's GDP divided by Kerala's population in a particular year.
 - II. Since Kerala has best literacy rate and excellent quality of life indices, it must have the highest SDP.
 - III. In a federal structure if we know all the SDPs we can have a fair idea of how big India's GDP will be in that year.
 - IV. Kerala's per capita SDP in a particular year is the value of all final goods and services produced by the Kerala state in that year divided by Kerala's population in that year.
- Which of the above statements are correct ?
1. I and III
 2. II and III
 3. III and IV
 4. I, III and IV
10. Shehnaaz joined a coaching institute for a professional course. At the time of joining the course, she paid a lump sum fee for the entire course of two years. However, she did not find the quality of teaching satisfactory and decided to quit after one year. When she asked for a refund of the fee for one year, she was refused. Which of the following right/s of Shehnaaz was/ were violated ?
- I. Right to choose
 - II. Right to represent
 - III. Right to be informed
 - IV. Right to seek redressal
1. Only I
 2. I and IV
 3. III and IV
 4. Only IV
11. Which of the following reflects situation where a person is employed but do not contribute in adding to the total product ?
- I. Open unemployment
 - II. Disguised unemployment
 - III. Seasonal unemployment
 - IV. Frictional unemployment
1. I and II
 2. Only II
 3. III and IV
 4. Only IV
12. There are 100 households in the village of Awangkhum, of which the loan taken by 20 household are from the State Bank of India, another 20 households from their friends and relatives, 5 households from Indian Bank, 10 households from a Regional Rural Bank, 15 households from businessmen, 10 households from village headmen and 20 households from cooperative societies. Which of the following inference (s) is/are correct.
- I. Formal sources of credit are lower than the others.
 - II Institutional sources of credit are higher than others.
 - III. Non-institutional sources of credit are higher than others.
 - IV. Informal sources of credit are slightly higher than others.
1. Only I
 2. I and II
 3. Only II
 4. III and IV
13. Which of the following statements are true about food security ?
- I. Landless people always have food insecurity.
 - II. Those who do not have enough nutritious food are food insecure.
 - III. Those who have enough food but not the requisite nutrition are food secure.
 - IV. Those who do not have enough purchasing power to buy sufficient food are food insecure.
1. I and III
 2. I and IV
 3. II and III
 4. II and IV

14. Siddhik issues a cheque of ₹ 19,000 in favour of Hanush's. What happens when the cheque is received and processed in Hanush's bank ?
- I. There is no change in their bank accounts
 - II. Both their bank balances increase by ₹ 19,000.
 - III. Siddhik's bank balance decreases by ₹ 19,000 and Hanush's bank balance increases by the same amount.
 - IV. There is no change in Siddhik's bank balance although Hanush's bank balance sees an increase
- Based on the above statements which option is correct?
1. Only I
 2. I and III
 3. Only III
 4. III and IV
15. The daily wage of a person in rural area is ₹ 180. Arrange the following households in descending order of vulnerability to poverty.

Name of the Household	Person days of employment	Size of the Household	Working members of the family
Ruldoo	14	4	2
Mulkha	15	7	2
Fakira	10	5	4
Preeto	12	6	3

1. Preeto > Mulkha > Fakira > Ruldoo
 2. Mulkha > Preeto > Ruldoo > Fakira
 3. Mulkha > Ruldoo > Preeto > Fakira
 4. Ruldoo > Fakira > Mulkha > Preeto
16. The following graph shows the distribution of mean monthly temperature and average rainfall of a particular city during the year.



- Which one of the following cities shows the climatic conditions presented in the above graph ?
1. Nagpur
 2. Chennai
 3. Jodhpur
 4. Bengaluru

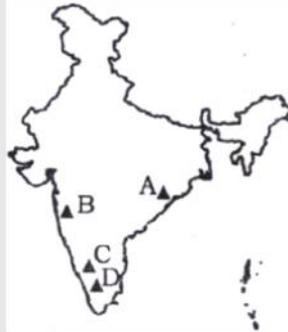
Identify the shaded regions with their corresponding geographical features and select the correct option using the codes given below.

1. A = Zone of laterite soil, B = Coffee producing area, C = Cotton textile industries, D = Evergreen forest cover
2. A = Evergreen forest cover, B = Coffee producing areas, C = Zone of laterite soil, D = Cotton textile industries.
3. A = Evergreen forest cover, B = Zone of laterite soil, C = Coffee producing area, D = Cotton textile industries
4. A = Cotton textile industries, B = Coffee producing area, C = Zone of laterite soil, D = Evergreen forest cover.

21. Which of the following geological sequence properly matches the tectonic events from old to recent time periods?

1. Formation of Aravalli – Deccan volcanism- formation of Shivalik – upliftment of Himadri.
2. Deccan volcanism – formation of Aravalli – Upliftment of Himadri- formation of Shivalik.
3. Deccan volcanism – formation of Shivalik – Upliftment of Himadri- formation of Aravalli.
4. Formation of Aravalli – Deccan volcanism – upliftment of Himadri- formation of Shivalik.

22. The given map shows location of different mountain peaks in India.



A mountaineer wants to scale the mountain peaks in Peninsular India starting from North to South. Identify the correct sequence of peaks the mountaineer will follow ?

1. A = Mahendragiri ; B = Anaimudi ; C = Dodabetta ; D = Mahabaleshwar
2. A = Dodabetta ; B = Mahabaleshwar ; C = Mahendragiri ; D = Anaimudi
3. A = Anaimudi ; B = Mahendragiri ; C = Dodabetta ; D = Mahabaleshwar
4. A = Mahendragiri ; B = Mahabaleshwar ; C = Dodabetta ; D = Anaimudi

23. While teaching a topic on agriculture, geography teacher had made the following statement about a particular crop in her class. "Mean Monthly Temperature of about 27°C., high relative humidity, rainfall of 150 cm in summer months and khaddar soils are the ideal physical requirements during the period of its vegetative growth."

Which one of the following crops was stated by the teacher ?

1. Tea
2. Jute
3. Rubber
4. Sugarcane

24. Bibhuti was travelling to study the traditional agricultural practices among various communities in Meghalaya, Jharkhand, Odisha and Western Ghats. Identify the correct sequence of forms of cultivation practised in these regions.

1. Jhumming –Kumari – Pama Dabi – Kuruwa
2. Kuruwa –Pama Dabi – Jhumming –Kumari
3. Jhumming –Kuruwa – Pama Dabi – Kumari
4. Pama Dabi – Kumari– Jhumming –Kuruwa

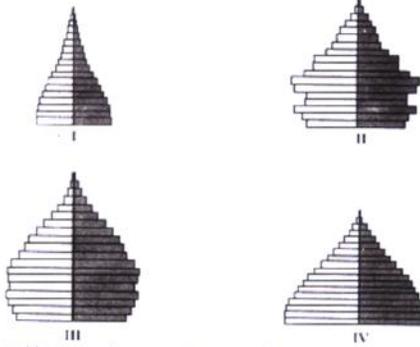
25. River Indus flows through Leh and Kargil districts in the state of Jammu and Kashmir. It has four major tributaries in India. Which one of the following is the correct sequence of the tributaries arranged from East to West in terms of their confluence with river Indus?

1. Zaskar – Dras –Hunza – Shyok
2. Zaskar – Hunza – Dras – Shyok
3. Hunza – Dras – Zaskar – Shyok
4. Zaskar – Dras – Shyok – Hunza

26. A tourist was travelling Indian States and came across a famous Buddhist Monastery, farming of three rice crops within the same agricultural year, a cement factory and floating gardens on a lake. Identify the proper sequence of the States the tourist travelled.

1. Sikkim - West Bengal - Assam - Meghalaya
2. Sikkim – Arunachal Pradesh - Assam - Manipur
3. Arunachal Pradesh - Assam – Meghalaya - Manipur
4. Arunachal Pradesh – West Bengal – Manipur - Meghalaya

27. Observe the following diagrams carefully.



Which one of the above population pyramids is an ideal representation of India's population?

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

28. Which of the following statements regarding printing in Medieval Europe are correct?

- I. Wood block printing reached Europe in the 13th Century.
 - II. The aristocrats and monks criticized printed books as cheap vulgarities in the beginning.
 - III. Printing did not entirely displace the art of producing books by hand.
 - IV. Martin Luther had reservations against printing of books.
1. I, II and III
 2. I, III and IV
 3. I, II and IV
 4. II, III and IV

29. Which of the following statements related to Mahatma Gandhi's view on Satyagraha are correct?

- I. The movement in South Africa was not passive resistance.
 - II. It is the weapon of the people, who are not weak.
 - III. India could not militarily face Britain.
 - IV. Truth is the supreme *dharma*.
1. I, II and III
 2. I, II and IV
 3. II, III and IV
 4. I, III and IV

30. Which of the following statements relating to the 'Scorched Earth Policy' in Java are correct?

- I. The Dutch destroyed the saw mills.
 - II. Teak logs were burnt by the Dutch.
 - III. Trees were cut freely to meet war needs.
 - IV. The villagers were encouraged to expand cultivation in the forest areas.
1. I and II
 2. I, II and III
 3. I and IV
 4. II, III and IV

31. Which of the following statements about opium cultivation in India during the British period are correct?

- I. The peasants could sell off the produce freely.
 - II. Local traders offered higher prices for opium.
 - III. Opium production was increasing in territories that were not under the British.
 - IV. Peasants were getting money advances from the village headman to produce opium.
1. I, II and III
 2. I, II and IV
 3. I, III and IV
 4. II, III and IV

32. Observe the given picture taken from New Orleans, Illustrated London news, 1851.



What does the picture represent?

1. Mourning 2. Slave auction 3. Market place 4. Roadside gathering
33. Why were Nghe An and Ha Tinh provinces called 'electrical fuses' of Vietnam?
 1. They were near to the capital city and were centers of power.
 2. They were among the poorest provinces and had an old radical tradition.
 3. They were very rich and had strong trade links with the outer world.
 4. They were at the borders and were in conflicts with the neighbouring countries.
34. Which of the following would be the part of the surroundings in a *Chawl* in Bombay during the colonial period?
 I. Large number of people living in shared rooms.
 II. A large population of people belonging to depressed and lower classes.
 III. Streets and neighbourhood being used for a variety of activities such as cooking, washing and sleeping.
 IV. Liquor shops and Akharas in any open spot.
 1. I, II and III 2. I, III and IV 3. II and III 4. II, III and IV
35. Which of the following statements are true in the context of Cricket in Victorian England?
 I. The rules of Cricket were made to favour those who were described as "Players".
 II. The wages of professionals was paid by patronage or subscription or gate money.
 III. Cricket was viewed as a way of teaching English boys discipline, importance of hierarchy and leadership qualities.
 IV. The rich who played were called amateurs.
 1. I, II and III 2. I, II and IV 3. I, III and IV 4. II, III and IV
36. Which of the following statements are true for eighteenth century France?
 I. There was much criticism of slavery.
 II. The national Assembly feared opposition from businessmen who were dependant on slave trade.
 III. Plantation owners understood their freedom as including the right to enslave Africans.
 IV. The Convention of 1791 legislated to free all slaves in the French overseas possessions.
 1. I and II 2. I, II and IV 3. II and III 4. II, III and IV
37. Which of the following statements are true in the context of Liberals in Modern Europe?
 I. They opposed the uncontrolled power of dynastic rulers.
 II. They wanted to safeguard the rights of individuals against governments.
 III. They argued for Independent judiciary.
 IV. They believed in universal adult franchise for all men and women with property.
 1. I, II and III 2. I, II and IV 3. I, III and IV 4. II, III and IV

Sol. (1)

$$P(n) = \frac{1}{n}, P(1) = 1, P(2) = \frac{1}{2}, P(3) = \frac{1}{3}, P(4) = \frac{1}{4}$$

$$P(n) \cdot n = k(n-1)(n-2)(n-3)(n-4) + 1$$

$$n = 0$$

$$0 = k(-1)(-2)(-3)(-4) + 1$$

$$\Rightarrow 24k + 1 = 0$$

$$k = -\frac{1}{24}$$

$$P(n) \cdot n = -\frac{1}{24}(n-1)(n-2)(n-3)(n-4) + 1$$

$$P(5) \cdot (5) = -\frac{1}{24} \times 4 \times 3 \times 2 \times 1 + 1$$

$$P(5) = 0$$

44. If α and β are the roots of the equation $3x^2 - 5x + 3 = 0$, then the quadratic equation whose roots are $\alpha^2\beta$ and $\alpha\beta^2$ is

1. $3x^2 - 5x + 3 = 0$ 2. $3x^2 - 8x + 5 = 0$ 3. $3x^2 - 8x + 3 = 0$ 4. $3x^2 - 5x - 3 = 0$

Sol. (1)

$$3x^2 - 5x + 3 = 0$$

α & β are zero

$$\alpha + \beta = \frac{5}{3} \quad \alpha\beta = \frac{3}{3} = 1$$

Now the required quadratic equation

$$x^2 - (\alpha^2\beta + \alpha\beta^2)x + \alpha^2\beta \times \alpha\beta^2 = 0$$

$$x^2 - \alpha\beta(\alpha + \beta)x + (\alpha\beta)^3 = 0$$

$$x^2 - (1) \frac{5}{3}x + (1)^3 = 0$$

$$x^2 - \frac{5x}{3} + 1 = 0$$

$$3x^2 - 5x + 3 = 0$$

45. In village Madhubani 8 women and 12 girls can paint a large mural in 10 hours. 6 women and 8 girls can paint it in 14 hours. The number of hours taken by 7 women and 14 girls to paint the mural is

1. 10 2. 15 3. 20 4. 35

Sol. (1)

$$8W + 12g = \frac{1}{10}$$

$$6W + 8g = \frac{1}{14}$$

$$80W + 120g = 1 \dots\dots(1)$$

$$84W + 112g = 1 \dots\dots(2)$$

from eq. (1) & (2)

$$80W + 120g = 84W + 112g$$

$$8g = 4W$$

$$W = 2g$$

$$\text{Now } 8(2g) + 12g = \frac{1}{10}$$

$$28g = \frac{1}{10}$$

$$g = \frac{1}{280}$$

$$W = \frac{1}{140}$$

$$\text{So, } 7W + 14g = 10$$

46. If $x = \frac{3 + \sqrt{5}}{2}$ and $y = x^3$, then y satisfies the quadratic equation

1. $y^2 - 18y + 1 = 0$ 2. $y^2 + 18y + 1 = 0$ 3. $y^2 - 18y - 1 = 0$ 4. $y^2 + 18y - 1 = 0$

Sol. (1)

$$x = \frac{3 + \sqrt{5}}{2}$$

$$x^3 = \left(\frac{3 + \sqrt{5}}{2}\right)^3 = \frac{72 + 32\sqrt{5}}{8} = 9 + 4\sqrt{5}$$

$$y = 9 + 4\sqrt{5}$$

Since one root is $9 + 4\sqrt{5}$

∴ other root is $9 - 4\sqrt{5}$

$$\text{Sum of roots} = 9 + 4\sqrt{5} + 9 - 4\sqrt{5} = 18$$

$$\text{Product} = (9 + 4\sqrt{5})(9 - 4\sqrt{5}) = 1$$

∴ polynomial is $y^2 - 18y + 1 = 0$.

47. If $\tan^2\theta = 1 - e^2$, then the value of $\sec\theta + \tan^3\theta \operatorname{cosec}\theta$ is equal to

1. $(1 - e^2)^{1/2}$ 2. $(2 - e^2)^{1/2}$ 3. $(2 - e^2)^{3/2}$ 4. $(1 - e^2)^{3/2}$

Sol. (3)

$$\tan^2\theta = 1 - e^2$$

$$\sec\theta + \tan^3\theta \operatorname{cosec}\theta$$

$$= \frac{1}{\cos\theta} + \frac{\sin^3\theta}{\cos^3\theta} \times \frac{1}{\sin\theta} = \frac{1}{\cos\theta} + \frac{\sin^2\theta}{\cos^3\theta} = \frac{1}{\cos\theta} + \frac{1}{\cos\theta} \times \tan^2\theta$$

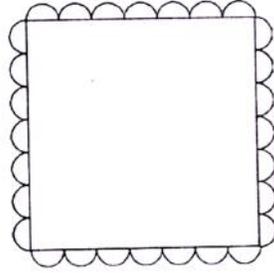
$$= \frac{1}{\cos\theta} (1 + \tan^2\theta) = \frac{1}{\sqrt{2 - e^2}} (1 + 1 - e^2) = \sqrt{2 - e^2} (2 - e^2) = (2 - e^2)^{3/2}$$

48. Let the volume of a solid sphere be $288\pi \text{ cm}^3$. A horizontal plane cuts the sphere at a distance of 3 cm from the centre so that the ratio of the curved surface areas of the two parts of the sphere is 3 : 1. The total surface area of the bigger part of the sphere (in cm^2) is

1. 36π 2. 108π 3. 135π 4. 144π

Sol. (3)

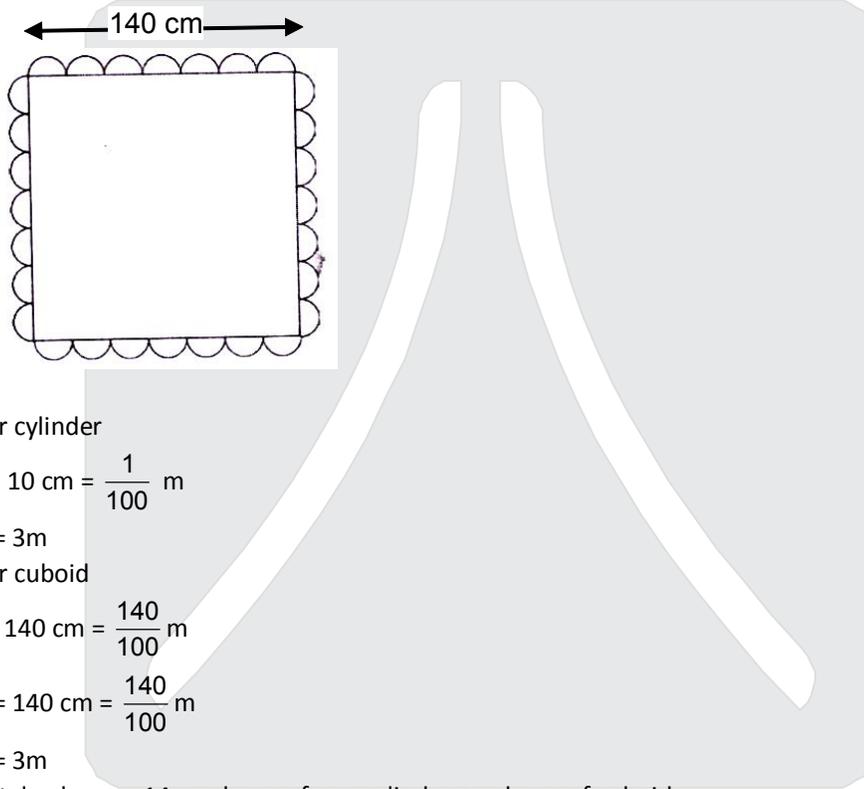
50. Each vertical face of square based vertical pillar of height 3 m has 7 equal, semi-cylindrical surfaces in such a way that its horizontal cross-section is as shown in the figure.



If the radius of each semi circle is 10 cm, the volume (in m^3) of the pillar so designed (taking $\pi = \frac{22}{7}$) is

1. 5.88 2. 6.14 3. 6.42 4. 7.2

Sol. (4)



For cylinder

$$r = 10 \text{ cm} = \frac{1}{100} \text{ m}$$

$$h = 3 \text{ m}$$

For cuboid

$$l = 140 \text{ cm} = \frac{140}{100} \text{ m}$$

$$b = 140 \text{ cm} = \frac{140}{100} \text{ m}$$

$$h = 3 \text{ m}$$

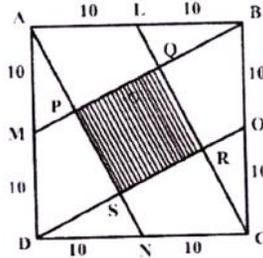
Total volume = 14 × volume of one cylinder + volume of cuboid

$$= 14 \times \pi r^2 h + l \times b \times h$$

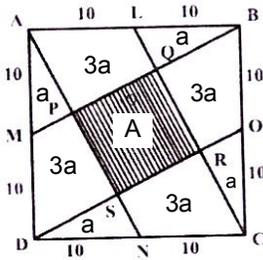
$$= 14 \times \frac{22}{7} \times \frac{10}{100} \times \frac{10}{100} \times 3 + \frac{140}{100} \times \frac{140}{100} \times 3$$

$$= 1.32 + 5.88 = 7.2 \text{ m}^3$$

51. Let ABCD be a square of side 20 cm. The area of the square PQRS (in cm)² interior to ABCD, shown in figure is



- Sol. (2)
1. 60 2. 80 3. 100 4. 400



Area of $\Delta LQB = \text{Area of } \Delta NSD = \text{Area of } \Delta ORC = \text{Area of } \Delta MPA = a$

Area of square = $A + 16a = 400$

Area of $\Delta ADN = \frac{1}{2} \times 20 \times 10 = 5a$

$5a = 100 \Rightarrow a = 20$

$16a + A = 400$

$A = 400 - 16 \times 20$

$A = 400 - 320 = 80$

52. A circle is inscribed in a right angled triangle of perimeter 7π . Then the ratio of numerical values of circumference of the circle to the area of the right angled triangle is

- Sol. (1)
1. 4 : 7 2. 3 : 7 3. 2 : 7 4. 1 : 7

Given perimeter = 7π

Semiperimeter = $\frac{7\pi}{2}$

Inradius = $\frac{\Delta}{S}$

$$r = \frac{\frac{1}{2} \times bh}{\frac{7\pi}{2}}$$

$$\frac{\pi r}{bh} = \frac{1}{7}$$

$$\Rightarrow \frac{\text{circumference}}{\text{Area of right triangle}} = \frac{2\pi r}{\frac{1}{2} \times b \times h} \Rightarrow \frac{4\pi r}{bh} \Rightarrow \frac{4}{7}$$

53. It is known that area of a cyclic quadrilateral is $\sqrt{(s-a)(s-b)(s-c)(s-d)}$ where a, b, c, d are the sides and $s = \frac{a+b+c+d}{2}$.

If a circle can also be inscribed in the cyclic quadrilateral then the area of this quadrilateral is

1. $\sqrt{(ab)^2 + (cd)^2}$ 2. \sqrt{abcd} 3. $\sqrt{(ac)^2 + (bd)^2}$ 4. $\sqrt{(ad)^2 + (bc)^2}$

Sol. For cyclic quadrilateral $a + c = b + d$

$$S = a + c = b + d$$



$$\therefore \text{Area} = \sqrt{(s-a)(s-b)(s-c)(s-d)}$$

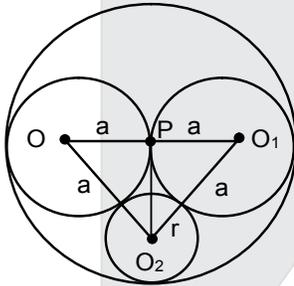
$$= \sqrt{(a+c-a)(b+d-b)(a+c-c)(b+d-d)}$$

$$\text{area} = \sqrt{c \times d \times a \times b}$$

$$\text{area} = \sqrt{abcd}$$

54. Two circles, both of radii a touch each other and each of them touches internally a circle of radius 2a. Then the radius of the circle which touches all the three circles is

1. $\frac{1}{2}a$ 2. $\frac{2}{3}a$ 3. $\frac{3}{4}a$ 4. a



Sol.

$$\text{Since } PO_2 = 2a - r$$

In $\triangle OPO_2$ by Pythagoras theorem

$$a^2 + (2a - r)^2 = (a + r)^2$$

$$a^2 + 4a^2 + r^2 - 4ar = a^2 + r^2 + 2ar$$

$$4a^2 \Rightarrow 6ar$$

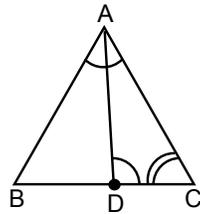
$$2a = 3r$$

$$\frac{2}{3}a = r$$

55. Let D be a point on the side BC of a triangle ABC such that $\angle ADC = \angle BAC$. If AC = 21 cm, then the side of an equilateral triangle whose area is equal to the area of the rectangle with sides BC and DC is

1. $14 \times 3^{1/2}$ 2. $42 \times 3^{-1/2}$ 3. $14 \times 3^{3/4}$ 4. $42 \times 3^{1/2}$

Sol. (3)



Given : $AC = 21$

$\Delta ACB \sim \Delta DCA$

$$\frac{AC}{DC} = \frac{BC}{CA} = \frac{AB}{AD}$$

$$BC \times DC = AC^2 = 21^2 = 441$$

$$\frac{\sqrt{3}}{4} a^2 = 441$$

$$a^2 = \frac{441 \times 4}{\sqrt{3}}$$

$$a = 42 \times 3^{-1/4}$$

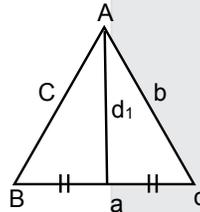
$$a = 14 \times 3 \times 3^{-1/4}$$

$$= 14 \times 3^{3/4}$$

56. Let ABC be a triangle with sides a, b, c. Then lengths of medians of the triangle formed by the medians of the triangle ABC are

1. $\frac{1}{2}a, \frac{1}{2}b, \frac{1}{2}c$ 2. $\frac{2}{3}a, \frac{2}{3}b, \frac{2}{3}c$ 3. $\frac{3}{4}a, \frac{3}{4}b, \frac{3}{4}c$ 4. $\frac{5}{6}a, \frac{5}{6}b, \frac{5}{6}c$

Sol. (3)



By Apollonius theorem

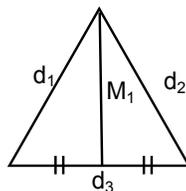
$$2 \left[d_1^2 + \left(\frac{a}{2} \right)^2 \right] = b^2 + c^2$$

$$d_1^2 \Rightarrow \frac{b^2 + c^2}{2} - \frac{a^2}{4} \dots\dots(1)$$

$$d_2^2 \Rightarrow \frac{a^2 + c^2}{2} - \frac{b^2}{4} \dots\dots(2)$$

$$d_3^2 \Rightarrow \frac{a^2 + b^2}{2} - \frac{c^2}{4} \dots\dots(3)$$

By Apollonius theorem



$$2\left(M_1^2 + \frac{d_3^2}{4}\right) \Rightarrow d_1^2 + d_2^2$$

$$M_1^2 + \frac{d_3^2}{4} \Rightarrow \frac{d_1^2 + d_2^2}{2}$$

$$M_1^2 \Rightarrow \frac{d_1^2 + d_2^2}{2} - \frac{d_3^2}{4}$$

$$M_1^2 \Rightarrow \frac{\frac{b^2 + c^2}{2} - \frac{a^2}{4} + \frac{a^2 + c^2}{2} - \frac{b^2}{4} - \frac{a^2 + b^2}{2} - \frac{c^2}{4}}{4}$$

$$M_1^2 \Rightarrow \left(\frac{2b^2 + 2c^2 - a^2 + 2a^2 + 2c^2 - b^2}{4}\right) - \left(\frac{2a^2 + 2b^2 - c^2}{4}\right)$$

$$M_1^2 \Rightarrow \frac{2b^2 + 2c^2 - a^2 + 2a^2 + 2c^2 - b^2}{8} - \frac{2a^2 + 2b^2 - c^2}{16}$$

$$M_1^2 \Rightarrow \frac{4b^2 + 4c^2 - 2a^2 + 4a^2 + 4c^2 - 2b^2 - 2a^2 - 2b^2 + c^2}{16}$$

$$M_1^2 \Rightarrow \frac{9c^2}{16} \Rightarrow M_1 = \frac{3}{4}c$$

Similarly $M_2 = \frac{3}{4}b$

$$M_3 = \frac{3}{4}a$$

57. $(x + 1)^4$ is divided by $(x - 1)^3$. Then the value of the remainder at $x = 1$ is
 1. -16 2. 0 3. 16 4. 32

Sol. (3)

Dividend = $(x + 1)^4$

Divisor = $(x - 1)^3$

Quotient = $q(x)$

$R(x)$ = Remainder = $ax^2 + bx + c$

By division algorithm

Dividend = Divisor \times Quotient + Remainder

$$(x + 1)^4 = (x - 1)^3 q(x) + ax^2 + bx + c$$

Put $x = 1$

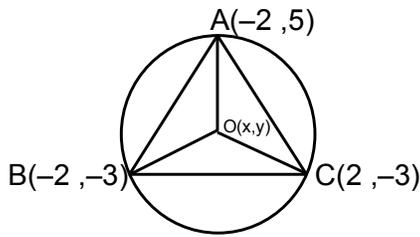
$$(1 + 1)^4 = (1 - 1)^3 q(1) + a(1)^2 + b(1) + c$$

$$16 = 0 + a + b + c$$

$$R(1) = a(1)^2 + b(1) + c = a + b + c = 16$$

58. A circle passes through the vertices of a triangle ABC. If the vertices are A(- 2, 5), B(- 2, - 3), C(2, - 3), then the centre of the circle is
 1. (0, 0) 2. (0, 1) 3. (-2, 1) 4. (0, - 3)

Sol. (2)



OA = OB = OC = Radius

$$OB^2 = OA^2$$

$$(x + 2)^2 + (y + 3)^2 = (x + 2)^2 + (y - 5)^2$$

$$16y = 16$$

$$y = 1$$

$$OB^2 = OC^2$$

$$(x + 2)^2 + (y + 3)^2 = (x - 2)^2 + (y + 3)^2$$

$$8x = 0$$

$$x = 0$$

$$O(x, y) = O(0, 1)$$

59. If two dice are thrown together, the probability that the difference of the numbers appearing on them is a prime number

1. $\frac{2}{9}$ 2. $\frac{4}{9}$ 3. $\frac{5}{12}$ 4. $\frac{17}{36}$

Sol.

(2)

Minimum difference 0

Maximum difference 5

Prime number between 0 and 5 are 2, 3, 5

Prime	Dice 1	Dice 2
2	3	1
	1	3
	4	2
	2	4
	5	3
	3	5
	6	4
	4	6
3	4	1
	1	4
	5	2
	2	5
	6	3
	3	6
5	1	6
	6	1

So total cases = 16

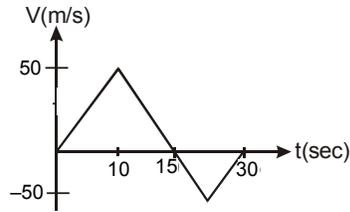
Total possible outcomes = $6 \times 6 = 36$

$$\text{Required probability} = \frac{16}{36} = \frac{4}{9}$$

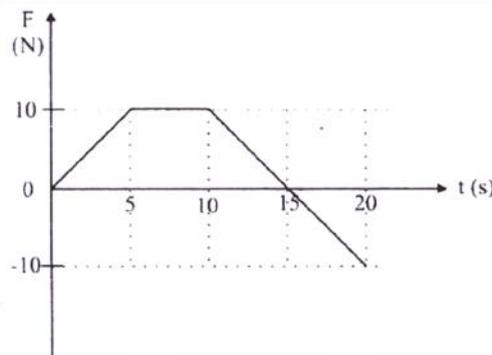
62. What is the total distance travelled by the particle during 30 s ?
 1. 0 m 2. 500 m 3. 750 m 4. 1000 m

Sol. (3)

$$\text{Total distance} = \frac{1}{2}(15)(50) + \left| \frac{1}{2}(15)(-50) \right| = 750 \text{ m}$$



63. An object of mass 2 kg moving under the action of a force which varies with time as shown in the figure.



Which one of the following statements is correct for the interval from 0 to 20 s ?

1. The momentum of the object decreases by 75 kg m/s.
2. The momentum of the object increases by 75 kg m/s.
3. The momentum of the object increases by 125 kg m/s.
4. The change in momentum cannot be found as initial speed is unknown.

Sol. (2)

$$\text{From graph } \Delta P = \frac{1}{2}(15+5)10 - \frac{1}{2}(10)5 = 75 \text{ kg m/s}$$

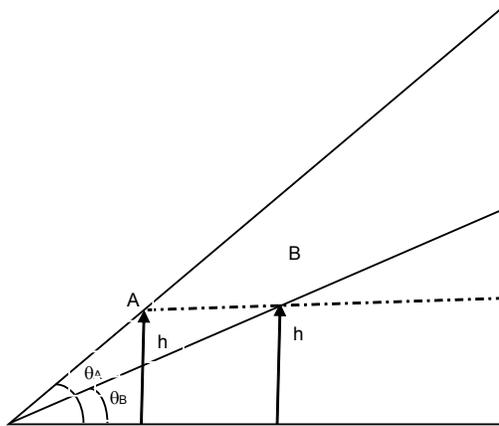
Momentum of object increases by 75 kgm/s

64. Two cars 'A' and 'B' of same mass start from the same location at the same time but on different straight roads. Car 'A' travels on a road that has greater angle of inclination with horizontal compared to the road on which 'B' travels.

At any instant both cars 'A' and 'B' have the same height above the starting point. If E_A and E_B are total energies of cars 'A' and 'B' respectively, then

1. $E_A < E_B$
2. $E_A = E_B$
3. $E_A > E_B$
4. Relation between E_A and E_B cannot be decided based on given information.

Sol. (1)



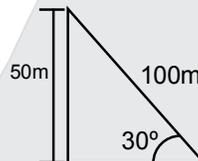
According to the figure $\theta_A > \theta_B$

At any instant height is same so potential energy will be same but B covers more distance in same time so speed of B will be more hence kinetic energy of B will be more. Mechanical energy of A will be less than that of B

65. The gravitational potential energy difference per unit mass between the surface of a planet and a point 100 m above it is 1000 J/kg. How much work is required to be done in moving a 5 kg object 100 m on a slope at 30° to the horizontal on this planet ?
1. 1250 J 2. 2500 J 3. 4350 J 4. 5000 J

Sol. (2)

Since h is only 100 m. so difference in gravitational potential energy = mgh.
or difference gravitational potential energy per unit mass,
= gh = 1000 (given)



where $h = 100 \text{ m}$

$$\therefore g = 10 \text{ m/s}^2$$

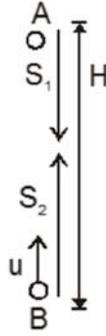
$$\text{Now work done} = mgh' = 5 \times 10 \times 50 = 2500 \text{ J}$$

Direction : (Question 66 - 67)

Two identical objects A and B each of mass m start moving along the same vertical line in opposite directions at the same instant. Object A is dropped from rest from a height H above the ground and object B is projected vertically upward from the ground with speed $u = \sqrt{2gH}$

66. At what height above the ground do they collide?
1. $(1/4) H$ 2. $(1/2) H$ 3. $(2/3) H$ 4. $(3/4) H$

Sol. (4)



$$S_1 = H - h = \frac{1}{2} g t^2 \quad \dots (1)$$

$$S_2 = h = ut - \frac{1}{2} g t^2 \quad \dots (2)$$

$$(1) \ \& \ (2) \quad H = ut \Rightarrow t = \frac{H}{u}$$

$$h = H - \frac{1}{2} g \frac{H^2}{u^2} \quad u = \sqrt{2gH}$$

$$= H - \frac{H}{4} = \frac{3H}{4}$$

67. After they collide, they stick to each other. What is the loss in their total energy?
 1. 0 2. (1/2) mgH 3. (3/2) mgH 4. 2 mgH

Sol. (2)

$$v_1^2 = 2gH - 2g\left(\frac{3H}{4}\right) = \frac{gH}{2} \Rightarrow v_1 = \sqrt{\frac{gH}{2}}$$

$$v_2 = \sqrt{2gh} = \sqrt{2g \frac{H}{4}} = \sqrt{\frac{gH}{2}}$$

$$U_1 = 0 \quad U_2 = m gH$$

$$K_1 = mgH \quad K_2 = 0$$

$$TE_i = 2 mgH$$

From momentum conservation at time of collision

$$m v_1 - m v_2 = 2 m v'$$

$v' =$ Common velocity after collision $= 0$

$$TE_f = 2mg \frac{3H}{4} = \frac{3mgH}{2}$$

$$\Delta TE = \frac{3mgH}{2} - 2mgH = \frac{-mgH}{2}$$

68. Given below are two different graphs of variation of density (or pressure) of the medium with position (fig. 1) and with time (fig. 2) as a wave passes through the medium.

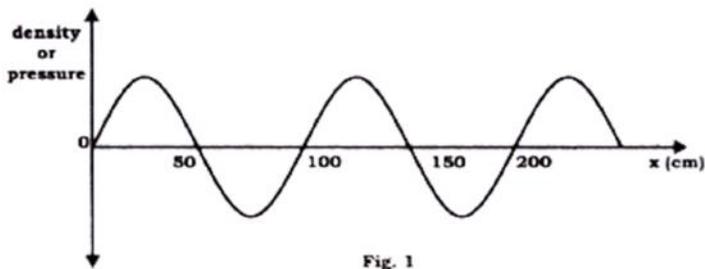


Fig. 1

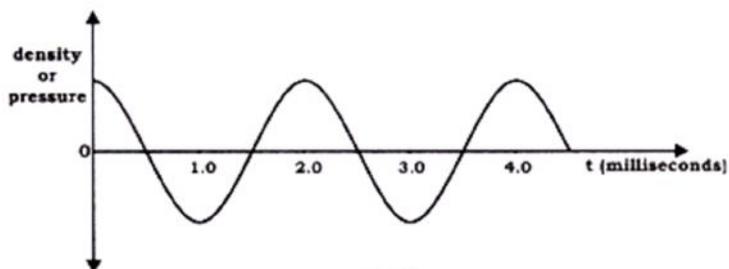


Fig. 2

What will be the speed of the wave in the given medium?

1. 25 m/s 2. 50 m/s 3. 250 m/s 4. 500 m/s

Sol. (4)

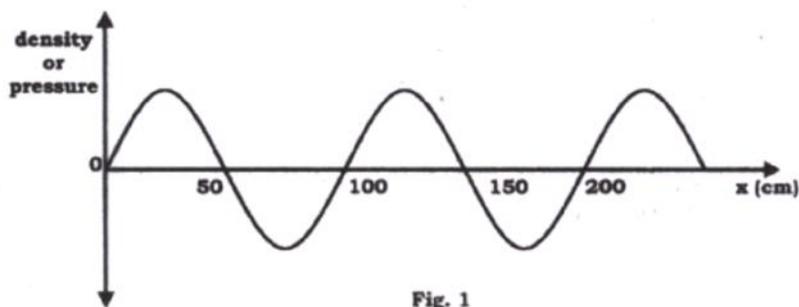


Fig. 1

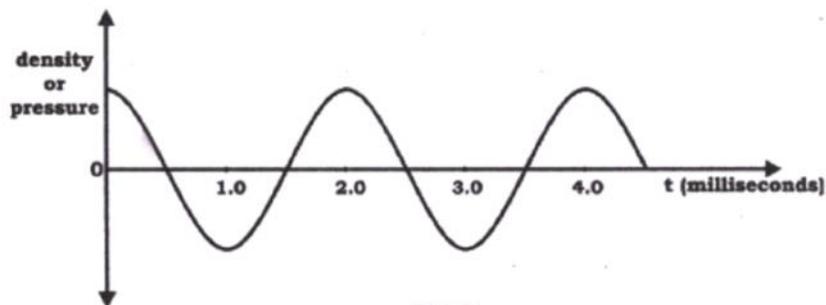


Fig. 2

From graph :

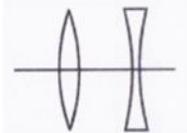
Time period = 2 ms

$\lambda = 100$ cm

$$\text{So } c = \frac{\lambda}{T} = \frac{100}{2 \times 10^{-3}} = 50 \times 10^3 \text{ cm/s}$$

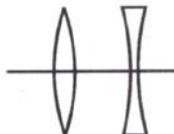
$$c = 500 \text{ m/s}$$

69. A convex lens and a concave lens, each of focal length 10 cm, are kept separated by a distance of 2 cm as shown in the figure. If the light is incident from left, the combinations of lenses will be _____.



1. Converging
2. Diverging
3. Behaving like a glass slab
4. Converging or diverging depending on whether the lenses are arranged as shown in the figure or in the reverse order.

Sol. (1)



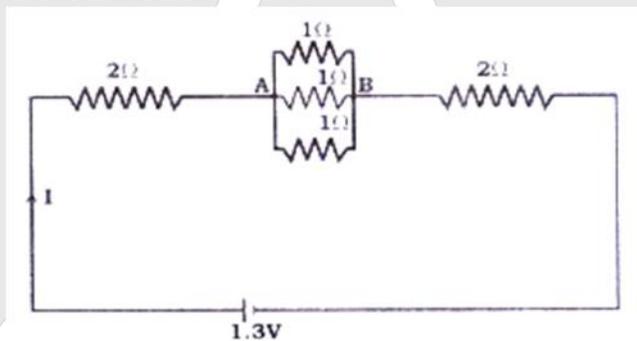
Equivalent focal length of combination

$$\frac{1}{F_{eq}} = \frac{1}{F_1} + \frac{1}{F_2} - \frac{d}{F_1 F_2}$$

$$= \frac{1}{10} - \frac{1}{10} - \frac{2}{10 \times (-10)} = \frac{2}{100} = 0.02 \text{ cm}$$

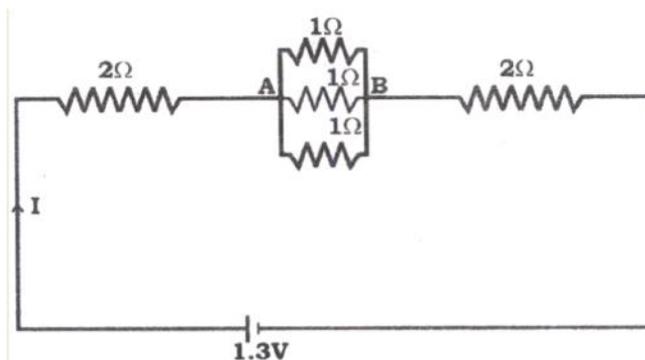
So, this combination behave as converging lens.

70. In the circuit given, the ratio of work done by the battery to maintain the current between point A and B to the work done for the whole circuit is



1. $\frac{1}{117}$
2. $\frac{1}{13}$
3. $\frac{1}{12}$
4. 1

Sol. (2)



Total current of circuit

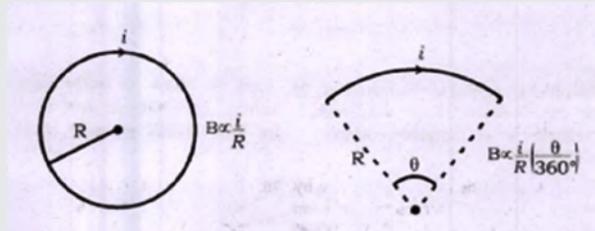
$$I = \frac{V}{R_{\text{equ}}} = \frac{1.3}{2 + \frac{1}{3} + 2} = \frac{1.3 \times 3}{6 + 1 + 6} = \frac{1.3 \times 3}{13} = 0.3 \text{ A}$$

Now P.d. between A and B $V_1 = IR_{AB}$
 $= 0.3 \times \frac{1}{3} = 0.1 \text{ Volt}$

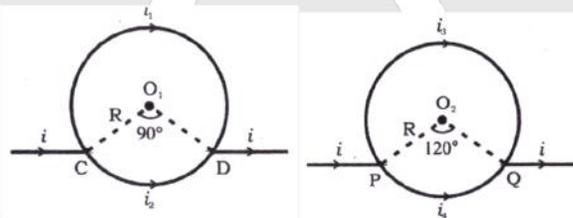
So Ratio of work done

$$\frac{W_1}{W_2} = \frac{V_1 I}{V I} = \frac{0.1}{1.3} = \frac{1}{13}$$

71. Magnetic field at the centre of a circular coil of radius R carrying current i is $B \propto \frac{i}{R}$ and its direction is given by right-hand thumb rule. Magnetic field at the centre of a circular arc subtending an angle θ (in degree) is $B \propto \frac{i}{R} \left(\frac{\theta}{360^\circ} \right)$ and its direction can be found using right hand rule.

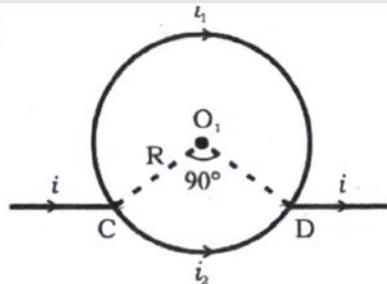


Consider two circular coils made of uniform conductors as shown in figure 3 and 4. In figure 3 points C and D are diametrically opposite to each other, and in figure 4 $\angle PO_2Q = 120^\circ$. Then magnetic fields _____.



1. At both O_1 and O_2 are zero
2. At both O_1 and O_2 are non-zero
3. is zero at O_1 but non-zero at O_2
4. is non-zero at O_1 but zero at O_2 .

Sol. (1)



$$B_1 = k \frac{i_1}{R} \frac{270}{360}$$

$$B_2 = k \frac{i_2}{R} \frac{90}{360}$$

So net MF at O_1 ,

$$B = B_2 - B_1$$

$$= \frac{K}{R} \left(\frac{1}{4} i_2 - \frac{3}{4} i_1 \right)$$

$$= \frac{K}{4R} [i_2 - 3i_1]$$

Now we know for parallel combination

$$I_1 R_1 = I_2 R_2$$

$$I_2 \left(\frac{R}{360} \times 90^\circ \right) = I_1 \left(\frac{R}{360} \times 270 \right)$$

$$\frac{I_2}{4} = \frac{3I_1}{4}$$

$$I_2 = 3I_1$$

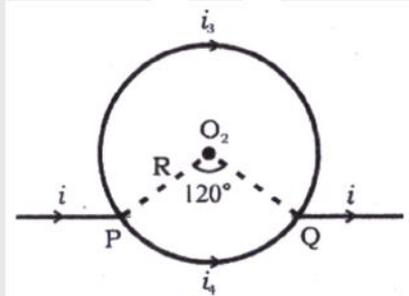
So

$$B = \frac{K}{4R} [3I_1 - 3I_1]$$

So, B at O_{SS1}

$$B = 0$$

Similarly



B at O_2

$$B = \frac{K}{R} \left[\frac{I_4}{3} - \frac{2}{3} I_3 \right]$$

$$B = \frac{K}{3R} [I_4 - 2I_3]$$

Now we know for parallel combination

$$I_3 \left[\frac{R}{360} \times 240 \right] = I_4 \left(\frac{R}{360} \times 120 \right)$$

$$\frac{2I_3}{3} = \frac{I_4}{3}$$

$$I_4 = 2I_3$$

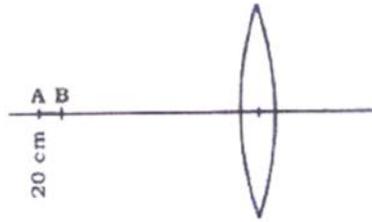
So B at O_2

$$B = \frac{K}{3R} [2I_3 - 2I_3] = 0$$

So, w

Net MF at O_1 and O_2 are zero

72. A pin AB of length 2 cm is kept on the axis of a convex lens between 18 cm and 20 cm as shown in figure. Focal length of convex lens is 10 cm. Find magnification produced for the image of the pin.



1. 0.83 2. 1.00 3. 1.25 4. 6.78

Sol. (3)

Image of A is formed at 20 cm (v_1) and for point B

$$u_2 = -18 \text{ cm}, \quad f = 10 \text{ cm}$$

$$\frac{1}{f} = \frac{1}{v_2} - \frac{1}{u_2}$$

$$v_2 = \frac{fu_2}{f + u_2} = \frac{10 \times -18}{10 - 18} = \frac{-10 \times 18}{-8}$$

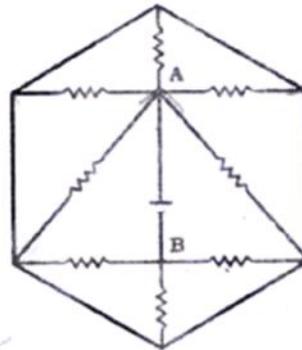
$$v_2 = 22.5 \text{ cm}$$

$$\text{Image length} = 22.5 - 20 = 2.5 \text{ cm}$$

and linear magnification

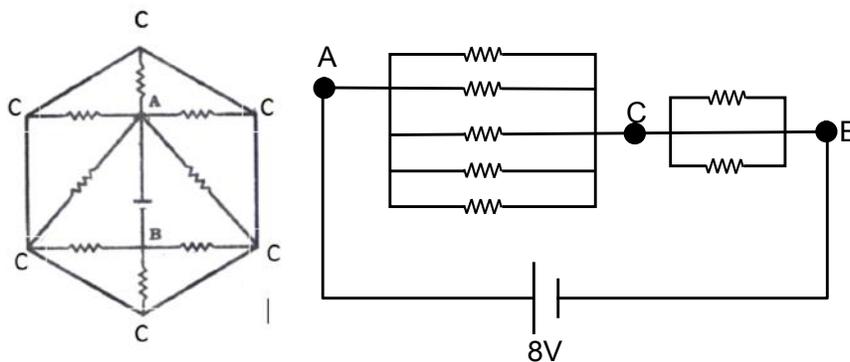
$$m = \frac{h_2}{h_1} = \frac{2.5}{2} = 1.25$$

73. What is the current supplied by the battery in the circuit shown below? Each resistance used in circuit is of $1k\Omega$ and potential difference $V_{AB} = 8 \text{ V}$.



1. 64 mA 2. 15 mA 3. 9.87 mA 4. 1 mA

Sol. (2)



$$R_{AB} = \frac{1}{\frac{1}{5} + \frac{1}{3}} = \frac{3+5}{15} = \frac{8}{15} \text{ k}\Omega$$

$$I = \frac{V_{AB}}{R_{AB}} = \frac{8}{\frac{8}{15} \times 10^3} = 15 \times 10^{-3} = 15 \text{ mA}$$

74. Read the following statements.

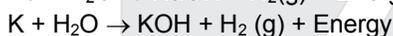
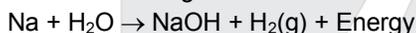
Statement - I : Sodium metal reacts violently with water to produce heat and fire.

Statement - II : Potassium metal reacts violently with water to form potassium hydroxide and hydrogen gas.

Select the correct answer from the options given below

1. Statement-I is true, Statement II is false
2. Statement-I is false, Statement II is true
3. Both statements are true, and Statement II provides correct explanation to Statement-I
4. Both statements are true, and Statement II does not provides correct explanation to Statement-I

Sol. Na and K are high reactive metal and reacts violently with water.



Ans 4

75. You are provided with 18 g each of O_2 , N_2 , CH_4 and H_2O . Which of the following is the correct decreasing order of number of atoms present in these samples ?

1. $\text{CH}_4 > \text{H}_2\text{O} > \text{N}_2 > \text{O}_2$
2. $\text{O}_2 > \text{N}_2 > \text{H}_2\text{O} > \text{CH}_4$
3. $\text{CH}_4 > \text{N}_2 > \text{O}_2 > \text{H}_2\text{O}$
4. $\text{N}_2 > \text{H}_2\text{O} > \text{O}_2 > \text{CH}_4$

Sol.

	O_2	N_2	CH_4	H_2O
Given mass	18 g	18 g	18 g	18 g
Number of Mole	$\frac{18}{32}$	$\frac{18}{28}$	$\frac{18}{16}$	$\frac{18}{18}$
Number of atoms	$\frac{18}{32} \times 2 \times N_A$ = $1.125 N_A$	$\frac{18}{28} \times 2 \times N_A$ = $1.285 N_A$	$\frac{18}{16} \times 5 \times N_A$ = $5.625 N_A$	$\frac{18}{18} \times 3 \times N_A$ = $3 N_A$

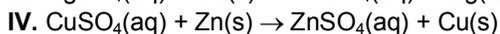
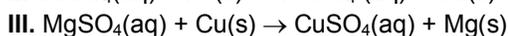
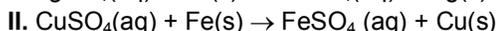
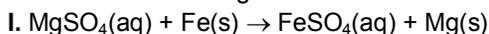
$$N_A = 6.023 \times 10^{23}$$

\therefore decreasing order of number of atoms is $\text{CH}_4 > \text{H}_2\text{O} > \text{N}_2 > \text{O}_2$

Ans 1



79. Which of the following set of reactions will **NOT** occur ?



1. I and III

2. II and IV

3. I, II and III

4. II, III and IV

Sol. More reactive metal can displace less reactive metal from its salt solution. According to activity series:

Reactivity order of following metal will be

$\text{Mg} > \text{Zn} > \text{Fe} > \text{Cu}$

Ans. 1

80. Two organic compounds 'A' and 'B' react with sodium metal and both produce the same gas 'X', but with sodium hydrogen carbonate only compound B reacts to give a gas 'Y'. Identify 'A', 'B', 'X' and 'Y':

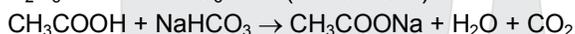
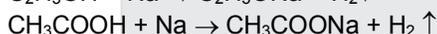
1. A = Ethylene, B = Ethyl Alcohol, X = Carbon dioxide, Y = Hydrogen

2. A = Ethyl Alcohol, B = Acetic acid, X = Hydrogen, Y = Carbon dioxide

3. A = Methyl alcohol, B = Ethyl alcohol, X = Hydrogen, Y = Carbon dioxide

4. A = Acetic acid, B = Formic acid, X = Carbon dioxide, Y = Hydrogen

Sol. $\text{C}_2\text{H}_5\text{OH} + \text{Na} \rightarrow \text{C}_2\text{H}_5\text{ONa} + \text{H}_2\uparrow$



Ans. 2

81. Consider the elements A, B, C and D with atomic numbers 11, 12, 16 and 17, respectively. Which among the following statements regarding these elements are correct ?

I. The element C will gain electron more easily than element D

II. The element B tends to lose electron more readily than C.

III. The oxide of A will be least basic while that of D will be most basic

IV. The energy required to remove an electron from outermost shell from A will be minimum while that from D will be maximum.

1. I and III only

2. I and IV only

3. II and III only

4. II and IV only

Sol.

	Atomic number	Element
A	11	Na
B	12	Mg
C	16	S
D	17	Cl

A

11

Element

Na

B

12

Mg

C

16

S

D

17

Cl

A & B will show metallic properties while C & D will show non metallic properties

Ans 4

82. The following observations are given for four metals :

I. Metal H does not react with dilute HCl

II. Metal K reacts with warm water

III. Metal L does not react with water but displaces metal H from its aqueous salt solution

IV. Metal M reacts with cold water

Choose the correct decreasing order of reactivity of these metals amongst the following :

1. $\text{M} > \text{L} > \text{H} > \text{K}$

2. $\text{K} > \text{M} > \text{H} > \text{L}$

3. $\text{M} > \text{K} > \text{L} > \text{H}$

4. $\text{L} > \text{H} > \text{K} > \text{M}$

Sol. M → React with cold water [Most reactive]

K → React with Hard water [Most reactive]

L → Do not react with water but do react with salt solution

H → Do not react with dil. acid

∴ decreasing order of reactivity of these metals $\text{M} > \text{K} > \text{L} > \text{H}$

Ans. 3

83. Match chemical reactions given in the list-I with the type of chemical reactions given in List-II and select the correct answer using the options given below

List-I (Chemical Reactions)	List-II (Type of Chemical Reactions)
A. Formation of NH_3 from N_2 and H_2	I. Decomposition
B. Calcination of zinc carbonate	II. Double displacement
C. Reaction of aqueous BaCl_2 solution with dilute H_2SO_4	III. Combination
D. Rancidity of oils	IV. Redox
	V. Displacement

1. A-I, B-V, C-III, D-IV

2. A-III, B-IV, C-V, D-I

3. A-IV, B-III, C-V, D-I

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

Sol.

A. Formation of NH_3 from N_2 & H_2 – Combination

B. Calcination of zinc carbonate – decomposition

C. Reaction of aqueous solution of BaCl_2 with H_2SO_4 – Double displacement

D. Rancidity of oil – Redox

Ans. 4

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

Sample	With blue Litmus solution	With Red Litmus solution	With phenolphthalein solution
A	No change	No change	No change
B	Turns red	No change	No change
C	No change	Turns blue	Turns pink

On the basis of above observations, identify A, B and C from the following options :

1. A = NH_4Cl , B = NaCl , C = CH_3COONa

2. A = NH_4Cl , B = CH_3COONa , C = NaCl

3. A = NaCl , B = NH_4Cl , C = CH_3COONa

4. A = CH_3COONa , B = NH_4Cl , C = NaCl

Sol.

A = NaCl – Neutral salt (No change)

B = NH_4Cl acidic in nature (Turn blue litmus to red)

C = CH_3COONa – Basic in nature (Turns Red litmus to blue)

Ans 3

85. Match List-I (Mixture to be separated) with the List-II (method used) and select the correct answer using the options given below :

List-I (Mixture to be separated)	List-II (Methods Used)
A. Liquid N_2 and liquid O_2	I. Chromatography
B. Red and Blue inks	II. Sublimation
C. Solution of NaCl in water	III. Fractional Distillation
D. Naphthalene and NaCl	IV. Evaporation
	V. Crystallisation

1. A-I, B-II, C-IV, D-V

2. A-III, B-V, C-II, D-IV

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

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

Sol.

Liquid N_2 and liquid O_2 - Fractional Distillation

Red and Blue inks - Chromatography

Solution of NaCl in water - Evaporation

Naphthalene and NaCl - Sublimation

Ans 3

86. Select the correct set of statements regarding change in properties, as we move down the second group in periodic table.
- I. Atomic size increases
 - II. Electronegativity increases.
 - III. Tendency to lose electrons increases
 - IV. Valency remains same
1. I, II and III 2. II, III and IV 3. I, II and IV 4. I, III and IV

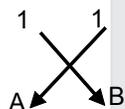
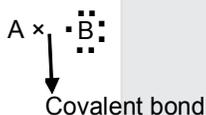
Sol. As we know that as we move down in a group in periodic table Atomic size increases, Tendency to lose electron increases, Valency remains same.
Ans 4

87. Which of the following options containing formula bonding and nature of aqueous solution respectively is correct for the compound formed by two elements A and B having atomic numbers 1 and 17 respectively ?
1. AB, Ionic, Acidic 2. AB₂, Ionic, Basic 3. AB, Covalent, Acidic 4. AB₂ Covalent, Neutral

Sol.

	A	B
Atomic number	1	17
Electronic Configuration	1	2, 8, 7
Valency	1	1

Both A and B requires one electron to complete their outermost shell



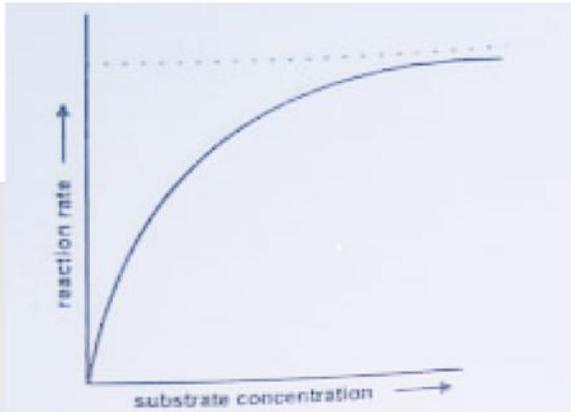
∴ The formula of the compound is AB, Its nature is covalent and its aqueous solution is acidic in nature.

Ans 3

88. Choose one of the following alternative statements given below which correctly explain the process of osmosis.
1. Movement of water from regions of concentrated to dilute solution.
 2. The passage of solute from weak solution to strong solution through a selectively-permeable membrane.
 3. A passive transport of a solvent through a selectively – permeable membrane from a region of low solute concentration to a region of high solute concentration.
 4. An energy – dependent transport of a solvent through a selectively – permeable membrane from region of low solute concentration to a region of high solute concentration.
89. In meiosis, each of the four daughter cells has one set of chromosomes. Due to randomness of process of chromosome separation in meiosis, large number of chromosome combinations can form gametes. How many such chromosome combinations in the gametes are possible in case of humans, assuming there is no crossing – over taking place ?
1. 2²² 2. 2²³ 3. 2⁴⁶ 4. 2³⁴
90. Sclerenchyma in plants is an example of simple permanent tissue comprising of two types of cells, sclereids and fibres. Why these cells are functionally important to the plants even after they die ? Choose the correct alternative from the options given below.
1. Both are thin walled cells lacking intercellular spaces.
 2. Walls in both the types of cells are thick and cutinized.
 3. Walls in both the cell types are thick and usually lignified.
 4. Both the cells are used for conducting solutes and providing strength to the plant.



91. Which one of the following organisms has a cellular respiratory pigment dissolved in plasma and is also a predaceous carnivore and shows matriphagy ?
 1.Scorpion 2.Cockroach 3.Earthworm 4.Sea cucumber
92. Lichens are sensitive to certain air pollutants and are often replaced by other plants. From the given options choose the best combination of sensitivity and replacement of lichens.
 1.Sulphur dioxide and moss 2.Sulphur dioxide and algae
 3.Carbon dioxide and ferns 4.Sulphur dioxide and grass
93. A student was performing an experiment to understand the enzyme-substrate reaction. The student measured the formation of coloured product using a colorimeter. The student plotted the graph below which shows the reaction rate versus the substrate concentration.



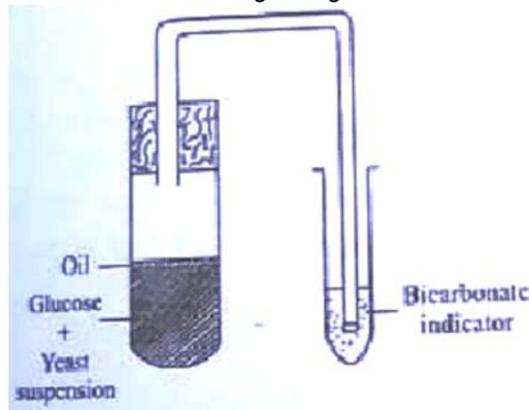
Following interpretations were drawn by the student :

- A. The higher concentration of substrate acts as an enzyme inhibitor.
 B. It is a sigmoidal curve with sharp transition from low to high reaction rates over the increasing substrate concentration.
 C. The curve reaches a plateau and does not further increase with increasing substrate concentrations due to saturation of enzyme with the substrate.

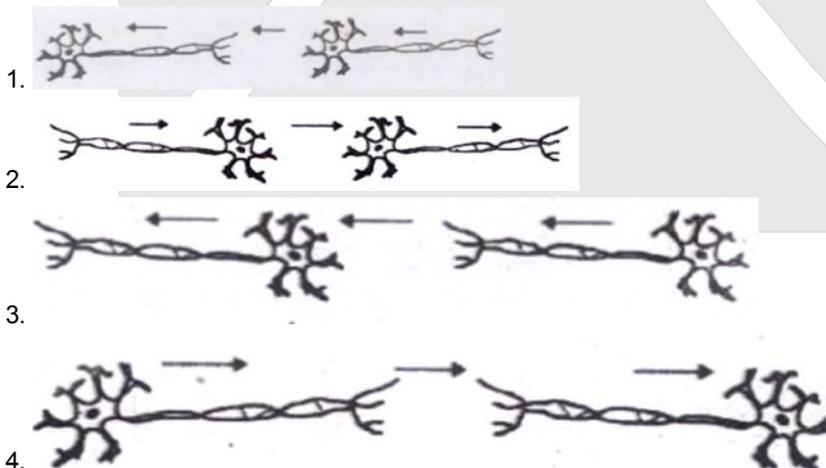
Choose which of the interpretations of the graph are correct.

1. A and B 2. A and C 3. B only 4. B and C
94. Glucose is the prime source of energy in our body. However, it is stored in the form of glycogen in the muscle and liver of animals and in the form of starch in plants. As a result, every time a cell requires glucose, it must hydrolyze glycogen which is an energy consuming process. Why does the cell store glycogen instead of glucose in free form ?
 1. Glycogen is more compact and more hydrophilic.
 2. Storage of glucose in free form will consume more ATP.
 3. Glucose in the free form creates more osmotic pressure.
 4. Glucose is highly reactive molecule hence storing in the free form can result in unwanted reactions in the cells.

95. The figure given below is designed to show yeast respiration. In one of the tubes, there is yeast suspension in glucose solution. This solution was boiled before yeast was added to it. Which one of the following is the possible reason for boiling of sugar solution?



1. To ensure aerobic fermentation.
 2. To provide the initial warmth for the yeast to become active.
 3. To remove the dissolved oxygen and carbon dioxide from the solution.
 4. To remove dissolved carbon dioxide and trap the oxygen from the atmosphere.
96. A squirrel was eating a fruit on the ground. Suddenly it was attacked by a dog. The squirrel rushed to the tree immediately and saved itself from the dangerous attack. What immediate changes are most likely to have taken place in the body of the squirrel ?
- A. Blood flows to the stomach for rapid digestion.
 - B. Adrenaline was secreted in the blood by the adrenal glands.
 - C. Heart beat becomes faster and pumps more blood so that muscles get more oxygen
 - D. Adrenocorticotrophic hormone is secreted in the blood and blood flows more towards the vital organs.
- Select the correct combination of options given below.
1. A and B 2. A and C 3. B and C 4. C and D 0
97. Stimulus from the environment is detected by the nerve cells. The stimulus acquired is transmitted in the form of electrical impulse. From the options given below choose the correct scheme showing the direction in which the nerve impulse travels. (Arrows shows the direction of impulse flow).



98. "Double fertilization" is a complex mechanism of flowering plants that is also unique to angiosperms. Choose the most appropriate statement from the options listed below that explains this phenomenon.
1. Fertilization in two flowers of the same plant forming endosperms.
 2. Two male gametes fertilize two eggs inside the ovule as a result the ovary gives rise to bigger fruits.
 3. Two fertilizations occur in a flower-one fertilization results in the formation of a diploid zygote and the second fertilization results in the formation of a triploid endosperm.
 4. Two pollen grains sending two pollen tubes inside the ovary, resulting in the formation of two seeds inside the fruit.
99. It is generally observed that malaria is rampant in areas where construction work and/or stagnant water are usually seen. Plasmodium species are known to cause malaria. The parasite when injected by the mosquito into the human blood stream goes through specific life cycle stages. Select from below the correct sequence of stages.
1. Mosquito (sporozoites) → human liver (merozoites) → human RBC (Gametes) → mosquito (zygote-oocyst-sporozoites)
 2. Mosquito (merozoites) → human RBC (Gametes) → human liver (sporozoites) → mosquito (oocyst - zygote - sporozoites)
 3. Mosquito (merozoites) → human liver (sporozoites) → human RBC (Gametes) → mosquito (oocyst - zygote - sporozoites)
 4. Mosquito (sporozoites) → human liver (sporozoites) → human RBC (merozoites) → mosquito (zygote-oocyst-sporozoites)
100. A plant with red coloured flowers is crossed with a plant having white flowers. The red and white colour of the flower is controlled by a single gene. Red is dominant over white. The F₁ progeny is self-pollinated and the flower colour in F₂ is observed. Given the above information. What is the expected phenotypic ratio of plants with different flower colours ?
1. All plants with red flowers.
 2. Red : white in the ratio of 3 : 1.
 3. Pink : white in the ratio of 3 : 1
 4. Red : pink : white in a ratio of 1 : 2 : 1.



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