NEET PG Social & Preventive Medicine Sample Paper-6

Duration: 25 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. An investigator compares the mean systolic blood pressure between two independent groups of hypertensive patients (Group A, $n = 45$, treated with Drug X; Group B, $n = 42$, treated with Drug Y). The data in both groups are normally distributed. Which of the following statistical tests is most appropriate to determine if there is a significant difference between the two group means?

(A) Paired t-test

(B) Student's independent samples t-test

(C) Chi-square test

(D) Analysis of Variance (ANOVA)

Q2. A newly introduced screening test for an asymptomatic viral infection is applied to a community of 10,000 individuals where the true disease prevalence is 5%. The test correctly identifies 450 of the true positive cases and yields 95 false positive results. What is the specificity of this screening test?

(A) 90.0%

(B) 95.0%

(C) 99.0%

(D) 82.5%

Q3. Under the National Tuberculosis Elimination Program (NTEP) diagnostic algorithm, a presumptive TB patient undergoes a molecular diagnostic test (CBNAAT/Truenat) as the initial investigation. If the molecular test detects *Mycobacterium tuberculosis* but indicates "Rifampicin Resistance Indeterminate," what is the immediate next recommended action according to NTEP guidelines?

(A) Start standard first-line anti-TB treatment (HRE) immediately

(B) Repeat the molecular test using a fresh specimen

(C) Initiate a standard longer oral drug-resistant TB regimen

(D) Refer the patient for a chest X-ray and treat non-specifically with amoxicillin for two weeks

Q4. The National Iron Plus Initiative (NIPI) guidelines recommend specific prophylactic iron and folic acid (IFA) supplementation schedules across different age groups. For adolescents aged 10–19 years in school, what is the exact weekly dosage of IFA prescribed?

(A) 100 mg elemental iron and 500 μg folic acid

(B) 60 mg elemental iron and 500 μg folic acid

(C) 45 mg elemental iron and 400 μg folic acid

(D) 20 mg elemental iron and 100 μg folic acid

Q5. A prospective cohort study was conducted over a 5-year period to evaluate the association between a specific dietary habit and the risk of developing type 2 diabetes mellitus. The investigators reported a Relative Risk (RR) of 2.4 with a 95% Confidence Interval (CI) of 0.85 to 4.12. Which of the following is the most accurate interpretation of this finding?

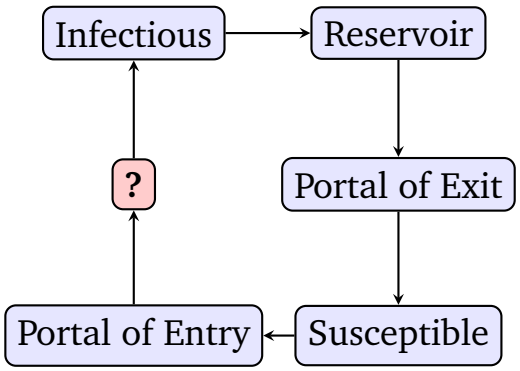
(A) Individuals with the dietary habit are 2.4 times more likely to develop diabetes, and the finding is highly statistically significant.

(B) The dietary habit is a definitive protective factor against developing type 2 diabetes mellitus.

(C) The association is not statistically significant at the 5% level because the confidence interval includes the value of 1.

(D) The p-value for this association must be less than 0.01.

Q6. The diagram below shows the chain of infection for an infectious disease. Which epidemiological concept is represented by the box marked with a question mark (?)?



(A) Mode of Transmission

(B) Herd Immunity Threshold

(C) Incubation Period

(D) Secondary Attack Rate

Q7. According to the National Immunization Schedule (NIS) in India, the Measles-Rubella (MR) vaccine is administered in two routine doses. What are the correct recommended ages and route of administration for these two doses?

(A) 6 weeks and 14 weeks, Intramuscular

(B) 9–12 months and 16–24 months, Subcutaneous

(C) At birth and 6 months, Intradermal

(D) 12 months and 5 years, Oral

Q8. A field epidemiologist investigates an outbreak of acute gastroenteritis following a community banquet. A total of 120 people attended, out of which 48 individuals became ill. Among those who ate a specific seafood salad, 36 out of 45 became ill. What is the food-specific attack rate among those who consumed the seafood salad?

(A) 40%

(B) 75%

(C) 80%

(D) 30%

Q9. In the evaluation of a diagnostic test, the relationship between sensitivity, specificity, and the disease prevalence affects the predictive values. If the prevalence of a specific disease increases in a target population while the inherent sensitivity and specificity of the test remain constant, how do the Positive Predictive Value (PPV) and Negative Predictive Value (NPV) change?

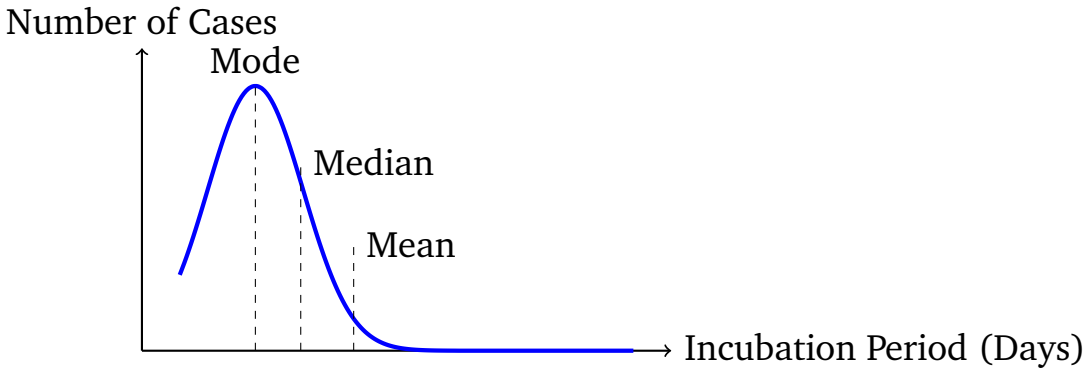
(A) Both PPV and NPV increase

(B) PPV increases and NPV decreases

(C) PPV decreases and NPV increases

(D) Both PPV and NPV decrease

Q10. A study monitors the clinical course of a newly identified variant of an engineered viral infection. The graph below displays the distribution of the incubation period in days for 200 confirmed cases. Which of the following parameters describes the shape of this distribution?



(A) Symmetrical distribution

(B) Positively skewed distribution

(C) Negatively skewed distribution

(D) Leptokurtic uniform distribution

Q11. The National Programme for Control of Blindness and Visual Impairment (NPCBVI) defines "blindness" for public health implementation using specific visual acuity criteria. Which of the following thresholds aligns with the revised NPCBVI/WHO criteria for blindness in an individual?

(A) Visual acuity less than 3/60 or Snellen equivalent in the better eye with best possible correction

(B) Visual acuity less than 6/60 or Snellen equivalent in the worse eye with best possible correction

(C) Visual acuity less than 6/18 in the better eye with best possible correction

(D) Visual acuity less than 1/60 in both eyes without correction

Q12. During a routine inspection under the National Vector Borne Disease Control Programme (NVBDCP), a public health team measures the density of vector mosquitoes. If they count the total number of female *Anopheles* mosquitoes caught inside human dwellings per man-hour of searching, which specific entomological indicator are they calculating?

(A) House Index

(B) Container Index

(C) Man-Hour Rate

(D) Breteau Index

Q13. A clinical trial evaluates a new vaccine formulation designed to prevent infection from a newly mutated strain of respiratory syncytial virus. The trial monitors 1,200 healthy participants over 12 months. The table below outlines the results. What is the Vaccine Efficacy (VE) based on this study?

Group	Total Participants	Developed Infection
Vaccine Group	600	12
Placebo Group	600	48

(A) 60%

(B) 75%

(C) 80%

(D) 90%

Q14. Under the Universal Immunization Programme (UIP), the cold chain must be maintained strictly from the manufacturer down to the peripheral delivery point. At the primary health centre (PHC) level, which equipment is designated as the principal component for storing deep-freeze sensitive vaccines like BCG, Measles, and OPV for up to one month?

(A) Cold boxes

(B) Ice-lined Refrigerators (ILR)

(C) Deep Freezers

(D) Vaccine Carriers

Q15. A state epidemiologist monitors seasonal influenza patterns. Over a three-month period, 150 active cases are monitored. Out of these, 15 individuals die from complications directly related to influenza. This finding highlights which of the following metrics?

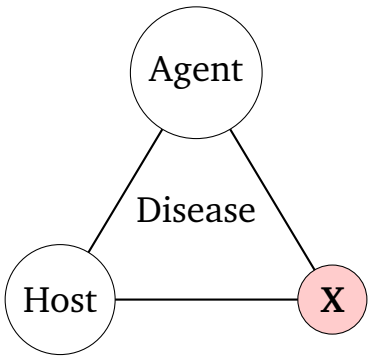
(A) Case Fatality Rate of 10%

(B) Cause-Specific Mortality Rate of 10%

(C) Proportional Mortality Ratio of 15%

(D) Crude Death Rate of 0.15 per 1,000

Q16. A public health intervention maps the epidemiological triad of a zoonotic parasitic disease. The diagram illustrates the interplay of three primary factors. What does structural element "X" represent in this model?



(A) Vector

(B) Environment

(C) Confounder

(D) Bias

Q17. An analytical epidemiological study design is selected to investigate a rare, slow-progressing congenital metabolic disorder to identify potential prenatal maternal exposures. Which study design is most efficient and logistically feasible under these conditions?

(A) Prospective Cohort Study

(B) Randomized Controlled Trial

(C) Case-Control Study

(D) Cross-Sectional Ecological Survey

Q18. The Sustainable Development Goals (SDGs) established by the United Nations outline specific targets for maternal and child health to be achieved globally by 2030. Under SDG Target 3.1, what is the specific global target for the Maternal Mortality Ratio (MMR)?

(A) Less than 70 per 100,000 live births

(B) Less than 100 per 100,000 live births

(C) Less than 50 per 10,000 live births

(D) Less than 20 per 1,000 live births

Q19. The correlation between daily physical activity duration (minutes) and fasting blood glucose levels (mg/dL) was analyzed in a sample of 85 pre-diabetic patients. The calculated Pearson correlation coefficient (r) was found to be -0.68 with a p-value < 0.001. What does this value indicate?

(A) A strong positive linear relationship that is statistically significant

(B) A weak negative linear relationship that occurs purely by chance

(C) A moderate-to-strong inverse linear relationship that is statistically significant

(D) No meaningful linear relationship since the value is less than zero

Q20. A municipal hospital registers a sharp increase in the number of admissions for waterborne hepatitis E over a brief 5-day period. All affected individuals reside in different sectors but share a common workplace facility that suffered a major water pipe contamination event exactly 3 weeks prior. What type of epidemic curve does this scenario represent?

(A) Propagated epidemic

(B) Point-source, common-vehicle epidemic

(C) Continuous, common-source epidemic

(D) Cyclical trends epidemic

Q21. Under the current guidelines of the National Reproductive, Maternal, Newborn, Child plus Adolescent Health (RMNCH+A) strategy, the "India Newborn Action Plan" (INAP) aims to reduce the Neonatal Mortality Rate (NMR) and Stillbirth Rate (SBR). What is the specific target milestone for both metrics to be achieved by the year 2030?

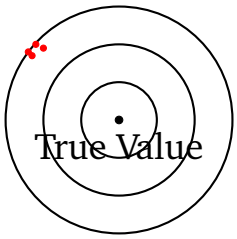
(A) Single digit NMR and SBR (less than 10 per 1,000 live births / total births)

(B) Less than 15 per 1,000 live births for NMR and 20 per 1,000 for SBR

(C) Reduction by 50% from the baseline of 2014

(D) Zero preventable neonatal deaths and stillbirths globally

Q22. A diagnostic laboratory validates a quantitative PCR assay for the detection of an emerging respiratory pathogen. The graph below displays the results of repeated measurements of a known standard reference concentration to determine the assay's precision and accuracy. If the true concentration value is located exactly at the center target, how would you classify the performance of an assay whose test runs cluster tightly together but far from the center target?



(A) High accuracy and high precision

(B) Low accuracy and low precision

(C) High accuracy and low precision

(D) Low accuracy and high precision

Q23. A clinical research protocol outlines an investigation into a new cardioprotective agent. The primary endpoint is the occurrence of acute myocardial infarction within a 2-year follow-up window. To control for the confounding effect of age, investigators match each case with a control of the same age decade. Which phase of the study design or analysis is being utilized here to manage confounding?

(A) Restriction at the design phase

(B) Matching at the design phase

(C) Stratification at the analysis phase

(D) Statistical modeling via multivariate regression Analysis

Q24. The World Health Organization (WHO) recommends the use of Vaccine Vial Monitors (VVM) on immunization vials to track heat exposure over time. A peripheral health worker inspects a vial of Oral Polio Vaccine (OPV) prior

to administration and observes that the inner square is lighter than the outer circle, but has started to darken slightly from its initial stark white appearance. The color of the inner square is still distinctly lighter than the outer ring. What is the correct clinical action?

(A) Discard the vaccine vial immediately as it has reached its expiry endpoint

(B) Use the vaccine vial immediately, provided it has not passed its printed expiry date

(C) Potentiate the vaccine by keeping it in deep freeze for 24 hours before use

(D) Return the vial to the regional cold chain hub for chemical re-validation

Q25. During a health survey of an industrial township, a public health officer notices an increased frequency of chronic respiratory symptoms among factory workers. The officer reviews medical records from the past calendar year to assess the total number of existing active cases of chronic bronchitis divided by the total mid-year population of the township. Which public health metric is being calculated?

(A) Period Prevalence Rate

(B) Point Prevalence Rate

(C) Cumulative Incidence Rate

(D) Incidence Density Rate

Detailed Solutions

Q1.

Solution

Concept:

Biostatistics deals with comparing numeric parameters across distinct groups. When evaluating quantitative continuous data like blood pressure, the investigator must analyze the distribution type and group independence to choose the proper parametric or non-parametric test. For two separate, normally distributed groups, a parametric test evaluating difference between distinct means is required.

Solution:

(a) The study measures systolic blood pressure, which is a continuous quantitative variable.

(b) There are two independent groups (Group A and Group B), meaning the measurements in one group do not affect or match the measurements in the other.

(c) The prompt explicitly states that the data in both groups are normally distributed, satisfying the core assumption for parametric statistics.

(d) Student's independent samples t-test is designed precisely to compare the means of two independent, normally distributed data sets.

(e) A paired t-test is incorrect because it is used for matched or repeated measures on the same subjects. Chi-square test is meant for categorical data rather than continuous parameters. Analysis of Variance (ANOVA) is used when comparing means across three or more groups simultaneously.

Final Answer: Student's independent samples t-test.

Answer: (B)

Go Back to Question 1

Q2.

Solution

Concept:

Screening metrics evaluate the diagnostic performance of a test against a gold standard. Specificity defines the ability of a screening test to correctly identify individuals who do not have the condition. Calculating this metric requires determining the total number of true negative individuals and dividing it by the total population that is truly free of the disease.

Solution:

(a) Total community population is $10,000$. Disease prevalence is 5%, meaning true diseased individuals equal $10,000 \times 0.05 = 500$.

(b) The total number of truly healthy individuals who do not have the disease is $10,000 - 500 = 9,500$.

(c) The test yields 95 false positive results among these healthy individuals, which means it incorrectly labeled 95 non-diseased people as positive.

(d) The number of true negative individuals (healthy people who correctly test negative) is calculated as $9,500 - 95 = 9,405$.

(e) Specificity is the percentage of true negatives out of total healthy individuals: $(9,405/9,500) \times 100 = 99.0\%$. Therefore, option (C) is the accurate calculation.

Final Answer: 99.0%.

Answer: (C)

Go Back to Question 2

Q3.

Solution

Concept:

The National Tuberculosis Elimination Program (NTEP) follows structured diagnostic algorithms to manage drug resistance efficiently. When molecular testing yields ambiguous markers for critical drugs like Rifampicin, specific protocol overrides are established to avoid improper regimen selection or unnecessary treatment delays while maintaining diagnostic precision.

Solution:

(a) Molecular diagnostic tools like CBNAAT or Truenat are the primary gateway for testing presumptive pulmonary tuberculosis cases in India.

(b) An "Indeterminate" result for Rifampicin resistance indicates that while the presence of *Mycobacterium tuberculosis* is confirmed, the genetic probe sequence for the rpoB gene region did not yield a clear clear-cut result due to low bacterial load or artifact.

(c) NTEP guidelines mandate that an indeterminate drug resistance result cannot be used to start a second-line regimen or assumed to be completely sensitive.

(d) The immediate protocol requirement is to repeat the molecular diagnostic test using an entirely fresh specimen from the patient to resolve the ambiguity.

(e) Starting standard first-line therapy or longer oral drug-resistant regimens immediately without confirmation is incorrect and violates the standard diagnostic pathway.

Final Answer: Repeat the molecular test using a fresh specimen.

Answer: (B)

Go Back to Question 3

Q4.

Solution

Concept:

The National Iron Plus Initiative (NIPI) is a comprehensive strategy targeting iron deficiency anemia across different lifecycle stages in India. Prophylactic dosages are precisely calibrated for age-specific metabolic needs and are distributed through institutional frameworks like schools and Anganwadi centers to combat micro-nutritional deficiencies uniformly.

Solution:

(a) NIPI covers age brackets including infants, children, adolescents, and pregnant or lactating women with tailored elemental compositions.

(b) For school-going adolescents aged 10–19 years, the guideline establishes a weekly administration schedule to improve compliance and iron absorption.

(c) The specific composition mandated for this adolescent age bracket is 100 mg of elemental iron paired along with 500 μg of folic acid.

(d) This corresponds exactly to option (A). Other listed compositions like 60 mg or 45 mg elemental iron are target specifications optimized for lower pediatric age demographics or alternative program components.

(e) The tablets provided are distinctively blue-colored to differentiate them from the adult or pediatric iron formulations distributed via public health channels.

Final Answer: 100 mg elemental iron and 500 $\mu g folic acid$.

Answer: (A)

Go Back to Question 4

Q5.

Solution

Concept:

Analytical epidemiology relies on interval estimation to determine the clinical significance and stability of an association. The confidence interval around a point estimate like Relative Risk (RR) provides boundaries within which the true population parameter lies. Interpreting this interval requires evaluating whether it encompasses the null value.

Solution:

(a) The point estimate for Relative Risk is 2.4, which suggests a positive directional trend linking the exposure to the development of type 2 diabetes.

(b) However, the 95% Confidence Interval spans from a lower boundary of 0.85 to an upper boundary of 4.12.

(c) For ratio measures like Relative Risk or Odds Ratios, a value of 1.0 represents the null hypothesis, indicating absolutely no difference in risk between exposed and unexposed groups.

(d) Because the interval $[0.85, 4.12]$ contains the value of 1.0, the observed risk increase could easily be due to random sampling variation.

(e) Therefore, the association is not statistically significant at the standard 5% significance level, making option (C) the correct analytical interpretation.

Final Answer: The association is not statistically significant at the 5% level because the confidence interval includes the value of 1.

Answer: (C)

Go Back to Question 5

Q6.

Solution

Concept:

The transmission of infectious diseases relies on a continuous sequence of events known as the chain of infection. Interrupting any single link in this chain can halt the spread of a pathogen within a community. Epidemiologists map this cycle to design specific target interventions like barrier precautions or sanitization.

Solution:

(a) The chain of infection is composed of six distinct sequential components: the infectious agent, the reservoir, the portal of exit, the mode of transmission, the portal of entry, and the susceptible host.

(b) The provided TikZ network traces the directional movement of a pathogen through these components.

(c) Looking closely at the diagram layout, the path moves from the Portal of Exit to the Susceptible Host via the Portal of Entry, with an intermediate link running from the entry back to the agent.

(d) The missing component marked by the question mark (?) sits between the Portal of Exit and the Portal of Entry.

(e) This specific spatial transition defines how the agent travels from the source to the new host, which is the Mode of Transmission, matching option (A).

Final Answer: Mode of Transmission.

Answer: (A)

Go Back to Question 6

Q7.

Solution

Concept:

The National Immunization Schedule (NIS) in India outlines specific schedules, operational routes, and dosages for vaccines to ensure maximum protective immunogenicity. Measles-Rubella (MR) elimination strategies rely on high coverage across two administrative time points during early childhood to avoid viral resurgence.

Solution:

(a) Under the current NIS guidelines, the first routine dose of the Measles-Rubella (MR) vaccine is administered to infants between 9–12 months of age.

(b) The second booster dose is subsequently scheduled to be administered during early childhood between 16–24 months of age.

(c) The required route of administration for the MR vaccine is strictly subcutaneous, typically delivered in the right upper arm.

(d) Evaluating the options, option (B) accurately details both the correct operational ages and the specific anatomical route.

(e) Option (A) is the schedule for pentavalent or rotavirus vaccinations, while option (C) describes the at-birth protocol for BCG vaccination, which is intradermal.

Final Answer: 9–12 months and 16–24 months, Subcutaneous.

Answer: (B)

Go Back to Question 7

Q8.

Solution

Concept:

Outbreak investigations utilize attack rates to identify specific vehicles or exposures responsible for acute clusters of disease. A food-specific attack rate isolates a specific subpopulation to determine the incidence of illness purely among those who consumed a particular item during a common event.

Solution:

(a) An attack rate is a form of cumulative incidence used during acute, time-limited scenarios like food poisoning outbreaks.

(b) The mathematical formula for a food-specific attack rate is: (Number of people who ate the food and became ill/Total number of people who ate that specific food 100.

(c) The problem states that a total of 45 individuals consumed the specific seafood salad.

(d) Among this exposed group, exactly 36 individuals subsequently developed symptoms of acute gastroenteritis and became ill.

(e) Substituting these values into the formula gives: $(36/45) \times 100 = 0.8 \times 100 = 80\%$. This makes option (C) the correct mathematical solution.

Final Answer: 80%.

Answer: (C)

Go Back to Question 8

Q9.

Solution

Concept:

Predictive values are highly dependent on the contextual setting and baseline prevalence of the condition in the population being tested. While sensitivity and specificity are fixed intrinsic properties of a diagnostic tool, the clinical utility of a positive or negative test result shifts as the underlying disease dynamics change.

Solution:

(a) Positive Predictive Value (PPV) is the probability that a person who tests positive truly has the disease. Negative Predictive Value (NPV) is the probability that a person who tests negative is truly healthy.

(b) When disease prevalence increases, the absolute number of true positive cases rises sharply while the number of true negative individuals falls.

(c) Consequently, a positive test result is more likely to represent a true case rather than a false alarm, which directly causes the PPV to increase.

(d) Conversely, because there are more diseased individuals in the population, the chance of a negative result being a false negative increases, causing the NPV to drop.

(e) Therefore, as prevalence increases, PPV increases and NPV decreases, which matches option (B).

Final Answer: PPV increases and NPV decreases.

Answer: (B)

Go Back to Question 9

Q10.

Solution

Concept:

Descriptive statistics uses asymmetry parameters to characterize asymmetrical data distributions. In epidemiology, metrics like incubation periods or outbreak curves rarely follow a perfectly symmetrical normal curve. Recognizing the relative alignment of central tendency measures helps clarify the directional skew of the data.

Solution:

(a) The provided TikZ graph displays an asymmetrical curve with a long tail extending towards the right side of the x-axis (higher values).

(b) Looking closely at the marked central tendency positions on the x-axis, the values follow a distinct sequential order: Mode $<$ Median $<$ Mean.

(c) The mean is pulled toward the right by a few extreme outlier values representing cases with unusually long incubation periods.

(d) Whenever the tail of a distribution extends toward the higher positive end of the axis and Mean $>$ Median, the distribution is classified as positively skewed.

(e) This matches option (B). A negatively skewed distribution would feature a tail trailing off to the left with the mean lower than the mode.

Final Answer: Positively skewed distribution.

Answer: (B)

Go Back to Question 10

Q11.

Solution

Concept:

The National Programme for Control of Blindness and Visual Impairment (NPCBVI) structures public health interventions based on quantitative thresholds of visual impairment. India updated its historical criteria to align directly with the standardized World Health Organization (WHO) classification system. This clinical update reduces the recorded prevalence of blindness but focuses delivery logistics on severe cases.

Solution:

(a) Historically, India defined blindness as visual acuity less than 6/60 in the better eye.

(b) To ensure universal standardization, the program updated its benchmark threshold to less than 3/60 (or Snellen equivalent) in the better eye with the best possible refractive correction.

(c) This revised standard categorizes an individual as blind when they cannot count fingers at a distance of three meters under bright daylight conditions.

(d) The threshold also includes individuals with a visual field restricted to less than 10 degrees around central fixation, regardless of their Snellen acuity.

(e) Options describing a cutoff of 6/60 or 6/18 relate to categories of severe or moderate visual impairment rather than clinical blindness under current guidelines.

Final Answer: Visual acuity less than 3/60 or Snellen equivalent in the better eye with best possible correction.

Answer: (A)

Go Back to Question 11

Q12.

Solution

Concept:

Vector-borne disease monitoring utilizes precise entomological indices to gauge transmission risks within communities. The National Vector Borne Disease Control Programme (NVBDCP) calculates vector density ratios to map areas vulnerable to dynamic outbreaks. These indicators evaluate adult mosquito density or track localized breeding container counts.

Solution:

(a) The prompt describes measuring the absolute volume of female *Anopheles* vector mosquitoes collected inside human dwellings over an explicit, standardized tracking window.

(b) This technique determines the average number of vectors captured per worker over one hour of active collection, which defines the Man-Hour Rate (MHR).

(c) The House Index represents the proportion of houses testing positive for mosquito larvae or breeding pools rather than tracking adult collection.

(d) The Container Index focuses on individual water storage units harboring active larvae, while the Breteau Index measures the total number of positive breeding containers identified per one hundred evaluated households.

(e) Because the team evaluated adult vector collections per unit of time, the operational parameter matches the standard definition of the Man-Hour Rate.

Final Answer: Man-Hour Rate.

Answer: (C)

Go Back to Question 12

Q13.

Solution

Concept:

Vaccine efficacy measures the proportionate reduction in disease attack rates among vaccinated cohorts compared to unvaccinated control populations during controlled trials. This metric determines the direct protective value of the formulation under optimal clinical trial environments, which is essential before wide community introduction.

Solution:

(a) The trial documents a cohort of $1,200$ total participants evenly divided into two separate experimental groups of 600 individuals each.

(b) The attack rate among the unvaccinated placebo group (ARU) is calculated as $48/600 = 0.08$ or 8%.

(c) The attack rate among the active vaccine group (ARV) is calculated as $12/600 = 0.02$ or 2%.

(d) The mathematical formula for Vaccine Efficacy (VE) is expressed as: $VE = [(ARU - ARV)/ARU] \times 100$.

(e) Substituting the values yields: $[(0.08 - 0.02)/0.08] \times 100 = (0.06/0.08) \times 100 = 0.75 \times 100 = 75\%$. This confirms that the correct calculation corresponds to option (B).

Final Answer: 75%.

Answer: (B)

Go Back to Question 13

Q14.

Solution

Concept:

The Universal Immunization Programme (UIP) depends on cold chain infrastructure to preserve the structural potency of immunobiological agents. Different levels of the healthcare delivery system use specific cooling equipment designed to withstand local power limitations while preserving correct storage temperatures.

Solution:

(a) Peripheral centers like Primary Health Centres (PHCs) represent critical endpoints where vaccines are stored for up to one month before administration.

(b) The Ice-lined Refrigerator (ILR) is the primary equipment used at the PHC level to hold sensitive supplies within a strict range of $+2 - +8°C$.

(c) ILRs contain internal water tubes or ice packs that maintain safe cold temperatures even during long power outages.

(d) Deep freezers are specialized units operated to freeze ice packs or store specific vaccines like OPV at low temperatures, but they cannot replace the multi-vaccine storage role of an ILR.

(e) Cold boxes and vaccine carriers are insulated transport tools intended for mobile field operations or temporary storage rather than routine one-month inventory holding.

Final Answer: Ice-lined Refrigerators (ILR).

Answer: (B)

Go Back to Question 14

Q15.

Solution

Concept:

Mortality statistics use specific ratios to describe how lethal a disease is or how it affects a population. Differentiating between mortality indices requires identifying whether the denominator represents the general population, a subgroup with a specific disease, or the total number of deaths from all causes.

Solution:

(a) The data focuses on a cohort of 150 active, confirmed cases of seasonal influenza monitored over a specified tracking window.

(b) Among this sick cohort, a subgroup of 15 individuals died from direct complications of the viral infection.

(c) The Case Fatality Rate (CFR) measures the proportion of deaths caused by a specific condition among the total number of people diagnosed with that condition.

(d) Calculating this percentage yields: $(15/150) \times 100 = 10\%$. This value directly represents the case fatality rate of the variant.

(e) Cause-specific mortality rate and crude death rate require the total mid-year population in the denominator, which is not provided in this clinical scenario.

Final Answer: Case Fatality Rate of 10%.

Answer: (A)

Go Back to Question 15

Q16.

Solution

Concept:

The epidemiological triad is a traditional model used to analyze the multi-factorial nature of infectious diseases. It illustrates that disease does not occur in isolation, but results from complex interactions between a biological agent, a vulnerable host, and external conditions that allow transmission to take place.

Solution:

(a) The epidemiological triad model is structured as a triangle where each corner represents a core factor that influences transmission dynamics.

(b) The top node represents the specific causative biological Agent, while the bottom-left node represents the human or animal Host.

(c) The bottom-right node, marked here with the structural indicator X, represents the external Environment.

(d) The environment includes physical factors like climate, biological factors like vector habitats, and socioeconomic variables that assist exposure.

(e) Disease sits at the center of the triangle, representing the clinical outcome when these three forces interact. Factors like vectors can be part of the environment, but the primary corner of the triad is the environment itself.

Final Answer: Environment.

Answer: (B)

Go Back to Question 16

Q17.

Solution

Concept:

Selecting an appropriate observational research design requires balancing efficiency, cost, and scientific validity. When studying clinical conditions with long latency periods or rare occurrences, certain designs become impractical due to high drop-out rates or the massive sample sizes required to observe rare events.

Solution:

(a) The investigator is studying a rare congenital metabolic disorder, meaning the baseline incidence in the general population is extremely low.

(b) A prospective cohort design would require tracking hundreds of thousands of pregnant individuals for years to observe a small number of cases, which is inefficient.

(c) A case-control study begins by identifying affected individuals (cases) and matching them with unaffected individuals (controls).

(d) Investigators then look back in time to compare maternal exposures during pregnancy.

(e) This retrospective approach is highly efficient for rare conditions because it relies on existing cases, saving time and resources compared to tracking a large group forward in time.

Final Answer: Case-Control Study.

Answer: (C)

Go Back to Question 17

Q18.

Solution

Concept:

The Sustainable Development Goals (SDGs) established by the United Nations set global health benchmarks to eliminate preventable mortality by 2030. SDG Target 3.1 focuses on maternal safety, establishing international standards to guide national programs like India's rhea initiatives.

Solution:

(a) Sustainable Development Goal Target 3.1 aims to reduce maternal complications during pregnancy and childbirth worldwide.

(b) The specific global target is to reduce the Maternal Mortality Ratio (MMR) to less than 70 deaths per $100,000$ live births by the year 2030.

(c) The Maternal Mortality Ratio uses $100,000$ live births as its standard base denominator to allow comparison across countries.

(d) Other options listed use incorrect denominators, such as $10,000$ or $1,000$, or represent targets for other metrics like neonatal mortality.

(e) India aligns its national healthcare goals with this benchmark, tracking progress through periodic Sample Registration System (SRS) surveys.

Final Answer: Less than 70 per 100,000 live births.

Answer: (A)

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Q19.

Solution

Concept:

Correlation metrics measure the linear relationship between two continuous quantitative variables. The Pearson correlation coefficient (r) indicates both the strength and direction of this relationship. However, correlation only measures association and does not prove a direct cause-and-effect link.

Solution:

(a) The calculated Pearson correlation coefficient (r) is -0.68, and the p-value is < 0.001.

(b) The negative sign reveals an inverse linear relationship, meaning that as daily physical activity increases, fasting blood glucose levels tend to fall.

(c) An absolute value of 0.68 indicates a moderate-to-strong correlation, as it shows a clear linear trend beyond minor variation.

(d) The tiny p-value (< 0.001) shows this inverse relationship is highly statistically significant and unlikely to occur by chance.

(e) Therefore, option (C) is the most accurate interpretation. Option (D) is incorrect because a negative sign shows direction, not a lack of relationship.

Final Answer: A moderate-to-strong inverse linear relationship that is statistically significant.

Answer: (C)

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Q20.

Solution

Concept:

Epidemic curves plot the distribution of cases over time to show the nature, source, and transmission pattern of an outbreak. Identifying the shape of the curve helps field teams distinguish between single exposure events, ongoing contamination, or person-to-person spread.

Solution:

(a) The scenario describes a sudden cluster of waterborne hepatitis E cases that emerged over a brief 5-day period.

(b) All affected individuals share a common workplace where a single water pipe contamination event occurred exactly three weeks prior.

(c) This timeframe matches the typical incubation period for hepatitis E, pointing to a shared exposure during that specific contamination event.

(d) Because the exposure occurred at a single point in time from a shared source, this represents a point-source, common-vehicle epidemic.

(e) A propagated epidemic would show a series of progressively larger peaks over weeks as the disease spreads from person to person, which does not fit this rapid cluster.

Final Answer: Point-source, common-vehicle epidemic.

Answer: (B)

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Q21.

Solution

Concept:

National child welfare strategies focus heavily on decreasing early pediatric and fetal mortality rates through targeted clinical frameworks. The India Newborn Action Plan (INAP) was launched within the broader RMNCH+A operational model to systematically accelerate the decline of neonatal deaths and stillbirth incidents using structured milestone tracking toward global criteria.

Solution:

(a) The India Newborn Action Plan establishes strategic goals to reduce preventable newborn deaths and tragic third-trimester fetal losses across the nation.

(b) The program outlines precise statistical targets aligned with sustainable development goals to be met before the end of the entry window.

(c) The formal milestone explicitly mandates reaching a single-digit target value for both the Neonatal Mortality Rate (NMR) and Stillbirth Rate (SBR).

(d) This means both clinical metrics must drop below 10 per 1,000 live births or total births, respectively, by the target year 2030.

(e) This objective is represented accurately in option (A), whereas intermediate double-digit limits or simple proportional percentage drops do not meet the mandated national framework guidelines.

Final Answer: Single digit NMR and SBR (less than 10 per 1,000 live births / total births).

Answer: (A)

Go Back to Question 21

Q22.

Solution

Concept:

Analytical test validation relies on differentiating clearly between experimental accuracy and statistical precision. In diagnostic laboratory medicine, an assay must be evaluated on its systemic bias relative to a true reference target, alongside its structural reliability when repeated across multiple independent experimental operational runs.

Solution:

(a) Accuracy reflects how closely the collective measurements or mean values align with the actual true standard value at the absolute center.

(b) Precision measures the degree of reproducibility or internal consistency among repeated measurements, regardless of how close they are to the true center.

(c) The provided diagram demonstrates that the individual red test dots cluster very tightly together in a confined area, indicating high reproducibility and high precision.

(d) However, this tight cluster is located far away from the designated true value target center, demonstrating a consistent systematic bias or error.

(e) Because the measurements are grouped closely together but remain significantly off-target, the performance is classified as having low accuracy and high precision.

Final Answer: Low accuracy and high precision.

Answer: (D)

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Q23.

Solution

Concept:

Confounding occurs when an extraneous variable correlates with both the exposure and the outcome, distorting the true analytical relationship. Epidemiologists manage these non-causal distortions using specific techniques split between the initial design setup phase or the later statistical analysis phase of a study.

Solution:

(a) Managing confounders can be done early via randomization, restriction, or matching, or handled later through statistical adjustment or stratification.

(b) The protocol describes an approach where investigators match each case with a control individual belonging to the exact same age decade.

(c) This deliberate step forces the age distribution to be identical between the two comparative groups, neutralizing age as a confounding variable.

(d) Because this structural selection occurs when choosing the study subjects before gathering outcome data, it operates during the design phase.

(e) Therefore, this process represents matching at the design phase, confirming option (B). Stratification or multivariate modeling would instead handle this variable during the computational phase.

Final Answer: Matching at the design phase.

Answer: (B)

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Q24.

Solution

Concept:

Vaccine Vial Monitors (VVM) utilize heat-sensitive chemical indicators to track cumulative thermal exposure over time. This mechanism ensures that heat-sensitive products like the Oral Polio Vaccine (OPV) maintain structural potency and have not degraded before reaching the peripheral delivery point.

Solution:

(a) A VVM is a small label featuring a light-colored inner square surrounded by a darker circular reference ring.

(b) As long as the inner square remains distinctly lighter than the outer circle, the vaccine has not reached its thermal limits and remains safe to use.

(c) The prompt notes that the square has started to darken slightly but remains distinctly lighter than the outer ring, meaning it has not yet reached its discard endpoint.

(d) The correct clinical action is to use the vaccine vial immediately, provided that the printed calendar expiration date has not passed.

(e) Discarding the vial is only required once the inner square matches or becomes darker than the outer circle, meaning options (A), (C), and (D) are incorrect.

Final Answer: Use the vaccine vial immediately, provided it has not passed its printed expiry date.

Answer: (B)

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Q25.

Solution

Concept:

Morbidity metrics quantify disease frequency within a population over a specified time window. Public health analysts distinguish between incidence, which tracks newly developing cases, and prevalence, which measures the total burden of existing disease states within a community.

Solution:

(a) The health officer reviews medical records spanning a full calendar year to evaluate the total number of existing active cases of chronic bronchitis.

(b) This count includes both long-standing pre-existing cases and any newly diagnosed cases that remained active during that specific calendar window.

(c) The denominator used is the total mid-year population of the industrial township, which acts as the standard average population at risk.

(d) Dividing the total number of old and new active cases over a defined period by the mid-year population yields the Period Prevalence Rate.

(e) Point prevalence applies only to a single specific date, while incidence metrics require isolating newly developed cases while excluding older diagnoses.

Final Answer: Period Prevalence Rate.

Answer: (A)

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Answer Key

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