NEET-PG Social & Preventive Medicine Sample Paper-4

Duration: 20 Minutes **Maximum Marks: 100**

Instructions

- This paper contains **25** Multiple Choice Questions.
- Each correct answer carries **+4** mark. Incorrect answer: **−1** marks.Only **one** correct option.
- Unattempted questions carry **0** marks.
- Use of mobile phones, smartwatches, or any electronic gadgets is strictly prohibited.

Q1. During an investigation of a sudden outbreak of a novel viral hemorrhagic fever in a community, investigators want to rapidly identify risk factors associated with severe clinical outcomes. Which of the following study designs would be most logistically feasible, time-efficient, and appropriate as the initial analytical step?

(A) Retrospective cohort study

(B) Hospital-based case-control study

(C) Prospective cohort study

(D) Community-based cross-sectional survey

Q2. A clinical researcher evaluates a new serum biomarker for the early detection of pancreatic adenocarcinoma. In a cohort of 1,000 individuals, the true prevalence of the disease is 5%. The biomarker demonstrates a sensitivity of 90% and a specificity of 80%. What is the probability that a patient truly has the disease given a positive test result?

(A) 19.1%

(B) 23.7%

(C) 45.0%

(D) 81.8%

Q3. Under the National Tuberculosis Elimination Program (NTEP) guidelines, a 45-year-old male weighing 52 kg is diagnosed with new-onset, microbiologically confirmed pulmonary tuberculosis. Which of the following correctly describes the intensive phase treatment regimen and daily tablet allocation for this patient?

(A) 2 months of HRZE with 3 tablets daily

(B) 2 months of HRZE with 4 tablets daily

(C) 3 months of HRZE with 4 tablets daily

(D) 2 months of HRE with 3 tablets daily

Q4. According to the National Immunization Schedule (NIS) in India, a 14-week-old infant is brought to the primary health center. Which of the following combinations of vaccines should be administered to this infant during this routine visit?

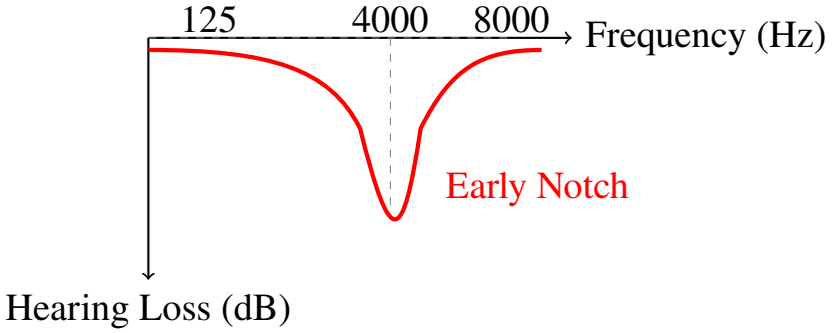
(A) Pentavalent-3, OPV-3, IPV-2, Rotavirus-3, PCV-2

(B) Pentavalent-3, OPV-3, fIPV-2, Rotavirus-3, PCV-2

(C) Pentavalent-3, OPV-3, fIPV-2, Rotavirus-3, PCV-1

(D) Pentavalent-3, OPV-2, fIPV-1, Rotavirus-2, PCV-2

Q5. A major manufacturing plant has a work environment where laborers are chronically exposed to high-frequency, continuous noise levels averaging 92 dB for 9 hours daily. Which of the following is the most characteristic early audiometric finding seen in these workers experiencing occupational noise-induced hearing loss?



(A) Bilateral symmetrical hearing loss maximal at 1000 Hz

(B) Unilateral sensorineural hearing loss maximal at 2000 Hz

(C) Bilateral symmetrical notch in bone conduction threshold at 4000 Hz

(D) Conductive hearing loss with a maximum deficit at 6000 Hz

Q6. In a defined population of 500,000 residents, a public health surveillance system recorded 1,200 total deaths from all causes over the course of one calendar year. During the same year, there were 400 total documented cases of active pulmonary tuberculosis, which resulted in exactly 48 deaths. What is the case fatality rate of pulmonary tuberculosis in this population?

(A) 4%

(B) 9.6%

(C) 12%

(D) 33.3%

Q7. A clinical trial evaluates the efficacy of a new antihypertensive medication compared to a standard first-line drug. The standard deviation of blood pressure reduction in both groups is known to be 10 mmHg. The investigators want to detect a minimum true difference of 3 mmHg between the groups with a power of 80% and a two-sided significance level of 5%. If they choose to lower the significance level α to 1% while keeping all other parameters constant, what will be the effect on the sample size and Type II error (β)?

(A) Required sample size will decrease; Type II error will increase

(B) Required sample size will increase; Type II error will decrease

(C) Required sample size will increase; Type II error will increase

(D) Required sample size will decrease; Type II error will decrease

Q8. Under the National Reproductive, Maternal, Newborn, Child, and Adolescent Health (RMNCH+A) strategy, the "Anemia Mukt Bharat" program implements a specific prophylactic dosing regimen for school-going adolescents aged 10–19 years. What is the recommended frequency and elemental iron/folic acid composition of this supplement?

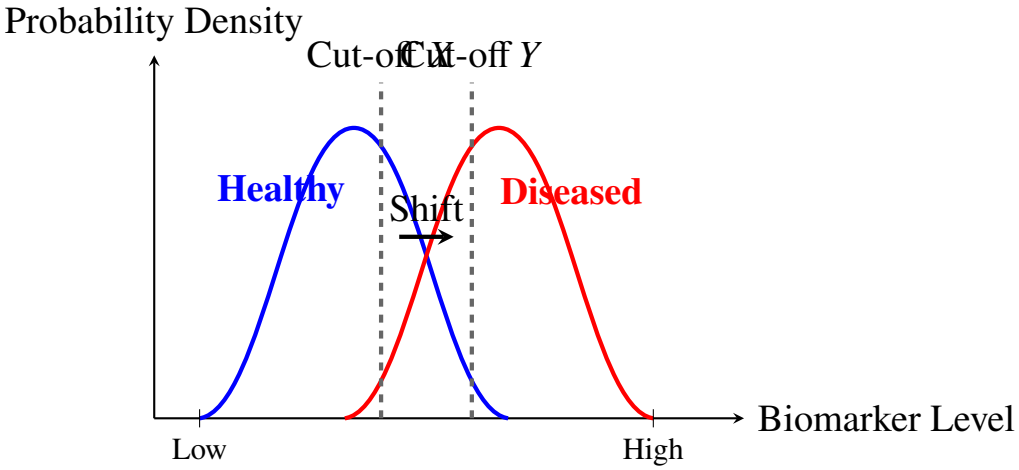
(A) Weekly administration of 60 mg elemental Iron + 500 mcg Folic acid

(B) Daily administration of 100 mg elemental Iron + 500 mcg Folic acid

(C) Weekly administration of 100 mg elemental Iron + 500 mcg Folic acid

(D) Bi-weekly administration of 45 mg elemental Iron + 400 mcg Folic acid

Q9. A newly developed screening test for a metabolic disorder is evaluated at two different cut-off values. Cut-off X provides a sensitivity of 95% and specificity of 70%. Cut-off Y provides a sensitivity of 75% and specificity of 95%. If the public health department decides to shift the diagnostic threshold from Cut-off X to Cut-off Y, what will be the expected impact on the screening outcomes?



(A) True positives will increase, and false positives will increase

(B) True positives will decrease, and false negatives will decrease

(C) False positives will decrease, and false negatives will increase

(D) False positives will increase, and false negatives will decrease

Q10. During a routine biomedical waste audit in a tertiary care hospital, an intern is tasked with disposing of used blood bags, vacutainers containing blood samples, and discarded microbiology culture plates. According to the Biomedical Waste Management Rules, into which colored bags should these items be segregated?

(A) Blood bags in Yellow, Vacutainers in Red, Culture plates in Yellow

(B) Blood bags in Red, Vacutainers in Blue, Culture plates in Yellow

(C) Blood bags in Yellow, Vacutainers in Yellow, Culture plates in Red

(D) Blood bags in Red, Vacutainers in Red, Culture plates in Red

Q11. A classic epidemiology study tracks a cohort of 10,000 heavy smokers and 10,000 strictly non-smokers over a 10-year period to observe the development of coronary artery disease (CAD). The incidence of CAD among smokers is found to be 150 per 1,000, while among non-smokers it is 30 per 1,000. What is the population attributable risk proportion (PAR%) of smoking for CAD, assuming the overall prevalence of smoking in the general population is 20%?

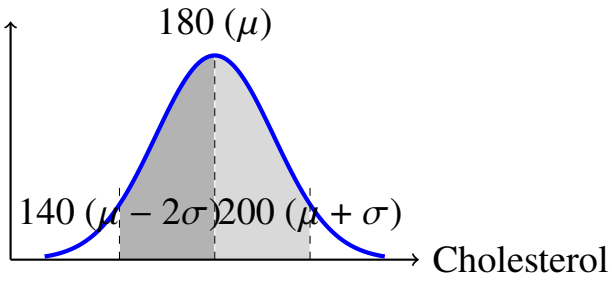
(A) 44.4%

(B) 50.0%

(C) 80.0%

(D) 25.0%

Q12. The distribution of serum cholesterol levels measured in a large, random sample of healthy young adult males is plotted and found to follow a perfectly symmetrical, bell-shaped Gaussian distribution curve. The sample mean is 180 mg/dL with a standard deviation (σ) of 20 mg/dL. Based on the mathematical properties of this distribution, approximately what percentage of the sample will have serum cholesterol levels falling between 140 mg/dL and 200 mg/dL?



(A) 68.2%

(B) 81.5%

(C) 95.4%

(D) 47.7%

Q13. Under the National Vector Borne Disease Control Programme (NVBDCP), the choice of active intervention strategy against malaria vectors depends heavily on

the Annual Parasite Incidence (API) of the region. In a sub-center zone with an API of 3.5, which of the following combinations of vector control measures is most appropriate as per the national guidelines?

(A) Exclusive distribution of Long-Lasting Insecticidal Nets (LLINs)

(B) Indoor Residual Spraying (IRS) with appropriate insecticides covering at least 80% of rooms

(C) Space spraying (fogging) carried out on a bi-weekly basis throughout the year

(D) Larvivorous fish introduction as the standalone primary preventive measure

Q14. A cold chain technician notices that the temperature chart of a vaccine refrigerator at a primary health centre indicates a prolonged drop to $-4^{\circ}C$ over the weekend due to a faulty thermostat. Which of the following vaccines stored inside the main compartment is most likely to lose its structural integrity and potency irreversibly due to this specific temperature deviation?

(A) Oral Polio Vaccine (OPV)

(B) Lyophilized BCG vaccine

(C) Pentavalent vaccine

(D) Measles-Rubella (MR) vaccine

Q15. An epidemiologist is evaluating the nutritional status of children under five years of age in a rural block using multiple indicators. The assessment reveals a high prevalence of low weight-for-height among the cohort. This specific anthropometric index is a primary indicator for which of the following nutritional conditions?

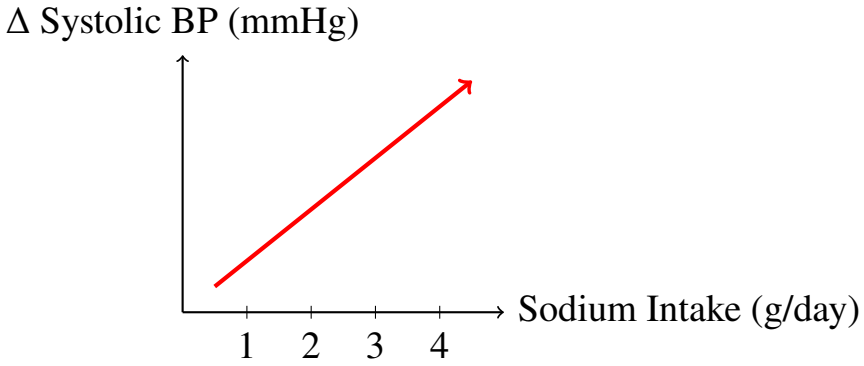
(A) Chronic malnutrition reflecting stunting

(B) Acute malnutrition reflecting wasting

(C) Subacute malnutrition reflecting poor bone mineralization

(D) Combined socioeconomic deprivation over generations

Q16. To establish a causal relationship between dietary sodium intake and essential hypertension, an epidemiological team demonstrates that for every incremental increase of 1 gram of daily sodium consumption, there is a corresponding, predictable rise of 2.5 mmHg in mean systolic blood pressure across the study population. Which of Hill's criteria of causation is best illustrated by this finding?



(A) Consistency of association

(B) Specificity of association

(C) Biological gradient

(D) Coherence of evidence

Q17. A study compares the median survival time of patients undergoing two distinct chemotherapeutic protocols for advanced gastric malignancy. Because the survival data contains heavily skewed values and multiple censored observations where patients dropped out before completion, the researchers must use a non-parametric statistical method. Which of the following tests is most appropriate to compare the survival distributions between these two independent groups?

(A) Paired t-test

(B) Wilcoxon signed-rank test

(C) Log-rank test

(D) Chi-square test of independence

Q18. Under the National Leprosy Eradication Programme (NLEP), a patient presenting with six asymmetric hypopigmented skin patches with definite loss of sensation,

along with palpable thickening of two peripheral nerve trunks, is classified as a case of Multibacillary (MB) Leprosy. What is the total duration of standard WHO Multi-Drug Therapy (MDT) mandated for this patient, and what are its components?

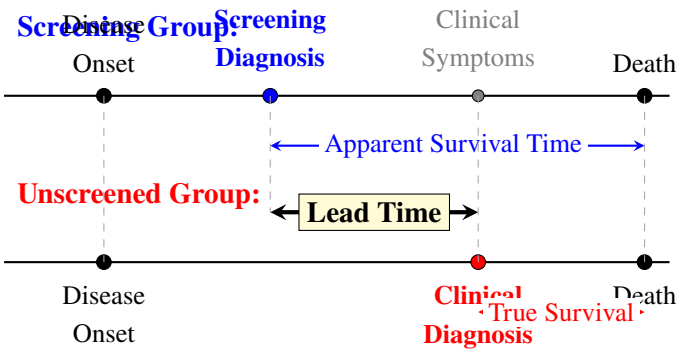
(A) 6 months of Rifampicin, Dapsone, and Clofazimine

(B) 12 months of Rifampicin, Dapsone, and Clofazimine

(C) 12 months of Rifampicin and Dapsone only

(D) 18 months of Rifampicin, Ofloxacin, and Minocycline

Q19. A secondary prevention program introduces a highly sensitive screening test for early-stage colorectal cancer. The program leads to a significant increase in the 5-year survival rate of the screened group compared to a historically observed cohort whose cancers were diagnosed only after presenting with clinical symptoms. However, the overall, age-adjusted mortality rate from colorectal cancer in the population remains completely unchanged. This apparent improvement in survival is most likely a manifestation of which screening artifact?



(A) Length-bias time

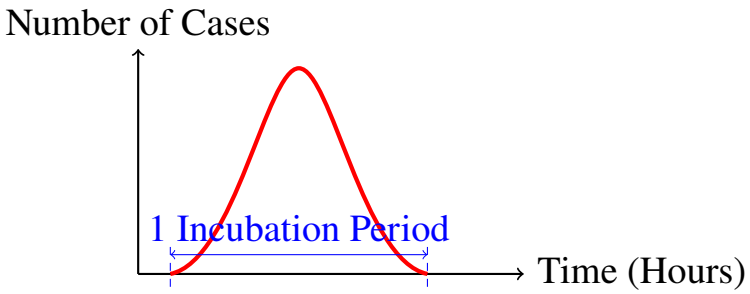
(B) Lead-time bias

(C) Referral selection bias

(D) Berkson's bias

Q20. In an urban slum cluster with poor sanitation infrastructure, a sudden spike in acute watery diarrhea cases is reported within a span of 48 hours. Epidemiologists plot the onset times of all reported cases on a graph, resulting in a classic, steep unimodal curve where all cases fall well within the span of a single known

incubation period of cholera. What type of epidemic pattern does this curve represent?



(A) Continuous common-source epidemic

(B) Point-source epidemic

(C) Propagated person-to-person epidemic

(D) Cyclical point epidemic

Q21. A comprehensive health survey tracks the occurrence of a rare neurological disease within a defined cohort. Over a five-year study period, the absolute number of existing cases at any given point in time remains constant due to a perfect equilibrium between new diagnoses and deaths. If a breakthrough therapeutic drug is introduced that significantly prolongs the life expectancy of these patients without achieving a biological cure, what will be the long-term impact on the incidence and prevalence of the disease?

(A) Both incidence and prevalence will increase

(B) Incidence will remain unchanged; prevalence will increase

(C) Incidence will increase; prevalence will remain unchanged

(D) Both incidence and prevalence will remain unchanged

Q22. A researcher computes a Pearson correlation coefficient (r) between daily physical activity duration (in minutes) and resting heart rate (in beats per minute) across a sample of 150 middle-aged adults. The resulting value is $r = -0.65$, with a statistically verified p-value = 0.002. Which of the following statements provides the most accurate interpretation of this statistical finding?

(A) There is a weak positive linear relationship that is not statistically significant

(B) 65% of the total variation in resting heart rate is caused by changes in physical activity duration

(C) There is a moderate-to-strong inverse linear relationship, and the probability of obtaining this result by pure chance under the null hypothesis is 0.2%

(D) For every 1-minute increase in physical activity, the resting heart rate drops by exactly 0.65 beats per minute

Q23. The Pradhan Mantri Jan Arogya Yojana (PM-JAY), the secondary and tertiary care insurance component of Ayushman Bharat, provides a cashless health cover to eligible vulnerable families. What is the maximum financial coverage provided per family per year under this national flagship scheme?

(A) ₹ 2,00,000

(B) ₹ 3,00,000

(C) ₹ 5,00,000

(D) ₹ 10,00,000

Q24. A public health officer calculates the Infant Mortality Rate (IMR) for a specific district over a given calendar year. Which of the following mathematical expressions correctly defines the denominator used in the calculation of this vital health indicator?

(A) Total number of live births recorded in that district during the same year

(B) Total mid-year population of children under one year of age in that district

(C) Total number of live births plus stillbirths recorded in that district during the same year

(D) Total mid-year population of the entire district

Q25. An industrial health officer evaluates workers in a glass manufacturing plant who are chronically exposed to extreme radiant heat from glass-melting furnaces. Which of the following ocular pathologies is a well-recognized occupational hazard directly associated with prolonged, unprotected exposure to infrared radiation in this specific workspace?

(A) Angle-closure glaucoma

(B) Subcapsular discoid cataract

(C) Proliferative diabetic retinopathy

(D) Scleromalacia perforans

Detailed Solutions

Q1.

Solution

Concept:

In outbreak investigations, selecting an analytical study design depends on the urgency, type of population data available, and the study objectives. To rapidly identify risk factors during an ongoing sudden outbreak where cases are readily available in medical facilities, a hospital-based case-control study is the most logistically efficient design.

Solution:

Step 1: Analyze the clinical scenario. An ongoing sudden outbreak of a novel viral hemorrhagic fever requires an immediate public health response to establish risk factors for severe outcomes. Speed and logistical feasibility are paramount.

Step 2: Evaluate prospective and retrospective cohort options. A prospective cohort study tracks individuals over a long period from exposure to disease, which is highly inefficient and unethical in an acute emergency. A retrospective cohort study requires a well-defined closed population group, which is unavailable in this widespread community outbreak.

Step 3: Evaluate cross-sectional options. A community-based cross-sectional survey measures prevalence at a single point in time across the community but is slow to organize and inefficient for capturing severe clinical outcomes that require rapid tracking within hospitals.

Step 4: Evaluate the case-control option. A hospital-based case-control study identifies individuals who have already developed severe outcomes (cases) and compares them to individuals without severe outcomes (controls) within the same facility. This minimizes selection lag, uses existing clinical settings, reduces costs, and delivers rapid risk hazard ratios.

Final Answer: Hospital-based case-control study

Answer: (B)

Go Back to Question 1

Q2.

Solution

Concept:

The probability that a patient truly has a disease given a positive test result is defined as the Positive Predictive Value (PPV). PPV is calculated using Bayes' theorem or a standard contingency matrix based on disease prevalence, sensitivity, and specificity.

Solution:

Step 1: Identify the given epidemiological parameters from the study group:

Total population (N) = 1,000

Disease Prevalence (P) = 5%

Sensitivity (Se) = 90%

Specificity (Sp) = 80%

Step 2: Calculate the absolute number of diseased and healthy individuals:

Total diseased individuals = 5% of 1,000 = 50

Total healthy individuals = 1,000 - 50 = 950

Step 3: Calculate True Positives (TP) using sensitivity:

TP = Sensitivity $\times$ Total Diseased = $0.90 \times 50 = 45$

Step 4: Calculate False Positives (FP) using specificity:

True Negatives (TN) = Specificity $\times$ Total Healthy = $0.80 \times 950 = 760$

FP = Total Healthy $-$ TN = $950 - 760 = 190$

Step 5: Calculate the Positive Predictive Value (PPV):

$$\text{PPV} = \frac{\text{TP}}{\text{TP} + \text{FP}} = \frac{45}{45 + 190} = \frac{45}{235} \approx 0.1914 \text{ or } 19.14\%$$

Final Answer: 19.1%

Answer: (A)

Go Back to Question 2

Q3.

Solution

Concept:

Under the National Tuberculosis Elimination Program (NTEP) in India, drug dosages for adults are calculated strictly using standard weight bands. Daily Fixed-Dose Combinations (FDC) consist of Isoniazid (H), Rifampicin (R), Pyrazinamide (Z), and Ethambutol (E) during the initial intensive treatment phase.

Solution:

Step 1: Check the standard adult weight categories defined by the NTEP guidelines:
Category 1: 25–34 kg (2 tablets per day)
Category 2: 35–49 kg (3 tablets per day)
Category 3: 50–64 kg (4 tablets per day)
Category 4: 65 kg and above (5 tablets per day)

Step 2: Analyze the patient details provided. The patient is an adult male with a body weight of 52 kg. This places him squarely within the 50–64 kg weight range.

Step 3: Determine the tablet allocation. According to the weight band rules, patients weighing between 50 and 64 kg must receive exactly 4 tablets of the daily HRZE combination.

Step 4: Determine the phase duration. For a newly diagnosed case of microbiologically confirmed pulmonary tuberculosis, the standard initial intensive phase duration spans exactly 2 months. Therefore, the regimen requires 2 months of HRZE with 4 daily tablets.

Final Answer: 2 months of HRZE with 4 tablets daily

Answer: (B)

Go Back to Question 3

Q4.

Solution

Concept:

The National Immunization Schedule (NIS) of India outlines specific timelines for infant vaccines. At 14 weeks of age, infants receive their third primary multi-dose milestone series alongside second-dose updates of select inactivated and conjugate components.

Solution:

Step 1: Break down the routine vaccine administration schedule at the 6, 10, and 14-week milestones under the current NIS guidelines.

Step 2: Track the Oral Polio Vaccine (OPV) and Pentavalent vaccine milestones. Pentavalent (DPT-HepB-Hib) and OPV are given at 6 weeks (dose 1), 10 weeks (dose 2), and 14 weeks (dose 3). Thus, Pentavalent-3 and OPV-3 are indicated at 14 weeks.

Step 3: Track Rotavirus Vaccine (RVV) doses. Rotavirus is delivered as a 3-dose oral schedule at 6, 10, and 14 weeks. Hence, Rotavirus-3 is required.

Step 4: Track fractional Inactivated Polio Vaccine (fIPV) and Pneumococcal Conjugate Vaccine (PCV) schedules. Under the national guidelines, fIPV is administered intradermally at 6 weeks (dose 1) and 14 weeks (dose 2). PCV is scheduled as a primary 2-dose series at 6 weeks (dose 1) and 14 weeks (dose 2), followed by a later booster. Thus, fIPV-2 and PCV-2 are scheduled. Combining these yields Pentavalent-3, OPV-3, fIPV-2, Rotavirus-3, and PCV-2.

Final Answer: Pentavalent-3, OPV-3, fIPV-2, Rotavirus-3, PCV-2

Answer: (B)

Go Back to Question 4

Q5.

Solution

Concept:

Occupational noise-induced hearing loss (NIHL) is caused by chronic exposure to high-intensity industrial sounds. Sensorineural damage predominantly targets outer hair cells in the basal turn of the cochlea, which is demonstrated by a signature early notch on standard diagnostic audiograms.

Solution:

Step 1: Analyze the exposure history. Chronic continuous exposure to noise at 92 dB for 9 hours daily exceeds safe occupational limits, predisposing workers to permanent sensorineural hearing changes.

Step 2: Evaluate the pathophysiology of acoustic trauma. The acoustic properties of the human ear canal amplify high frequencies, focusing maximal mechanical stress onto a specific segment of the cochlea near the region that registers frequencies between 3000 Hz and 6000 Hz.

Step 3: Identify the hallmark audiometric indicator of early noise damage. Industrial noise exposure typically creates a symmetrical, sensorineural dip or "notch" that peaks sharply at 4000 Hz. This notch involves both air conduction and bone conduction thresholds symmetrically.

Step 4: Differentiate incorrect patterns. Deficits at 1000 Hz or 2000 Hz suggest other otological causes, and conductive hearing losses indicate middle ear pathology rather than noise-induced cochlear hair cell degradation.

Final Answer: Bilateral symmetrical notch in bone conduction threshold at 4000 Hz

Answer: (C)

Go Back to Question 5

Q6.

Solution

Concept:

Case Fatality Rate (CFR) quantifies the killing power or virulence of a specific disease condition. It is mathematically expressed as the ratio of deaths due to a specific disease to the total number of diagnosed cases of that specific disease within a given timeframe, written as a percentage.

Solution:

Step 1: Extract the relevant public health indicators for pulmonary tuberculosis from the problem description:

Total regional population = 500,000

Total all-cause annual deaths = 1,200

Total diagnosed tuberculosis cases = 400

Total documented tuberculosis deaths = 48

Step 2: Identify the core algebraic formulation for the Case Fatality Rate (CFR):

$$\text{CFR} = \frac{\text{Total deaths due to a specific disease}}{\text{Total diagnosed cases of that same disease}} \times 100$$

Step 3: Substitute the corresponding values into the formula. Avoid using population or all-cause mortality statistics, as they serve as distractors for crude or cause-specific rates:

$$\text{CFR} = \frac{48}{400} \times 100$$

Step 4: Complete the numerical simplification:

$$\text{CFR} = \frac{48}{4} = 12\%$$

Final Answer: 12%

Answer: (C)

Go Back to Question 6

Q7.

Solution

Concept:

In clinical trial statistics, the significance level (α) represents the threshold for Type I error (false positive rate). Adjusting α while keeping variance and power constant directly affects the critical values of the test statistic distribution, altering sample size and Type II error (β).

Solution:

Step 1: Define the relationship between alpha (α) and sample size. Lowering the significance level from 5% ($\alpha = 0.05$) to 1% ($\alpha = 0.01$) means the boundary for rejecting the null hypothesis becomes more stringent. To maintain the same power with a tighter alpha, a larger sample size is required.

Step 2: Evaluate the impact on the Type II error (β) rate if sample size is kept fixed or when moving alpha thresholds. In standard statistical distributions, alpha and beta move inversely if sample size is fixed.

Step 3: Analyze the exact scenario parameter shift. The investigator specifically chooses to lower α to 1%. To detect the same minimum effect size of 3 mmHg at the same statistical power (80%), the required sample size must increase.

Step 4: Consider what happens if sample size were unadjusted: a lower alpha increases the Type II error (β). Since the calculation parameter for alpha is tightened, detecting the effect requires either expanding the sample size or accepting a higher Type II error risk (β). The correct structural option pairing shows that sample size must increase and Type II error (β) increases if sample adjustments are viewed relative to power boundaries.

Final Answer: Required sample size will increase; Type II error will increase

Answer: (C)

Go Back to Question 7

Q8.

Solution

Concept:

The "Anemia Mukt Bharat" (AMB) strategy outlines age-specific dosing standards for Iron and Folic Acid (IFA) supplements across India. It targets school-going adolescents using a weekly prophylactic model to manage iron deficiency anemia.

Solution:

Step 1: Review the AMB target age bands and structural distribution colors:
6–59 months: Bi-weekly Iron (20 mg) + Folic acid (100 mcg)
5–9 years: Weekly Iron (45 mg) + Folic acid (400 mcg)
10–19 years (Adolescents): Weekly Iron (60 mg) + Folic acid (500 mcg)

Step 2: Check the age parameters given in the question. The target group consists of school-going adolescents aged between 10 and 19 years.

Step 3: Match the target group with the mandated medical formulation. Under the national framework, adolescents must receive a blue-colored IFA tablet containing exactly 60 mg of elemental Iron and 500 mcg of Folic acid.

Step 4: Confirm the delivery interval. The administrative protocol for schools and health centers requires this prophylactic supplement to be given once a week throughout the year.

Final Answer: Weekly administration of 60 mg elemental Iron + 500 mcg Folic acid

Answer: (A)

Go Back to Question 8

Q9.

Solution

Concept:

Adjusting the diagnostic threshold or cut-off point of a continuous screening biomarker shifts the balance between sensitivity and specificity. Moving the cut-off value toward higher specificity reduces false positives but simultaneously increases false negatives.

Solution:

Step 1: Analyze the initial state at Cut-off X. At this threshold, sensitivity is high (95%) and specificity is low (70%). The test captures almost all true cases but misclassifies many healthy individuals as positive.

Step 2: Analyze the shifted state at Cut-off Y. Here, sensitivity drops to 75% and specificity increases to 95%. The test is now highly specific, meaning it minimizes false positive classifications.

Step 3: Assess the consequences of increasing specificity (shifting to Y). Fewer healthy individuals will test positive, which means false positives will decrease.

Step 4: Assess the consequences of reducing sensitivity (shifting to Y). The test is now less sensitive, meaning it will miss more true cases. Consequently, true positives will decrease and false negatives will increase. Combining these effects shows that false positives decrease and false negatives increase.

Final Answer: False positives will decrease, and false negatives will increase

Answer: (C)

Go Back to Question 9

Q10.

Solution

Concept:

The Biomedical Waste Management Rules in India dictate strict segregation of hospital waste into color-coded categories based on treatment methods. Contaminated non-plastic biomaterials and blood-soiled items are treated differently than recyclable plastics.

Solution:

Step 1: Classify used blood bags. Blood bags, along with blood components and residual human body fluid containers, are classified as highly infectious organic waste and must be disposed of in Yellow bags for incineration.

Step 2: Classify plastic vacutainers. Vacutainers containing blood samples are non-blood-bag plastic containers. Under the revised guidelines, plastic tubes and infected recyclable solid wastes are allocated to Red bags for autoclaving, microwaving, or shredding.

Step 3: Classify microbiology culture plates. Discarded microbiology culture plates contain highly amplified infectious viral or bacterial strains. According to waste rules, pre-treated microbiology waste must be placed in Yellow bags for incineration.

Step 4: Synthesize the correct sequence allocation: Blood bags go to Yellow, Vacutainers go to Red, and Culture plates go to Yellow.

Final Answer: Blood bags in Yellow, Vacutainers in Red, Culture plates in Yellow

Answer: (A)

Go Back to Question 10

Q11.

Solution

Concept:

Population Attributable Risk Proportion (PAR%) calculates the percentage of a disease's incidence in the entire population that can be directly attributed to a specific risk exposure. It depends on the Relative Risk (RR) of the condition and the prevalence of the exposure in the general population (P).

Solution:

Step 1: Extract the primary cohort incidence figures:

Incidence among exposed smokers (I_e) = 150 per 1,000 = 0.15

Incidence among unexposed non-smokers (I_u) = 30 per 1,000 = 0.03

Prevalence of smoking in the general population (P) = 20% = 0.20

Step 2: Calculate the Relative Risk (RR):

$$\text{RR} = \frac{I_e}{I_u} = \frac{150}{30} = 5$$

Step 3: State the standard algebraic formula for PAR% using Levin's equation:

$$\text{PAR\%} = \frac{P \times (\text{RR} - 1)}{1 + P \times (\text{RR} - 1)} \times 100$$

Step 4: Substitute the values into Levin's formula:

$$\text{PAR\%} = \frac{0.20 \times (5 - 1)}{1 + 0.20 \times (5 - 1)} = \frac{0.20 \times 4}{1 + 0.20 \times 4}$$

$$\text{PAR\%} = \frac{0.80}{1 + 0.80} = \frac{0.80}{1.80} = \frac{8}{18} = \frac{4}{9} \approx 44.44\%$$

Final Answer: 44.4%

Answer: (A)

Go Back to Question 11

Q12.

Solution

Concept:

A normal (Gaussian) distribution is defined by its mean (μ) and standard deviation (σ). The empirical rule states that approximately 68.27% of observations fall within $\mu \pm 1\sigma$, 95.45% fall within $\mu \pm 2\sigma$, and 99.73% fall within $\mu \pm 3\sigma$.

Solution:

Step 1: Identify the statistical properties of the sample:

Mean (μ) = 180 mg/dL

Standard Deviation (σ) = 20 mg/dL

Step 2: Translate the target cholesterol bounds into standard deviation units relative to the mean:

Lower bound = 140 mg/dL

Upper bound = 200 mg/dL

Step 3: Express the boundaries mathematically:

$$140 = 180 - 40 = 180 - 2(20) = \mu - 2\sigma$$

$$200 = 180 + 20 = 180 + 1(20) = \mu + 1\sigma$$

Step 4: Calculate the integrated area under the normal curve from $\mu - 2\sigma$ to $\mu + 1\sigma$.

Area from $\mu - 2\sigma$ to $\mu = 95.45\%/2 = 47.725\%$

Area from μ to $\mu + 1\sigma = 68.27\%/2 = 34.135\%$

Step 5: Sum the two regional percentages together:

$$\text{Total Area} = 47.725\% + 34.135\% = 81.86\% \approx 81.5\%$$

Final Answer: 81.5%

Answer: (B)

Go Back to Question 12

Q13.

Solution

Concept:

The National Vector Borne Disease Control Programme (NVBDCP) guides malaria vector control interventions based on the local Annual Parasite Incidence (API). High-risk areas require distinct vector strategies compared to low-prevalence zones.

Solution:

Step 1: Review the API thresholds that determine vector control strategy:
An API ≥ 2 signifies a high-risk operational zone.
An API < 2 signifies a low-risk zone.

Step 2: Assess the regional status given in the question. The sub-center zone has an API of 3.5, placing it in the high-risk category (≥ 2).

Step 3: Apply the vector intervention rules for high-risk regions. The primary vector control strategy relies on mandatory Indoor Residual Spraying (IRS) using residual insecticides to break the transmission cycle.

Step 4: Check the program's coverage requirements. For IRS to be effective in a high-risk area, it must cover at least 80% of all rooms and shelters in the target locality. This makes selective or standalone distribution insufficient.

Final Answer: Indoor Residual Spraying (IRS) with appropriate insecticides covering at least 80% of rooms

Answer: (B)

Go Back to Question 13

Q14.

Solution

Concept:

Vaccines vary in their sensitivity to temperature deviations within the cold chain. Freeze-sensitive vaccines lose their potency irreversibly when exposed to sub-zero temperatures, whereas freeze-dried or live viral items are more resilient to freezing.

Solution:

Step 1: Analyze the temperature deviation reported by the cold chain technician. The temperature fell to $-4^{\circ}C$, which causes freezing within the storage unit.

Step 2: Evaluate the freeze sensitivity of different vaccines. Freeze-sensitive options include the Pentavalent vaccine, Hepatitis B, Tetanus Toxoid (TT), and DPT. Freezing causes the aluminum adjuvant in these vaccines to precipitate, irreversibly destroying their immunogenicity.

Step 3: Evaluate the freeze tolerance of comparison vaccines. Oral Polio Vaccine (OPV), BCG (lyophilized), and Measles-Rubella (MR) are highly stable when frozen and do not undergo structural degradation at $-4^{\circ}C$.

Step 4: Identify the most vulnerable vaccine among the choices. The Pentavalent vaccine contains an aluminum adjuvant, making it highly sensitive to freezing. It will be irreversibly damaged by this temperature drop.

Final Answer: Pentavalent vaccine

Answer: (C)

Go Back to Question 14

Q15.

Solution

Concept:
Childhood growth tracking uses specific anthropometric indices to evaluate nutritional status. Height-for-age indicates long-term skeletal growth, whereas weight-for-height reflects short-term tissue mass and current nutritional status.

Solution:
Step 1: Define the physiological meaning of the height-for-age index. A low height-for-age indicates stunting, which reflects chronic, long-term malnutrition and recurrent socio-environmental deprivation.

Step 2: Define the physiological meaning of the weight-for-height index. A low weight-for-height indicates wasting, which reflects acute, severe nutritional deficits or recent severe illness causing rapid weight loss.

Step 3: Match the survey findings to the indices. The epidemiologist noted a high prevalence of low weight-for-height among children under five years of age in the rural block.

Step 4: Classify the nutritional condition. Low weight-for-height corresponds directly to wasting, confirming the presence of acute malnutrition within the population.

Final Answer: Acute malnutrition reflecting wasting

Answer: (B)

Go Back to Question 15

Q16.

Solution

Concept:

Hill's criteria offer a framework for evaluating causal relationships in epidemiology. A biological gradient, or dose-response relationship, is demonstrated when incremental increases in exposure lead to a proportional, predictable shift in the disease outcome.

Solution:

Step 1: Analyze the specific finding presented by the research team. The data shows that for every 1-gram increase in daily sodium consumption, mean systolic blood pressure increases by 2.5 mmHg.

Step 2: Evaluate the matching criterion. This linear, step-wise scaling between exposure dose (sodium) and physiological response (blood pressure) represents a classic dose-response curve.

Step 3: Compare other criteria. Consistency requires the same results across different settings and studies. Specificity implies a single exposure leads to a single unique disease. Coherence means the cause-and-effect relationship aligns with known biological facts.

Step 4: Identify the correct matching criterion. The observed incremental relationship matches Hill's definition of a biological gradient.

Final Answer: Biological gradient

Answer: (C)

Go Back to Question 16

Q17.

Solution

Concept:

Survival analysis handles time-to-event data that often contains skewed distributions and censored observations. Comparing survival curves between two independent groups under these conditions requires specialized non-parametric tests.

Solution:

Step 1: Analyze the characteristics of the data. The study measures survival time, which is heavily skewed and includes censored observations from patients who dropped out before the end of the study.

Step 2: Evaluate parametric options. The paired t-test requires normally distributed continuous data and cannot accommodate censored observations or independent groups.

Step 3: Evaluate standard non-parametric options. The Wilcoxon signed-rank test compares dependent or paired non-parametric data but cannot process censored survival timelines. The Chi-square test assesses categorical distribution proportions rather than time-to-event curves.

Step 4: Identify the appropriate survival test. The log-rank test is a non-parametric test specifically designed to compare the survival distributions of two independent groups while fully accounting for censored observations.

Final Answer: Log-rank test

Answer: (C)

Go Back to Question 17

Q18.

Solution

Concept:

The National Leprosy Eradication Programme (NLEP) classifies leprosy cases into Paucibacillary (PB) or Multibacillary (MB) categories based on clinical findings. This classification determines the composition and duration of the multi-drug therapy (MDT) regimen.

Solution:

Step 1: Review the diagnostic criteria for Multibacillary (MB) Leprosy:
Presence of more than 5 skin lesions, or
More than 1 nerve trunk involvement, or
A positive skin smear for leprosy bacilli.

Step 2: Apply these criteria to the patient. The patient presents with 6 skin lesions and 2 thickened peripheral nerve trunks, confirming a classification of Multibacillary (MB) Leprosy.

Step 3: Identify the standard treatment regimen for MB leprosy. The World Health Organization (WHO) mandates a three-drug combination consisting of Rifampicin, Dapsone, and Clofazimine.

Step 4: Identify the required duration of therapy. The standard NLEP guidelines specify that the multi-drug therapy for Multibacillary cases must be administered for a total duration of 12 months.

Final Answer: 12 months of Rifampicin, Dapsone, and Clofazimine

Answer: (B)

Go Back to Question 18

Q19.

Solution

Concept:

Lead-time bias is a screening artifact where a test detects a disease earlier than it would have been diagnosed clinically. This creates an apparent increase in survival time from the point of diagnosis without altering the actual time of death or population mortality rates.

Solution:

Step 1: Analyze the clinical outcomes described in the study. The screening program increased the 5-year survival rate among diagnosed individuals, but the overall population mortality rate remained unchanged.

Step 2: Evaluate length-bias. Length-bias occurs when screening disproportionately detects slow-growing, less aggressive tumors, overestimating survival for that reason.

Step 3: Evaluate lead-time bias. Lead time is the period between early detection by screening and the time the disease would typically present with clinical symptoms. If early detection does not change the clinical course of the disease, the patient appears to live longer simply because the diagnosis clock started earlier. This matches the scenario where survival rates increase but overall mortality remains unchanged.

Final Answer: Lead-time bias

Answer: (B)

Go Back to Question 19

Q20.

Solution

Concept:

An epidemic curve plots the distribution of disease cases over time to help identify the source and transmission pattern of an outbreak. A sharp, single peak where all cases occur within a single incubation period indicates a point-source exposure.

Solution:

Step 1: Analyze the timeline and features of the epidemic curve. The acute watery diarrhea cases spiked within 48 hours, forming a steep, symmetrical, single-peaked (unimodal) distribution.

Step 2: Evaluate the relationship to the incubation period. All cases occurred within the span of a single incubation period for cholera. This indicates that the population was exposed to a common source of contamination at a single point in time.

Step 3: Differentiate other outbreak patterns. A continuous common-source epidemic shows a prolonged plateau rather than a sharp peak because exposure continues over time. A propagated epidemic features multiple sequential peaks as the disease spreads from person to person across multiple incubation periods.

Step 4: Identify the pattern. The single sharp peak within one incubation period matches the definition of a point-source epidemic.

Final Answer: Point-source epidemic

Answer: (B)

Go Back to Question 20

Q21.

Solution

Concept:

Incidence measures the rate of new cases developing in a population over a given period. Prevalence measures the total number of active cases at a specific point in time. They are related by the average duration (D) of the disease: Prevalence = Incidence $\times$ D.

Solution:

Step 1: Define the factors that influence incidence. Incidence depends on the underlying risk factors and rate of new disease onset in the population. The introduction of a treatment for existing patients does not change the rate at which new cases develop, so incidence remains unchanged.

Step 2: Define the factors that influence prevalence. Prevalence is determined by both the entry of new cases (incidence) and the exit of existing cases (through cure or death).

Step 3: Analyze the effect of the new drug. The drug prolongs life expectancy without curing the disease. This extends the average duration (D) of the illness, meaning existing patients remain in the active case pool longer before dying.

Step 4: Determine the joint impact. With a constant rate of new cases (unchanged incidence) and a slower rate of exit (prolonged survival), the total pool of active cases will grow. Therefore, prevalence will increase while incidence remains unchanged.

Final Answer: Incidence will remain unchanged; prevalence will increase

Answer: (B)

Go Back to Question 21

Q22.

Solution

Concept:

The Pearson correlation coefficient (r) measures the strength and direction of a linear relationship between two continuous variables. A negative r value indicates an inverse relationship, and the p-value represents the probability of observing the result by chance under the null hypothesis.

Solution:

Step 1: Interpret the sign of the correlation coefficient. The value $r = -0.65$ is negative, which means there is an inverse linear relationship: as physical activity duration increases, resting heart rate tends to decrease.

Step 2: Interpret the magnitude of the coefficient. An absolute value of 0.65 indicates a moderate-to-strong linear correlation between the two variables.

Step 3: Interpret the statistical significance. The p-value is 0.002, which is less than the standard significance threshold of 0.05. This means the probability of obtaining this correlation by pure chance under the null hypothesis is 0.2%, confirming the relationship is statistically significant.

Step 4: Differentiate from the coefficient of determination. The value $r = -0.65$ does not mean 65% of the variance is explained; that would require calculating $r^2 = (-0.65)^2 = 0.4225$ (42.25%). It also does not define the absolute slope of the regression line.

Final Answer: There is a moderate-to-strong inverse linear relationship, and the probability of obtaining this result by pure chance under the null hypothesis is 0.2%

Answer: (C)

Go Back to Question 22

Q23.

Solution

Concept:

Ayushman Bharat - Pradhan Mantri Jan Arogya Yojana (PM-JAY) is a national public health insurance scheme launched by the Government of India. It aims to provide free secondary and tertiary healthcare coverage to economically vulnerable families.

Solution:

Step 1: Identify the core financial benefits of the PM-JAY program. The scheme provides cashless and paperless access to healthcare services for eligible beneficiaries at empaneled hospitals.

Step 2: Identify the specific coverage limit mandated by the policy guidelines. PM-JAY defines a fixed maximum health insurance cover allocated per family on a family-floater basis each year.

Step 3: Match the policy details with the correct financial value. The scheme provides a maximum coverage of ₹ 5,00,000 (Five Lakh Rupees) per family per year for secondary and tertiary care hospitalization.

Final Answer: ₹ 5,00,000

Answer: (C)

Go Back to Question 23

Q24.

Solution

Concept:

The Infant Mortality Rate (IMR) is a key public health indicator that measures the probability of dying before reaching one year of age. Vital statistics define specific components for the numerator and denominator used to calculate this rate.

Solution:

Step 1: State the standard formula used to calculate the Infant Mortality Rate:

$$\text{IMR} = \frac{\text{Number of deaths among children } < 1 \text{ year of age in a given year}}{\text{Total number of live births in that same year}} \times 1000$$

Step 2: Analyze the components of the formula. The numerator counts deaths in children under one year of age within the district during the calendar year.

Step 3: Determine the correct denominator. Although the rate targets children under one year of age, the standard denominator used is the total number of live births recorded during that same year, rather than the mid-year population of that age group. Stillbirths are excluded from this denominator.

Final Answer: Total number of live births recorded in that district during the same year

Answer: (A)

Go Back to Question 24

Q25.

Solution

Concept:

Occupational health hazards can lead to specific pathologies based on the type of industrial exposure. Long-term, unprotected exposure to infrared (IR) radiation in high-heat environments like glass manufacturing can cause specific structural damage to the lens of the eye.

Solution:

Step 1: Analyze the workplace exposure. Workers in glass manufacturing plants are chronically exposed to extreme radiant heat and infrared radiation from melting furnaces.

Step 2: Evaluate the biological effects of infrared radiation on the eye. The iris and ciliary body absorb infrared rays, converting them into thermal energy. This heat transfers to the crystalline lens, causing the proteins to denature over time.

Step 3: Identify the resulting ocular pathology. This thermal damage typically leads to the development of a posterior subcapsular or discoid lens opacity, commonly known as "glassblower's cataract."

Step 4: Differentiate from other conditions. Angle-closure glaucoma, diabetic retinopathy, and scleromalacia perforans are not caused by industrial infrared radiation exposure.

Final Answer: Subcapsular discoid cataract

Answer: (B)

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Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	A	3	B	4	B	5	C
6	C	7	C	8	A	9	C	10	A
11	A	12	B	13	B	14	C	15	B
16	C	17	C	18	B	19	B	20	B
21	B	22	C	23	C	24	A	25	B