

# JSO - DNA Forensics - Examination

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1. In a certain code language, "COMPUTER" is written as "RFUVQNPD". How is "MEDICINE" written in that code language?
  - A DOJIDJEF
  - B EOJDJEFO
  - C BOJDJEFN
  - ✓ D FOJDJEFN
  
2. In a family of six persons A, B, C, D, E and F, there are two married couples. A is the mother of D and F is the father of E. C is the son of A and brother of D. B is the daughter-in-law of F. Who is the husband of B?
  - ✓ A C
  - B D
  - C E
  - D F
  
3. Six people – P, Q, R, S, T, and U – are sitting in a circle facing the center. P is sitting between T and U. Q is sitting between R and S. R is not sitting adjacent to P. Who is sitting opposite to P?
  - A Q
  - ✓ B R
  - C S
  - D T
  
4. Arrange the following words in logical order: 1. Seed 2. Plant 3. Fruit 4. Tree 5. Flower
  - ✓ A 1, 2, 4, 5, 3
  - B 1, 2, 5, 4, 3
  - C 1, 5, 2, 4, 3
  - D 1, 3, 5, 2, 4

5. In a row of 21 children, when Rohan was shifted by four places towards the right, he became 12th from the left end. What was his earlier position from the right end?

- ☒ A 14th
- ☐ B 13th
- ☐ C 12th
- ☐ D 11th

6. What is the next number in the sequence: 2, 5, 10, 17, ?

- ☐ A 24
- ☒ B 26
- ☐ C 30
- ☐ D 35

7. A is twice as old as B. Five years ago, A was three times as old as B. What is the present age of A?

- ☐ A 10 years
- ☐ B 15 years
- ☒ C 20 years
- ☐ D 25 years

8. Which type of mirror is used in vehicle rearview mirrors to provide a wider field of view?

- ☐ A Plane mirror
- ☐ B Concave mirror
- ☒ C Convex mirror
- ☐ D Parabolic mirror

9. A shopkeeper buys a product for ₹500 and sells it for ₹600. What is his profit percentage?

- ☐ A 0.1
- ☐ B 0.15
- ☒ C 0.2
- ☐ D 0.25

**10.** A shopkeeper marks up a product by 40% and then gives a 25% discount. What is the overall profit or loss percentage?

- ☒ **A** 5% profit
- ☐ **B** 5% loss
- ☐ **C** 10% profit
- ☐ **D** 10% loss

**11.** What is the chemical formula of ozone?

- ☐ **A**  $O_2$
- ☒ **B**  $O_3$
- ☐ **C**  $H_2O_2$
- ☐ **D**  $CO_2$

**12.** A man is facing north. He turns 90 degrees clockwise, then 180 degrees counterclockwise, and finally 90 degrees clockwise. Which direction is he facing now?

- ☒ **A** North
- ☐ **B** South
- ☐ **C** East
- ☐ **D** West

**13.** Two pipes can fill a tank in 20 minutes and 30 minutes, respectively. If both pipes are opened together, how long will it take to fill the tank?

- ☐ **A** 10 min
- ☒ **B** 12 min
- ☐ **C** 15 min
- ☐ **D** 18 min

**14.** A mixture contains acid and water in the ratio 2:3. If 10 liters of water is added to the mixture, the ratio becomes 2:5. Find the quantity of acid in the original mixture.

- ☒ **A** 10 liters
- ☐ **B** 15 liters
- ☐ **C** 20 liters
- ☐ **D** 25 liters

**15.** If  $3x + 7 = 22$ , what is the value of  $x$ ?

- ☐ A 6
- ☐ B 7
- ☐ C 8
- ☒ D 5

**16.** Identify the part of speech of the underlined word: She spoke confidently during the presentation.

- ☐ A Adjective
- ☒ B Adverb
- ☐ C Verb
- ☐ D Noun

**17.** Which vitamin is primarily produced in the human body when exposed to sunlight?

- ☐ A Vitamin A
- ☐ B Vitamin B
- ☒ C Vitamin D
- ☐ D Vitamin C

**18.** What is the main function of red blood cells?

- ☒ A Transport oxygen
- ☐ B Fight infections
- ☐ C Digest food
- ☐ D Produce hormones

**19.** Which of the following is the main component of natural gas?

- ☐ A Ethane
- ☒ B Methane
- ☐ C Propane
- ☐ D Butane

**20.** Choose the correct passive voice transformation: "The teacher corrected the assignments."

- ☐ A The assignments is corrected by the teacher.
- ☒ B The assignments were corrected by the teacher.
- ☐ C The teacher was corrected by the assignments.
- ☐ D The assignments correct the teacher.

**21.** What does the expression "To break someone's bubble" imply?

- ☐ A To harm a person physically
- ☒ B To destroy someone's illusions or dreams
- ☐ C To burst a literal bubble
- ☐ D To surprise someone with a gift

**22.** Choose the word closest in meaning to "Ephemeral":

- ☐ A Permanent
- ☐ B Significant
- ☒ C Transient
- ☐ D Powerful

**23.** Which buffer system is most common in human blood?

- ☒ A Bicarbonate buffer
- ☐ B Phosphate buffer
- ☐ C Acetate buffer
- ☐ D Tris buffer

**24.** Choose the correct spelling for the word:

- ☐ A Carribean
- ☐ B Carribbean
- ☒ C Caribbean
- ☐ D Caribean

**25.** What is the pH value of pure water at room temperature?

- ☐ A 5
- ☐ B 9
- ☐ C 12
- ☒ D 7

**26.** Which of the following is an example of a non-reducing disaccharide?

- ☒ **A** Sucrose
- ☐ **B** Cellobiose
- ☐ **C** Maltose
- ☐ **D** Lactose

**27.** What is the term for an annual calendar containing important dates and statistical information?

- ☐ **A** Algorithm
- ☐ **B** Atlas
- ☒ **C** Almanac
- ☐ **D** Agenda

**28.** Which enzyme is responsible for removing RNA primers and filling gaps in the lagging strand during DNA replication?

- ☒ **A** DNA polymerase I
- ☐ **B** RNA polymerase II
- ☐ **C** DNA polymerase III
- ☐ **D** Helicase

**29.** The predominant antibody in saliva is

- ☐ **A** IgM
- ☒ **B** IgA
- ☐ **C** IgG
- ☐ **D** IgD

**30.** Which statement of the following is incorrect for human blood

- ☐ **A** Biconcave RBC
- ☐ **B** RBCs are produced in red bone marrow
- ☐ **C** Erythrocyte diameter is  $7\mu\text{m}$
- ☒ **D** RBC count range is about 6.5- 7.5 million/ $\text{mm}^3$  of blood

**31.** Monoclonal antibodies differ from polyclonal antibodies in their property of reacting with

- ☒ **A** Specific epitope
- ☐ **B** Specific antigen
- ☐ **C** Specific clone of the cells
- ☐ **D** All of the mentioned

**32.** An example of an agglutination test used in serology is that in which

- ☐ **A** The dissolved cells break open during lysis
- ☐ **B** Viruses multiply within bacteria
- ☒ **C** A visible clump appears to the observer
- ☐ **D** The body's B cells diminish in number

**33.** At the conclusion of the ELISA test

- ☐ **A** Radioactivity is produced
- ☐ **B** A clumping reaction is seen
- ☐ **C** Cells undergo lysis
- ☒ **D** A colour change takes place

**34.** A man of group -B marry a woman of group- A. The group of first progeny is B, its genotype is-

- ☐ **A**  $L^A L^B$
- ☐ **B**  $L^A L^O$
- ☐ **C**  $L^B L^B$
- ☒ **D**  $L^B L^O$

**35.** Semenogelins I and II are secreted by the

- ☐ **A** Prostate gland
- ☒ **B** Seminal vesicles
- ☐ **C** Cowper's gland
- ☐ **D** Both Prostate gland & Seminal vesicles

**36.** Which of the following statement is best describes the Bombay blood group?

- ☒ **A** It lacks A, B, & H antigens
- ☐ **B** It lacks A and B antigens but has H antigen
- ☐ **C** It lacks only the A antigen
- ☐ **D** It contains all antigens (A, B, & H)

**37.** Which blood group antigen is associated with malaria resistance?

- ☐ **A** Kell
- ☐ **B** Kidd
- ☒ **C** Duffy
- ☐ **D** Lewis

**38.** Enzyme present in saliva

- ☐ **A**  $\alpha$ -Amylase
- ☐ **B** Ptyalin
- ☐ **C** Trypsin
- ☒ **D** Both  $\alpha$ -Amylase & Ptyalin

**39.** Which statement is wrong for  $\alpha$ -amylases

- ☐ **A** found in salivary gland
- ☐ **B** found in pancreas
- ☒ **C** During the ripening of fruit, it breaks starch into maltose
- ☐ **D** Act on  $\alpha$ -1,4-glycosidic bonds.

**40.** What is the primary mechanism by which hemolytic disease of the newborn occurs in an Rh-incompatible pregnancy?

- ☐ **A** The fetal immune system attacks maternal red blood cells
- ☐ **B** The mother's B cells attack the fetal red blood cells directly
- ☐ **C** The maternal IgM antibodies cross the placenta and cause hemolysis
- ☒ **D** The maternal IgG antibodies cross the placenta and destroy fetal red blood cells



**41.** Which statement is wrong about Prostatic specific antigen

- ☐ A found in Prostate gland
- ☒ B Not found in female body
- ☐ C also known as kallikrein-3
- ☐ D More specific than the acid phosphatase tests for semen identification

**42.** Which of the following statements is wrong about a compound microscope ?

- ☒ A The numerical aperture of the objective lens does not affect image resolution.
- ☐ B It uses two sets of lenses to magnify the specimen.
- ☐ C The resolving power of a compound microscope is limited by the wavelength of visible light.
- ☐ D It can be used to view live cells with high contrast.

**43.** What is the primary advantage of a stereo microscope over a compound microscope?

- ☒ A Ability to observe 3D structures
- ☐ B Higher magnification
- ☐ C Better resolution through stereo wave beam
- ☐ D Utilization of 3 D effects of phase contrast principles

**44.** In scanning Electron Microscope (SEM), to form an image of the specimen

- ☐ A Electron should pass through the specimen
- ☒ B Electron are scattered from the surface of the specimen
- ☐ C A thin film of heavy metal is evaporated
- ☐ D Specimen are stained

**45.** Electron microscopes have higher powers of magnification than optical microscopes do because:

- ☐ A The electron beam is not subject to refraction
- ☐ B The electron beam displaces electrons in the specimen
- ☒ C The electron beam operates at shorter wavelengths than light does
- ☐ D The human eye is more sensitive to electrons than to light rays

**46.** In microscopy, resolution is a measure of

- ☒ **A** The ability of the lenses to separate two tiny details that are close together
- ☐ **B** The total magnification power of the microscope
- ☐ **C** The empty magnification of the microscope
- ☐ **D** The ability of an electron microscope to determine the presence of the large number of elements

**47.** What is the main principle behind phase contrast microscopy?

- ☐ **A** Use of phase light to enhance contrast.
- ☒ **B** Conversion of phase shifts in light passing through a transparent specimen into changes in intensity.
- ☐ **C** Reflection of phase contrast light from the surface of the specimen.
- ☐ **D** Detection of fluorescence emitted by labeled molecules.

**48.** What is the major limitation of fluorescence microscopy?

- ☐ **A** Inability to detect live fluorescence cells
- ☒ **B** Rapid photobleaching of fluorescent dyes
- ☐ **C** Poor resolution compared to light microscopy
- ☐ **D** High cost of traditional light sources

**49.** Standard deviation is the square root of

- ☐ **A** Standard error
- ☒ **B** Variance
- ☐ **C** Geometric mean
- ☐ **D** Regression

**50.** Chi square is zero when

- ☐ **A** Expected frequency is lesser than the observed frequency
- ☐ **B** Expected frequency is greater than the observed frequency
- ☒ **C** Expected frequency is equal to the observed frequency
- ☐ **D** Expected frequency is half to that of the observed frequency

**51.** The mean deviation of the values 18, 12, 15 is

- ☐ A 6
- ☐ B Zero
- ☐ C 3
- ☒ D 2

**52.** With regard to the chi-squared test, following statement is correct:

- ☒ A The greater the value of the chi-square, the greater likely it is to be significant
- ☐ B It is used as an alternative to the t-test to determine the difference between two means
- ☐ C The number of degrees of freedom is the number of independent comparisons.
- ☐ D The greater the value of the chi-square, the less likely it is to be significant

**53.** Following is not the merit of standard deviation:

- ☐ A Judging the representativeness of the mean smaller standard deviation more representative the mean
- ☐ B It is used in further algebraic treatment
- ☐ C It is possible to calculate the combined standard deviation.
- ☒ D It gives more weight to extreme values and less to the values nearer to the mean

**54.** Which of these distributions is used for a testing hypothesis?

- ☐ A Normal distribution
- ☒ B Chi-Squared distribution
- ☐ C Poisson distribution
- ☐ D Binomial distribution

**55.** In a Binomial distribution, if 'n' is the number of trials and 'p' is the probability of success, then the mean value is given by:

- ☐ A  $(np)/2$
- ☐ B  $p(n-1)$
- ☐ C  $np(1-p)$
- ☒ D  $np$

**56.** Which of the following test is Non-parametric Tests

- ☐ A Mann-Whitney U Test
- ☐ B Wilcoxon Signed-Rank Test
- ☐ C Kruskal-Wallis Test
- ☒ D All of the mentioned

**57.** If a surgeon transplant a kidney in 400 cases and succeeds in 160 cases, calculate the probability of survival after operation. What would be the probability of not surviving ?

- ☒ A 0.6
- ☐ B 0.67
- ☐ C 0.5
- ☐ D 0.4

**58.** Poisson distribution is applied for:

- ☐ A Continuous Random Variable
- ☒ B Discrete Random Variable
- ☐ C Irregular Random Variable
- ☐ D Uncertain Random Variable

**59.** Which of the following is the primary purpose of an F-test?

- ☐ A To compare the means of two groups
- ☐ B To test for independence between two variables
- ☐ C To evaluate significance of a correlation coefficient
- ☒ D To compare the variances of two or more groups

**60.** Two unbiased coins are tossed. What is the probability of getting at most one head?

- ☐ A 1
- ☒ B 0.75
- ☐ C 0.5
- ☐ D 0.25

**61.** The blood groups of 200 people is distributed as follows: 50 have type A blood, 65 have B blood type and 70 have O blood type. If a person from this group is selected at random, what is the probability that this person has AB blood type?

**A** 0.025

**B** 0.05

**C** 0.065

✓ **D** 0.075

**62.** Which one of the following is not the property of normal distribution?

**A** The normal curve is symmetrical about the mean.

**B** The height of the curve declines as we go in either direction from the mean.

✓ **C** Mean and SD are not the parameters of normal distribution.

**D** The value of mean, median and mode will coincide

**63.** Why Polyacrylamide gel electrophoresis is considered as superior than agarose gel electrophoresis for DNA separation?

**A** Compatibility with non-denaturing conditions

**B** Lower cost of reagents

✓ **C** Ability to separate smaller DNA fragments with higher resolution

**D** Faster migration of DNA molecules

**64.** Why Real-Time PCR is advantageous over conventional PCR?

**A** Detects quality, quantity and gender of DNA

**B** Requires gel electrophoresis for result interpretation

**C** Does not require a thermocycler

✓ **D** Detects DNA amplification in real time

**65.** Which of the following is essential for chain termination in the Sanger sequencing method?

✓ **A** ddNTPs

**B** DNA polymerase II

**C** dNTPs

**D** RNA primers

**66.** In the Southern blot technique, which type of probe is used to detect specific DNA sequences?

- ☐ A Stained DNA probe
- ☒ B Radio labelled DNA probe
- ☐ C EtBr labelled RNA probe
- ☐ D Fluorescently labeled Protein probe

**67.** Stochastic effects in PCR are due to

- ☐ A High concentration of DNA template
- ☐ B Using optimal PCR conditions
- ☒ C Low copy number of DNA template
- ☐ D Shorter amplicon length.

**68.** Methylation on CpG island leads to-

- ☒ A Gene silencing
- ☐ B RNA splicing
- ☐ C Decreased DNA replication
- ☐ D Increased transcription rate

**69.** The function of Multiplex PCR is to

- ☒ A Amplify more than one region of a DNA template in a single reaction.
- ☐ B Amplify single region of a DNA template in a multiple reaction.
- ☐ C Amplify more than one region of a DNA template in a multiple reaction.
- ☐ D Amplify more than one region of a RNA template in a multiple reaction.

**70.** The Klenow fragment of DNA polymerase I lacks which activity?

- ☐ A 5' to 3' polymerase activity
- ☐ B 3' to 5' exonuclease activity
- ☒ C 5' to 3' exonuclease activity
- ☐ D 3' to 5' polymerase activity

**71.** What is the function of the sliding clamp in DNA replication?

- ☐ A To unwind the DNA helix.
- ☒ B To hold DNA polymerase in place.
- ☐ C To synthesize RNA primers.
- ☐ D To provide site for replication

**72.** Which statement is best explaining the relationship between DNA denaturation and renaturation?

- ☒ A Renaturation is dependent on complementary base pairing and is influenced by factors such as salt concentration and temperature.
- ☐ B Denaturation is an irreversible process, while renaturation is highly efficient under all conditions.
- ☐ C Denaturation involves the breaking of phosphodiester bonds, while renaturation involves the reformation of covalent bonds between bases.
- ☐ D Denaturation is primarily driven by changes in pH, while renaturation is driven by changes in salt concentration.

**73.** Chelex 100 which is used for isolation of DNA is composed of

- ☐ A styrene divinyl hexane copolymers
- ☒ B styrene divinyl benzene copolymers
- ☐ C styrene diphenyl hexane copolymers
- ☐ D styrene diphenyl benzene copolymers

**74.** The function of chloroform in a phenol-chloroform extraction is to-

- ☒ A increase the density of the organic phase and aid in phase separation
- ☐ B Decrease the density of the organic phase and aid in phase separation
- ☐ C precipitate single stranded DNA
- ☐ D denature DNA

**75.** Which histone protein is not a part of the core nucleosome?

- ☒ A H1
- ☐ B H3
- ☐ C H2A
- ☐ D H4

**76.** What is the principle of isoelectric focusing ?

- ☐ A Separation of RNA molecules based on base pairing
- ☐ B Separation of DNA fragments based on size
- ☒ C Separation of proteins based on charge at a specific Ph
- ☐ D Separation of proteins based on molecular weight

**77.** What is the purpose of adding formamide in capillary electrophoresis?

- ☐ A To increase fluorescence intensity
- ☐ B To denature DNA and prevent degradation
- ☐ C To decrease DNA degradation and secondary structure formation
- ☒ D To denature DNA and prevent secondary structure formation

**78.** Which of the following is a common detection method in Western blotting?

- ☒ A Immunodetection using antibodies
- ☐ B Autoradiography
- ☐ C Ethidium bromide staining
- ☐ D Silver staining

**79.** Commonly used chaotropic agent in DNA extraction is

- ☐ A 70% Ethanol
- ☐ B Phenol
- ☒ C Guanidine thiocyanate
- ☐ D Isopropanol

**80.** Which of the following is true for the major groove of DNA?

- ☐ A It is primarily involved in the binding of histone proteins for DNA packaging.
- ☐ B It is narrower than the minor groove and offers limited sequence-specific information.
- ☒ C It allows for direct access to the hydrogen bonding patterns of the base pairs.
- ☐ D It is formed by the close proximity of the sugar-phosphate backbones.

**81.** Which of the following sentence explain the function of type II topoisomerases?

- ☐ A They are responsible for the formation of supercoiled DNA.
- ☒ B They introduce double-strand breaks and pass one DNA segment through another.
- ☐ C They primarily function in the unwinding of DNA during replication.
- ☐ D They introduce single-strand breaks to relieve torsional stress



**82.** Mitochondrial DNA is useful in forensic analysis because it is

- ☐ A Found only in the nucleus
- ☐ B Inherited from both parents
- ☐ C Highly variable in individuals
- ☒ D Present in multiple copies per cell

**83.** Why using internal lane standards in capillary electrophoresis?

- ☒ A To provide a size standard for precise sizing of DNA fragments and correct for run-to-run variations in electrophoresis.
- ☐ B To amplify the DNA sample
- ☐ C To label DNA fragments with fluorescent dyes for precise sizing of DNA fragments and correct for run-to-run variations in electrophoresis.
- ☐ D To remove PCR inhibitors from the DNA sample

**84.** How does the "likelihood ratio" (LR) approach compare to the "random match probability" (RMP) in evaluating DNA evidence?

- ☐ A LR and RMP are statistically identical.
- ☐ B LR is only used in paternity testing, while RMP is used in forensic casework.
- ☐ C LR is a subjective measure, while RMP is an objective measure.
- ☒ D LR considers both the prosecution and defence hypotheses, incorporating information beyond just the rarity of the DNA profile, whereas RMP only considers the rarity of the profile.

**85.** What is the main difference between cDNA and genomic DNA?

- ☐ A cDNA is single-stranded, while genomic DNA is double-stranded.
- ☐ B cDNA contains introns, while genomic DNA does not.
- ☒ C cDNA is made from RNA, while genomic DNA is the DNA found in the nucleus.
- ☐ D cDNA is only found in prokaryotes, while genomic DNA is only found in eukaryotes.

**86.** Which of the following is not a feature of mtDNA ?

- ☐ A It is circular.
- ☐ B It is inherited maternally.
- ☒ C It contains introns.
- ☐ D It has a high mutation rate.

**87.** Which of the following is a characteristic of heterochromatin?

- ☐ A Loosely packed DNA
- ☒ B Tightly packed DNA
- ☐ C High level of gene expression
- ☐ D Rich in actively transcribed genes

**88.** What is the function of reverse transcriptase?

- ☒ A To synthesize DNA from an RNA template
- ☐ B To synthesize RNA from a DNA template
- ☐ C To degrade RNA
- ☐ D To repair damaged DNA

**89.** The brown colour of faeces primarily results from the presence of

- ☒ A Stercobilin
- ☐ B Biliverdin
- ☐ C Ferrous oxide
- ☐ D Hematin

**90.** The Phadebas test is commonly used for detecting which body fluid?

- ☐ A Vomit
- ☒ B Saliva
- ☐ C Urine
- ☐ D Vaginal secretions

**91.** The Edelman Test is used for the forensic identification of which bodily fluid?

- ☐ A Saliva
- ☐ B Vomit
- ☒ C Urine
- ☐ D Feces

**92.** A polycistronic mRNA contains intercistronic regions which consist

- ☐ A GUG, AUC
- ☐ B UAA, UGA
- ☒ C UAA, AUG
- ☐ D AAA, CAC

**93.** Which part of the spermatozoa is responsible for energy production, enabling motility?

- ☐ A Acrosome
- ☒ B Middle piece
- ☐ C Nucleus
- ☐ D Centrioles

**94.** The exit site of 70s ribosome exits

- ☒ A Deacylated tRNA
- ☐ B Peptidyl tRNA
- ☐ C Deacylated rRNA
- ☐ D Aminoacyl-tRNA

**95.** Primer annealing in PCR takes place at temperature

- ☐ A 93-95 degree
- ☐ B 70-75 degree
- ☒ C 50-70 degree
- ☐ D 90-95 degree

**96.** Sebaceous gland are

- ☐ A .Apocrine
- ☒ B Holocrine
- ☐ C Mesocrine
- ☐ D Eccrine

**97.** What would be happen if vasa deferentia of man are cut

- ☐ A Sperm without nucleus
- ☐ B Oligospermia
- ☐ C Aspermia
- ☒ D Azoospermia

**98.** Write key difference between DNA replication in prokaryotes and eukaryotes?

- ☒ A Eukaryotes use multiple origins of replication, while prokaryotes have a single origin
- ☐ B Prokaryotic DNA replication has multiple origins of replication
- ☐ C Eukaryotic DNA replication occurs only in the cytoplasm
- ☐ D Eukaryotic DNA polymerases synthesize DNA only in the 3' to 5' direction

**99.** Which of the following statement about transcription is false?

- ✓ **A** RNA polymerase requires a primer to initiate transcription
- B** Transcription occurs in the nucleus of eukaryotic cells
- C** Transcription is regulated by promoter sequences
- D** The template strand of DNA is read in the 3' to 5' direction

**100.** Which of the following is true regarding the role of ribosomes in translation?

- A** The ribosome moves along mRNA in the 3' to 5' direction
- ✓ **B** The small ribosomal subunit binds to mRNA first in both prokaryotes and eukaryotes
- C** The ribosome catalyzes peptide bond formation via RNA polymerase
- D** The ribosome directly synthesizes proteins without the help of tRNA