As per IS:1172–1963, average domestic water consumption is

(A) 85 lpcd

(B) 95 lpcd

(C) 115 lpcd

(D) 135 lpcd

ANSWER: (D) 135 lpcd

Maximum daily water demand = _____ x Average per capita daily demand

(A) 1.2

(B) 1.5

(C) 1.8

(D) 2.0

ANSWER: (C) 1.8

Domestic water demand amounts _____ of total water demand

(A) 40 %

(B) 50 %

(C) 80 %

(D) 20 %

ANSWER: (B) 50 %

Water quantity required to extinguish fire amounts _____ of total water demand of the city

(A) 10 to 15 %

(B) 15 to 20 %

(C) 20 to 25 %

(D) 5 to 10 %

ANSWER: (D) 5 to 10 %

Freeman's formula to calculate fire demand is

(A) Q = 1135(P/5+10)

(B) Q = 1135(P/10+5)

(C) Q = 3182(P/5+10)

(D) Q = 3182(P/10+5)

ANSWER: (A) Q = 1135(P/5+10)

Out of the given population forecast methods, _____ gives comparatively accurate results

(A) Geometrical increase method

(B) Simple graphical method

(C) Arithmetical increase method

(D) Comparative graph method

ANSWER: (D) Comparative graph method

Burton's and Buston's formula to determine fire demand are respectively

(A) Q = 900√P and Q = 5663√P

(B) Q = 5663√P and Q = 900√P

(C) Q = 500√P and Q = 9663√P

(D) Q = 3182√P and Q = 900√P

ANSWER: (A) Q = 900√P and Q = 5663√P

Pipe mains carrying water from the source to the reservoir are designed to carry

(A) Maximum hourly demand of maximum daily

(B) Maximum daily demand

(C) Average daily demand

(D) Average hourly demand

ANSWER: (B) Maximum daily demand

Fire demand Q in lit/min as per 'National board of fire writers formula' is

(A) $Q = 4637\sqrt{P}(1- 0.1\sqrt{P})$

(B) $Q = 4637\sqrt{P}(1- 0.01\sqrt{P})$

(C) $Q = 3112\sqrt{P}(1- 0.01\sqrt{P})$

(D) $Q = 3112\sqrt{P}(1- 0.1\sqrt{P})$

ANSWER: (B) $Q = 4637\sqrt{P}(1- 0.01\sqrt{P})$

Tintometer is used to conduct _____ of water sample

(A) Temperature test

(B) Colour test

(C) Turbidity test

(D) Odour test

ANSWER: (B) Colour test

Odour and taste of the water sample can be determined using

(A) Nephelometer

(B) Odometer

(C) Odoscope

(D) Osmoscope

ANSWER: (D) Osmoscope

Permissible turbidity in water sample is upto

(A) 5 ppm

(B) 10 ppm

(C) 15 ppm

(D) 25 ppm

ANSWER: (A) 5 ppm

Temperature of the water to be supplied should be between

(A) 0º C to 10º C

(B) 10º C to 20º C

(C) 20º C to 30º C

(D) 30º C to 40º C

ANSWER: (B) 10º C to 20º C

Colour of the water sample can be measured on

(A) Platinum Chloride scale

(B) Cobalt scale

(C) Both (A) and (B)

(D) None of the above

ANSWER: (C) Both (A) and (B)

In odour test, the mixture giving first detectable odour is taken as

(A) Threshold odour

(B) pO value

(C) Limiting dilution number

(D) Odour intensity

ANSWER: (A) Threshold odour

Technically, turbidity is a measure of

(A) Murkiness of water

(B) Resistance to passage of light through water

(C) Presence of colloidal matter in water

(D) Aesthetics of water

ANSWER: (B) Resistance to passage of light through water

Turbidity can be measured by

(A) Jackson's turbidimeter

(B) Bayli's turbidimeter

(C) Nephelometer

(D) All of the above

ANSWER: (D) All of the above

In colour test of water, for domestic supply, number on cobalt scale should not exceed

(A) 20

(B) 25

(C) 100

(D) 150

ANSWER: (A) 20

Permissible limit for total solids in drinking water is

(A) 250 ppm

(B) 350 ppm

(C) 500 ppm

(D) 750 ppm

ANSWER: (C) 500 ppm

_____ causes acidity in water

(A) Carbon dioxide

(B) Oxygen

(C) Hydrogen

(D) Nitrogen

ANSWER: (A) Carbon dioxide

To determine total hardness of water, following method is used

(A) Clark's method

(B) Hehner's method

(C) Versenate method

(D) All of these

ANSWER: (D) All of these

Presence of phenolic compound in water should not exceed

(A) 1 ppm

(B) 0.001 ppm

(C) 0.01 ppm

(D) 0.1 ppm

ANSWER: (B) 0.001 ppm

pH of water can be measured by

(A) Colorimetric test

(B) Electrometric test

(C) Both (A) and (B)

(D) None of the above

ANSWER: (C) Both (A) and (B)

EDTA solution is used in determination of

(A) Dissolved oxygen

(B) Hardness

(C) Iron

(D) Chlorine

ANSWER: (B) Hardness

Phenolic compounds in water can be determined by

(A) Amino antipyring method

(B) Gibb's colorimetric method

(C) Nessler's method

(D) Both (A) and (B)

ANSWER: (D) Both (A) and (B)

Blue baby disease (methemoglobinemia) is caused in infants due to presence of _____ in water

(A) Nitrites

(B) Albuminoid nitrogen

(C) Nitrates

(D) Ammonium

ANSWER: (C) Nitrates

Winkler's method is used to determine

(A) Hydrogen

(B) Dissolved oxygen

(C) Nitrogen

(D) Albuminoid nitrogen

ANSWER: (B) Dissolved oxygen

Pollution by faecal contamination of water is indicated by

(A) Clostridium Welchii

(B) Sporing bacteria

(C) E-coli

(D) None of the above

ANSWER: (C) E-coli

Bacteria that can survive temperature range of 40º C to 60º C are called

(A) Psychrophilic bacteria

(B) Mesophilic bacteria

(C) Thermophilic bacteria

(D) Pyrophilic bacteria

ANSWER: (C) Thermophilic bacteria

Bacteria that can live with or without oxygen are known as

(A) Aerobic bacteria

(B) Anaerobic bacteria

(C) Mesophilic bacteria

(D) Facultative bacteria

ANSWER: (D) Facultative bacteria

Sporing and non sporing bacteria occur in

(A) Soil

(B) Water

(C) Air

(D) Sewage

ANSWER: (A) Soil

Coliform test having 3 stages viz. presumptive test, confirmed test and completed test is

(A) Membrane filter technique

(B) Multiple tube fermentation technique

(C) MPN technique

(D) None of the above

ANSWER: (B) Multiple tube fermentation technique

Typhoid fever is caused by

(A) Salmonella Typhi

(B) Salmonella Paratyphi A

(C) Streptococci

(D) All of these

ANSWER: (A) Salmonella Typhi

In bacterial test of water, MPN should be

(A) Less than 1 per 100 ml

(B) Less than 1 per 50 ml

(C) Less than 1 per 20 ml

(D) Less than 1 per 10 ml

ANSWER: (A) Less than 1 per 100 ml

_____ produce slimy reddish deposits in water tanks

(A) Slime forming bacteria

(B) Iron bacteria

(C) Sulphur bacteria

(D) Nitrogen bacteria

ANSWER: (B) Iron bacteria

Worms that may occur in water are

(A) Nematodos

(B) Flat worms

(C) Rotifers

(D) All of these

ANSWER: (D) All of these

Screening unit in water treatment may have

(A) Coarse screen

(B) Fine screen

(C) Fine screen followed by coarse screen

(D) Coarse screen followed by fine screen

ANSWER: (D) Coarse screen followed by fine screen

Micro strainers are used at

(A) Intake point

(B) Treatment plant, before sedimentation

(C) Upstream of rapid or slow sand filter

(D) Downstream of bar screen

ANSWER: (C) Upstream of rapid or slow sand filter

Maximum head loss through clogged racks and screens is

(A) 30 cm

(B) 50 cm

(C) 80 cm

(D) 100 cm

ANSWER: (C) 80 cm

Coarse screens have their bar spacing as

(A) 10 to 20 mm c/c

(B) 25 to 50 mm c/c

(C) 50 to 75 mm c/c

(D) 75 to 100 mm c/c

ANSWER: (D) 75 to 100 mm c/c

Aeration reduces _____ from water because of which corrosiveness of water decreases and pH of water increase

(A) Carbon monoxide

(B) Carbon dioxide

(C) Hydrogen sulphide

(D) Ammonia

ANSWER: (B) Carbon dioxide

Simplest free fall type aerator is

(A) Cascade aerator

(B) Inclined apron aerator

(C) Slat tray aerator

(D) Gravel bed aerator

ANSWER: (A) Cascade aerator

Compressed air diffusion in closed pipelines

(A) Increase dissolved oxygen

(B) Remove taste and odour

(C) Do NOT remove carbon dioxide

(D) All of these

ANSWER: (D) All of these

Aeration may add more oxygen to water thus rendering it

(A) More corrosive

(B) Tasteless

(C) Free of Fe and Mn

(D) None of the above

ANSWER: (A) More corrosive

_____ which causes odour problem in water is removed by aeration

(A) Hydrogen sulphide

(B) Carbon monoxide

(C) Carbon dioxide

(D) Sulphur dioxide

ANSWER: (A) Hydrogen sulphide

In sedimentation tank, velocity of water is maintained at

(A) 50 to 70 cm/min

(B) 50 to 70 cm/hour

(C) 15 to 30 cm/hour

(D) 15 to 30 cm/min

ANSWER: (D) 15 to 30 cm/min

Length of rectangular tank should not be more than

(A) 0.5B

(B) B

(C) 2B

(D) 4B

ANSWER: (D) 4B

Alum as coagulant in sedimentation process works best at pH of

(A) 2 - 3

(B) 3 - 5

(C) 6 - 8

(D) 8 - 12

ANSWER: (C) 6 - 8

In a sedimentation tank, to increase settling velocity of particle

(A) Depth should be reduced

(B) Depth should be increased

(C) Surface area of the tank should be increased

(D) Surface area of tank should be decreased

ANSWER: (C) Surface area of the tank should be increased

In comparison with sedimentation with coagulation, plain sedimentation has

(A) More detention time, more overflow rate

(B) Less detention time, more overflow rate

(C) Equal detention time, more overflow rate

(D) More detention time, less overflow rate

ANSWER: (D) More detention time, less overflow rate

Requirement of alum increases with

(A) Increase in turbidity of water

(B) Decrease in turbidity of water

(C) Decrease in temperature

(D) Both (A) and (C)

ANSWER: (D) Both (A) and (C)

Type III settling is also known as

(A) Discrete settling

(B) Compression settling

(C) Hindered settling

(D) Zone settling

ANSWER: (D) Zone settling

In water treatment, following types of settling is encountered

(A) Type I only

(B) Type I and II

(C) Type I, II and III

(D) Type IV only

ANSWER: (B) Type I and II

Detention time for plain sedimentation tank is

(A) 2 to 4 hours

(B) 4 to 8 hours

(C) 8 to 12 hours

(D) 12 to 14 hours

ANSWER: (B) 4 to 8 hours

In the process of filtration, which of the following actions take place?

(A) Mechanical straining and electrolytic action

(B) Mechanical straining and sedimentation

(C) Mechanical straining, sedimentation and biological action

(D) Mechanical straining, sedimentation, biological action and electrolytic action

ANSWER: (D) Mechanical straining, sedimentation, biological action and electrolytic action

In the top layer of sand in filter, a layer of algae, bacteria and protozoa form known as

(A) Bio layer

(B) Bio mat

(C) Schmutzdecke

(D) Garnet layer

ANSWER: (C) Schmutzdecke

Effective size of sand for slow sand filter and rapid sand filter

(A) 0.2 to 0.3 mm and 0.8 and 1.0 mm respectively

(B) 0.2 to 0.3 mm and 0.45 to 0.7 mm respectively

(C) 0.4 to 0.6 mm and 0.8 to 1.0 mm respectively

(D) 0.25 to 0.45 mm and 0.9 to 1.1 mm respectively

ANSWER: (B) 0.2 to 0.3 mm and 0.45 to 0.7 mm respectively

Uniformity coefficient of sand used in slow sand filter is

(A) 3.0 to 5.0

(B) 1.7 to 1.9

(C) 1.1 to 1.3

(D) 1.5 to 1.9

ANSWER: (A) 3.0 to 5.0

In slow sand filter, media is cleaned by

(A) Replacing complete media by new media

(B) Scrapping off sand layers

(C) Backwashing

(D) Placing fresh media over old media

ANSWER: (B) Scrapping off sand layers

Filtration rate in slow sand filter is

(A) 1000 to 2000 liter/hour/sq.m

(B) 500 to 1000 liter/hour/sq.m

(C) 300 to 600 liter/hour/sq.m

(D) 100 to 200 liter/hour/sq.m

ANSWER: (D) 100 to 200 liter/hour/sq.m

Under normal conditions, slow sand filter removes bacteria about

(A) 70 to 80 %

(B) 98 to 99 %

(C) 50 to 60 %

(D) 60 to 70 %

ANSWER: (B) 98 to 99 %

Compared to rapid sand filter, slow sand filter has

(A) High filtration rate, high bacteria removal efficiency

(B) Low filtration rate, high bacteria removal efficiency

(C) High filtration rate, low bacteria removal efficiency

(D) Low filtration rate, low bacteria removal efficiency

ANSWER: (B) Low filtration rate, high bacteria removal efficiency

Slow sand filter is suitable where

(A) Population is less, large area is available

(B) Population is high, initial cost is chief concern

(C) Skilled labour is available

(D) Less land is available

ANSWER: (A) Population is less, large area is available

Uniformity coefficient of sand used in rapid sand filter is

(A) 1.3 to 1.7

(B) 2.0 to 2.5

(C) 2.1 to 2.3

(D) 1.1 to 1.3

ANSWER: (A) 1.3 to 1.7

Rate of filtration in rapid sand filter is

(A) 1000 to 2000 liter/hour/sq.m

(B) 500 to 1000 liter/hour/sq.m

(C) 3000 to 6000 liter/hour/sq.m

(D) 1500 to 3000 liter/hour/sq.m

ANSWER: (C) 3000 to 6000 liter/hour/sq.m

As compared with slow sand filter, rapid sand filter

(A) Requires large area, has higher filtration rate

(B) Requires small area, has lower filtration rate

(C) Requires small area, has higher filtration rate

(D) Requires large area, has lower filtration rate

ANSWER: (C) Requires small area, has higher filtration rate

Amount of wash water required for rapid sand filter from its filtered water is

(A) 12 %

(B) 10%

(C) 2 to 4%

(D) 8 to 10 %

ANSWER: (C) 2 to 4%

Insufficient washing of sand grains of rapid sand filter leads to

(A) Formation of mud balls

(B) Air binding

(C) Sand boils

(D) Sand leakage

ANSWER: (A) Formation of mud balls

Method of cleaning media of rapid sand filter is

(A) Backwashing

(B) Scrapping off sand

(C) Replacement of media

(D) Addition of new media over old media

ANSWER: (A) Backwashing

Sand leakage trouble in filter can be avoided by

(A) Providing gravel above fine sand

(B) Properly proportioning the media

(C) Both (A) and (B)

(D) None of the above

ANSWER: (B) Properly proportioning the media

Excessive negative head in rapid sand filter leads to

(A) Formation of mud balls

(B) Air binding

(C) Clogging of filter bed

(D) Sand jetting

ANSWER: (B) Air binding

Pressure filters have filtration rate

(A) Equal to rapid sand filter and more than slow sand filter

(B) Less than rapid sand filter and slow sand filter

(C) More than rapid sand filter and slow sand filter

(D) Less than rapid sand filter and more than slow sand filter

ANSWER: (C) More than rapid sand filter and slow sand filter

Disinfection takes place by following mechanism

(A) Damage to cell wall of microorganism

(B) Alteration of cell permeability or colloidal nature of cell protoplasm

(C) Inactivation of critical enzyme system of microorganism

(D) All of the above

ANSWER: (D) All of the above

Following is NOT a chemical method of disinfection

(A) Metal ion disinfection

(B) Alkali and acid disinfection

(C) Disinfection by surfactants

(D) Irradiation by ultraviolet light

ANSWER: (D) Irradiation by ultraviolet light

For private buildings, institutions and swimming pools, method of disinfection adopted is

(A) Excess lime treatment

(B) Ultraviolet irradiation

(C) Potassium permanganate treatment

(D) Disinfection by heat

ANSWER: (B) Ultraviolet irradiation

Bleaching powder contains chlorine at about

(A) 5 to 10 %

(B) 10 to 20 %

(C) 30 to 40 %

(D) 70 to 80 %

ANSWER: (C) 30 to 40 %

Chlorine can be applied as a disinfectant in form of

(A) Hypochlorites

(B) Chloramines

(C) Free chlorine gas

(D) Any of (A),(B) or (C)

ANSWER: (D) Any of (A),(B) or (C)

Free residual chlorination is also known as

(A) Double chlorination

(B) Prechlorination

(C) Break point chlorination

(D) Post chlorination

ANSWER: (C) Break point chlorination

Dechlorination is done by

(A) Sodium thio-sulphate

(B) Sodium chloride

(C) Sodium sulphate

(D) All of the above

ANSWER: (A) Sodium thio-sulphate

Residual chlorine in water can be determined using

(A) Orthotolidine test

(B) Heffner's test

(C) Winkler's test

(D) Any of (A),(B) or (C)

ANSWER: (A) Orthotolidine test

Disinfection efficiency of chlorine is best at _____ pH and _____ temperature of water

(A) low, high

(B) high, high

(C) high, low

(D) low, low

ANSWER: (A) low, high

Acceptable limit for hardness of water in public water supplies is

(A) 350 ppm

(B) 300 ppm

(C) 250 ppm

(D) 200 ppm

ANSWER: (D) 200 ppm

Temporary hardness and permanent hardness can be removed from water by _____ and _____ respectively

(A) boiling, addition of lime

(B) addition of lime, lime soda process

(C) boiling, silver nitrate process

(D) addition of lime, boiling

ANSWER: (B) addition of lime, lime soda process

Zeolite method of water softening is

(A) Suitable for highly turbid water

(B) Sludge forming process

(C) Suitable where water quality fluctuates

(D) Suitable for acidic waters

ANSWER: (C) Suitable where water quality fluctuates

Zeolite bed can be regenerated using

(A) Sodium chloride solution

(B) Sodium fluoride solution

(C) Magnesium chloride solution

(D) Potassium chloride solution

ANSWER: (A) Sodium chloride solution

Which of the following method of water softening is most economical?

(A) Zeolite method

(B) Lime soda method

(C) De-ionisation method

(D) All are equal in terms of economy

ANSWER: (B) Lime soda method

Zero hardness water can be rendered using

(A) Boiling method

(B) Zeolite method

(C) Lime soda method

(D) All of the above

ANSWER: (B) Zeolite method

Lime soda process

(A) is suitable for turbid, acidic water

(B) has bactericidal effect

(C) is cost effective

(D) All of the above

ANSWER: (D) All of the above

_____ requires recarbonation of water after it has taken place

(A) Zeolite water softening process

(B) Lime soda water softening process

(C) De-ionization water softening process

(D) All of the above

ANSWER: (B) Lime soda water softening process

Lime soda process has major disadvantage that

(A) It decreases pH of water

(B) It creates sludge precipitate

(C) It can not be used for very hard water

(D) None of the above

ANSWER: (B) It creates sludge precipitate

Colour, taste and odour of water can be removed by

(A) Use of chlorine dioxide

(B) Ozonization

(C) Treatment by activated carbon

(D) All of the above

ANSWER: (D) All of the above

Copper sulphate is used to

(A) Remove colour and odour of water

(B) Control growth of algae in water

(C) Remove hardness

(D) Only (A) and (B)

ANSWER: (D) Only (A) and (B)

Fluorides should be present in water at concentration of

(A) 0.1 to 0.5 ppm

(B) 0.5 to 0.7 ppm

(C) 2.0 to 3.5 ppm

(D) 0.5 to 1.5 ppm

ANSWER: (D) 0.5 to 1.5 ppm

Fluoride presence in water at concentrations of about 3 ppm lead to

(A) Crippling fluorosis

(B) Mottling of teeth

(C) Dental caries

(D) None of the aove

ANSWER: (B) Mottling of teeth

To carry out fluoridation, compound used is

(A) Sodium fluoride

(B) Sodium silico fluoride

(C) Hydrofluosilicic acid

(D) All of the above

ANSWER: (D) All of the above

Activated carbon can

(A) Remove colour, taste and odour

(B) Remove bacteria

(C) Remove hardness

(D) All of the above

ANSWER: (A) Remove colour, taste and odour

Desalination is done by

(A) Reverse osmosis

(B) Addition of bone charcoal

(C) Addition of lime

(D) All of the above

ANSWER: (A) Reverse osmosis

In terms of economy, best method of desalination is

(A) Distillation by multistage evaporator

(B) Freezing

(C) Solar evaporation

(D) Electrodialysis

ANSWER: (C) Solar evaporation

Iron and manganese are removed from water by

(A) Aeration followed by sedimentation and filtration

(B) Activated carbon

(C) Addition of lime

(D) None of the above

ANSWER: (A) Aeration followed by sedimentation and filtration

Valve used in pipelines that allows water to flow in one direction only is called as

(A) Air relief valve

(B) Check valve

(C) Scour valve

(D) Pressure relief valve

ANSWER: (B) Check valve

Function of pressure relief valve is to

(A) Prevent pipe from air pressure damage

(B) Prevent pipe from water pressure damage

(C) Control flow of water from pipe

(D) None of the above

ANSWER: (B) Prevent pipe from water pressure damage

Function of gate valve or sluice valve is to

(A) Control flow of water

(B) Shut down flow of water

(C) Divide water mains into suitable sections

(D) All of the above

ANSWER: (D) All of the above

Scour valves are used to

(A) Prevent scouring action of water in pipe

(B) Remove sand and silt from pipe ends

(C) Remove excess water pressure from pipe

(D) Control head loss in pipes

ANSWER: (B) Remove sand and silt from pipe ends

When water flowing with high velocity inside a pipe encounters sudden closure of valve, effect that may occur is known as

(A) Water blast

(B) Water hammer

(C) Pipe burst

(D) Overburden

ANSWER: (B) Water hammer

Which of the following factor is not responsible for pipe corrosion?

(A) Composition of pipe material

(B) Soil bacteria

(C) Temperature

(D) Water pressure

ANSWER: (D) Water pressure

Pipe corrosion can be prevented using

(A) Cathodic protection

(B) Proper selection of pipe material

(C) Providing protective coating on pipe

(D) All of the above

ANSWER: (D) All of the above

Altitude valves are installed at

(A) Places where pipelines are at high altitude

(B) Lines which supply water to ESR or stand pipe

(C) Locations where higher heads are required

(D) Grid iron system

ANSWER: (B) Lines which supply water to ESR or stand pipe

Head loss in pipes can be calculated using

(A) Manning's formula

(B) Hazen - William's formula

(C) Darcy – Weisbach formula

(D) All of the above

ANSWER: (D) All of the above

_____ is the most economical water distribution system

(A) Pumping system

(B) Gravity system

(C) Pumping and gravity combined system

(D) Both (B) and (C)

ANSWER: (B) Gravity system

Distribution system that can be easily expanded is

(A) Grid iron system

(B) Radial system

(C) Ring system

(D) Dead end system

ANSWER: (D) Dead end system

Ring system of water distribution is suitable for

(A) Well planned city

(B) Cities growing in haphazard manner

(C) Small cities

(D) Large cities

ANSWER: (A) Well planned city

Scour valves are needed at large extent in

(A) Grid iron system

(B) Dead end system

(C) Ring system

(D) Radial system

ANSWER: (B) Dead end system

_____ is also known as reticulation system

(A) Ring system

(B) Radial system

(C) Grid iron system

(D) Dead end system

ANSWER: (C) Grid iron system

In intermittent system of water supply,

(A) Tendency of domestic storage of water increases

(B) Pollution in supplies may take place

(C) More staff is required for operations

(D) All of the above

ANSWER: (D) All of the above

In which type of distribution system, area is divided into district and each district has its own ESR?

(A) Grid iron system

(B) Radial system

(C) Dead end system

(D) Ring system

ANSWER: (B) Radial system

In case of fire outbreak, following system may fail

(A) Gravity system

(B) Combined gravity and pumping system

(C) Pumping system

(D) None of the above

ANSWER: (C) Pumping system

Continuous water supply system

(A) Provides fresh water at all the time

(B) Leads to water wastage in more amounts

(C) Eliminates need of domestic storage of water

(D) All of the above

ANSWER: (D) All of the above