

**DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO**

**TEST BOOKLET**  
**SCIENTIFIC OFFICER (DNA)-2016**

Time Allowed : 2 Hours]

[Maximum Marks : 100

*All questions carry equal marks.*

**INSTRUCTIONS**

1. Immediately after the commencement of the examination, you should check that test booklet does not have any unprinted or torn or missing pages or items, etc. If so, get it replaced by a complete test booklet.
2. Write your Roll Number only in the box provided alongside.   
Do not write anything else on the Test Booklet.
3. This Test Booklet contains 100 items (questions). Each item comprises four responses (answers). Choose only one response for each item which you consider the best.
4. After the candidate has read each item in the Test Booklet and decided which of the given responses is correct or the best, he has to mark the circle containing the letter of the selected response by blackening it completely with Black or Blue ball pen. In the following example, response "C" is so marked :

(A)    (B)    ●    (D)

5. Do the encoding carefully as given in the illustrations. While encoding your particulars or marking the answers on answer sheet, you should blacken the circle corresponding to the choice in full and no part of the circle should be left unfilled.
6. You have to mark all your responses ONLY on the ANSWER SHEET separately given according to 'INSTRUCTIONS FOR CANDIDATES' already supplied to you. *Responses marked on the Test Booklet or in any paper other than the answer sheet shall not be examined.*
7. All items carry equal marks. Attempt all items. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet. There will be no negative marking.
8. Before you proceed to mark responses in the Answer Sheet fill in the particulars in the front portion of the Answer Sheet as per the instructions sent to you.
9. After you have completed the test, hand over the Answer Sheet only, to the Invigilator.

**DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO**

P.T.O.

**SCIENTIFIC OFFICER (DNA)-2016**

Time Allowed : 2 Hours]

[Maximum Marks : 100

1. Who advocated first the application of science to criminal investigation ?  
(A) Alphonse Bertillon (B) Hans Gross  
(C) Paul Kirk (D) August Vollmer
2. In India the first state forensic science laboratory was established at :  
(A) Calcutta, 1952 (B) Calcutta, 1955  
(C) Delhi, 1952 (D) Delhi, 1955
3. Who propounded the 'principle of exchange' ?  
(A) Francis Galton (B) Edmond Locard  
(C) Hans Gross (D) Alphonse Bertillon
4. The most reliable form of evidence is :  
(A) Blood (B) Weapon  
(C) Clothes (D) Eye witness

5. The final breakthrough for the fingerprint method of personal identification was made by :
- (A) Edward Henry (B) Sir Francis Galton  
(C) Joseph Faurot (D) William Herschel
6. Quadrant/zone method of crime scene investigation is suitable for :
- (A) Indoor crime scene (B) Outdoor crime scene  
(C) Automobile crime scene (D) None of these
7. The acid phosphatase screening test is used to detect which physiological fluid ?
- (A) Sweat (B) Semen  
(C) Blood (D) Saliva
8. How much stock solution is required to make 100 ml of 25 mM solution of NaCl from a 1M stock :
- (A) 2.5 ml (B) 0.25 ml  
(C) 25 ml (D) 50 ml

9. Buffer systems are effective when the pH values are within ..... pH unit(s) of the  $pK_a$  value.
- (A) 1.0 (B) 1.5  
(C) 3.0 (D) 4.0
10. Which of the following individuals is known as the "Father of Forensic Toxicology" ?
- (A) R.A. Riess (B) Edmond Locard  
(C) Calvin Goddard (D) Mathieu Orfila
11. A scalp hair specimen with significant root sheath material would indicate that the hair originated from which phase of growth ?
- (A) Anagen (B) Collagen  
(C) Catagen (D) Telogen
12. Which of the following is the preferred way to identify a deceased person ?
- (A) Visual inspection  
(B) Tattoos  
(C) Surgical scars  
(D) Examination of teeth, surgical records

13. Which of the following best defines rigor mortis ?
- (A) This is the body cooling after death
  - (B) Livor mortis
  - (C) Postmortem rigidity
  - (D) Postmortem medical examination
14. Which of the following physiological fluids would be expected to have a high concentration of the enzyme amylase ?
- (A) Urine
  - (B) Sweat
  - (C) Semen
  - (D) Saliva
15. Blood or buccal swabs for DNA analysis are to be taken from any consensual partner having sex with the victim within ..... hours following intercourse.
- (A) 24 hours
  - (B) 36 hours
  - (C) 48 hours
  - (D) 72 hours

16. Luminol reagent reacts with blood in the presence of peroxide to emit light by a chemical process is known as :
- (A) Fluorescence (B) Chemiluminescence  
(C) Coagulation (D) Illumination
17. The condition characterised by the absence of sperm cells in the seminal fluid is known as :
- (A) Hypospermia (B) Hyperspermia  
(C) Oligospermia (D) Azoospermia
18. The determination of whether or not a substance is blood is best made by means of a preliminary color test such as the Kastle-Meyer color test, which uses the chemical :
- (A) p30 (B) Benzidine  
(C) Precipitin (D) Phenolphthalein
19. Corpora-basal index is used to determine :
- (A) Age (B) Sex  
(C) Race (D) Stature

20. Properties of evidence that can be attributed to a common source with an extremely high degree of certainty is/are :
- (A) Individual characteristics                      (B) Referent characteristics  
(C) Comparison characteristics                      (D) Class characteristics
21. How much seminal fluid does the normal male release during an ejaculation ?
- (A) 2.5 ounces    (B) 6 pints  
(C) 1 milliliter    (D) 2.5 to 6 milliliters
22. For most fingerprint examiners, the chemical method of choice for visualizing latent prints is :
- (A) Silver nitrate    (B) Iodine  
(C) Chlorate    (D) Ninhydrin
23. The State Forensic Science Laboratory Shimla was established in :
- (A) 1986    (B) 1987  
(C) 1988    (D) 1989

24. Cheiloscopy is the study of :
- (A) Lips (B) Eyes  
(C) Ears (D) Nose
25. In the ABO system, blood group 'O' is characterised by the :
- (A) Presence of antigen A and the absence of antigen B  
(B) Presence of both antigen A and antigen B  
(C) Presence of antigen O  
(D) Absence of both antigen A and antigen B
26. The ideal place to record the temperature of dead body is :
- (A) Rectum (B) Axilla  
(C) Mouth (D) Groin
27. Diatoms in bone barrow are seen in death due to :
- (A) Strangulation (B) Drowning  
(C) Electrocutation (D) Asphyxia



28. Specimens for toxicological evaluation should be preserved in :
- (A) 10% Formaldehyde
  - (B) Alcohol
  - (C) Normal Saline
  - (D) Saturated solution of common salt
29. All of the following are items to be collected from a deceased's body and sent to the forensic laboratory, *except* :
- (A) Head and pubic hairs
  - (B) Ocular fluid
  - (C) Blood
  - (D) Fingernail scrapings
30. Based on a mathematical calculation by Victor Balthazard, the probability of two individuals having the same fingerprints is one out of :
- (A)  $1 \times 10$  to the 30th power
  - (B)  $1 \times 10$  to the 60th power
  - (C)  $1 \times 10$  to the 100th power
  - (D)  $1 \times 10$  to the 90th power

31. The separation of polypeptides in SDS-PAGE is based on.:
- (A) Electrical charge                      (B) pH
- (C) Molecular shape                      (D) Molecular size
32. In Electrophoresis if the buffer pH is above the isoelectric point of the protein, the protein will :
- (A) Migrate towards the anode
- (B) Migrate towards the cathode
- (C) Not migrate at all
- (D) Migrate partly to anode and partly to cathode
33. Which of the following is *not* a suggested precaution when taking samples of DNA evidence at a crime scene ?
- (A) Wear gloves and change them often
- (B) Avoid touching any area where DNA evidence may exist
- (C) Air-dry evidence before packaging evidence
- (D) Use plastic bags

34. The DNA evidence database is called :
- (A) CODNA (B) CODIS  
(C) CODIA (D) CCDNA
35. Portions of the DNA molecule useful for DNA typing :
- (A) code for the production of proteins  
(B) are useful for recombinant DNA  
(C) are repeated many times  
(D) are useful for the production of insulin
36. SNPs are polymorphisms that are similar in composition to those found at :
- (A) Minisatellite loci (B) Microsatellite loci  
(C) VNTR loci (D) mtDNA HV1 and HV2 regions
37. A particular SNP locus can be A, C or T. How many genotypes can be expected to be found in the population ?
- (A) 12 (B) 3  
(C) 9 (D) 6

38. A PCR reaction that continues for 30 cycles will produce approximately how many PCR products from a single template DNA molecule ?
- (A) 64 (B) 1,28,000  
(C) Approximately 1 million (D) Approximately 1 billion
39. What is the natural function of restriction enzymes ?
- (A) Protecting bacteria by cleaving the DNA of infecting viruses  
(B) Protecting bacteria by cleaving their own DNA  
(C) Protecting bacteria by methylating their own DNA  
(D) Protecting bacteria by methylating the DNA of infecting viruses
40. One excellent source of DNA profiling for missing persons is :
- (A) Lipstick (B) Glosses  
(C) Balms (D) Lip cosmetics
41. The polymerase for a PCR reaction comes from what organism ?
- (A) Staphylococcus aurelia (B) Thermus aquaticus  
(C) Drosophila melanogaster (D) Homo sapiens

42. The technique that utilizes probes to detect specific DNA sequences is known as what ?
- (A) Southern blot (B) Northern blot  
(C) Western blot (D) Northwestern blot
43. pH at which amino acids does *not* migrate in an electric field in :
- (A) Isoelectric point (B) Neutral point  
(C) Field point (D) Electrical neutrality
44. DNA molecule is visualized in agarose gels with :
- (A) Ethidium Bromide (B) Commassie Blue  
(C) Giemsa (D) Amido black
45. How many different bands would you expect an individual to have in a VNTR test ?
- (A) Two (B) Between 20 and 40  
(C) Up to 100 (D) Thousands

46. What outcome would you least expect if the amount of template in a multiplex PCR fell significantly below the optimal amount ?
- (A) Longer targets amplify poorly or fail to amplify
  - (B) Allelic drop out
  - (C) Increased yield
  - (D) Heterozygote imbalance
47. A genetic locus that is analyzed in many forensic and paternity testing laboratories is the human leukocyte antigen locus known as HLA-DQ alpha. There are four major alleles at this locus known as 1, 2, 3 and 4. How many different genotypes are possible for these four alleles ?
- (A) 8
  - (B) 10
  - (C) 12
  - (D) 16
48. Which of the following statements about forensic analysis of DNA is *correct* ?
- (A) A DNA profile using short tandem repeats is unique to an individual
  - (B) Forensic analysis makes use of SNPs in coding sequences to distinguish between individuals
  - (C) PCR is used for DNA profiling (DNA fingerprinting)
  - (D) DNA fingerprinting cannot be used for paternity testing

49. Current forensic DNA typing procedures analyze STR loci that are found in non-coding regions of the human genome that are known as :
- (A) HV1 regions (B) HV2 regions  
(C) HLA-DQA1 (D) "Junk" DNA
50. The forensic DNA typing procedure that uses restriction endonucleases, electrophoresis and Southern blotting to analyze DNA is known by the acronym :
- (A) PCR (B) RFLP  
(C) VNTR (D) STR
51. A molecule that can be incorporated into DNA and used as a non-radioactive label :
- (A) Biotin (B) Avidin  
(C) DAB (D) HRP
52. Oligonucleotide gene probes are defined as what ?
- (A) The pieces of DNA produced by restriction endonucleases  
(B) An enzyme important in splicing genes into plasmids and chromosomes  
(C) A short stretch of DNA of a known sequence that will base-pair with a complementary sequence  
(D) A piece of DNA to which new nucleotides are added during DNA sequencing

53. What is the alternative molecule if nuclear DNA is absent :
- (A) mRNA (B) mtDNA  
(C) tRNA (D) cDNA
54. DNA fingerprinting was developed by :
- (A) Karry Mullis (B) Arther Kornberg  
(C) Daniel Nathans (D) Alec Jeffrey
55. Just considering one locus, evidence at a crime scene shows a genotype of 5, 9 at the FGA locus. The allele frequencies for 5 and 9 are 0.120 and 0.320 respectively. How frequent would the genotype 5, 9 be expected to be in the population ?
- (A) 0.0768 (B) 0.1024  
(C) 0.0144 (D) 0.0384
56. In the SGM plus system, regarding the Amelogenin locus, which are *true* ?
- (A) The allele on the Y chromosome is shorter than that on the X chromosome.  
(B) Two peaks in the analysis indicate that the sample probably originated from a male.  
(C) Two peaks in the analysis indicate the sample probably originated from a female.  
(D) The locus examined is an STR.



57. The forensic science community has standardized ..... STRs for entry into a national database known as the Combined DNA Index System.
- (A) 64 (B) 26  
(C) 13 (D) 128
58. Short tandem repeats normally consist of repeating sequences of approximately how many bases ?
- (A) 10-13 (B) 3-7  
(C) 14-17 (D) 1-3
59. The Y-STR's utility in the forensic sciences is that :
- (A) The frequency of occurrence in the general population is very small.  
(B) It is shorter by six bases on the Y chromosome than the X chromosome.  
(C) Replication of the DNA takes less than one hour.  
(D) It originates only from a male donor of DNA.
60. A molecular marker which is amplified by PCR and is polymorphic by length is a(n) :
- (A) Restriction fragment length polymorphism (RFLP)  
(B) Variable number of tandem repeats site (VNTR)  
(C) Amplified fragment length polymorphism (AFLP)  
(D) Single nucleotide polymorphism (SNP)

61. Which of the following restriction enzymes would create "blunt ends" following digestion of genomic DNA ?
- (A) RsaI (B) HindIII  
(C) KpnI (D) TaqI
62. What is the purpose of the 94 degree Celcius cycle of a PCR reaction ?
- (A) Allows the Taq polymerase to polymerize the new strand  
(B) Allows effective ligation of the DNA fragments  
(C) Separates the DNA into single-stranded molecules  
(D) Allows the primers to base-pair with their target sequence
63. A restriction enzyme with a recognition site of CAANNNTTG (where N is any base) cuts an average every :
- (A) 256 bp (B) 400 bp  
(C) 4.1 kb (D) 65 kb
64. Pulse field gel electrophoresis is a technique used for separation of DNA fragments with size :
- (A) Upto 10 Mb (B) Upto 20 kb  
(C) Upto 200 kb (D) Upto 500 kb

65. Rocket immunoelectrophoresis allows :

- (A) Detection of antigens
- (B) Quantification of antigens
- (C) Cross reactivity of antigen-antibody
- (D) Detection of antibody

66. The Hardy-Weinberg law states that an equilibrium of allele frequencies in a gene pool will remain in effect in each succeeding generation of a sexually reproducing population as long as ..... conditions are met.

- (A) 1
- (B) 3
- (C) 5
- (D) 7

67. Which of the following is the ultimate source of genetic variation in a population ?

- (A) Gene flow
- (B) Assortive mating
- (C) Mutation
- (D) Selection

68. What is the frequency of the dominant allele in a population of 100 individuals with the following genotypes : 30 BB, 60 Bb, 10 bb ?
- (A) 0.2 (B) 0.4  
(C) 0.6 (D) 0.8
69. Which of these genetic markers is most likely to be highly polymorphic ?
- (A) RFLP (B) Microsatellite  
(C) SNP (D) All of these
70. A polymorphism is :
- (A) Any change in the DNA sequence  
(B) The most common variation of a gene or marker sequence  
(C) The least common variation of a gene or marker sequence  
(D) A variation of gene or marker sequence present in >1% of the population
71. Stutter ratio is usually less than :
- (A) 0.15 (B) 15  
(C) 100 (D) 1000

72. The population match frequency of SGM plus is :

(A)  $10^{-7}$  (B)  $10^{-4}$

(C)  $10^{-13}$  (D)  $10^{-15}$

73. The dye used for STR analysis for Amel is :

(A) JOE (B) 5-FAM

(C) NED (D) CY5

74. The rate of migration of DNA within an agarose gel in the gel electrophoresis technique is primarily based on what factor ?

(A) The size of the DNA fragments

(B) The number of the DNA fragments

(C) The size of the wells of the gel

(D) The negative charge of the DNA

75. The tracking dye used in PAGE electrophoresis for separation of proteins is :

(A) Acridine orange (B) Bromophenol Blue

(C) Indigo (D) Rose Bengal

76. Optimum temperature of DNA polymerase of Taq polymerase is :

(A) 25°C

(B) 37°C

(C) 54°C

(D) 72°C

77. Using the Hardy-Weinberg Principle, which expression represents the frequency of the homozygous recessive genotype ?

(A)  $p^2$

(B)  $2pq$

(C)  $q^2$

(D)  $Q$

78. The random loss of alleles in a population is called :

(A) Mutation

(B) Selection

(C) Genetic drift

(D) Gene flow

79. In meiosis, recombination occurs in :

(A) Metaphase I

(B) Prophase I

(C) Metaphase II

(D) Prophase II

80. Repeat core sequences consisting of 2, 3 or 4 base pairs are **known as** what ?
- (A) Single nucleotide polymorphisms (SNPs)
- (B) Microsatellites
- (C) Minsatellites
- (D) Satellites
81. Who edited the *Vansavali* of Rajas of Kullu around 1869-71 ?
- (A) Alexander Cunningham                      (B) William Moorcroft
- (C) Captain Harcourt                              (D) Vigne
82. According to an inscription at LUJ in Pangi which Raja of Chamba controlled the Lahul valley in 1105 AD ?
- (A) Mushan Varman                              (B) Lalita Varman
- (C) Soma Varman                                  (D) Jasta Varman

83. Which eulogy speaks about the love of a noble lady who wanted to follow her husband to the funeral pyre but was kept back by her two sons ?
- (A) Baijnath (B) Devi Kothi  
(C) Mulkihar (D) None of these
84. In which village in Mandi District is Mahu Nag temple ?
- (A) Bakhari (B) Saraaur  
(C) Mamel (D) Nabahi Devi
85. Which mountain pass joins Chamba and Jammu ?
- (A) Kugti (B) Jalsu  
(C) Padri (D) Sach
86. Which river's tributary is Asni stream ?
- (A) Bata (B) Giri  
(C) Andhra (D) Markanda



87. In which District of H.P. is Shilli sanctuary ?

(A) Solan

(B) Shimla

(C) Bilaspur

(D) Hamirpur

88. In which river basin is Killar hydro-power project ?

(A) Ravi

(B) Chenab

(C) Satluj

(D) Beas

89. Who organised the *Dhami Riyasti Praja Mandal* ?

(A) Padam Dev

(B) Uma Dutt

(C) Sita Ram

(D) Bhaskra Nand

90. According to 2015-16 *Economic Survey* what has been the growth rate in the Secondary Sector in H.P. during 2014-15 ?

(A) 5.9

(B) 6.1

(C) 7.2

(D) 7.5

91. When was *Swacch Bharat Abhiyan* launched ?
- (A) October, 2014 (B) November, 2014  
(C) April, 2015 (D) None of these
92. Where is Central Institute of Indian Languages (CIIL) situated ?
- (A) Bengaluru (B) Mysuru  
(C) Hyderabad (D) Mangalore
93. Why was Shani Shingnapur temple of Maharashtra in news recently ?
- (A) Fire works display which killed many people  
(B) Communal clashes between different religious groups  
(C) Issue of ban on the entry of women  
(D) Stampede in which many people were killed
94. Who is called *Adi Kavi* ?
- (A) Surdas (B) Tulsidas  
(C) Valmeeki (D) Bhushan
95. How many seats did the BJP win in Kerala during the 2016 Vidhan Sabha elections ?
- (A) None (B) One  
(C) Three (D) Four

96. Which country's Prime Minister was the first to resign after his name appeared in Panama Papers ?
- (A) Iceland (B) Ireland  
(C) Vietnam (D) Italy
97. In which country is UFA which was the venue of July 2015 Shanghai Cooperation Organisation Summit ?
- (A) China (B) Russia  
(C) Brazil (D) South Africa
98. Which Day is observed as Antarctica Day ?
- (A) June 21 (B) August 16  
(C) October 8 (D) December 19
99. Among the following which country has the highest life expectancy ?
- (A) Iceland (B) Andorra  
(C) San Marino (D) Japan
100. Which among the following countries pays for all of its citizens' medical care and education including college education ?
- (A) Brunie (B) Burkina Faso  
(C) Mali (D) Macao