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|| आपकी सफलता, हमारी प्रतिबद्धता ||

1. Answer C

Solution

Central Arid Zone Research Institute - Jodhpur

Central Sheep and Wool Research Institute - Avikanagar (Malpura, Tonk)

Sheep and Wool Training Institute - Jaipur

Central Mustard Research Institute - Sewar (Bharatpur)

केन्द्रीय शुष्क क्षेत्र अनुसंधान संस्थान - जोधपुर

केन्द्रीय भेड़ एवं ऊन अनुसंधान संस्थान - अविकानगर (मालपुरा, टोंक)

भेड़ और ऊन प्रशिक्षण संस्थान - जयपुर

केन्द्रीय सरसों अनुसंधान संस्थान - सेवर (भरतपुर)

2 Answer D

Solution

The largest quantity of iron is found in Jaipur, while the highest volume of iron ore is extracted from Kanpura (Jaipur). Key locations include Morija-Banola in Jaipur; Dabla-Singhana in Jhunjhunu; Nimla-Raisela and Lalsot in Dausa; the Pur-Banera region in Bhilwara and Nathra-ki-Pal and Thur-Hunder in Udaipur.

सर्वाधिक लौहा जयपुर में, जबकि सर्वाधिक कच्चा लौहा कानपुरा (जयपुर) से निकाला जाता है। जयपुर के मोरिजा बानोला, झुंझुनूँ के डाबला-सिंघाना, दौसा के नीमला-राइसेला व लालसोट तथा भीलवाड़ा के पुर बनेड़ा क्षेत्र, उदयपुर के नाथरा की पाल एवं थुर हुण्डेर।

3. Answer A

Solution

Wells and tubewells play a significant role in Rajasthan's agriculture, accounting for approximately 70.10%.

कुएँ और नलकूप राजस्थान की कृषि में महत्वपूर्ण भूमिका करीब 70.10% निभाते हैं।

4. Answer C

Solution

The foundation stone for the Indira Gandhi Canal Project was laid on March 31, 1958.

इंदिरा गाँधी नहर परियोजना का शिलान्यास 31 मार्च, 1958 में किया गया।

5. Answer D

Solution

(i) Rathi - Bikaner (North-Western Rajasthan): This is an excellent breed of cow.

(ii) Gir - Ajmer (South-Eastern/Central Rajasthan): Originating from the Gir forest in the Saurashtra region of Gujarat, this dual-purpose breed is known as 'Randa' in Rajasthan and 'Ajmera' in Ajmer.

(iii) Tharparkar - Barmer (Western Rajasthan): It is also referred to as 'Malani' or 'Thari'.

(iv) Sanchore (Kankrej) - Jalore (South-Western Rajasthan): The bullocks of this breed are renowned for their speed and their ability to carry heavy loads.

(i) राठी - बीकानेर (उत्तरी-पश्चिमी राजस्थान) : यह गाय की सर्वश्रेष्ठ नस्ल है।

(ii) गिर- अजमेर (दक्षिण पूर्व मध्यवर्ती राजस्थान) : गुजरात के सौराष्ट्र प्रदेश में स्थित गिर वन की इस द्विप्रयोजनीय नस्ल को राजस्थान में 'रैंडा' तथा अजमेर में 'अजमेरा' कहते हैं

(iii) थारपारकर- बाड़मेर (पश्चिमी राजस्थान) : इसे मालाणी व थारी भी कहा जाता है।

(iv) सांचौर (कांकरेज) - जालौर (दक्षिणी पश्चिमी राजस्थान): इस नस्ल के बैल तेज दौड़ने व बोझा ढोने के लिए प्रसिद्ध है।

6. Answer D

Solution

High quality varieties of major crops →

Cotton → Narma, Bikaneri Narma, PST-9, US-51, US-71, US-81, Veernar, Varalakshmi, Shankar-4

Sugarcane → CO-419, CO-449, CO-1007, CO-1111

प्रमुख फसलों की उच्च गुणवत्ता वाली किस्में →

कपास → नरमा, बीकानेरी नरमा, PST-9, US-51, US-71, US-81, वीरनार, वरलक्ष्मी, शंकर-4

गन्ना → CO-419, CO-449, CO-1007, CO-1111

7. Answer C

Solution

Desert soil has low fertility and a low content of organic matter.

मरुस्थल की मृदा में उर्वरता और खाद-मिट्टी की मात्रा निम्न होती है।

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8. Answer D

Solution

The Rajasthan Action Plan on Climate Change (RAPCC), formulated in 2012, was a comprehensive strategy developed by the Government of Rajasthan to address the impacts of climate change in the state, with the goal of implementing adaptation and mitigation measures.

2012 में तैयार की गई राजस्थान एक्शन प्लान ऑन क्लाइमेट चेंज (RAPCC) राज्य में जलवायु परिवर्तन के प्रभावों से निपटने के लिए राजस्थान सरकार द्वारा बनाई गई एक विस्तृत रणनीति थी, जिसका लक्ष्य अनुकूलन और शमन के उपायों को लागू करना है।

9. Answer C

Solution

Mixed deciduous forests are found in eastern Rajasthan. These forests typically occur in regions that receive between 50 and 85 cm of rainfall. They can also be described as 'dry monsoon open forests.' Such forests are found in parts of Udaipur, Salumbar, Kota, Rajsamand, Bundi, Chittorgarh, and Sirohi. Common tree species in these areas include Dhok, Banyan (Bargad), Gular, Palash, Tendu, Sal, Bamboo, Mango, Jamun, Babool, and Khair. Due to the prevalence of the Dhok tree, these are also referred to as 'Dhokda' forests.

मिश्रित पतझड़ वन [Mixed Deciduous Forest] पूर्वी राजस्थान में पाये जाते हैं। जिन प्रदेशों में वर्षा 50 से 85 सेमी. के मध्य होती है, वहाँ अधिकांशतः ऐसे वन पाये जाते हैं। इन्हें 'शुष्क मानसूनी खुले वन' भी कहा जा सकता है। ये वन उदयपुर, सलूम्बर, कोटा, राजसमंद, बूंदी, चित्तौड़गढ़ और सिरोही के कुछ भागों में पाये जाते हैं। यहाँ सामान्य रूप से धोंक, बरगद, गूलर, पलाश, तेंदू, साल, बाँस, आम, जामुन, बबूल, खैर आदि के वृक्ष प्रमुख है। धोंक वृक्ष की अधिकता के कारण इन्हें धौंकड़ा वन भी कहा जाता है।

10. Answer C

Solution

The Ramgarh Vishdhari Tiger Reserve project (2021-22) is situated across an area of 1,496.49 sq km in the Kota and Bundi districts.

रामगढ़ विषधारी बांध परियोजना (2021-22) में कोटा व बूंदी के 1496.49 km क्षेत्रफल में स्थित है।

11. Answer C

Solution

Animal Symbol – District

Black Francolin – Jhunjhunu

Honey Badger – Udaipur

Chital (Spotted Deer) – Jaipur

Leopard – Pali

Swan – Tonk

प्राणी प्रतीक – जिला

काला तीतर – झुंझुनूं

कब्रा बिज्जू – उदयपुर

चीतल – जयपुर

तेंदुआ – पाली

हंस – टोंक

12. Answer D

Solution

Badland Topography: In the Chambal River valley region of Rajasthan, the landscape characterized by deep ravines and gullies is known as 'badland topography'. Affected districts: This is prominently observed in districts within the Chambal basin, such as Sawai Madhopur, Karauli, and Dholpur. In the local dialect, this region is also referred to as the 'Dang region'.

उत्खात भूमि (Badland Topography): राजस्थान में चम्बल नदी घाटी क्षेत्र में गहरे खड्डों और बीहड़ों वाली स्थलाकृति को 'उत्खात भूमि' कहा जाता है।प्रभावित जिले: यह मुख्य रूप से चम्बल बेसिन के जिलों जैसे सवाई माधोपुर, करौली और धौलपुर में विस्तृत रूप से दिखाई देती है। इस क्षेत्र को स्थानीय भाषा में 'डांग क्षेत्र' भी कहा जाता है

13. Answer B

Solution

According to Köppen, BShw is the largest climatic region in Rajasthan.

कोपेन के अनुसार BShw राजस्थान का सबसे बड़ा जलवायु प्रदेश है।

14. Answer B

Solution

Tributaries joining the Mahi River from the right and left sides: Right bank → Som, Jakham, Moren, Iru, Bhadar (Sab)

Left bank → Anas, Chap, Haran

माही नदी की दाई और बाई ओर से मिलने वाली सहायक नदियाँ -

दायाँ किनारा → सोम, जाखम, मोरेन, ईरू, भादर (साब)

बायाँ किनारा → अनास, चाप, हरण

15. Answer C
Solution
District - Date of Formation
Dholpur - April 15, 1982
Rajsamand - April 10, 1991
Karauli - July 19, 1997
Pratapgarh - January 26, 2008
जिला - निर्माण की तिथि
धौलपुर - 15 अप्रैल, 1982
राजसमंद - 10 अप्रैल, 1991
करौली - 19 जुलाई, 1997
प्रतापगढ़ - 26 जनवरी, 2008

16. Answer A
Solution
Major Rans (salt flats/playas) in Rajasthan –
Churu → Tal Chhapar, Parihara / Padihara
Phalodi → Baap, Phalodi
Jaisalmer → Bhakri, Pokaran
Balotra → Thob, Pachpadra
Barmer → Redana
राजस्थान के प्रमुख रन –
चूरू → तालछापर, परिहारा / पड़िहारा
फलौदी → बाप, फलौदी
जैसलमेर → भाकरी, पोकरण
बालोतरा → थोब, पचपदरा
बाड़मेर → रेडाना

17. Answer B
Solution
So far, three women have held the office of Governor in Rajasthan:
1. Smt. Pratibha Patil (2004–2007)
2. Smt. Prabha Rau (2009–2010)
3. Smt. Margaret (2012–2014)
राजस्थान में अब तक तीन महिलाएँ राज्यपाल पद पर रही हैं-
1. श्रीमती प्रतिभा पाटिल (2004-2007)
2. श्रीमती प्रभा राव (2009-2010)
3. श्रीमती मार्गरेट (2012-2014)

18. Answer C
Solution
The State Information Commission in Rajasthan was constituted on April 18, 2006 (notification dated April 13, 2006). The Rajasthan State Information Commission is a statutory and autonomous body.
राजस्थान में राज्य सूचना आयोग का गठन 18 अप्रैल, 2006 (अधिसूचना-13 अप्रैल, 2006) को किया गया है। राजस्थान राज्य सूचना आयोग एक सांविधिक एवं स्वायत्तशासी निकाय है।

19. Answer C
Solution
Municipal Corporation - Year of Establishment
Kota Municipal Corporation - 1993
Jodhpur Municipal Corporation - 1992
Udaipur Municipal Corporation - 2014
Bikaner Municipal Corporation – 2008
नगर निगम - स्थापना वर्ष
कोटा नगर निगम - 1993
जोधपुर नगर निगम - 1992
उदयपुर नगर निगम - 2014
बीकानेर नगर निगम – 2008

20. Answer B
Solution
Committee - Year of Formation
Girdharilal Vyas - 1973 AD
Gulabchand Kataria - 2009 AD
Harishchandra Sharma - 1963 AD
Harlal Singh Kharra - 1990 AD
समिति - गठन वर्ष
गिरधारीलाल व्यास - 1973 ई.
गुलाबचंद कटारिया - 2009 ई.
हरिशचन्द्र शर्मा - 1963 ई.
हरलाल सिंह खर्रा - 1990 ई.

21. Answer A
Solution
Public Service Guarantee Act -
This Act was the 23rd Act of the year 2011.
This Act received the Governor's assent on September 21, 2011.
लोक सेवा गारंटी अधिनियम -
यह अधिनियम वर्ष 2011 का 23 वाँ था।
इस अधिनियम को राज्यपाल की स्वीकृति 21 सितम्बर, 2011 को प्राप्त हुई।

22. Answer D
Solution
Election Process –
1/3 of MLCs – by MLAs
1/3 of MLCs – by local urban bodies
1/12 of MLCs – by teachers (at the secondary and higher secondary levels)
1/12 of MLCs – by graduates (who graduated at least 3 years prior)
1/6 of MLCs – by the Governor (Article 171(5)) (from the fields of literature, science, art, the cooperative movement, or social service)
विधानपरिषद प्रक्रिया –
1/3 MLC - MLA द्वारा
1/3 MLC - स्थानीय शहरी निकायों द्वारा
1/12 MLC - अध्यापकों द्वारा (माध्यमिक व उच्च माध्यमिक स्तर के)
1/12 MLC - स्नातक (3 वर्ष पूर्व)
1/6 MLC - राज्यपाल द्वारा (171(5)) (साहित्य, विज्ञान, कला, सहकारी आंदोलन, समाज सेवा)

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23. Answer D

Solution

The functions of the Lokayukta include:

Recommending the suspension or transfer of public servants accused of corruption.

Initiating an investigation into a matter on its own initiative for the purpose of controlling corruption.

Penalizing a complainant in cases where the complaint was filed with malicious intent.

लोकायुक्त का कार्य है

भ्रष्टाचार के आरोपी लोकसेवकों के निलंबन या स्थानांतरण की सिफारिश करना।

भ्रष्टाचार नियंत्रण के लिए स्वयं की पहल पर किसी मामले की जाँच शुरू करना।

दुर्भावनावश की गई शिकायतों के क्रम में शिकायतकर्ता को दण्डित करना।

24. Answer A

Solution

The first attempt to foster public awareness in the Bikaner State was made by Swami Gopal Das of Churu. To this end, Swami Gopal Das—with the assistance of Pandit Kanhaiya Lal and Pandit Shriram Master—established the Sarvahitkarini Sabha in Churu (1907 AD). Due to its political activities, this organization came to be known as the 'Congress of Churu'. The Sarvahitkarini Sabha established the 'Putri Pathshala' (Girls' School) in Churu to promote women's education, and the 'Kabir Pathshala' to provide education to the Harijans and empower them toward self-reliance.

बीकानेर राज्य में जनजागृति पैदा करने का प्रथम प्रयास चूरू के स्वामी गोपालदास ने किया। इस हेतु सर्वहितकारिणी सभा की चूरू (1907 ई.) में स्थापना स्वामी गोपालदास ने पं. कन्हैया लाल तथा पं. श्रीराम मास्टर के सहयोग से की, जो अपने राजनैतिक कार्यों के कारण 'चूरू की कांग्रेस' कहलायी। सर्वहितकारिणी सभा ने नारी शिक्षा के लिए चूरू में 'पुत्री पाठशाला' तथा हरिजनों को शिक्षित करने व स्वावलम्बी बनाने के लिए 'कबीर पाठशाला' की स्थापना की।

25. Answer B

Solution

Integration phase – Prime Minister

Matsya Sangh - Shobharam Kumawat

Rajasthan Union - Gokul Lal Asawa

United Rajasthan - Manikyalal Verma

Greater Rajasthan - Hiralal Shastri

एकीकरण चरण – प्रधानमंत्री

मत्स्य संघ - शोभाराम कुमावत

राजस्थान संघ - गोकुल लाल असावा

संयुक्त राजस्थान - माणिक्यलाल वर्मा

वृहद राजस्थान - हीरालाल शास्त्री

26. Answer D

Solution

The Alwar farmers' movement had its grievances published in a magazine called "Pukar."

अलवर कृषक आंदोलन ने अपनी समस्याओं को "पुकार" नामक पत्रिका में प्रकाशित करवाया था।

27. Answer A

Solution

On June 25, 1818, a treaty was concluded between the East India Company and Alijah Daulat Rao Scindia. Under this agreement, Ajmer came under British control. In the same year, the British government established a military cantonment at Nasirabad. The region of Merwara was also incorporated into Ajmer. Thus, the centrally administered territory of 'Ajmer-Merwara'—under British suzerainty—came into existence.

25 जून, 1818 को ईस्ट इण्डिया कम्पनी और आलीजाह दौलतराव सिंधिया के बीच एक संधि हुई। इसके तहत अजमेर अंग्रेजों को प्राप्त हो गया। इसी वर्ष ब्रिटिश सरकार ने नसीराबाद में सैनिक छावनी स्थापित की। मेरवाड़ा का क्षेत्र भी अजमेर में मिला दिया गया। इस प्रकार अंग्रेज आधिपत्य वाला केन्द्रशासित प्रदेश 'अजमेर-मेरवाड़ा' अस्तित्व में आया।

28. Answer C

Solution

Ara (Nimej) Conspiracy Case - March 20, 1913

Revolutionaries -> Manakchand, Motichand, Zorawar Singh, Jaychand

आरा (नीमेज) षड्यंत्र काण्ड - 20 मार्च, 1913

क्रांतिकारी -> मानकचन्द, मोतीचंद, जोरावर सिंह, जयचंद

29. Answer C

Solution

Mount Abu and Ranakpur are included in the Godwar tourist circuit.

माउण्ट आबू और रणकपुर गोडवाड़ पर्यटक परिपथ में सम्मिलित हैं।

30. Answer D

Solution

Paniwada - A ritual associated with death (funeral rites).

Badhar - A communal feast held on the occasion of a wedding.

Kanyaval - A fast observed by the bride's parents and relatives on the day of the wedding.

Badi Padla - Clothes, jewelry, and gifts sent by the groom's family for the bride.

पानीवाडा - मृत्यु (अंतिम संस्कार) से संबंधित रस्म है।

बढार - विवाह के अवसर पर दिया जाने वाला सामूहिक प्रीति भोज

कन्यावल - विवाह के दिन वधू के माता-पिता व रिश्तेदारों द्वारा रखा जाने वाला उपवास।

बड़ी पडला - वर पक्ष द्वारा वधू के लिए भेजे जाने वाले कपड़े, गहने और उपहार।

31. Answer B

Solution

Kanakti - Waist

Ramjhol - Feet

Hansli - Neck

Memand - Head

कणकती - कमर

रमझोल - पैर

हंसली - गला

मेमन्द - सिर

32. Answer D

Solution

Kanhaiyalal Sethia -> He authored more than 30 books in Rajasthani and Hindi.

Major works: - Vanphool (first poetry collection)

Agni Veena, Dharti Dhora Ri

Patal aur Peethal

कन्हैयालाल सेठिया -> इन्होंने राजस्थानी व हिन्दी में 30 से अधिक पुस्तकों की रचना की।

प्रमुख रचनाएँ

- वनफूल (पहला काव्य संग्रह)
- अग्नि वीणा, धरती धोरां री
- पातल और पीथल

33. Answer C

Solution

Kripal Singh Shekhawat is a renowned artist of blue pottery.

Kudrat Singh was awarded the Padma Shri in 1988 for his contribution to the famous art of Meenakari (enameling) from Jaipur.

ब्लू पॉटरी के प्रसिद्ध कलाकार कृपाल सिंह शेखावत हैं।

कुदरत सिंह जयपुर की प्रसिद्ध मीनाकारी कला के लिए 1988 में पद्मश्री से सम्मानित किया गया था।

34. Answer B

Solution

Saint Dadu Dayal was born in Ahmedabad (Gujarat) on the eighth day of the bright fortnight (shukla ashtami) of the month of Phalguna in 1544 CE.

संत दादूदयाल जी का जन्म अहमदाबाद (गुजरात) में फाल्गुन शुक्ल अष्टमी 1544 ई. में हुआ था।

35. Answer C

Solution

The tomb (dargah) of Saint Abdullah Pir is located in the village of Bhawanpura in Banswara, where thousands of people from the Dawoodi Bohra community offer prayers during the Urs. The tomb of Alauddin Khan, situated in Ajmer, is known as 'Sola Thamba'.

संत अब्दुल्ला पीर का मकबरा (दरगाह) बाँसवाड़ा के भवानपुरा गाँव में स्थित है, जहाँ दाऊदी बोहरा सम्प्रदाय के हजारों लोग उर्स के दौरान नमाज अदा करते हैं। अजमेर स्थित अलाउद्दीन खाँ का मकबरा 'सोला थम्बा' कहलाता है।

36. Answer D

Solution

The haveli of Danchand Chopra is located in Sujangarh, Churu. Other notable havelis in Churu include the Goenka Haveli, the 'Hawa Mahal' (palace of winds) of the Suranas, the haveli of Ramvilas Goenka, and the 'Moti Haveli' (grand haveli) of the Mantris. The Surana Haveli features 1,100 doors and windows.

चूरू के सुजानगढ़ में दानचन्द्र चौपड़ा की हवेली स्थित है। चूरू में स्थित अन्य हवेलियाँ -गोयनका की हवेली - यहाँ स्थित प्रसिद्ध हवेलियों में सुराणों के हवामहल और रामविलास गोयनका की हवेली, मंत्रियों की मोटी हवेली आदि हैं।सुराणा की हवेली - इसमें 1100 दरवाजे एवं खिड़कियाँ हैं।

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37. Answer D

Solution

Events related to Maharaja Ganga Singh –

Establishment of the Praja Pratinidhi Sabha (People's Representative Assembly) – 1913 (Bikaner)

Participation in the Paris Peace Conference – 1919

Establishment of the Chamber of Princes – 1921

Construction of the Gang Canal – 1927

महाराजा गंगासिंह से संबंधित घटनाएं –

प्रजा प्रतिनिधि सभा की स्थापना - 1913 (बीकानेर)

पेरिस शांति सम्मेलन में भाग लेना – 1919

चैम्बर्स ऑफ प्रिंसेस की स्थापना – 1921

गंगनहर का निर्माण - 1927

38. Answer A

Solution

Raja Bharmal was the first Rajput ruler to accept Mughal suzerainty; he submitted to Akbar at Sambhar in 1562 CE.

For his valiant role in suppressing the Mirza rebellion in Gujarat (at Sarnal), Akbar honored Bhagwant Das by bestowing upon him a nagada (kettledrum) and a parcham (standard/flag).

मुगलों की अधीनता स्वीकार करने वाले पहले राजपूत शासक राजा भारमल थे जिन्होंने 1562 ई. में सांभर में अकबर की अधीनता स्वीकार की थी।

गुजरात (सरनाल) के मिर्जा विद्रोह को बहादुरी से दबाने के कारण अकबर ने भगवंतदास को "नगाड़ा व परचम (झंडा)" देकर सम्मानित किया था।

39. Answer A

Solution

In the Ganeshwar civilization, houses were constructed using stone; no evidence of the use of bricks has been found here. This cultural tradition flourished in the regions of eastern Rajasthan and the Ganges Valley. Copper artifacts discovered at the site include arrowheads, chisels, fishhooks, copper pins with double-spiral heads, razor blades, and rings. Two types of brownish-red (ochre-colored) earthenware have been found at Ganeshwar: (1) thin, light-red pottery associated with the pre-Harappan culture, and (2) sturdy pottery made of fine red clay, featuring distinct decorative patterns. Notable examples among these vessels include jars, pots (kalash), lids, and cooking vessels (handi).

गणेश्वर सभ्यता में मकान पत्थर के बनाये जाते थे। यहाँ ईंटों के उपयोग के प्रमाण नहीं मिले। यह सभ्यता संस्कृति पूर्वी राजस्थान एवं गंगाघाटी के क्षेत्र में पल्लवित हुई है। ताम्र उपकरणों में बाण, छैनियाँ, मछली पकड़ने के काँटे, दोहरी पेचदार शिरावाली ताम्रपिन, उस्तरे के फलक, अंगुठियाँ प्राप्त हुए हैं। गणेश्वर में मिट्टी के कपिषवर्णी दो प्रकार के बर्तन मिले हैं- (1) हड़प्पा पूर्व संस्कृति के हल्के लाल रंग के पतले बर्तन, (2) लाल चिकनी मिट्टी विशिष्ट चित्रकारी वाले मजबूत बर्तन। इन बर्तनों में मर्तबान कलश, ढक्कन- हाण्डी प्रमुख हैं।

40. Answer C

Solution

Ghatiyala Inscriptions: Dating to 861 CE (Vikram Samvat 918), these inscriptions are engraved on a pillar in the village of Ghatiyala, located 20 miles from Jodhpur district. They extol the virtues of the Pratihara ruler Kakkuka—describing him as a just, courageous, and valiant king dedicated to the welfare of his subjects—and provide his genealogy (tracing the lineage from Rohilliddhi to Kakkuka). The inscriptions are composed in both Sanskrit and Prakrit. They also make mention of the 'Mag' (or Maga) caste of Brahmins. The text was authored by a member of the Mag community, while the engraving was executed by a goldsmith named Krishneshvara; the entire project was commissioned by Kakkuka. These individuals are known as Shakadvipiya Brahmins, who lived under the patronage of the Oswal community.

घटियाला के शिलालेख : 861 ई. (वि. सं. 918) के ये लेख जोधपुर जिले से 20 मील दूर घटियाली गाँव में में एक स्तंभ पर उत्कीर्ण हैं। इनमें प्रतिहार नरेश कक्कुक का यशोगान (न्यायप्रिय, जनहित का सम्पादक, वीर व साहसी शासक) है एवं उसकी वंशावली (रोहिलिद्ध से लेकर कक्कुक तक) दी गई है। ये लेख संस्कृत व प्राकृत दोनों भाषाओं में है। इस लेख में 'मग' जाति के ब्राह्मणों का उल्लेख भी है। इस अभिलेख का रचयिता मग एवं उत्कीर्णकर्ता सुवर्णकार कृष्णेश्वर था। इसे कक्कुक ने उत्कीर्ण करवाया था। इन्हें शाकद्वीपीय ब्राह्मण कहा जाता है जो ओसवालों के आश्रित रहकर जीवनयापन करते थे।

41. Answer B

Solution

Estimating is the process in which the exact quantities of various items of work are determined.

42. Answer D

Solution

Post-chlorination is the practice of adding chlorine to water at the very end of the treatment process, right before it enters the distribution system.

By this final stage, most of the organic matter, algae, and impurities have already been removed

through sedimentation and filtration. Because these organic materials are gone, adding chlorine at this point drastically minimizes the formation of foul tastes, medicinal odours, and dangerous **carcinogenic compounds** like Trihalomethanes (THMs). Furthermore, the chlorine reacts with any remaining ammonia in the clean water to form **chloramines**, which are highly stable and provide lasting disinfection as the water travels through the pipe network to consumers.

In contrast, statement 1 is incorrect because delaying chlorination to the final stage does not change or reduce the water's chemical chlorine demand; it simply ensures that the chlorine applied is used efficiently for disinfection rather than reacting with raw organic pollutants.

43. Answer A

Solution

Coagulation relies on optimizing chemical conditions and particle collisions to successfully clump together suspended impurities in water.

The entire process becomes highly efficient when dealing with **high-turbidity water** because the dense concentration of suspended particles increases collision frequencies, leading to faster floc aggregation and a higher overall removal percentage. To make these flocs even larger and heavier, **coagulant aids like activated silica** are added to serve as structural nuclei that physically bind smaller micro-flocs together for rapid settling.

However, none of this works efficiently without controlling the **pH of the water**, which is the single most critical factor when selecting a chemical coagulant. The pH dictates how the coagulant dissolves and interacts with the electrical charges on the impurities; for instance, a common coagulant like alum will completely fail to precipitate if the water falls outside its strict optimal pH range. Because particle density, chemical aids, and pH levels all simultaneously dictate the success of the process, all three factors are correct and necessary.

44. Answer C

Solution

Time for 8 sheds at the planned rate = (8/30) x 90 24 days.

They were completed in 20 days, so the project is ahead of schedule.

Expected cost = 8 × 10,000 =80,000.

Actual cost is Rs. 85,000, so cost overrun exists.

45. Answer A

Solution

Chlorine residual determination relies on specific biochemical and colorimetric indicators to measure how much active disinfectant remains in water.

The **Starch-iodide**, **Orthotolidine**, **SNORT** (Stabilized Neutral Orthotolidine), and **DPD** (N,N-diethyl-p-phenylenediamine) methods are all standard laboratory and field procedures specifically designed to differentiate or measure free and combined forms of residual chlorine. For example, the modern DPD method is highly favored because it quickly turns a distinctive pink colour to distinguish free available chlorine from combined chloramines.

In contrast, the **Amperometric titration method** (statement 3) is a highly precise electrochemical technique used to determine the total concentration of chlorine or oxidants in a sample rather than dynamically isolating the individual free and combined residuals in general field testing setups. Therefore, methods 1, 2, 4, and 5 are the correct answers grouped together.

46. Answer C

Solution

The net annual worth method converts costs and benefits into equivalent annual values and is suitable for comparing alternatives with different service lives.

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47. Answer D

Solution

Wastewater treatment units are strategically sequenced so that each unit operation targets a specific size and category of impurity based on its settling property or chemical nature.

grit chamber is a preliminary treatment unit designed to reduce the flow velocity of sewage just enough to allow heavy, coarse inorganic solids like **sand, silt, and gravel** to settle out by gravity without letting organic particles settle. Following this, the wastewater moves into the **primary sedimentation tank**, where the velocity is dropped even further over a few hours to facilitate the gravitational settling of fine **suspended organic impurities** (or "impurifiers").

Conversely, a **detritus tank** is structurally designed to remove much finer inorganic silt and sand than a standard grit chamber, not bulk organic matter. For floating materials like **oils, grease, and fats**, a specialized *skimming tank* is utilized rather than an aeration tank, which is instead reserved for biological oxidation of dissolved organic matter in an activated sludge plant. Because only the first and third pairs accurately describe the intended target impurities of those specific units, they form the correct combination.

48. Answer C

Solution

Slip-form construction pours concrete continuously into a moving form. The form is raised at a controlled rate; the rate specified here is 20-30 cm per hour.

49. Answer C

Solution

Sludge characteristics and treatment dynamics are governed by biological classification, fluid mechanics, and volumetric mass relationships.

Secondary sludge is composed primarily of the **living biomass** generated during biological treatment stages (like the activated sludge process). Microorganisms feed on the dissolved organic material in aeration tanks, multiplying and aggregating into active microbial flocs that subsequently settle out in the secondary

50. Answer D

Solution

The principles listed include aspect and prospect, roominess, grouping, and flexibility and privacy.

51. Answer C

Solution

Grit chamber hydraulics require a highly specific, unchanging flow velocity (typically around **0.3 m/s**) to function effectively. This speed is a critical threshold: it is slow enough to let heavy inorganic materials like sand and silt settle to the bottom, but fast enough to keep lighter organic matter moving forward without settling and fouling the chamber.

52. Answer D

Solution

An **oxidation pond** (also known as a waste stabilization pond) is a completely natural, low-rate biological treatment system. Because it is designed very shallow (typically 1 to 1.5 metres deep) to allow full sunlight penetration and relies entirely on natural atmospheric oxygen transfer and algal-bacterial symbiosis rather than mechanical aeration, it requires a very low organic loading rate. Consequently, it demands a massive surface area and extensive hydraulic retention times (often spanning 10 to 20 days) to treat a given discharge.

53. Answer D

Solution

In a standard breakpoint chlorination process, the very first section of the curve (**portion AB**) stays flat along the bottom axis because the added chlorine is immediately destroyed by immediate reducing compounds like iron, manganese, and nitrates. No residual chlorine can form during this initial phase.

If **only ammonia** is present in the water, these alternative reducing compounds are completely absent. As a result, the added chlorine will instantly react with the ammonia to form **chloramines** from the very first drop. This shifts the starting point of the residual curve directly back to the **origin (Point A)** rather than delaying it to Point B, causing the curve to pass directly through the origin.

54. Answer C

Solution

Excavation and moving – scrapers

pure excavation – power shovel

pure transportation – dump truck

pure hoisting – derrick.

55. Answer A

Solution

Slow sand filters utilize a naturally forming biological layer at the surface known as the *Schmutzdecke*. This active layer is highly effective at biological purification, removing up to 98% to 99% of bacteria. RSF relies entirely on mechanical straining and chemical pretreatments, resulting in a lower independent bacterial removal efficiency.

Rapid sand filtration systems are invariably paired with upstream chemical coagulation and flocculation processes. These chemical coagulants bind to dissolved organic matter and colloidal pigments, allowing RSF to remove complex color compounds that pass right through an un-coagulated SSF.

56. Answer B

Solution

Draglines are used to excavate soft earth below the machine's operating level.

57. Answer A

Solution

Double filtration is used to increase the filtration capacity of slow sand filters

58. Answer B

Solution

TDS (Total Dissolved Solids): Represents the minerals and salts dissolved in water. When they dissolve, they split into charged ions.

EC (Electrical Conductivity): Measures water's ability to conduct electricity, which relies entirely on these free-moving ions.

Direct Relation: More dissolved solids (higher TDS) means more ions, which means electricity flows more easily (higher EC). Therefore, EC increases as TDS increases.

59. Answer B

Solution

Manganese Zeolite is used for removing soluble Iron and Manganese from solution. Activated carbon is widely used for removing tastes and odours from public supplies.

60. Answer A

Solution

Settlement may occur due to moisture changes, increased loading and other factors. An allowance of approximately 5-7% may be provided along the embankment, as stated in the book.

61. Answer C

Solution

As per Kuichling's formula, the fire demand rate is calculated as:

$Q = 3182\sqrt{P}$

Where:

Q = Fire demand in liters/minute

P = Population in thousands

Calculation:

Given population = 1,40,000 → P = 140

Q = 3182 × $\sqrt{140}$

Q = 3182 ×11.832

Q ≈ 37,649.93 (which rounds to 37,650)

62. Answer C

Solution

For 0.8 m³ concrete,

cement required = 0.8 × 5.5 = 4.4 bags.

Using 4 whole bags,

volume (4/4.4) × 0.8 = 0.73 m³.

63. Answer B

Solution

Grit chambers are provided in the form of channels of longer length and smaller cross section area.

Grit chamber should not allow settlement of organic materials.

Velocity in the grit chamber should be such that organic matters do not settle. Or if it has settled, the velocity should be sufficient to scour away the settled organic matter.

Flow velocity adopted for the design of grit chamber is 0.15 to 0.3 m/s.

Two channels are provided one for normal flow and other for peak flow, obviously used with normal flow.

64. Answer B

Solution

(i) Self cleaning velocity is the minimum velocity at which no solid gets deposited at the bottom of sewer.

S.No.	Minimum velocity	Type of flow
1.	0.8 m/sec	Design peak flow
2.	0.6 m/sec	Current peak flow
3.	0.45 m/sec	Minimum flow

(ii) Maximum velocity

To avoid erosion of pipe surface maximum velocity should be limited as follows

Concrete sewer → 2.5 - 3 m/sec

Cast iron sewer → 3.5-4.5 m/sec

Stone ware sewer → 3-4 m/sec

65. Answer D

Solution

Assertion (A) is FALSE: Slow sand filters are actually more efficient at removing bacteria (98% to 99% efficiency) than rapid sand filters (80% to 90% efficiency). This high efficiency is due to the formation of a biological layer (Schmutzdecke) and a lower filtration rate.

Reason (R) is TRUE: The sand used in slow sand filters is finer. It has an effective size D_{10} of 0.2 to 0.35 mm, whereas rapid sand filters use coarser sand with an effective size of 0.45 to 0.7 mm.

66. Answer A

Solution

Wet volume =3 x 3 × 0.1 = 0.9 m³.

Dry volume 0.9 × 1.54 = 1.386 m³.

Cement fraction 1/10, so cement volume 0.1386 m³.

Using 0.035 m³ per bag: 0.1386/0.035 3.96, or about 4 bags.

67. Answer B

Solution

Siphonage pipe: A pipe which is installed for the purpose of preserving the water seal of traps in drainage system is called anti siphonage pipe.

It is very helpful to seal the back flow of drainage.

Vent pipe: A pipe which is provided for the ventilation purpose to facilitate the exit of foul gases into atmosphere.

Waste water pipe: A pipe which carries only liquid wastes from kitchens, wash basins etc. is called waste pipe. It does not carry human excreta.

Soil pipe: A pipe which carries human excreta from water closet to septic tank is called soil pipe. It is not connected to any other pipe except vent pipe

68. Answer C

Solution

- Check Valve or Reflux Valve or Non-Returning
- These possess some automatic device which allows the water to flow in one direction only.
- These are made of brass or gun metal.
- This valve is provided in the pipe line which draws water from the pump.
- When the pump is operated, the valve is opened, but when the pump is suddenly stopped the valve is automatically closed and the water is prevented from returning to the pump.

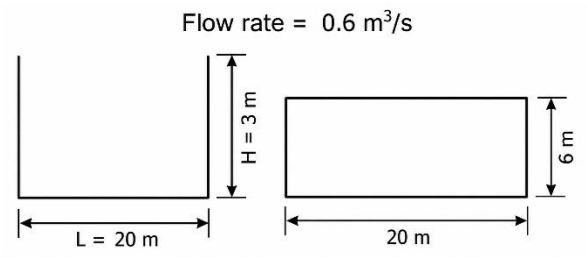
69. Answer A

Solution

Free Settling / Discrete Settling (Type I): Occurs in low solid concentrations where individual particles are far apart. They settle independently by gravity without any interparticle interaction or interference. Examples include grit removal chambers.

70. Answer B

Solution



Surface overflow rate $(V_0) = \frac{Q}{B.L.} = \frac{0.6}{20 \times 6}$

$= 5 \times 10^{-3}$ m/sec

Settling velocity of particle (V_s) = 0.004 m / sec

$$\% \text{ removal} = \frac{V_s}{V_0} \times 100 = \frac{0.004}{0.005} \times 100$$

= 80%

71. Answer A

Solution

Sedimentation is a natural process by which solids with higher density than the fluid in which they are suspended, settle under the action of gravity.

For a given discharge with increase in surface area, (Q/BL) result in increase in the efficiency of the sedimentation tank for the removal of the particles.

Efficiency of ideal sedimentation tank

$$\eta = \frac{V_s}{V_0} \times 100$$

Theoretically depth does not have any the efficiency of tank.

72. Answer A

Solution

0.01 mg/L (ppm) is the maximum permissible unit for arsenic in drinking water (as per IS 3025) and WHO guidelines and cause for rejection is 0.05 mg/L.

73. Answer A

Solution

The supplied book states that no deduction is made for openings up to 1,000 cm² (0.1 m²). It also mentions beam and rafter ends up to 500 cm² or 0.05 m² in cross-section.

74. Answer B

Solution

Measurement of turbidity is done using the following:

- Turbidity rod
- Jackson's turbidimeter
- Baylis turbidimeter
- Nephelometer

Baylis Turbidimeter

It is consists of a closed galvanized iron box, on one side of which, two glass tube can be held vertically side by side.

On the other side, in front of the tubes, a 250 watts electric bulb is located with a reflector, so as to throw light on the tube.

The glass tube are supported at bottom by a white opal glass plate and surrounded by blue cobalt plates.

One of the two glass tube is filled with water sample and other is filled with standard water sample of known turbidity.

Match test sample with different standard water sample till colour of both the tubes is same.

75. Answer D

Solution

Maximum hourly consumption

= 2.7 × (Annual average hourly demand)

= 2.7 × 100000 = 270000

Note:

(i) Maximum daily consumption = 1.8 × Average daily demand

(ii) Maximum hourly consumption = 1.5 × Average hourly consumption of maximum day

$$= 15 \times \left(\frac{\text{Maximum daily demand}}{24}\right)$$

$$= 1.5 \times 1.8 \times \left(\frac{\text{Average daily demand}}{24}\right)$$

= 2.7 × (Annual average hourly demand)

76. Answer B

Solution

For survival of fishes, the minimum dissolved oxygen required is 4 mg/l

77. Answer A

Solution

Excavation not exceeding 30 cm in depth is described as surface excavation when the specified plan dimensions are satisfied.

78. Answer B

Solution

Carbon monoxide, an odourless and colourless gas, has its major origin in the incomplete combustion of carbonaceous material. It is a highly poisonous gas and is generally classified as an asphyxiant. Carbon monoxide has a strong affinity for combining with the haemoglobin of the blood to form carboxy-haemoglobin. This reduces the ability of haemoglobin to carry oxygen to the body tissues.

Hence option (b) is correct.

79. Answer D

Solution

Good quality water, modern living and hotter climate increase the per capita water consumption.

However, then the supplies are metered, people use only that much of water as much is required by them. Hence metering system causes reduction in per capita water consumption.

80. Answer A

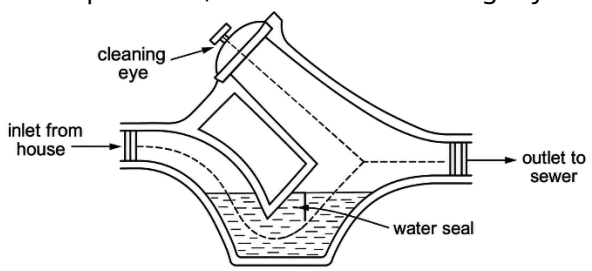
Solution

Mass haul is the volume of material multiplied by the distance through which it is moved. Mass haul diagrams help compare earthwork distribution methods in road and railway construction.

81. Answer B

Solution

An intercepting trap is often provided at the juction of a house sewer and a municipal sewer, so as to prevent the entry of the foul gases of the municipal sewer, into the house drainage system.



An Intercepting trap

82. Answer A

Solution

Volume of tank = discharge × detention time

$$15 \times 6 \times 3 = \left(\frac{2\times10^{6}\times10^{-3}}{24}\right)\times t_d$$

$$\therefore \quad t_d = \left(\frac{24\times15\times6\times3}{2\times10^{3}}\right) hours$$

$$t_d = 3.24 hours$$

83. Answer C

Solution

The supplied book specifies a 25% deduction to compensate for consolidation and settlement of loose soil.

25% deduction: For earth measured in loose stacks, carts, or lorries.

10% deduction: For ordinary consolidated filling.

5% deduction: For compaction using heavy mechanical machinery.

0% deduction: For consolidated fills done in strictly confined situations.

84. Answer B

Solution

Decade (1)	Population (Lakh) (2)	Increase in population (3)	% increase in population = growth rate% = $\frac{\text{Col.}(3)}{\text{Col.}(2)}\times100$
1	1	0.1	10%
2	1.1		
		0.1	9.09%
3	1.2		

Constant growth rate,

$$r = \sqrt{10\times9.09} = 9.534\%$$

The population in the 4th decade

$$P = P_0\left(1+\frac{r}{100}\right)^n = 1.2\left(1+\frac{9.534}{100}\right)^1$$

= 1.314 lakh

Most close option is (b)

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

85. Answer D

Solution

The occupancy classification listed in the book is:

Group

A Residential	B Educational
C Institutional for care	D Health care
E Business	F Mercantile
G Industrial	H Storage
I Assembly	J Hazardous
K Garages	L Utility

M Miscellaneous.

86. Answer C

Solution

The stoneware pipes offer the maximum advantage of being highly resistant to sulphide corrosion and therefore, preferred for carrying polluted sewage and industrial wastes.

87. Answer B

Solution

Theoretical Oxygen Demand (Th.O.D.): The maximum calculated oxygen required assuming 100% complete chemical oxidation of all organic compounds based strictly on chemical formulas. (Highest value)

Chemical Oxygen Demand (C.O.D.): The oxygen required to chemically oxidize both biodegradable and non-biodegradable organic matter using strong oxidizing agents. (Intermediate value)

Biochemical Oxygen Demand (B.O.D.): The oxygen required by microorganisms to biochemically degrade only the biodegradable portion of the organic matter. (Lowest value)

Therefore, the correct decreasing magnitude hierarchy is: Th.O.D. > C.O.D. > B.O.D..

88. Answer A

Solution

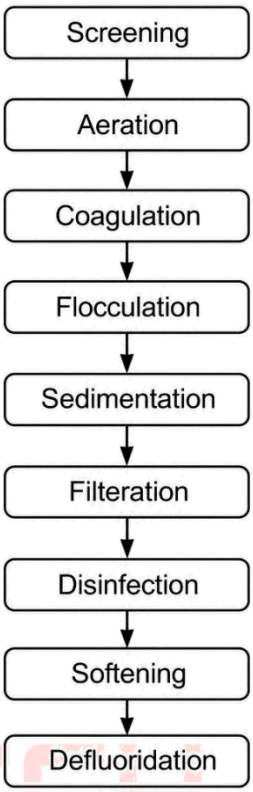
Net area is the area available for specific uses, measured to the interior face of enclosing walls. Plinth area is the covered built-up area at floor level; carpet area is the internal usable area; floor area is calculated according to the applicable floor measurement convention.

Note: The book's answer letter appears inconsistent with its explanation. The explanation describes net area, which is option (a).

89. Answer B

Solution

Water treatment include following process.



90. Answer B

Solution

The decomposition and putrefaction of sewage inside the sewers may result in the production of various gases, such as carbon dioxide, carbon monoxide, methane, hydrogen sulphide, amonia etc. If these gases are not removed, may cause serious problems and prove hazardous to the workers entering the sewers.

So these gases are disposed of into the atmosphere by suitable method of ventilation like ventilation columns etc.

91. Answer C

Solution

Given L = 10 m,

d = 0.016 m

steel density = 7,850 kg/m³.

Weight $W = (\pi/4)d^2 L_\rho \times \rho = \pi/4 \times 0.016^2 \times 10 \times 7850$

= 15.78 kg - 15.8 kg.

92. Answer D

Solution

Recommended spacing of manhole on straight reaches of sewer lines as per IS 1742-1960		Size of Sewer (m)
1.	45m	≤ 0.3 m (upto)
2.	75m	≤ 0.6 m (upto)
3.	90 m	≤ 0.9 m (upto)
4.	120 m	≤1.2 m (upto)
5.	250 m	≤1.5 m (upto)
6.	300 m	≤1.5 m (greater than)

93. Answer D

Solution

Indicator used in COD test of waste water is ferroin

94. Answer A

Solution

A detailed estimate separately calculates quantities and costs of the various work items using finalized designs and detailed working drawings.

95. Answer C

Solution

Aerobic bacteria: In presence of oxygen.

Anaerobic bacteria: Absence of oxygen

Facultative bacteria: With or without free oxygen

96. Answer D

Solution

Task work is the quantity of work a skilled labourer is expected to complete in a day for a particular construction activity.

97. Answer D

Solution

Water from spring along hilly slopes may not contain much impurities.

98. Answer B

Solution

Grit chamber - Two minutes

Primary sedimentation - Two hours

Activated sludge - Six hours

Sludge digestion - Twenty days

99. Answer B

Solution

Linear work such as cornices is measured in running metres. Surface work is measured in square metres, volume-based work in cubic metres, and individual items such as doors and windows by number.

100. Answer C

Solution

SVI (ml/gm) = $\frac{30\,cm^3}{3\,gms} = 10ml/gm$

101. Answer C

Solution

Alum reacts with alkalinity present in water and result in formation of sticky gelantinous precipitate of aluminium hydroxide which attract fine suspended impurities over its surface, thus grow in size and gets easily settled in the following sedimentation process.

For sweep computation to work water should have high alkalinity and high turbidity.

102. Answer A

Solution

Sludge bulking is due to the sludge having poor settling characteristics. Sludge bulking is due to the growth of filamentous micro-organisms (Nitrosomonas and nitrobacter). In order to avoid sludge bulking, either secondary sedimentation tank is chlorinated or nutrient content is increased in the system.

103. Answer C

Solution

Mechanism: In a Chemical Oxygen Demand (COD) test, organic matter is chemically oxidized using a strong oxidizing agent, Potassium Dichromate $K_2Cr_2O_7$

Role of acid: This oxidation reaction must take place under a highly acidic environment to proceed efficiently. Concentrated Sulfuric Acid H_2SO_4 is added to provide these strong acidic conditions.

Catalyst usage: Additionally, Silver Sulfate Ag_2SO_4 is dissolved in the H_2SO_4 to act as a catalyst to help oxidize straight-chain organic compounds.

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104. Answer D

Solution

According to the supplied book: plinth area uses external dimensions at floor level, excluding plinth offsets; balconies and cantilever projections are excluded; floor area is obtained by subtracting the area occupied by walls from plinth area.

105. Answer B

Solution

Steel pipe - Electrolytic corrosion: Steel is a metal and highly susceptible to galvanic or electrochemical corrosion when in contact with soil and moisture.

Concrete pipe - Sulfide corrosion: Sewage generates hydrogen sulfide H_2S gas, which converts to sulfuric acid and eats away the concrete crown (known as crown corrosion).

Asbestos cement pipe - Highly resistant to corrosion but can break easily: These pipes handle corrosion well but are brittle and prone to structural failure under heavy external loads.

Vitrified clay pipe - Virtually corrosion resistant: Clay is an inert ceramic material, making it completely resistant to acids and chemical corrosion from municipal sewage.

106. Answer D

Solution

Carbon monoxide - Asphyxia: Carbon monoxide CO binds strongly with blood hemoglobin to form carboxyhemoglobin. This prevents oxygen transportation in the body, leading to tissue hypoxia and chemical asphyxia (suffocation).

Halogenated Solvents - Attack the liver: Halogenated hydrocarbon solvents (such as carbon tetrachloride or chloroform) undergo metabolic activation in the body, releasing toxic free radicals that primarily target and cause severe damage to the liver (hepatotoxicity).

Hydrocarbons - Cause cancer: Many ambient hydrocarbons, particularly Polycyclic Aromatic Hydrocarbons (PAHs) like benzene or benzo[a] pyrene, are well-documented carcinogens that mutate DNA and lead to cancer.

107. Answer A

Solution

Dry volume = 1 x 1.52 = 1.52 m³.

Total mix ratio = 1+2+4 = 7.

Cement volume 1.52/7 = 0.2171 m³.

Using a cement bag volume of 0.035 m³, number of bags = 0.2171/0.035 =6.20 bags.

The nearest listed option is 6.25 bags.

108. Answer C

Solution

Hardy Cross method - Algebraic sum of head loss in any closed loop is zero: This is the core hydrodynamic principle $\sum h_L = 0$ used by this iterative technique to balance closed-loop circuists.

Equivalent pipe - Long and narrow pipe: The method replaces a complex combination of series or parallel lines into a single, uniform equivalent pipe that exhibits the same head loss for a given discharge.

Circle method - Domestic supply is neglected and fire demand is considered: A specialized analysis technique typically mapped onto looped water systems to ensure they can adequately handle localized firefighting demand during an emergency.

Electrical Analysis - Establishes analysis between flow fluid and flow of current: Uses electrical circuitry analogies where water discharge acts like electric current and friction head loss mirrors voltage drop

109. Answer C

Solution

Statement 1 is CORRECT: Slow sand filters have an exceptionally high bacterial removal efficiency, typically removing 98% to 99% of the bacterial load due to the action of the biological layer (Schmutzdecke).

Statement 2 is CORRECT: They are designed to effectively remove raw water turbidity up to 50 ppm (or mg/L). If raw water turbidity exceeds 60

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ppm, a preliminary treatment (like plain sedimentation) is required to prevent immediate clogging.

Statement 3 is INCORRECT: While they are less efficient at it compared to rapid sand filters, they do remove a small fraction of colour (typically around 20% to 25%) rather than failing to remove it entirely.

Statement 4 is INCORRECT: Fine colloidal matter passes through the sand media relatively easily unless chemical coagulants are used (which are not applied in slow sand filtration). They do not remove anywhere near 95% of colloidal matter

110. Answer C

Solution

Statement I is correct: Primary treatment is a physical process designed to remove large floating debris and suspended organic and inorganic solids through sequential filtration and sedimentation.

Statement II is correct: The liquid portion that remains after primary sedimentation is known as the primary effluent. This effluent is then transferred directly into secondary treatment units (such as aeration tanks or trickling filters) for biological decomposition.

111. Answer B

Solution

Statement A is correct: In a trickling filter (an attached-growth process), microorganisms grow as a fixed biofilm on stationary filter media (such as gravel, rocks, or plastic). If organic or hydraulic loads are unbalanced, this stationary layer can grow too thick and clog the media voids over time.

Statement B is correct: In the activated sludge process (a suspended-growth process), the bacterial mass is not attached to any fixed structure. Instead, the fine suspended particles and microbes group together to form dynamic sludge flocs. These active, free-moving biological films are kept continuously moving and suspended in the wastewater by artificial constant agitation or aeration

112. Answer D

Solution

Statement 1 is correct: While unpolluted rainwater is naturally slightly acidic with a pH of about 5.6 (due to dissolved carbon dioxide forming weak carbonic acid), it is broadly defined as acid rain when its pH drops below 5.6. A value falling to 5 or below directly qualifies it as acid rain, with typical acid rain averaging between 4 and 5.

Statement 2 is correct: When acid rain falls, it flows into runoff and directly enters aquatic ecosystems. It can severely acidify fresh water bodies such as lakes, reservoirs, springs, and shallow wells, causing critical harm to fish and aquatic life.

113. Answer A

Solution

The Load on the Treatment Plant: In a combined system, a single sewer pipe carries both sanitary domestic sewage and rainwater/stormwater runoff. During a rainstorm, the volume of stormwater entering the network significantly multiplies the total volumetric flow rate, thereby increasing the hydraulic load on the wastewater treatment facility compared to a separate system.

114. Answer C

Solution

Statement I is correct: Water hardness is primarily caused by the presence of multivalent metallic cations, most notably calcium Ca^{2+} and magnesium Mg^{2+} ions.

Statement II is incorrect: Hard water is not suitable for bathing, washing, and cleaning. The calcium and magnesium ions react with soap to form an insoluble, sticky precipitate known as soap scum. This prevents the soap from lathering easily, which wastes soap and leaves a residue on skin, hair, and fabrics.

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115. Answer C

Solution

As compared to continuous supply system, intermittent supply has more pressure and leakage losses are less due to intermittent supply.

116. Answer C

Solution

The BOD of water during the first five days at 20°C is generally taken as standard demand. If sufficient oxygen is present in water the useful aerobic bacteria will flourish and cause organic biological decomposition of water and matter.

117. Answer B

Solution

When the flow in circular sedimentation tank enters at centre and flows radially towards the perimeter, the horizontal velocity of the water is continually decreasing as the distance from the centre increases. Thus, discrete particle with settling velocity (Vo) is continually undergoing a change in its absolute flow velocity due to the increasing area of flow and hence horizontal velocity decrease in flow direction as the horizontal velocity is decreasing and vertical velocity is constant. Thus, the particle path in a circular basin is a parabola as opposed to straight path line in long rectangular tank. The reason for parabolic path is therefore the decreasing horizontal velocity, not the constant vertical velocity.

118. Answer A

Solution

CH = min(TH, alkalinity}

= min {200, 260} = 200mg / l

NCH TH – alkalinity

= 200 – 260 – 60 (negative)

= NCH = 0

119. Answer B

Solution

Q = 1 MLD = 1 × 10^6 l / d

Rate of filtration = 4000 l/hr/m²

Size of filter = $\dfrac{1\times\frac{10^6}{24}\,l/hr}{4000\,l/hr/m^2}$

=10.42 m² =11 m²

Size of underdrainage system = 0.2% of size of filter = 0.022 m²

120. Answer D

Solution

Q_w = 1.5 m³/s

BOD_w = 250 mg/l

Q_s = 20 m³/s

BOD_s = 10 mg/l

$BOD_{mix} = \dfrac{Q_w \times BOD_w + Q_s \times BOD_s}{Q_w + Q_s}$

$= \dfrac{1.5\times250+20\times10}{1.5+20} = 26.7\,mg/L$

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