**1. Donated blood is tested for infectious diseases and other contaminants. Since most donated blood is safe, it saves time and money to test batches of donated blood rather than test individual samples. A certain test is performed to see if a certain toxin is present, and the entire batch is discarded if the toxin is detected. This is similar to using a null and an alternative hypothesis to determine whether to discard or keep the batch. The hypotheses being tested could be stated as:**

**H0: The blood is not contaminated**

**H0: The blood is contaminated**

**What is type 1 and type 2 error in this problem?**

* Type I error: Rejecting a true null hypothesis

If H0 is true, then the batch does not actually contain the toxin. So, a Type I error would occur if the test detects the toxin and the batch is discarded.

* Type II error: Failing to reject a false null hypothesis

If H0 is true, and the batch does actually contain the toxin. So, a Type II error would occur if the test doesn't detect the toxin and the batch is kept.

**2. An interview in some South East Asian countries showed that the popularity of music group grew by 9% after their first English release. Their company wants to know if this is also reflected globally.**

**H0: The global popularity is same as local popularity**

**H0: The global popularity and the local popularity is not the same.**

**What is type 1 and type 2 error in this problem?**

* Type I error in this problem would occur if we reject the null hypothesis that global popularity is the same as local popularity when it is actually true.
* Type II error would occur if we fail to reject the null hypothesis when it is actually false.

**3. What is meant by Statistical Hypothesis? Give any examples of hypothesis.**

* In a statistical hypothesis, the statement should be logical or illogical, and the hypothesis is verified statistically.
* Statistical hypothesis is a statement about a population parameter that is tested using statistical methods. It is a claim or assumption about the distribution of a variable or relationship between variables that is to be verified through statistical analysis. Example: The average height of adult men is 6 feet.

4. **Which are 2 types of statistical hypothesis? Give its definitions.**

Two types of statistical hypothesis are:

1. Null hypothesis: - Null hypothesis is a statement of no effect or no difference between groups or variables.
2. Alternative hypothesis: - Alternative hypothesis is a statement that there is an effect or difference between groups or variables.

**5. Define simple/null and alternative hypothesis with the help of examples.**

Null hypothesis is a statement of no effect or no difference between groups or variables. While, Alternative hypothesis is a statement that there is an effect or difference between groups or variables. Example: H0: There is no difference in the mean weight of two groups. Ha: The mean weight of two groups is significantly different.

**6. Explain types of alternative hypothesis with the help of simple examples.**

Basically, there are three types of the alternative hypothesis, they are;

1. Left Tailed (H: x<x0)
2. Right Tailed (H: x>x0)
3. Two-Tailed (H: x≠x0)

**7. Define One sided hypothesis two-sided hypothesis.**

One-sided hypothesis is a hypothesis that specifies the direction of the expected difference or relationship between variables, while two-sided hypothesis does not specify the direction.

**8. Explain the concept of left sided hypothesis and right sided hypothesis using simple examples.**

* **Left-Tailed:** Here, it is expected that the sample proportion (π) is less than a specified value which is denoted by π0, such that;

H1 : π < π0

* **Right-Tailed:** It represents that the sample proportion (π) is greater than some value, denoted by π0.

H1 : π > π0

**9. Define type I and type II errors.**

Type I error is the rejection of a true null hypothesis (false positive), while type II error is the failure to reject a false null hypothesis (false negative).

**10. Give any 2 examples of type I and type II error.**

Example of type I error: Rejecting a null hypothesis that a patient is not sick when they are actually healthy.

Example of type II error: Failing to reject a null hypothesis that a patient is healthy when they are actually sick.

**11. What is the probability of type I error and probability of type II error?**

Probability of type I error is equal to the chosen significance level (alpha), while probability of type II error depends on factors such as sample size, effect size, and alpha level.

**12. What do you mean by Critical Region and critical value?**

Critical region is the region of the sampling distribution of a test statistic where the null hypothesis is rejected. Critical value is the value of the test statistic that defines the boundary between the critical region and the acceptance region.

**13. Define power of the test.**

Power of the test is the probability of rejecting the null hypothesis when it is false (1 - probability of type II error). It is the ability of the test to detect a significant difference or relationship between variables.

**14. Define p-value.**

P-value is the probability of obtaining a test statistic as extreme or more extreme than the observed value, assuming the null hypothesis is true. It is used to determine the significance level of the test and whether to reject or fail.

The probability that a particular statistical measure, such as the mean or standard deviation, of an assumed probability distribution will be greater than or equal to (or less than or equal to in some instances) observed results.

**15. What is Level of significance?**

The level of significance is defined as the fixed probability of wrong elimination of null hypothesis when in fact, it is true. The level of significance is stated to be the probability of type I error and is preset by the researcher with the outcomes of error. The level of significance is the measurement of the statistical significance. It defines whether the null hypothesis is assumed to be accepted or rejected. It is expected to identify if the result is statistically significant for the null hypothesis to be false or rejected.

**16. Define critical region and acceptance region.**

The critical region is the range of values for the test statistic that leads to the rejection of the null hypothesis. It is the region of the sampling distribution that corresponds to the p-value that is less than or equal to the level of significance.

The acceptance region is the range of values for the test statistic that leads to the failure to reject the null hypothesis. It is the region of the sampling distribution that corresponds to the p-value that is greater than the level of significance.

**17. When we reject the null hypothesis based on p-value?**

We reject the null hypothesis based on the p-value when the p-value is less than or equal to the level of significance.