Agniveer Army GD 4th June 2026 (Shift 1) Memory-Based Paper (Previous Year Paper)

Army GD Agniveer • 2026 • 50 questions • 60 minutes • Answer key and solutions

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GENERAL KNOWLEDGE

Q1. Which Schedule of the Indian Constitution deals with Municipalities?

(a) Tenth
(b) Twelfth
(c) Ninth
(d) Eleventh

Q2. Which Indian islands are located in the Bay of Bengal?

(a) Andaman and the Nicobar Islands
(b) Lakshadweep Islands
(c) Maldives
(d) Aminidivi Islands

Q3. When was the Constitution of India enacted by the Constituent Assembly?

(a) 26 January, 1950
(b) 26 November, 1949
(c) 26 January, 1949
(d) 20 January, 1949

Q4. By which amendment act, Unity and intergrity of the nation was substituted?

(a) 32nd
(b) 75nd
(c) 42nd
(d) 68th

Q5. Whose birth anniversary is celebrated as National Unity Day every year in India?

(a) Dadabhai Naoroji
(b) Rajiv Gandhi
(c) Vallabhbhai Patel
(d) Maulana Abul Kalam Azad

Q6. Where was the first session of the Indian National Congress held in December 1885?

(a) Calcutta
(b) Bombay
(c) Lahore
(d) Madras

Q7. At which of the following places Mangal Pandey was hanged till death for attacking his officers?

(a) Chandigarh
(b) Barrackpore
(c) Delhi

(d) Lucknow

Q8. From which place did the Revolt of 1857 start?

(a) Agra
(b) Meerut
(c) Kanpur
(d) Delhi

Q9. Which of the following is not a part of the Lal-Bal-Pal group related to the Indian freedom struggle?

(a) Bal Gangadhar Tilak
(b) Lala Lajpat Rai
(c) Bipin Chandra Pal
(d) Lala Hardayal

Q10. Which of the following coastal lakes is located in Kerala?

(a) Kolleru
(b) Pulicat
(c) Vembanad
(d) Chilika

Q11. Which of the following makes India's maritime boundary with Myanmar ?

(a) Eight Degree Channel
(b) Great Channel
(c) Coco channel
(d) None of these

Q12. What is the name of joint bi-annual military exercise conducted by India and Russia?

(a) VAJRA
(b) INDRA
(c) CHAKRA
(d) DHANUSH

Q13. The yellow ring in the Olympic flag represents which continent?

(a) America
(b) Africa
(c) Asia
(d) Europe

Q14. Brihadiswara Temple located in which of the following state?

(a) Maharashtra
(b) Kerala
(c) Tamil Nadu
(d) Madhya Pradesh

Q15. Which of the following rivers falls into Arabian Sea?

(a) Godavari
(b) Krishna
(c) Cauvery
(d) Narmada

GENERAL SCIENCE

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Q16. Name the metal used for coating on iron to prevent rusting.

(a) Zinc
(b) Sodium
(c) Copper
(d) Gold

Q17. A rainbow is formed in the sky after rain, which is due to _____.

(a) refraction and dispersion of light by raindrops
(b) scattering of light by air
(c) absorption of light by water
(d) reflection only

Q18. Which of the following is not a correct example of muscular force?

(a) A person lifting a bucket of water placed on the ground with both his hands.
(b) A person lifting a book on the table with both his hands.
(c) A person stops rowing a boat with both his hands then boat stops after travelling some distance in the water.
(d) A person pushing a table placed on the floor with both his hands.

Q19. Which among the following methods is best for separating husk from grain?

(a) winnowing
(b) threshing
(c) Sieving
(d) Handpicking

Q20. Which of the following nutrients provides energy to the body?

(a) Fat
(b) Zinc
(c) Vitamin A
(d) Vitamin D

Q21. What is the motion of an object in a specified direction called?

(a) Speed
(b) Displacement
(c) Velocity
(d) Movement

Q22. Heating effect produced by current is due to the _____.

(a) Collision of electrons
(b) Movement of electrons
(c) Resistance in electrons
(d) Lose of energy

Q23. Which of the following reproductive method will generate greater diversity in population?

(a) Fragmentation
(b) Budding
(c) Binary fission
(d) Sexual reproduction

Q24. Carbon dioxide is transported to the lungs from all parts of the body through _____ in humans.

(a) Sweat
(b) Mucus
(c) Blood
(d) Lymph

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Q25. Which of the following instrument is used to measure sound under water?

(a) Hydrophone
(b) Hygroscope
(c) Hypsometer
(d) Machmeter

Q26. A device used for converting AC into DC is called

(a) Transformer
(b) Rectifier
(c) Induction coil
(d) Dynamo

Q27. Influenza disease is caused by which of the following?

(a) Bacteria
(b) Virus
(c) Fungi
(d) Protozoan

Q28. _____ controls involuntary activities like coughing and sneezing.

(a) Medulla
(b) Cerebrum
(c) Pons
(d) Cerebellum

Q29. Which of the following solutions in water do not conduct electricity?

(a) Lemon juice
(b) Sugar solution
(c) Caustic soda solution
(d) Common salt solution

Q30. Which of the following is called 'Pearl ash'?

(a) Na_2CO_3
(b) $NaHCO_3$
(c) K_2CO_3
(d) $CaCO_3$

MATHEMATICS

Q31. If a : b = 9 : 5, b : c = 4 : 11, Find a : c

(a) 36 : 55
(b) 26 : 55
(c) 36 : 53
(d) 35 : 52

Q32. The square root of $7 + 4\sqrt{3}$ is:

(a) $2 + \sqrt{3}$
(b) $2 - \sqrt{3}$
(c) $\sqrt{7} + 2\sqrt{3}$
(d) $\sqrt{7} - 2\sqrt{3}$

Q33. The sum of the interior angles of a quadrilateral is equal to:

(a) 180°
(b) 270°
(c) 390°
(d) 360°

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Q34. Simplify the expression $5 + 2 \times (9 - 4)^2 \div 5$.

(a) 15
(b) 12
(c) 11
(d) 7

Q35. In a group of fifty students, the average score is 70. If the average score of 30 boys is 75, then find the average score of the 20 girls.

(a) 65.9
(b) 60.1
(c) 62.5
(d) 68.2

Q36. One bell rings for every 6 minutes. Another bell rings every 8 minutes. The third bell rings every 9 minutes. After how many minutes all the three bells will ring together?

(a) 72 minutes
(b) 144 minutes
(c) 432 minutes
(d) 216 minutes

Q37. A game card is 100 cm by 50 cm. What is its perimeter?

(a) 300 cm
(b) 240 cm
(c) 425 cm
(d) 500 cm

Q38. The value of an item falls from Rs. 8000 to Rs. 7200. What is the percentage decrease?

(a) 8%
(b) 9%
(c) 10%
(d) 12%

Q39. If A : B = 5 : 3, then what is the value of (A + B) : (A - B)?

(a) 4 : 1
(b) 2 : 1
(c) 4 : 3
(d) 8 : 3

Q40. The sum of two positive numbers is 45 and their difference is 19. What are the numbers?

(a) 32, 13
(b) 30, 15
(c) 31, 15
(d) 25, 20

Q41. A car travels from A to B at 80 km/h and returns at 60 km/h. Find the approx. average speed of the car.

(a) 68.57 km/h
(b) 58.57 km/h
(c) 58.58 km/h
(d) 48.48 km/h

Q42. If the perimeter of a square is 25 cm, then how long is each side?

(a) 6.25 cm
(b) 10 cm
(c) 7.5 cm
(d) 5 cm

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Q43. If an item marked at Rs. 4,000 is sold for Rs. 280, then what is the discount percentage?

(a) 91%
(b) 95%
(c) 94%
(d) 93%

Q44. In what duration (in years) will Rs. 9,000 fetch a simple interest of Rs. 720 at 4% per annum rate of interest?

(a) 2
(b) 1
(c) 4
(d) 3

Q45. Evaluate: $5 \times 4 + (3 + 4)^2 \div 7 \times 4$

(a) 47
(b) 46
(c) 48
(d) 49

LOGICAL REASONING

Q46. In a certain language "TABLE" is coded as "ABELT" then how "APPLE" is coded in that language?

(a) AELPP
(b) APPEL
(c) PAPLE
(d) LPPEA

Q47. Select the word pair in which the two words are related in the same way as the two words in the following word-pair.
Five : Pentagon

(a) Four : Rectangle
(b) Triangle : Three
(c) Square : Four
(d) Septagon : Seven

Q48. The 12^(th) letter to the right of the 6th letter from the left side is:
T H I S K D O W P A N E C M X U Z R B

(a) B
(b) R
(c) M
(d) C

Q49. In a certain code language, '12-28-15-26' is written as '25-57-31-53'. What will be the code for '13-33-22-21' in that code language?

(a) 26-66-44-42
(b) 27-67-43-43
(c) 27-67-45-42
(d) 27-67-45-43

Q50. Five toys A, B, C, D and E are kept one above the other (not necessarily in the same order). A is four places above C. D is between B and E. E is three places below A. Three of the given four options follows a same logic based on their arrangement. Which of the following does not follow that logic?

(a) AC
(b) DE
(c) EC
(d) BD

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ANSWER KEY

1	b	2	a	3	b	4	c	5	c	6	b	7	b	8	b	9	d	10	c
11	c	12	b	13	c	14	c	15	d	16	a	17	a	18	c	19	a	20	a
21	c	22	a	23	d	24	c	25	a	26	b	27	b	28	a	29	b	30	c
31	a	32	a	33	d	34	a	35	c	36	a	37	a	38	c	39	a	40	a
41	a	42	a	43	d	44	a	45	c	46	a	47	a	48	b	49	d	50	a

SOLUTIONS

Q1. Answer: (b) Twelfth

• The twelfth schedule of the Indian Constitution deals with the Municipalities.

• It was inserted into the Constitution by the 74thAmendment Act, 1992.

• The Constitution provides for three types of Municipalities are Nagar Panchayat, Municipal Council and the Municipal Corporation

• The members of a municipality are generally elected by direct election.

Q2. Answer: (a) Andaman and the Nicobar Islands

Concept:

• An island is an isolated piece of land that is surrounded by water.

• Islands present a diversity of landforms.

• India has a total of 1382 offshore identified islands.

Explanation:

• India is a country of vast geographical expanse.

• In the north, it is bound by the lofty Himalayas.

• The Arabian Sea in the west, the Bay of Bengal in the east, and the Indian Ocean in the south.

• The Andaman and the Nicobar Islands lie to the southeast of the Indian mainland in the Bay of Bengal.

• Lakshadweep Islands are located in the Arabian Sea.

• These are coral islands located off the coast of Kerala.

• Across the sea to the south, lie our island neighbours Sri Lanka and the Maldives.

• The Aminidivi Islands, are one of the three island subgroups in the Union Territory of Lakshadweep, India.

Thus, the Andaman and the Nicobar Islands are located in the Bay of Bengal.

Q3. Answer: (b) 26 November, 1949

The correct answer is 26 November, 1949.

Key Points

• Constitution was adopted on November 26, 1949 and came into force on 26th January, 1950.

• The motion on Draft Constitution was declared as passed on November 26, 1949, and received the signatures of the members and the president.

Additional Information

• The Constituent Assembly was constituted in November 1946 under the scheme formulated by the Cabinet Mission Plan.

• The total strength of the Constituent Assembly was 389. 296 seats were allotted to British India and 93 seats to the Princely States.

• Seats allotted to British India were divided among Muslims, Sikhs and General (all except Muslims and Sikhs) in proportion to their population.

• Representatives of princely states were nominated by the heads of princely states.

• Constituent Assembly was partly elected and partly nominated body.

• The Constituent Assembly drafted the Constitution for an independent India after a careful study of precedents of foreign Constitutions.

• The Constituent Assembly worked for nearly three full years through committees and general sessions to draft the constitution.

• The Constitution was authenticated by the Chairman of the Constituent Assembly.

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Q4. Answer: (c) 42nd

• The correct answer is option 3, i.e., 42nd.

• By the 42nd amendment act, the Unity and integrity of the nation were substituted.

• The 42nd amendment act was the most comprehensive amendment act of all times and hence is sometimes known as the 'mini-constitution'.

• The 42nd Amendment Act, 1976 was enacted by the then PM Indira Gandhi at the time of emergency.

• Major changes were made to the Preamble of the Constitution:

1. "Sovereign, Socialist, Secular, Democratic Republic" substituted "Sovereign Democratic Republic"

2. "unity and integrity of the Nation" substituted "unity and of the Nation"

• The objective of the 32nd Amendment Act, 1974 - to protect the regional rights of in Andhra and Telangana regions of the Indian state of Andhra Pradesh.

• The objective of the 75th Amendment Act, 1994 - to make provisions for setting up the Rent Control tribunals.

• The objective of the 66th Amendment Act, 1990 - to bring land reforms as per the Schedule 9th of the Indian Constitution.

Q5. Answer: (c) Vallabhbhai Patel

The correct answer is Vallabhbhai Patel

Key PointsNational Unity Day:

• The day is also called the Rashtriya Ekta Diwas.

• It was celebrated for the first time on 31st October 2014.

• The is celebrated to commemorate the birth anniversary of Sardar Vallabhbhai Patel.

• The theme for National Unity Day 2020 was Unity in diversity is better than, unity in similarities.

Additional InformationSardar Vallabhbhai Patel:

• He was born on 31st October 1875 in Nadiad, Gujarat.

• He is known as the Iron Man of India for playing an important role in the integration and unification of princely states into the Indian union.

• He was the first home minister and deputy prime minister of India.

• He also headed Advisory Committee on Fundamental Rights, Committee on Minorities and Tribal and Excluded Areas and Provincial Constitution Committee in the constituent assembly.

• He was an active part of Kheda Satyagraha in 1918 and Bardoli Satyagraha in 1928.

• He was given the title of Sardar by the Women of Bardoli.

Q6. Answer: (b) Bombay

The correct answer is Bombay.

Key Points

• The Indian National Congress (INC) was founded by Allan Octavian Hume on 28th December 1885.

• The first session of INC was held in Bombay at Gokuldas Tejpal Sanskrit Collegeram.

• The first President of the INC session held in Bombay was Womesh Chandra Banerjee.

• 72 delegates attended the session.

• The important leaders during the foundation of INC were Dadabhai Naoroji, Badruddin Tyyabji, Anand Mohan Bose, R.C Dutt, Pherozshah Mehta, G.K Gokhale, G. Subramaniyam Aiyyar, Dinshaw Vacha, Bal Gangadhar Tilak, Mahadev Govind Ranade, Madan Mohan Malviya, etc.

• Formerly Indian National Congress was known as Indian National Union.

• The INC was formed during the tenure of Lord Dufferin (Viceroy of India from 1884-1888).

Sessions of INC Held at	Year	President
Bombay	1885	Womesh Chandra Banerjee
Calcutta	1896	Rahimtullah Sayani
Lucknow	1899	Romesh Chandra Dutt
Benaras	1905	Gopal Krishna Gokhale
Calcutta	1906	Dadabhai Naoroji
Surat	1907	Rash Bihari Ghosh
Lucknow	1916	A. C. Majumdar

Calcutta (Special Session)	1920	Lala Lajpat Rai
Nagpur	1920	C. Vijayaraghavachariar
Madras	1927	Dr. M. A. Ansari
Bombay	1934	Rajendra Prasad
Tripuri	1939	Rajendra Prasad

Q7. Answer: (b) Barrackpore

The correct answer is Barrackpore.

Key Points

• Mangal Pandey, a soldier in the 34th Bengal Native Infantry of the British East India Company, was a key figure in the events leading to the Indian Rebellion of 1857.

• Mangal Pandey attacked British officers on March 29, 1857, at the military garrison of Barrackpore near Kolkata (then Calcutta).

• He was subsequently court-martialed and sentenced to death for his actions of rebellion and insubordination.

• Barrackpore, a town in West Bengal, served as a major military cantonment under the British rule, and it was the location of this significant incident.

• Mangal Pandey was hanged to death on April 8, 1857, at Barrackpore, making him one of the earliest martyrs of the Indian freedom struggle.

Additional Information

• Background to the Incident:

• The immediate cause of the rebellion was the introduction of the new Enfield P-53 rifle, which required soldiers to bite off the greased cartridge. The grease was rumored to be made of cow and pig fat, offending both Hindu and Muslim religious beliefs.

• Mangal Pandey's protest was symbolic of the growing discontent among Indian soldiers, also known as sepoys, against British rule.

• Indian Rebellion of 1857:

• The event at Barrackpore is often considered one of the initial sparks of the Indian Rebellion of 1857, also known as the First War of Indian Independence.

• The rebellion, which began in May 1857, was a widespread but ultimately unsuccessful uprising against British rule in India.

• Barrackpore’s Historical Significance:

• Barrackpore was one of the first military cantonments established by the British in India, dating back to the late 18th century.

• It later became a site of numerous protests and uprisings against British colonial rule during the freedom struggle.

• Mangal Pandey’s Legacy:

• Mangal Pandey is remembered as a symbol of resistance against British colonial oppression.

• The Government of India honors his sacrifice, and numerous institutions, films, and memorials have been created in his name, including the Mangal Pandey Park in Barrackpore.

Important Points

• Other Locations Mentioned in the Options:

• Chandigarh: This city was not established during Mangal Pandey’s time. It was planned by Le Corbusier and became the capital of Punjab and Haryana post-independence.

• Delhi: Though Delhi played a significant role in the 1857 rebellion, it was not related to the specific incident involving Mangal Pandey.

• Lucknow: Another key center during the 1857 rebellion, but not connected to Mangal Pandey’s actions directly.

• Impact of the 1857 Rebellion:

• The rebellion marked a turning point in Indian history, leading to the dissolution of the East India Company in 1858.

• The British Crown took direct control of Indian administration, marking the beginning of the British Raj.

• Current Relevance:

• Mangal Pandey is celebrated as one of the earliest martyrs in India’s struggle for independence.

• His story is taught in Indian history as an example of courage and the fight against oppression.

Q8. Answer: (b) Meerut

The correct answer is Meerut.

Key Points

• The Revolt of 1857 was the first rebellion against the British East India Company.

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• The first war of Indian Independence started on 10th May 1857.

• The revolt was started at Meerut.

• It began as a revolt of the sepoys of the British East India Company's army but eventually secured the participation of the masses.

• The issue of greased cartridges and military grievances has been over-emphasized as the factor for the Revolt of 1857.

• In March 1857, Mangal Pandey, a sepoy in Barrackpore, refused to use the cartridge and attacked his senior officers.

• He was hanged to death on 8^(th) April 1857.

• On 9^(th) May 1857, 85 soldiers in Meerut refused to use the new rifle and were sentenced to ten years' imprisonment.

• The revolt is known by several names: the Sepoy Mutiny (by the British Historians), the Indian Mutiny, the Great Rebellion (by the Indian Historians), the Revolt of 1857, the Indian Insurrection, and the First War of Independence (by Vinayak Damodar Savarkar).

• Lord Canning was the British viceroy during the revolt of 1857.

Important Points

• The main causes of revolt were the contemporary Religious & Social, Political, and Economic scenarios of the country.

• The revolt is known by different names:

• The Sepoy Mutiny (by the British Historians)

• The Indian Mutiny

• The Great Rebellion (by the Indian Historians)

• The Revolt of 1857

• The First War of Independence (by Vinayak Damodar Savarkar)

Additional Information

• Agra: Agra was an important city during the Mughal era and was the capital of the Mughal Empire under Akbar, Jahangir, and Shah Jahan.

• Kanpur: Kanpur was one of the major centers of the revolt and was the site of the infamous Bibighar massacre, where British women and children were killed by rebels. However, it was not the starting point of the revolt.

• Delhi: Delhi was the center of the rebellion and the site of the formation of the rebel government, with Bahadur Shah Zafar as the nominal leader.

Q9. Answer: (d) Lala Hardayal

The correct answer is Lala Hardayal.

Key Points

• Lal-Bal-Pal refers to the trio of prominent leaders during the Indian freedom struggle: Lala Lajpat Rai, Bal Gangadhar Tilak, and Bipin Chandra Pal. Their efforts were focused on promoting Swadeshi movements, boycotting British goods, and advocating for self-governance.

• Lala Lajpat Rai: He was known as the "Lion of Punjab" and played a pivotal role in the Swadeshi Movement. He worked extensively to unite people and instill patriotic fervor. He was also associated with the Punjab National Bank.

• Bal Gangadhar Tilak: Known as "Lokmanya Tilak," he was a prominent leader advocating Swaraj (self-rule) and used newspapers like Kesari to spread awareness. His slogan, "Swaraj is my birthright, and I shall have it," became iconic during the freedom struggle.

• Bipin Chandra Pal: He was a social reformer from Bengal and advocated for political radicalism. He actively participated in the Swadeshi Movement and supported the boycott of British goods.

• Lala Hardayal: Unlike the other three, Lala Hardayal was not a member of the Lal-Bal-Pal trio. He was a revolutionary and intellectual known for founding the Ghadar Party in 1913, which aimed to overthrow British rule in India through armed struggle. Hence, he does not belong to the Lal-Bal-Pal group.

• Hence, the correct answer is Lala Hardayal.

Additional Information

• Lal-Bal-Pal:

• The trio emerged during the Swadeshi Movement in the early 20th century, particularly after the partition of Bengal in 1905 by Lord Curzon.

• They advocated for boycotts of British goods, promotion of indigenous industries, and adopting self-reliance to weaken British economic control over India.

• The trio's leadership transformed the Indian National Congress from being moderate to a more radical and assertive organization.

• They were instrumental in igniting nationalist sentiments among Indians and inspiring mass participation in the freedom struggle.

• Their contributions laid the foundation for subsequent movements like Non-Cooperation and Civil Disobedience.

• Lala Hardayal:

• Lala Hardayal was a revolutionary who believed in armed struggle to free India from British rule. He founded the Ghadar Party in San Francisco, USA, in 1913.

• The Ghadar Party aimed to mobilize Indians living abroad, particularly in the USA and Canada, to support India's independence movement.

• He was also a scholar and an influential speaker, spreading awareness about Indian independence among the Indian diaspora.

• Though his efforts were significant, his ideology and methods differed from the peaceful and political approaches of Lal-Bal-Pal.

• Swadeshi Movement:

• Started in 1905, the Swadeshi Movement was a response to the partition of Bengal. It advocated boycotting British goods and adopting indigenous alternatives.

• Prominent leaders like Lal-Bal-Pal played a crucial role in popularizing the movement among Indians.

• The movement also emphasized promoting Indian industries, culture, and education.

• This was one of the first instances where mass mobilization occurred for India's freedom struggle.

• Ghadar Party:

• Founded by Lala Hardayal, the Ghadar Party aimed to overthrow British rule through revolutionary means.

• It predominantly consisted of Indian immigrants in the USA and Canada, including Punjabi farmers and workers.

• The party published literature and organized events to inspire Indians to take up arms against the British.

• While the party's impact was limited due to strong British countermeasures, its efforts highlighted the global reach of India's independence movement.

Important Points

• Partition of Bengal (1905): This act by Lord Curzon was aimed at dividing Bengal based on religious lines, sparking widespread protests and the emergence of movements like Swadeshi.

• Radical Leadership: The Lal-Bal-Pal trio represented the shift in Congress leadership from moderate to radical, demanding complete independence rather than reforms.

• Ghadar Party Activities: The party's revolutionary efforts were primarily focused abroad, emphasizing the role of the Indian diaspora in the freedom struggle.

• Legacy of Lal-Bal-Pal: Their efforts inspired subsequent leaders like Subhas Chandra Bose and movements like Quit India.

Q10. Answer: (c) Vembanad

The correct answer is Vembanad.

Key Points

• Vembanad Lake is the largest lake in Kerala and the longest lake in India, spanning multiple districts in the state.

• The lake is a significant part of Kerala's backwaters and is known for its rich biodiversity and scenic beauty.

• It is designated as a Ramsar site, which marks it as a wetland of international importance.

• Vembanad Lake is a hub for tourism activities, including houseboat cruises and traditional snake boat races like the Nehru Trophy Boat Race.

• The lake supports a vibrant ecosystem and provides livelihoods to local communities through fishing, tourism, and agriculture.

Additional Information

• Kolleru Lake:

• Kolleru is one of the largest freshwater lakes in India, situated in Andhra Pradesh between the Krishna and Godavari deltas.

• It serves as a bird sanctuary and is home to numerous migratory birds during the winter season.

• The lake is also a Ramsar site, highlighting its ecological significance.

• It plays a vital role in irrigation and fishing for the nearby communities.

• Pulicat Lake:

• Pulicat Lake, located on the border of Tamil Nadu and Andhra Pradesh, is the second-largest brackish water lagoon in India.

• The lagoon is known for the Pulicat Bird Sanctuary, which attracts flamingos and other migratory birds.

• The lake is separated from the Bay of Bengal by the Sriharikota island, where India’s spaceport is located.

• Fishing and salt production are key economic activities around Pulicat Lake.

• Chilika Lake:

• Chilika Lake, located in Odisha, is the largest coastal lagoon in India and the second-largest in the world.

• It is a Ramsar site and renowned for its rich biodiversity, including the Irrawaddy dolphins.

• The lake serves as a critical habitat for migratory birds and supports thousands of fishermen in the region.

• Chilika is famous for its eco-tourism activities, such as bird watching and boating.

Q11. Answer: (c) Coco channel

The correct answer is 'Coco Channel'

Key Points

• Coco Channel:

• The Coco Channel is a narrow body of water that separates the northernmost tip of the Andaman and Nicobar Islands from the Coco Islands of Myanmar.

• This channel serves as the maritime boundary between India and Myanmar in the Bay of Bengal region.

• It is strategically significant due to its location, as it lies on important shipping routes and plays a role in India's maritime security and trade.

• The Coco Channel is approximately 20 kilometers wide and is known for its geopolitical importance in the Indo-Pacific region.

Additional Information

• Eight Degree Channel:

• The Eight Degree Channel, also known as the Perim Channel, lies between the islands of the Maldives and the Lakshadweep group of islands.

• It is named after the 8-degree latitude line that passes through it.

• This channel is important for international shipping but does not form the maritime boundary between India and Myanmar.

• Great Channel:

• The Great Channel is located in the southernmost part of India and separates the Nicobar Islands from the Indonesian island of Sumatra.

• It is situated in the Indian Ocean and is far from the maritime boundary with Myanmar.

• Thus, it is not relevant to the maritime boundary between India and Myanmar.

Q12. Answer: (b) INDRA

The correct answer is INDRA.

Key Points

• INDRA is the joint bi-annual military exercise conducted by India and Russia with the aim of boosting their defence cooperation.

• It was started in 2003.

• Word INDRA is the representation of initials of participating countries.

• Exercise involves live firing drills, air defence, anti-submarines exercises.

Q13. Answer: (c) Asia

The correct answer is Asia

Key Points

• The Olympic flag has a white background, with five interlocked rings in the center.

• The five interlocking rings, colored blue, yellow, black, green, and red.

• The five rings represent the five continents of the world: Europe, Asia, Africa, The Americas, and Oceania

• The symbol was originally designed in 1913 by de Coubertin (Released in 1914).

Blue	Europe
Yellow	Asia
Black	Africa
Green	Oceania. Australia
Red	America

Q14. Answer: (c) Tamil Nadu

The correct answer is Tamil Nadu.

Key Points

• Brihadeshwara Temple:

• Brihadeshwara Temple, also known as Raja Rajeswara Temple, is dedicated to Shiva and is located in Thanjavur (Tamil Nadu).

• Thanjavur lies in the delta of the Cauvery River.

• It is one of the best examples of the Dravidian style of temple architecture built by Chola emperor Raja Raja Chola I (985-1014 AD) between 1003 AD and 1010 AD.

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• The Dravidian style of temple architecture flourished roughly from the 8th century to about the 13-14 century AD.

• The temple consists of a pyramidal spire and is adorned with sculptures and paintings inside as well as outside.

• The temple entered the UNESCO World Heritage Site list in 1987 and is also a part of "Great Living Chola Temples" along with the Brihadisvara Temple at Gangaikondacholapuram and the Airavatesvara Temple at Darasuram.

Q15. Answer: (d) Narmada

The correct answer is Narmada.

Key Points

• The rivers that flow into the Arabian Sea are Tapi, Narmada, Sindhu, Purna, and Sabarmati.

• Narmada is also called Reva and is located in Madhya Pradesh and Gujarat.

• It is called the lifeline of Gujarat and Madhya Pradesh as it contributes largely to both states in several ways.

• The river rises from the Amarkantak plateau in Madhya Pradesh and flows westwards.

• It has a length of 1312 kilometres and drains into the Arabian Sea.

• It is the longest west flowing river and is among the only three major rivers of Peninsular India along with the Tapti River and Mahi river.

• Narmada river does not form any delta.

Q16. Answer: (a) Zinc

The correct answer is Zinc.

Key Points

• Zinc is used for coating iron to prevent rusting.

• Galvanization -

• The process of putting a protective zinc coating on iron to prevent rusting is known as galvanization.

• It extends the life of iron parts by establishing a membrane between the metal and the air, which prevents iron oxide from developing on the steel layer.

• Galvanization also provides greater corrosion protection to parts that are exposed to air.

• Galvanizing protects against rust and corrosion in several ways:

1. It acts as a barrier, preventing corrosive chemicals from reaching the iron beneath.

2. The zinc acts as a sacrificial anode, meaning that even if the coating is damaged, the exposed steel is still protected by the zinc that remains on it.

3. The zinc surface reacts with the environment to generate a dense, adhering patina that is impervious to moisture.

Additional Information

• Zinc is used to make many useful alloys.

• Brass, an alloy of Zinc that contains between 55% and 95% Copper, is among the best-known alloys.

• Zinc is alloyed with Lead and Tin to make solder, a metal with a relatively low melting point used to join electrical components, pipes, and other metallic items.

• Other Zinc Alloys include Nickel Silver, typewriter metal, and German Silver.

Q17. Answer: (a) refraction and dispersion of light by raindrops

The correct answer is refraction and dispersion of light by raindrops.

Key Points

• A rainbow is a meteorological phenomenon that is caused by reflection, refraction, and dispersion of light in water droplets resulting in a spectrum of light appearing in the sky.

• When sunlight strikes a raindrop, it is first refracted as it enters the surface of the droplet. This causes the white light to slow down and bend.

• During this process, dispersion occurs, where the white sunlight is split into its component colors (VIBGYOR) because different wavelengths of light travel at different speeds within the water.

• The light then hits the back of the raindrop and undergoes internal reflection. After reflecting, the light is refracted once more as it exits the droplet, further spreading the colors.

• The combined effect of these optical processes—refraction, dispersion, and reflection—directs the light toward the observer's eye at specific angles (approximately 40 to 42 degrees), forming a circular arc of colors. Hence, the correct answer is refraction and dispersion of light by raindrops.

Additional Information

• The Visible Spectrum (VIBGYOR): The colors in a rainbow always appear in a specific order: Violet, Indigo, Blue, Green, Yellow, Orange, and Red. Red light has the longest wavelength and is refracted the least, appearing on the outer arc. Violet light has the

shortest wavelength and is refracted the most, appearing on the inner arc.

• Conditions for Formation: For a rainbow to be visible, two conditions must be met simultaneously: the Sun must be shining in one part of the sky, and it must be raining (or water droplets must be present) in the opposite part of the sky. The observer must stand with their back to the Sun.

• Primary vs. Secondary Rainbows: A Primary Rainbow is formed by one internal reflection inside the raindrop. A Secondary Rainbow is formed when light undergoes two internal reflections. The secondary rainbow is fainter, appears outside the primary arc, and its color sequence is reversed (Red on the inside, Violet on the outside).

• Shape of a Rainbow: While we usually see a rainbow as an arc from the ground, it is actually a full circle. The ground usually obstructs the bottom half of the circle. However, observers in airplanes or at high altitudes can sometimes see a complete circular rainbow.

• Historical Context: Sir Isaac Newton was the first to demonstrate in the 17th century (specifically around 1666) that white light is composed of a spectrum of colors by using a glass prism, which mimics the dispersive behavior of raindrops.

Important Points

• Refraction: This is the bending of light when it passes from one medium (like air) to another medium of different density (like water). The refractive index of water is approximately 1.33.

• Dispersion: This is the separation of white light into colors of different frequencies and wavelengths. This happens because the velocity of light in a medium depends on its wavelength.

• Total Internal Reflection: While a portion of light undergoes internal reflection at the back of the raindrop to form a rainbow, it is important to note that it is often technically partial reflection, though it is the primary reason the light returns toward the observer.

Q18. Answer: (c) A person stops rowing a boat with both his hands then boat stops after travelling some distance in the water.

Explanation:

• Muscular force is a type of contact force.

• On any object when the force is applied by using muscles like arms, legs is known as muscular force.

• It is a force that results because of the action of muscles, due to the expansion and contraction of muscles.

• Pulling, lifting, pushing, and running require muscular force.

• Let's discuss the four examples given in the option,

• As a person lift the bucket of water from the ground he applies muscular force to it for lifting and putting potential energy into it.

• A person lifts a book from the table also puts energy on the book and applies muscular force to it.

• But while person stops rowing the boat he actually dis engaging his muscles from the task or here the muscular force was applied before when the boat moving on water but at the instant when a person stops rowing he actually stopped the muscular force on the boat hence it is not the correct example of muscular force.

• A person pushing a table placed on the floor with both of his hands, which needed muscular force against the friction.

Q19. Answer: (a) winnowing

Concept:

Method of Separation	Description	Separation of
Threshing	• Stalks are usually dried after they are harvested. - By beating the dry stalks to shake off the dried grains, the grain is separated from the stalks and crushed into the floor.	Separation of grain from the stalk
Winnowing	• After the grains are recovered during the threshing process, they must be cleaned of husks and chaffs before being ground into flour. - The separation of the mixture is usually accomplished with the aid of wind or blowing air. - When farmers drop the combination from a given height to the ground, the husk and chaff are blown away by the powerful wind. - The heavier grains are gathered in one location.	Separation of grain from Husk

Sieving	• It is used to separate mixtures containing predominantly different-sized components. - The mixture is filtered via the sieve's pores. - All of the tiny compounds pass through easily, while the mixture's larger components are kept.	Separation of different sized mixtures like pebbles from flour
Handpicking	• This process entails manually sorting out all of the undesirable compounds and separating them from the useful ones.	Stones and other visible impurities from wheat, rice by hand

Explanation:

• Winnowing is the process that is used to separate the grain from the husk.

• It is done with the help of wind or blowing air.

• The mixture is dropped from a height and with the help of wind, it blows away the chaff and the husk.

• The grains which are heavier are left behind and gathered at one location.

• Hence the correct answer to this question is - Winnowing.

Q20. Answer: (a) Fat

Concept:-

Fat is the main source of energy for humans, with glucose the main energy source for the brain, nervous system, blood cells, and gastrointestinal lining.

Important Points All of the below provide energy-

• Carbohydrates: 4 kcal per 1 gram

• Proteins : 4 kcal per 1 gram

• Fats: 9 kcal per 1 gram

Hint The composition of a healthy human diet includes carbohydrates, vitamins, proteins, fats, minerals, and fiber. While the consumption of these nutrients is required in varying amounts, they are usually represented in a triangle with carbohydrates forming the basis. Of all the nutrients, carbohydrates produce the maximum energy required by the body followed by fats. Proteins produce energy only in emergency situations.

Additional Information

• Dietary fat is necessary to give your body energy and support cell growth.

• fat also helps protect organs and keep the body warm.

• Fat helps the body absorb certain nutrients and also produces important hormones.

• Fats provide a source of concentrated energy as well as the fat-soluble vitamins- A, D, E, K

• Fats are the most energy-efficient form of food but fats are the slowest source of energy.

Key Points

• Zinc is a chemical element with the symbol Zn found throughout the body, which helps the immune system and metabolism to function. Zinc is also important for wound healing and your sense of taste and smell.

• Vitamin A is a fat-soluble vitamin(retinol, retinoic acid) that is a nutrient important to vision, growth, cell division, reproduction, and immunity. Vitamin A also has antioxidant properties.

• Vitamin D (also known as "calciferol") is a fat-soluble vitamin that is naturally present in some foods, added to others, and available as a dietary supplement. It is also produced endogenously when ultraviolet (UV) rays from sunlight hit the skin and trigger vitamin D synthesis.

Q21. Answer: (c) Velocity

The correct answer is Velocity.

Key Points

• The motion of an object in a specified direction is called velocity.

• The speed of an object in a particular direction is called velocity.

• Velocity can also be defined as the rate of change of the object's position with respect to a frame of reference and time.

Additional Information

• Speed is the distance traveled per unit of time. It is how fast an object is moving.

• Speed is the scalar quantity that is the magnitude of the velocity vector.

• It doesn't have a direction.

• The displacement is simply the difference in the position of the two marks and is independent of the path taken when traveling

between the two marks.

• The distance traveled, however, is the total length of the path taken between the two marks.

• Motion is the phenomenon in which an object changes its position over time.

• Motion is mathematically described in terms of displacement, distance, velocity, acceleration, speed, and time.

Q22. Answer: (a) Collision of electrons

CONCEPT:

• Whenever a current is flowing in the resistance then heat is produced in it.

• The phenomenon of producing heat by the electric current is called as the heating effect of electric current.

• The amount of heat produced (H) in joules = I2 R t

Where I is current, R is resistance and t is the time taken

• The heating effect of an electric current depends on three factors:

1. The resistance R of the conductor i.e., a higher resistance produces more heat.

2. The time t for which current flows i.e., the longer the time the larger the amount of heat produced.

3. The amount of current I i.e., the higher the current the larger the amount of heat generated.

EXPLANATION:

Cause of heating effect of current:

• When a potential difference is applied across the ends of a conductor, its free electrons get accelerated in the opposite direction of the applied field.

• But the speed of the electrons does not increase beyond a constant drift speed. This is because, during the course of their motion, the electrons collide frequently with the positive metal ions.

• The kinetic energy gained by the electrons during the intervals of free acceleration between collisions is transferred to the metal ions at the time of the collision.

• The metal ions begin to vibrate about their mean positions more and more violently.

• The average kinetic energy of the ions increases. This increases the temperature of the conductor. Thus the conductor gets heated due to the flow of current. Therefore option 1 is correct.

Q23. Answer: (d) Sexual reproduction

The correct answer is Sexual Reproduction.

Key Points

• Sexual reproduction involves the fusion of male and female gametes (sperm and egg), resulting in the formation of offspring with genetic material from both parents.

• This process leads to genetic recombination, which creates new combinations of genes, thereby increasing genetic diversity in the population.

• It enables populations to adapt better to changing environments, as greater genetic variation increases the likelihood of individuals possessing traits that enhance survival and reproduction.

• Unlike asexual reproduction methods like fragmentation, budding, or binary fission, sexual reproduction does not produce clones, thus avoiding the risk of accumulating harmful mutations over generations.

• Examples of organisms reproducing sexually include humans, animals, flowering plants, and some fungi.

Additional Information

• Fragmentation:

• Fragmentation is a form of asexual reproduction where an organism splits into fragments, and each fragment grows into a new, genetically identical organism.

• Examples: Spirogyra (a type of algae) and some flatworms.

• While it is a quick way to reproduce, it results in no genetic variation, as offspring are clones of the parent.

• Budding:

• Budding is another asexual method where a new organism develops from an outgrowth or bud on the parent organism.

• Examples: Yeast, hydra, and some species of coral.

• Like fragmentation, it produces genetically identical offspring, limiting genetic diversity.

• Binary Fission:

• Binary fission is an asexual reproductive process where a single organism divides into two identical daughter cells.

• It is common in prokaryotic organisms like bacteria and some protozoa.

• This method is efficient but does not contribute to genetic diversity.

• Sexual Reproduction:

• Sexual reproduction is the process where genetic material from two parents combines to produce genetically distinct offspring.
• It involves processes such as meiosis (formation of haploid gametes) and fertilization (fusion of gametes).
• This method is common in animals, plants, and fungi and is essential for evolution and adaptation.

Important Points

• Advantages of sexual reproduction:
• Promotes genetic diversity, which is crucial for adaptation and survival in changing environments.
• Allows for the elimination of harmful mutations over generations.
• Facilitates species evolution by introducing new gene combinations.
• Limitations of asexual reproduction:
• Lack of genetic diversity can make populations vulnerable to environmental changes, diseases, and other challenges.
• Organisms are exact clones, so any genetic defect in the parent is passed on to the offspring.
• Adaptation and Evolution:
• Sexual reproduction is a driving force behind the process of evolution, as it facilitates natural selection by producing varied traits in offspring.
• Populations with greater genetic diversity are better equipped to adapt to new environmental pressures, such as climate change or emerging diseases.

Q24. Answer: (c) Blood

The correct answer is Blood.

Key Points

• Carbon dioxide (CO_2) is transported in the human body primarily through the bloodstream. It is carried from various tissues where it is produced to the lungs for exhalation.
• Approximately 70% of carbon dioxide is transported as bicarbonate ions (HCO_3^-) in the blood after reacting with water and forming carbonic acid (H_2CO_3), which then dissociates.
• About 20-23% of CO_2 is bound to hemoglobin and transported as carbaminohemoglobin. Hemoglobin acts as a carrier for CO_2, just as it does for oxygen.
• Only 7-10% of CO_2 is transported in the blood in a dissolved form within the plasma.
• CO_2 is released into the alveoli of the lungs during gas exchange, where it is expelled during exhalation.

Additional Information

• Role of Hemoglobin:
• Hemoglobin is a protein in red blood cells that primarily transports oxygen from the lungs to the tissues. It also plays a vital role in the transport of carbon dioxide.
• When CO_2 binds to hemoglobin, it forms carbaminohemoglobin. This is a reversible reaction, allowing hemoglobin to release CO_2 in the lungs.
• Bicarbonate Buffer System:
• Carbon dioxide reacts with water in the presence of the enzyme carbonic anhydrase to form carbonic acid (H_2CO_3).
• Carbonic acid dissociates into bicarbonate ions (HCO_3^-) and hydrogen ions (H^+) in the blood, maintaining the pH balance of the body.
• This buffering system is crucial for preventing drastic changes in blood pH levels.
• Gas Exchange in the Lungs:
• At the lungs, CO_2 diffuses from the blood into the alveoli due to the concentration gradient.
• It is expelled from the body during exhalation, completing the cycle of gas exchange.
• Other Transport Mechanisms:
• While blood is the primary medium for CO_2 transport, other bodily fluids such as plasma also carry dissolved CO_2.
• Options like sweat, mucus, and lymph are not involved in CO_2 transport as these do not serve as primary systems for respiratory gas exchange.

Important Points

• Respiratory System Functions:
• The human respiratory system is responsible for the exchange of gases, including oxygen and carbon dioxide, between the body and the external environment.
• CO_2 is a waste product of cellular respiration and must be removed efficiently to maintain homeostasis.
• Enzyme Involvement:
• Carbonic anhydrase is an enzyme found in red blood cells that facilitates the conversion of CO_2 and water into carbonic acid.
• This enzyme accelerates the reaction, ensuring efficient CO_2 transport and pH regulation.

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• Medical Relevance:

• Disruptions in CO_2 transport or elimination can lead to conditions such as respiratory acidosis or alkalosis.

• Understanding CO_2 transport mechanisms is critical in managing respiratory and metabolic disorders.

Q25. Answer: (a) Hydrophone

The correct answer is Hydrophone.

Key Points

• The Hydrophone was invented by Reginald Fessenden in 1914.

• The word hydrophone is the combination of hydro and phone where hydro means water and phone means sound hence hydrophone is used for measuring sound under the water.

Name of the Instrument	Functions/ Used for
Hydrophone	Measures sound under the water.
Hydroscope	A device to see an object at a considerable distance below the surface of the water by means of a series of mirrors enclosed in a steel tube
Hypsometer	Determines the boiling point of the liquid.
Machmeter	Determines the speed of an aircraft relative to the speed of sound.
Ondometer	Measures the frequency of electromagnetic waves.
Ohmmeter	Measures electrical resistance.
Odometer	Measures distance travelled by a vehicle.
Nephelometer	Measures the scattering of light by particles suspended in a liquid.
Microscope	Gives a magnified view of small objects.

Additional Information

Name of the Instrument	Functions/ Used for
Optometer	Testing the refractive power of the eye.
Otoscope	Visual examination of the eardrum.
Quadrant	Measures altitudes and angles in navigation and astronomy.
Sextant	Measure the angular distance between two objects.
Refractometer	Measures the refractive index of a substance.
Rain Gauge	Measures rainfall.
Seismograph	Recording intensity and origin of earthquake shocks.
Pyrheliometer	Measuring solar radiation.
Photometer	Compares luminous intensity of two sources of light.
Phonograph	Reproduces sound.

Image of Hydrophone:

Q26. Answer: (b) Rectifier

The correct answer is Rectifier.

Key Points

• A rectifier is a device that converts an oscillating two-directional alternating current (AC) into a single-directional direct current (DC).

• Rectifiers can take a wide variety of physical forms, from vacuum tube diodes and crystal radio receivers to modern silicon-based diode.

• There are two types of rectifiers: Half wave rectifier and full-wave rectifier.

• Half-wave rectifiers work by eliminating one side of the AC, thereby only allowing one direction of current to pass through.

• Since half of the AC power input goes unused, half-wave rectifiers produce a very inefficient conversion.

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• Full-wave rectifier eliminates AC from both the directions hence it is more efficient.

• Rectifier mostly used in Power supply, inverters etc.

Additional Information

Other devices and their functions:

Devices	Functions
Transformer	• A transformer is a device that can change the voltage of an alternating current.
Induction Coil	• An electrical device for producing an intermittent source of high voltage.
Dynamo	• It converts mechanical energy into electrical energy.

Q27. Answer: (b) Virus

Influenza disease is caused by a Virus.

Diseases	Caused By
Tuberculosis	Bacteria
Influenza	Virus
Fungal Infection	Fungi
Malaria	Protozoan

Trick: Virus influence many Diseases

Q28. Answer: (a) Medulla

The correct answer is Medulla.

Key Points

• The medulla is the lowest part of the brain and the lowest portion of the brainstem.

• The medulla is connected by the pons to the midbrain and is continuous posteriorly with the spinal cord.

• The medulla plays a critical role in transmitting signals between the spinal cord and the higher parts of the brain and in controlling autonomic activities, such as heartbeat and respiration.

Additional Information

Parts of Brain	Functions
Cerebrum	Sensory processing, Language, and communication, Learning and memory
Cerebellum	Posture, balance, coordination, and speech, resulting in smooth and balanced muscular activity.
Brain Stem	Cardiac and respiratory functions.

Q29. Answer: (b) Sugar solution

The correct answer is Sugar solution.

Concept:

• Good conductors of electricity are materials that allow an electric current to pass through them.

• Materials that do not easily allow an electric current to pass through them are poor conductors of electricity.

• Common salt (NaCl) conducts electricity in aqueous solution or molten state.

NaCl (aq) → Na^+ + Cl^-

• Due to the mobility of ions, common salt conducts electricity.

• Sugar is sucrose which is a non-electrolyte and does not give ions to the solution.

Explanation:

• Electricity cannot be conducted by all liquids. However, some of them are considered good conductors of electricity, while others are considered poor conductors of electricity.

• Water with dissolved salts and minerals always conducts electricity. For example, water obtained from taps, hand pumps, wells, and ponds.

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• Electricity cannot be conducted by distilled water that does not contain any salts.
• Any acid or base solution can conduct electricity.
• During electrolysis, Sugar solution will not deflect the magnetic needle kept in its vicinity in a closed circuit.
NaCl (aq) → Na+ + Cl-
NaOH (aq) → Na+ + OH-
Lemon Juice - Weak acid (H^+) ions
Additional Information
Good/Poor Conducting Liquids :

S. No.	Material	Compass Needle Shows Deflection Yes/No	Good Conductor/Poor Conductor
1.	Lemon juice	Yes	Good Conductor
2.	Vinegar	Yes	Good Conductor
3.	Tap water	Yes	Good Conductor
4.	Vegetable oil	No	Poor Conductor
5.	Milk	Yes	Good Conductor
6.	Honey	No	Poor Conductor
7.	Sugar solution	No	Poor Conductor
8.	Distilled water	No	Poor Conductor
9.	Sulphuric acid solution	Yes	Good Conductor
10.	Saltwater	Yes	Good Conductor
11.	Caustic soda solution	Yes	Good Conductor

Q30. Answer: (c) K2CO3

K2CO3 or potassium carbonate is known as pearl ash.
• Pearl ash, in ancient times, was created by baking potash in a kiln in order to remove impurities. The remaining fine, white powder was pearl ash.
• Potassium carbonate is an inorganic compound and a white salt which is soluble in water.
• It is mainly used in the production of glass and soap.
Additional Information

Chemical Formula	Chemical Name	Common Name
Na2CO3	Sodium Carbonate	Washing soda
NaHCO3	Sodium bicarbonate	Baking soda
K2CO3	Potasium carbonate	Pearl ash
CaCO3	Calsium carbonate	Limestone

Q31. Answer: (a) 36 : 55

Given:
a : b = 9 : 5
b : c = 4 : 11
Formula used:
Make common term (b) same in both ratios
Calculations:
a : b = 9 : 5
b : c = 4 : 11
LCM of 5 and 4 = 20
=> Multiply (9 : 5) by 4 → 36 : 20

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=> Multiply (4 : 11) by 5 → 20 : 55

=> a : b : c = 36 : 20 : 55

=> a : c = 36 : 55

Therefore a : c = 36 : 55.

Q32. Answer: (a) 2 + √3

Shortcut Trick

Compare 7 + 4√3 with the identity $a^2 + b^2 + 2ab$.

Here, 2ab = 4√3 => ab = 2√3.

Find factors of 2√3 whose squares sum to 7: 2 and √3.

Check: $2^2 + (\sqrt{3})^2 = 4 + 3 = 7$.

The square root is (a + b) = 2 + √3.

Therefore The correct answer is 2 + √3.

Alternate Method

Given: 7 + 4√3

Formula Used: $(a + b)^2 = a^2 + b^2 + 2ab$

=> 7 + 4√3 = 4 + 3 + 4√3

=> $7 + 4\sqrt{3} = 2^2 + (\sqrt{3})^2 + 2 \times 2 \times \sqrt{3}$

=> $7 + 4\sqrt{3} = (2 + \sqrt{3})^2$

=> $\sqrt{(7 + 4\sqrt{3})} = \sqrt{(2 + \sqrt{3})^2}$

=> $\sqrt{(7 + 4\sqrt{3})} = 2 + \sqrt{3}$

Therefore The correct answer is 2 + √3.

Additional Information

Square Root of Negative Surds

For an expression $a - 2\sqrt{b}$, the square root is $\sqrt{x} - \sqrt{y}$ where x + y = a and xy = b.

Rationalization of Surds

To rationalize $1/(a + \sqrt{b})$, multiply the numerator and denominator by its conjugate $(a - \sqrt{b})$.

Pure and Mixed Surds

A surd consisting of only an irrational part is a pure surd (e.g., √3), while one with a rational part is a mixed surd (e.g., 2 + √3).

Q33. Answer: (d) 360°

Shortcut Trick

The sum of the interior angles of any polygon with n sides is given by the formula: $(n - 2) \times 180°$.

For a quadrilateral, the number of sides is n = 4.

Substituting n = 4 into the formula:

Sum of interior angles = $(4 - 2) \times 180° = 2 \times 180° = 360°$.

Therefore The correct answer is 360°.

Alternate Method

Given:

A polygon is a quadrilateral (number of sides, n = 4).

Formula Used:

Any quadrilateral can be divided into two triangles by drawing a single diagonal.

The sum of the interior angles of a triangle is always 180°.

Calculations:

Let ABCD be a quadrilateral. Draw diagonal AC, which divides the quadrilateral into two triangles: ΔADC and ΔABC.

=> Sum of angles in ΔADC = angle D + angle DAC + angle DCA = 180°

=> Sum of angles in ΔABC = angle B + angle BAC + angle BCA = 180°

=> Total sum of interior angles of quadrilateral ABCD = Sum of angles in ΔADC + Sum of angles in ΔABC

=> Total sum = 180° + 180°

=> Total sum = 360°

Let us analyze why the other options are incorrect:

=> Option (1) 180° is incorrect because 180° is the sum of the interior angles of a triangle (3-sided polygon).

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=> Option (2) 270° is incorrect because there is no standard convex polygon whose interior angle sum is 270°.

=> Option (3) 390° is incorrect because the sum of interior angles of any polygon must be a multiple of 180°.

Therefore The correct answer is 360°.

Additional Information

Sum of Exterior Angles

For any convex polygon, regardless of the number of sides, the sum of the exterior angles is always 360°.

Interior Angle of a Regular Polygon

Each interior angle of a regular polygon with n sides is given by the formula: [(n − 2) × 180°] ÷ n.

Types of Quadrilaterals

Common quadrilaterals include squares, rectangles, parallelograms, trapezoids, rhombuses, and kites, all of which have interior angles summing to exactly 360°.

Q34. Answer: (a) 15

Calculation:

We have,

5 + 2 × (9 - 4)2 ÷ 5

=> 5 + 2 × (5)2 ÷ 5

=> 5 + 2 × 25 ÷ 5

=> 5 + 2 × 5

=> 5 + 10 = 15

Therefore The correct answer is option (1).

Q35. Answer: (c) 62.5

Shortcut Trick

Ratio of Boys : Girls = 30 : 20 = 3 : 2.

Boys average (75) is +5 relative to total average (70).

Total deviation for boys = 3 × (+5) = +15.

To balance, girls must have a total deviation of −15.

Deviation per girl = −15 ÷ 2 = −7.5.

Average of girls = 70 − 7.5 = 62.5.

Therefore The correct answer is 62.5.

Alternate Method

Given:

Total students = 50 | Total average = 70

Number of boys (n1) = 30 | Average of boys (x1) = 75

Number of girls (n2) = 50 − 30 = 20

Formula Used:

Total Sum = Average × Number of items

Combined Average (X) = (n1x1 + n2x2) ÷ (n1 + n2)

Calculations:

=> Total score of 50 students = 50 × 70 = 3500

=> Total score of 30 boys = 30 × 75 = 2250

=> Total score of 20 girls = Total score − Boys score

=> Total score of 20 girls = 3500 − 2250 = 1250

=> Average score of girls = 1250 ÷ 20

=> Average score of girls = 62.5

Therefore The correct answer is 62.5.

Additional Information

Weighted Average Formula

Used when two or more groups are combined: X_(avg) = (n1a1 + n2a2 + ...) ÷ (n1 + n2 + ...).

Alligation Method

The ratio of the quantities is the inverse of the differences between the individual averages and the mean average.

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Net Deviation Principle

The sum of deviations of all observations from their arithmetic mean is always zero (Σ(x − X) = 0).

Q36. Answer: (a) 72 minutes

Given:

One bell rings every 6 minutes. Another bell rings every 8 minutes. The third bell rings every 9 minutes.

Concept used:

LCM is the smallest common multiple of two or more numbers.

Calculation:

Now, the three bells will ring together after

=> LCM (6, 8, 9)

=> $2^3 \times 3^2$

=> 8 × 9

=> 72 minutes

Therefore The three bells will ring together after 72 minutes.

Q37. Answer: (a) 300 cm

Given:

Length (L) = 100 cm

Breadth (B) = 50 cm

Formula used:

Perimeter of a rectangle = 2 × (Length + Breadth)

Calculation:

Perimeter = 2 × (100 + 50)

=> Perimeter = 2 × 150

=> Perimeter = 300 cm

Therefore The correct answer is option 1.

Q38. Answer: (c) 10%

Shortcut Trick

Ratio of Initial Value to Final Value = 8000 : 7200 = 10 : 9.

Reduction in units = 10 − 9 = 1 unit.

Percentage Decrease = (Reduction ÷ Initial Units) × 100 = (1 ÷ 10) × 100 = 10%.

Therefore The correct answer is 10%.

Alternate Method

Given:

Initial Value of the item = Rs. 8000

Final Value of the item = Rs. 7200

Formula Used:

Percentage Decrease = (Decrease in Value ÷ Original Value) × 100

Calculations:

=> Decrease in Value = 8000 − 7200 = Rs. 800

=> Percentage Decrease = (800 ÷ 8000) × 100

=> Percentage Decrease = (1 ÷ 10) × 100

=> Percentage Decrease = 10%

Therefore The correct answer is 10%.

Additional Information

Percentage Change

The Percentage Change represents the relative change between an old value and a new value, calculated as (Difference ÷ Original Value) × 100.

Successive Percentage

When a value changes by a% and then by b%, the effective percentage change is given by the formula: a + b + (a × b ÷ 100).

Fraction to Percentage Conversion

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To convert a fraction to a percentage, multiply the fraction by 100 and add the % symbol (e.g., 1/5 × 100 = 20%).

Q39. Answer: (a) 4 : 1

According to Componendo and dividend rule,

If (a/b) = (c/d), then (a + b)/(a - b) = (c + d)/(c - d)

Hence,

If A : B = 5 : 3

Therefore (A + B) : (A - B) = (5 + 3) : (5 - 3) = 8 : 2 = 4 : 1

Q40. Answer: (a) 32, 13

Shortcut Trick

To find two numbers when their sum (S) and difference (D) are given:

Larger number = (S + D) ÷ 2 = (45 + 19) ÷ 2 = 64 ÷ 2 = 32

Smaller number = (S − D) ÷ 2 = (45 − 19) ÷ 2 = 26 ÷ 2 = 13

Therefore The correct answer is 32, 13.

Alternate Method

Given:

Sum of two numbers (x + y) = 45

Difference of two numbers (x − y) = 19

Calculations:

=> Let the numbers be x and y (where x > y).

=> Equation 1: x + y = 45

=> Equation 2: x − y = 19

=> Adding both equations: (x + y) + (x − y) = 45 + 19

=> 2x = 64

=> x = 32

=> Substituting x = 32 in Equation 1: 32 + y = 45

=> y = 45 − 32 = 13

Therefore The correct answer is 32, 13.

Additional Information

Algebraic Identity

The relation between sum and difference can also be expressed as: (x + y)2 − (x − y)2 = 4xy.

Product of Numbers

If the product is required: Product = [(Sum)2 − (Difference)2] ÷ 4. For this case: (452 − 192) ÷ 4 = (2025 − 361) ÷ 4 = 1664 ÷ 4 = 416.

Verification

Check the values: 32 + 13 = 45 (Correct) and 32 − 13 = 19 (Correct).

Q41. Answer: (a) 68.57 km/h

Shortcut Trick

When the distance covered is the same for both speeds, Average Speed = (2 × x × y) / (x + y)

Here, x = 80 km/h and y = 60 km/h.

Average Speed = (2 × 80 × 60) / (80 + 60) = 9600 / 140 = 960 / 14

Average Speed = 480 / 7 ≈ 68.57 km/h

Therefore The correct answer is 68.57 km/h.

Alternate Method

Given:

Speed from A to B (S1) = 80 km/h

Speed from B to A (S2) = 60 km/h

Formula Used:

Average Speed = Total Distance ÷ Total Time

Let the distance between A and B be the LCM of 80 and 60 = 240 km.

=> Time taken from A to B (t1) = 240 ÷ 80 = 3 hours

=> Time taken from B to A (t2) = 240 ÷ 60 = 4 hours
=> Total Distance = 240 + 240 = 480 km
=> Total Time = 3 + 4 = 7 hours
=> Average Speed = 480 ÷ 7
=> Average Speed ≈ 68.57 km/h
Therefore The correct answer is 68.57 km/h.
Additional Information
Average Speed (Equal Time)
If a person travels for equal time intervals at speeds v1 and v2, then Average Speed = (v1 + v2) ÷ 2.
Harmonic Mean Property
The average speed for equal distances is the Harmonic Mean of the individual speeds: 2 ÷ [(1/v1) + (1/v2)].
Conversion of Units
To convert km/h to m/s, multiply by 5/18. To convert m/s to km/h, multiply by 18/5.

Q42. Answer: (a) 6.25 cm

Given:
Perimeter = 25 cm
Number of sides = 4
Formula Used:
Perimeter = 4 × Side
Side = Perimeter ÷ 4
Calculation:
=> Side = 25 ÷ 4
=> Side = 6.25 cm
Therefore The correct answer is 6.25 cm.

Q43. Answer: (d) 93%

Shortcut Trick
Discount = 4000 − 280 = 3720
Discount % = (3720 ÷ 4000) × 100
Discount % = 372 ÷ 4 = 93%
Therefore The correct answer is 93%.
Alternate Method
Given:
Marked Price (MP) = Rs. 4,000
Selling Price (SP) = Rs. 280
Formula Used:
Discount % = [(MP − SP) ÷ MP] × 100
Calculations:
=> Discount = 4000 − 280
=> Discount = 3720
=> Discount % = (3720 ÷ 4000) × 100
=> Discount % = 372000 ÷ 4000
=> Discount % = 93%
Therefore The correct answer is 93%.
Additional Information
Marked Price (MP)
The price printed on the item or label, also known as the List Price or Tag Price.
Successive Discounts
When multiple discounts are applied, the Effective Discount is calculated as d1 + d2 − (d1 × d2)/100.
Profit and Discount Relation
The ratio of MP to CP is given by: MP/CP = (100 + Profit%)/(100 − Discount%).

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Q44. Answer: (a) 2

Shortcut Trick

Use SI = (P × R × T) ÷ 100

Rearrange => T = (SI × 100) ÷ (P × R)

Substitute values => T = (720 × 100) ÷ (9000 × 4)

= 72000 ÷ 36000 = 2

Therefore Answer = 2 years

Alternate Method

Given:

Principal = 9000

Simple Interest = 720

Rate = 4% per annum

Formula used:

SI = (P × R × T) ÷ 100

Calculation:

=> 720 = (9000 × 4 × T) ÷ 100

=> 720 = 360T

=> T = 720 ÷ 360

=> T = 2 years

Therefore The correct answer is 2 years.

Additional Information

Simple Interest Formula

SI = (P × R × T) ÷ 100

Time Formula

T = (SI × 100) ÷ (P × R)

Unit Note

Rate is always taken per annum unless mentioned otherwise.

Application

Used in banking, loans, and investment calculations.

Q45. Answer: (c) 48

Concept used:

Calculation:

5 × 4 + (3 + 4)2 ÷ 7 × 4

=> 20 + 7^2 ÷ 7 × 4

=> 20 + 7 × 4

=> 20 + 28 = 48

Therefore The correct answer is 48.

Q46. Answer: (a) AELPP

The logic is as,

Alphabets within the words are arranged according to their positions.

Letters of given words are arranged in alphabetical order (A - Z) from left to right.

Word	**T**	**A**	**B**	**L**	**E**
Alphabetical order	A	B	E	L	T

Therefore, TABLE = ABELT.

Similarly,

Word	**A**	**P**	**P**	**L**	**E**
Alphabetical order	A	E	L	P	P

APPLE will be arranged AELPP.

Hence, the code for APPLE is AELPP.

Mistake Points The words are arranged in alphabetical order. This type of method is generally asked in exams also.

Q47. Answer: (a) Four : Rectangle

The pattern followed here is:

The format of the given statement is;

Sides : Polygon

As, there are five sides in a pentagon.

Similarly,

There are four sides in a rectangle.

So, the solution also must be in the same format

Hence, 'Four : Rectangle' is the correct answer.

Q48. Answer: (b) R

Given series: Left side T H I S K D O W P A N E C M X U Z R B Right side

6^(th) letter from the left side = D

12^(th) letter from the right side of D

As here both direction are used left and right so we can solve it as

6th letter from the left + 12th letter to the right of 6th letter = 18th letter from left (here total nineteen letters are there so we can count 2nd from the right also)

So 18th letter from the left or 2nd from the right end will be R.

Hence, R is the correct answer.

Q49. Answer: (d) 27-67-45-43

The pattern followed here is:

Similarly,

Hence, the correct answer is "27-67-45-43".

Q50. Answer: (a) AC

1) A is four places above C.

2) E is three places below A.

A
E
C

3) D is between B and E.

A
B
D
E
C

AC is different from the given option.

Thus, the correct answer is "AC".

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