

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

CPG-EE-2017 (Forensic Science)-(SET-B)

A

Used for jury box chart

28/6/17

23/6/17

Sr. No. 10161

Time : 1½ Hours

Total Questions : 166

Max. Marks : 100

Roll No. (in figures) _____ (in words) _____

Candidate's Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Exam : _____

(Signature of the Candidate)

(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

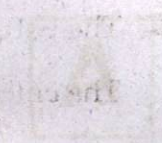
1. All questions of **Section-"A"** are **compulsory**. Students are required to attempt either **Section "B"** or **Section "C"**. Students of *Medical Group* are required to attempt **Section "B"**. Students of *Non-Medical Group* are required to attempt **Section "C"**. All questions carry equal marks i.e. one mark each.
2. The candidates **must return** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself.
4. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing **within two hours** after the test is over. No such complaint(s) will be entertained thereafter.
5. **Use only blue or black ball point pen of good quality in the OMR Answer-Sheet.**
6. There will be **negative** marking. Each correct answer will be awarded **one** full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
7. **Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after the start of examination.**

CPG-EE-2017(Forensic Science)-(SET-B)/(A)

SEAL

10101

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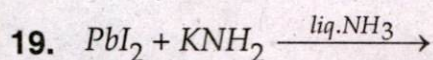


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SECTION - A

- The difference between ΔH and ΔU at constant volume is equal to :
(1) R (2) $p\Delta V$ (3) $V\Delta p$ (4) $3/2R$
- The enthalpies of formation of gaseous N_2O and NO at 298K are 82 and 90 kJ mol^{-1} .
The enthalpy of the reaction $N_2O(g) + \frac{1}{2}O_2 \rightarrow 2NO(g)$ is :
(1) -8 kJ (2) 98 kJ (3) -74 kJ (4) 8 kJ
- The overall energy change during Carnot cycle is :
(1) equal to w (2) zero (3) maximum (4) equal to q
- A process in which the system, after undergoing various processes, returns to its initial state is called a/an :
(1) reversible process (2) irreversible process
(3) cyclic process (4) Hess law
- The diameter of molecule B is half that of molecule A , the ratio of mean free path (λ_A/λ_B) will be :
(1) $1/2$ (2) $1/4$ (3) 4 (4) 2
- The SI units of the Vander Waals b term are :
(1) $\text{m}^3 \text{mol}$ (2) m^2/mol (3) m^3/mol (4) $\text{m}^2 \text{mol}$
- The law which relates the solubility of a gas to its pressure is called :
(1) Raoult's law (2) The distribution law
(3) Henry's law (4) Ostwald's law
- By adding a non-volatile solute to a solvent, the boiling point of the solvent :
(1) will increase (2) will decrease
(3) will not change (4) may increase or decrease
- If $2.303RT/F = 0.059$ and the activities of the solids are constant, then e.m.f. of the cell $Zn|Zn^{2+}(a_1)||Cu^{2+}(a_2)|Cu$ is :
(1) $E = E^\circ - 0.059 \log(a_2/a_1)$ (2) $E = E^\circ + 0.059 \log(a_2/a_1)$
(3) $E = E^\circ - \frac{0.059}{2} \log(a_2/a_1)$ (4) $E = E^\circ + \frac{0.059}{2} \log(a_2/a_1)$

10. The hybridization of Xe in XeO_2F_2 is :
(1) sp^3d (2) sp^3d^2 (3) sp^3d^3 (4) dsp^3
11. O_2^{2-} is isoelectronic with :
(1) H_2 (2) N_2 (3) F_2 (4) S
12. Which one of the following species is paramagnetic ?
(1) O_2^- (2) CN^- (3) CO (4) F_2
13. In NaCl type structure, the coordination numbers of cation and anion are :
(1) 6 and 4 (2) 6 and 6 (3) 4 and 4 (4) 8 and 4
14. Which one of the following complex can exhibit coordination isomers ?
(1) $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$ (2) $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$
(3) $[\text{Co}(\text{en})_2\text{Cl}_2]^+$ (4) $[\text{Cr}(\text{en})_2\text{Cl}_2]^+$
15. $\text{Cr}(\text{CO})_x$ has EAN of Cr = 36, hence x = :
(1) 2 (2) 4 (3) 6 (4) 5
16. IUPAC name of $[\text{Cr}(\text{CO})_5\{\text{P}(\text{C}_6\text{H}_5)_3\}]$ is :
(1) Triphenylphosphine pentacarbonyl chromium (0)
(2) Pentacarbonyl triphenylphosphine chromium (0)
(3) Pentacarbonyl triphenylphosphine chromate (III)
(4) Triphenylphosphine pentacarbonyl chromate (III)
17. Which one of the following ions is colourless ?
(1) U^{3+} (2) Cm^{4+} (3) Th^{4+} (4) Pu^{4+}
18. Solubility of iodine in liquid SO_2 is increased on addition of KI. This is attributed to the formation of :
(1) KI_3 (2) $\text{I}_2 \cdot \text{SO}_2$ (3) $\text{KI} \cdot 4\text{SO}_2$ (4) SOI_2



Products of the Reaction are :

- (1) $PbNH_2 \downarrow + I_2 + KI$ (2) $PbNH \downarrow + HI + KI$
(3) $PbNH_2 \downarrow + KI_3$ (4) None of the above

20. Which gives red colour with Fehling solution ?

- (1) Glucose (2) Cellulose
(3) Benzaldehyde (4) Cane sugar

21. A substance which can act both as an antiseptic and disinfectant is :

- (1) Aspirin (2) Phenol
(3) Analgin (4) Sodium pentothal

22. Out of the following which does *not* exhibit IR spectra ?

- (1) O_2 (2) CO_2 (3) SO_2 (4) HBr

23. Hyperconjugation involves overlap of the following orbitals :

- (1) $\sigma - \sigma$ (2) $\sigma - p$ (3) $p - p$ (4) $\pi - \pi$

24. The correct order of reactivity towards electrophilic substitution of the compound amongst the following aniline (I), benzene (II) and nitrobenzene (III) is :

- (1) $II > III > I$ (2) $I < II > III$
(3) $I > II > III$ (4) $III > II > I$

25. Vitamin B_{12} contains :

- (1) cobalt (2) magnesium (3) iron (4) nickel

26. Compound A undergoes formation of cynohydrin which on hydrolysis gives lactic acid. Therefore, compound A is :

- (1) formaldehyde (2) acetaldehyde
(3) acetone (4) benzaldehyde

27. Which of the following polymer is thermosetting polymer ?
- (1) Nylon-6 (2) Nylon-6,6
(3) Bakelite (4) None of these
28. Which of the following is useful in treatment of cyanide poisoning ?
- (1) Amyl nitrite (2) Sodium nitrite
(3) Nitrite thiosulphate (4) All of the above
29. Enthalpies of combustion of methane, graphite and hydrogen are 890.2 kJ, 393.4 kJ and 285.7 kJ respectively. Enthalpy of formation of methane is :
- (1) $-211.1 \text{ kJ mol}^{-1}$ (2) $-890.2 \text{ kJ mol}^{-1}$
(3) $-74.6 \text{ kJ mol}^{-1}$ (4) 85.7 kJ mol^{-1}
30. Containers A, B and C of equal volume contain oxygen, neon and methane respectively at the same temperature and pressure. The correct order of their masses is :
- (1) $A < B < C$ (2) $B < C < A$ (3) $C < A < B$ (4) $C < B < A$
31. The root mean square velocity of an ideal gas at constant pressure varies with density 'd' is :
- (1) d^2 (2) $b \cdot d$ (3) \sqrt{d} (4) $1/\sqrt{d}$
32. For the reaction $2\text{Cl}(g) \rightarrow \text{Cl}_2(g)$ the signs of ΔH and ΔS respectively are :
- (1) +, - (2) +, + (3) -, - (4) -, +
33. The principal buffer present in human blood is
- (1) $\text{H}_3\text{PO}_4 + \text{NaH}_2\text{PO}_4$ (2) $\text{CH}_3\text{COOH} + \text{CH}_3\text{COONa}$
(3) $\text{Na}_2\text{HPO}_4 + \text{Na}_3\text{PO}_4$ (4) $\text{H}_2\text{CO}_3 + \text{HCO}_3^-$
34. If a neutral solution has $\text{p}K_w = 13.36$ at 50°C , then pH of the solution is :
- (1) 6.68 (2) 7 (3) 7.63 (4) 13.5

SECTION - B

35. The pigments found in polysiphonia (algae) are :
- (1) Chlorophyll only (2) Phycocyanin only
(3) Phycocyanin and chlorophyll (4) Phycocyanin and phycoerythrine
36. Life cycle which contain a dominant multicellular diploid stage, are called :
- (1) Gametic type (2) Zygotic type
(3) Sporic type (4) Gametophytic type
37. Which of the following statements are *correct* ?
- (A) *Puccinia graminis* is known as stem-rust of wheat
(B) D-glutamic acid and D-lysine are found in bacterial cell wall
(C) 80s ribosomes are found in bacteria
(D) *E. Coli.* is found in cluster form
- The correct answer is :
- (1) A and B (2) B and C (3) C and D (4) B, C and D
38. Which of the following cells are involved in fight against cancer ?
- (1) B Cells (2) Natural killer cells
(3) Memory cells (4) Plasma cells
39. Which of the following cancers are associated with Human Papilloma virus ?
- (1) Lung (2) Cervical
(3) Ovarian (4) Liver
40. The true skeleton of a cell is formed by :
- (1) Actin filaments (2) Microtubules
(3) Intermediate filaments (4) Actin filaments and microtubules
41. When in a eukaryotic cell all the copies of its mitochondrial DNA are identical, it is called :
- (1) Homoplasmy (2) Heteroplasmy
(3) Apospory (4) None of the above

42. Oxydative phosphorylation enzyme system is found in which part of the mitochondria ?
- (1) Cytosol (2) Outer membrane of mitochondria
(3) Inner membrane of mitochondria (4) Mitochondrial fluid
43. The main function of peroxisome is :
- (1) Catabolism of very long chain fatty acids
(2) Glyoxylate cycle in seeds
(3) Phosphorespiration in leaves
(4) Glycolysis in Trypanosomes
44. In Bryophytes, heterothallic condition is :
- (1) When male sex organs are not formed
(2) When male and female sex organs are found in the same individual
(3) When male and female sex organs are found in separate individuals
(4) When two different forms of thallus occur
45. Which of the following statements are *not* correct ?
- (1) *Funaria hygrometrica* is a common moss on Indian hills
(2) The adult plant body of *Anthoceros* is a sporophyte
(3) *Selaginella* bears spores of two types
(4) Apogamy is a type of reproduction in some ferns in which sporophyte develops from the gametophyte without fusion of gametes
46. In which of the following animals sex is determined by hormones ?
- (1) Hippocampus (2) Alligator
(3) Bonellia (4) Cobra
47. Which of the following types of inheritance is *not* found in ciliate protozoa ?
- (1) Chloroplast inheritance (2) Mendalian inheritance
(3) Cortical inheritance (4) Cytoplasmic inheritance
48. The cytoplasmic factors responsible for male sterility in maize plants, are located in :
- (1) Nucleus (2) Mitochondria
(3) Chloroplast (4) Cytosol

49. Mitochondrial DNA is *not* associated with which of the following ?
- (1) Regulation of apoptosis (2) Generation of reactive oxygen species
(3) Energy production (4) Regulation of cellular transport
50. Which of the following is a chaperone ?
- (1) Nucleoplasmin (2) Chromatosome
(3) Histone H_1 and H_2 (4) Histone H_3 and H_4
51. Unexplained substantial variation in the haploid nuclear DNA content even between closely related species is called :
- (1) Kinetic complexity (2) Haploidy
(3) Aneuploidy (4) C-value paradox
52. Which of the following disease is *not* spread by housefly ?
- (1) Amoebic dysentery (2) Cholera
(3) Typhoid (4) Plague
53. Coelomic cavity of Balanoglossus is made up of how many parts ?
- (1) One (2) Two
(3) Four (4) Five
54. Which of the following pairs are correctly matched ?
- (A) Trochophore – Balanoglossus
(B) Bipinnaria–Asterias
(C) Holothuria – Auricularia
(D) Fasciola – Cercaria
- The *correct* answer is :
- (1) A and B only (2) B and D only
(3) C and D only (4) B, C and D only
55. The early seed fern *Ekinsia* evolved in :
- (1) Late Devonian (2) Early Devonian
(3) Carboniferous (4) Triassic

56. Coralloid roots are found in :
- (1) Lycopodium (2) Pinus
(3) Cycas (4) Dryopteris
57. Which of the following is *not* correctly matched ?
- (1) Marigold – Capitulum (2) Mimosa – Corymb
(3) Brassica – Spike (4) Anthurium – Spadix
58. Synandrous condition is found in the family :
- (1) Cucurbitaceae (2) Ranunculaceae
(3) Leguminosae (4) Liliaceae
59. Which of the following statements are *not* correct ?
- (A) Spike inflorescence is found in Acalypha.
(B) Fruit of family ranunculaceae is etaerio.
(C) The inflorescence which appear like a single bisexual flower is cyathium.
(D) Almost all plants have latex in family euphorbiaceae.
- The *correct* answer is :
- (1) A and D (2) B and C
(3) A only (4) C only
60. In the secondary steles of *Boerhaavia* :
- (1) Xylem surrounds phloem (2) Phloem surrounds xylem
(3) Both are parallel (4) Both are alternate
61. In which of the following plants secondary growth occurs ?
- (1) Yucca (2) Dracaena
(3) Oryza (4) Triticum
62. Which of the following is *not* a part of periderm of a plant ?
- (1) Phellogen (2) Phellocerm
(3) Phellem (4) Phloem

63. Path of pollen tubes in the pistil is guided by :
- (1) Enzymes of the pollen apparatus (2) Stigmatic fluid
(3) Tissues of the style (4) Secretion of ovule
64. Which of the following type of the fruit, strawberry is ?
- (1) Drupe (2) Berry
(3) Achene (4) Follicle
65. In which of the following animals, blood flows in both the directions (reverse also) ?
- (1) Petromyzon (2) Fish
(3) Herdmania (4) Branchistoma
66. Respiration of the cephalochordates occurs through which of the following ?
- (1) Lungs (2) Gills
(3) Fins (4) General body surface
67. Which of the following pairs are correctly matched ?
- (A) *Alytes* – midwife toad
(B) *Petromyzon* – male is parasite on female
(C) Bony fish – cycloid scale
(D) *Ichthyophis* – apoda
- The answer is :
- (1) A, B, C and D (2) B, C and D only
(3) A and B only (4) A and D only
68. Which of the following is *not* a flight muscle ?
- (1) Coraco-brachialis brevis (2) Coraco-brachialis langus
(3) Gastronemius (4) Pectoralis major
69. Non-renal and pronephric head kidneys are found in :
- (1) *Rana* (2) *Hemidactylus*
(3) *Labeo* (4) Alligator

70. The optimum pH for action of pancreatic amylase is :
(1) 3.7 (2) 5.4 (3) 6.2 (4) 7.1
71. For the digestion of fatty acids, which of the following are required ?
(1) Alpha-lipase only (2) Colipase only
(3) Alpha-lipase + Colipase (4) Alpha-lipase + Colipase + bile salts

72. Which of the following statements are *not* true ?
(A) Autonomic nervous system controls smooth muscles.
(B) Sympathetic nervous system is voluntarily controlled via fore-brain.
(C) The action potential a neuron is terminated by efflux of potassium.
(D) Schwann cell is responsible for myelin secretion on the peripheral nerves.

The answer is :

- (1) B only (2) B and C only
(3) C and D only (4) A, C and D only
73. Which of the following are *not* matched correctly ?
(A) Hypoxia – deficiency of O_2 in the tissues
(B) Tidal volume in normal man – 0.5 liters
(C) Proximal convoluted kidney tubule – reabsorption
(D) Stomach – cholecystokinin secretion

The answer is :

- (1) A and B only (2) A and C only
(3) B only (4) D only

74. Which of the following statements are *not* correct ?
(A) Testosterone acts by a second messenger system.
(B) Triiodothyronine binds to intracellular receptors.
(C) Epinephrine is not a neurotransmitter.
(D) A steroid hormone enters the target cell and alters its gene expression.

The answer is :

- (1) A and C only (2) A and D only
(3) B and C only (4) C and D only

75. The enzyme that fixes atmospheric carbon dioxide in C₄ plants is :
- (1) Hydrogenase (2) PEP carboxylase
(3) RuBP Oxygenase (4) Hydrolase
76. Which of the following statements are *incorrect* about movement of water through xylem of plant ?
- (1) Root pressure plays important role
(2) Transpiration pull has no role
(3) Capillary action has no role
(4) Hydrogen ion/AT Pase pump at the xylem element membrane plays a role
77. Most of the plant cytokinins are synthesized in :
- (1) Flowers (2) Roots
(3) Leaves (4) Stem
78. Phytochrome plays a key role in :
- (1) Photomorphogenesis (2) Water transport
(3) Electrolyte balancing (4) Stomatal movement
79. Most of the CO₂ generated on the earth is absorbed by :
- (1) Green plants (2) Green plants and Oceans
(3) Lime stones (4) All of these
80. Which one of the following is *not* a characteristic of an ecosystem ?
- (1) It is self regulated
(2) It is leaky in relation to flow of matter and energy
(3) It has relations with the surrounding ecosystems
(4) It does not change with time
81. Green house effect is related to which of the following cycle ?
- (1) Carbon (2) Nitrogen
(3) Oxygen (4) Sulphur

82. Which of the following is *not* a grassland ?
- (1) Prairie (2) Pampa
(3) Steppe (4) Tundra
83. Which of the following statements about human evolution is *not* correct ?
- (1) The first species of genus *Homo* was *Homo habilis*
(2) Fossil of *Australopithecus anamensis* was found in Kenya
(3) *Homo erectus* was the first to move out of Africa
(4) *Sivapithecus* was ancestor of man
84. A bacterium that can cause tumors in plants and transfer its genes to them is :
- (1) *Bacillus thuriengensis* (2) *Rhizobium*
(3) *Nitrobacterium* (4) *Agrobacterium*
85. Which of the following vectors contain DNA sequences from lambda phage ?
- (1) Plasmid Ti (2) Cosmid
(3) RNA phase (4) Plasmid Ri
86. Michaelis-Menten rate equation is about :
- (1) Enzyme - substrate complex formation
(2) Rate of Krebs cycle
(3) Rate of oxidative phosphorylation
(4) Rate of reaction of an enzyme
87. The rate of regulatory enzymes is *not* modulated by which the following :
- (1) Feed-back inhibition
(2) Reversible covalent modification
(3) Irreversible covalent modification and activation of enzymes
(4) Coupling factors

88. The parts of genome which keep on changing their positions are known as :

- (1) Exons (2) Introns
(3) Transposable elements (4) Repressors

89. Which of the following are correctly matched ?

- (A) *Balanoglossus* – radial cleavage
(B) Chick – discoidal cleavage
(C) Cockroach – superficial cleavage
(D) *Ascaris* – spiral cleavage

The answer is :

- (1) A and B only (2) C and D only
(3) A, B and D only (4) A, B, C and D

90. Coeloblastula is blastula of :

- (1) Insect (2) Frog (3) Bird (4) Lizard

91. Blastodisc of chick is united with the yolk mass in chick by :

- (1) Epiblast (2) Mesoblast
(3) Endoblast (4) Periblast

92. Which of the following extra-embryonic membrane serves as urinary bladder ?

- (1) Amnion (2) Chorion
(3) Allantois (4) Yolk sac

93. Which of the following are correctly matched for their centers of origin ?

- (A) Americas – Potato, Corn
(B) China Center – Soyabean
(C) Near East – Chick pea, Barley
(D) India Center – Rice, Mango

The correct answer is :

- (1) A and B only (2) A, B and C only
(3) A, B, C and D (4) B and D only

94. The family and generic name of flax-seed plant is :
- (1) Linaceae, *Linum* (2) *Camelliaceae*, *Camellia*
(3) *Malvaceae*, *Chorchorus* (4) *Euphorbiaceae*, *Hevea*
95. Which of the following combination is *not* correct ?
- (1) *Cinchona*, *Rauwolfia*, *Withania* (2) Gram, Arhar, Pea
(3) Rice, Wheat, Maize (4) Coriander, Ginger, Cannabis
96. Which one of the following combinations are *not* correctly matched ?
- (1) Catla, Labeo – Major freshwater carps
(2) Silver carp, Grass carp – Major exotic carps
(3) *Clarias batrachus*, *Heteropneustus* – Air breathing carnivores
(4) Bombay Duck, Hilsa – Marine food fishes
97. Which of the following is a crop pest ?
- (1) *Spodoptera* (2) *Trogoderma*
(3) *Rhizopertha* (4) *Sitophilus*
98. Which of the following statement is wrong ?
- (1) *Pyrilla perpusilla* is a bug
(2) Adults of red pumpkin beetles attack vegetables
(3) The name Gandhibug of *Lepocorisa Oratorius* is derived from its unpleasant odour
(4) *Tribolium castanneum* is known as lesser grain borer.
99. Hadda beetles usually prefer to feed on :
- (1) Brinjal (2) Brinjal and Potato
(3) Citrus fruits (4) Sugarcane
100. Which of the following statement is *false* ?
- (1) Sweet sorghum is used to obtain ethanol.
(2) Quinine is obtained from the bark of *Rauwolfia*.
(3) Sunflower is a source of edible oil.
(4) Morphine is obtained from opium plant.

SECTION - C

101. The product of the characteristic roots of the matrix :

$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix} \text{ is :}$$

- (1) 3 (2) 18 (3) 0 (4) 45

102. If the roots of equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A. P., then one of the root is :

- (1) 4 (2) 3 (3) -4 (4) 6

103. The radius of curvature of the hyperbola $r^2 = a^2 - b^2 + \frac{a^2b^2}{p^2}$ is :

- (1) $\frac{a^2b}{p^3}$ (2) $\frac{a^2b^2}{p^3}$ (3) $\frac{ab^2}{p^3}$ (4) $\frac{a^2b^2}{p}$

104. $\int_0^1 \frac{x^3}{\sqrt{1-x^2}} dx$ is equal to :

- (1) $\frac{3}{2}$ (2) 0 (3) $-\frac{3}{2}$ (4) $\frac{2}{3}$

105. The Co-ordinates of the centre of conic $x^2 + 12xy - 4y^2 - 6x + 4y + 9 = 0$ are :

- (1) $\left(\frac{1}{2}, 0\right)$ (2) $\left(-\frac{1}{2}, 0\right)$
 (3) $\left(0, \frac{1}{2}\right)$ (4) $\left(\frac{1}{2}, \frac{1}{2}\right)$

106. If $x = \cos\theta + i\sin\theta$, then $x^n + \frac{1}{x^n}$ is equal to :

- (1) $2 \cos n\theta$ (2) $2i \cos n\theta$
 (3) $\frac{\cos n\theta}{2}$ (4) $\cos 2n\theta$

107. The least positive integer (mod II) to which 282 is congruent :

- (1) 4 (2) 7 (3) 5 (4) 2

108. The integrating factor of differential equation $2 \cos(y^2) dx - xy \sin(y^2) dy = 0$ is :

(1) $\frac{1}{x^3}$ (2) x^2

(3) x^3 (4) $\frac{1}{x^2}$

109. Particular integral for the differential equation $(D^2 - 6D + 9)y = e^{3x}$ is :

(1) $\frac{e^{3x}}{2}$ (2) $x^2 e^{3x}$

(3) $\frac{e^{3x}}{x^2}$ (4) $\frac{x^2}{2} e^{3x}$

110. The value of λ so that the following vectors are coplanar $\vec{a} = 2\hat{i} - 7\hat{j} + \lambda\hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{c} = 3\hat{i} - 5\hat{j} + 2\hat{k}$ is :

(1) -3 (2) 3

(3) $\frac{1}{3}$ (4) $-\frac{1}{3}$

111. $\lim_{x \rightarrow \infty} x \tan \frac{1}{x}$ is :

(1) 1 (2) -1

(3) 0 (4) 2

112. If $z = \tan^{-1}\left(\frac{x}{y}\right)$, then $\frac{\partial z}{\partial x}$ is :

(1) 0 (2) $\frac{x}{x^2 + y^2}$

(3) $\frac{y}{x^2 + y^2}$ (4) $\frac{1}{x^2 + y^2}$

113. The partial differential equation $x \frac{\partial^2 z}{\partial x^2} + 2 \frac{\partial^2 z}{\partial y \partial x} + y \frac{\partial^2 z}{\partial y^2} + \frac{\partial z}{\partial x} = 0$ is parabolic if :

- (1) $xy \neq 1$ (2) $xy < 1$
 (3) $xy > 1$ (4) $xy = 1$

114. The particular integral of the differential equation $\frac{\partial^3 z}{\partial x^3} - 3 \frac{\partial^3 z}{\partial x^2 \partial y} + 4 \frac{\partial^3 z}{\partial y^3} = e^{x+2y}$ is :

- (1) $\frac{e^x}{72}$ (2) $\frac{e^{x+2y}}{27}$
 (3) $\frac{e^{x+2y}}{72}$ (4) $\frac{e^y}{27}$

115. Any wrench may be resolved into two wrenches, whose axes intersect at right angles in how many ways ?

- (1) One way (2) Three ways
 (3) Infinite number of ways (4) None of these

116. $\lim_{x \rightarrow \infty} \left(\frac{2}{1} \cdot \frac{3}{2} \cdot \frac{4}{3} \cdots \frac{n}{n-1} \right)^{\frac{1}{n}}$ is equal to :

- (1) 1 (2) -1
 (3) 0 (4) $\frac{1}{2}$

117. The series $1^2 + 2^2 + 3^2 + \dots + n^2 + \dots$ diverges to :

- (1) $-\infty$ (2) $+\infty$
 (3) 0 (4) 1

118. The value of $H_{2n+1}(0)$ is :

- (1) 1 (2) -1
 (3) $\frac{1}{n}$ (4) 0

119. The inverse Laplace Transform of $\frac{1}{s^{7/2}}$ is :

(1) $\sqrt{\frac{t}{\pi}}$

(2) $\frac{8}{15}\sqrt{\frac{t}{\pi}}$

(3) $\frac{8t^2}{15}\sqrt{\frac{t}{\pi}}$

(4) 0

120. The operator $||$ means :

(1) Logical OR

(2) Logical AND

(3) Logical NOT

(4) None of these

121. Let (R, d) be the usual metric space. Then derived set of :

$$A = \left\{ \frac{1}{n} : n \in \mathbb{N} \right\} \text{ is :}$$

(1) A

(2) $\{0\}$

(3) ϕ

(4) $\{1\}$

122. Let (X, d) be a metric space and A be any subset of X. Then A is open if and only if :

(1) $A = -A^\circ$

(2) $A = \frac{1}{A}^\circ$

(3) $A = A^\circ$

(4) None of these

123. If $G = \{1, w, w^2\}$ is the group of cube roots of unity, then order of w^2 under the binary operation multiplication is :

(1) 2

(2) 4

(3) 1

(4) 3

124. A division ring has how many zero divisors ?
- (1) 1 (2) 3
(3) 2 (4) None of these
125. "The rate of change of momentum is directly proportional to the impressed force and takes place in the direction of the force" is :
- (1) Newton's first law of motion
(2) Newton's second law of motion
(3) Newton's third law of motion
(4) None of these
126. Time of flight of a projectile is given by :
- (1) $\frac{2u \sin \alpha}{g}$ (2) $\frac{u \sin \alpha}{g}$
(3) $\frac{u \sin \alpha}{2g}$ (4) None of these
127. $T\left(\frac{1}{2}\right)$ is equal to :
- (1) e (2) π
(3) $\sqrt{\pi}$ (4) \sqrt{e}
128. The fixed point of the Mobius transformation $w = \frac{3z-4}{z-1}$ is :
- (1) $z=1$ (2) $z=-1$
(3) $z=-2$ (4) $z=2$
129. The set of vectors $\{(1, 0), (0, 1)\}$ in R^2 is :
- (1) Linearly dependent (2) Linearly independent
(3) Not defined (4) None of these

130. If $T: V \rightarrow W$ is a linear transformation, then T is one-one iff $N(T)$ is :

- (1) $\{1\}$ (2) ϕ
 (3) 0 (4) None of these

131. For the table :

x	0	1	2	3	4	5
$f(x)$	0	3	8	15	24	25

$\Delta^3 f(x)$ is :

- (1) 3 (2) 0
 (3) 2 (4) 7

132. For the data :

x	-1	1	2	3
$f(x)$	-21	15	12	3

$\Delta^2 f(x)$ are :

- (1) -7 and -3 (2) 7 and 3
 (3) 7 and -3 (4) -7 and 3

133. Runge-Kutta method is a :

- (1) Single step method
 (2) Multiple step method
 (3) Method for solving cubic equation
 (4) None of these

134. The force acting on a system of n particles is conservative only if :

(1) $\nabla \cdot \vec{F} = 0$

(2) $\nabla \times \vec{F} = 0$

(3) $\nabla \cdot \nabla \cdot \vec{F} = 0$

(4) $\nabla \cdot \nabla \times \vec{F} = 0$

135. In Lagrangian's Equation Q_j represents :

(1) Generalized force having dimensions of force explicitly

(2) Quantized force having dimensions of force

(3) Generalized force may or may not have dimensions of force

(4) Work done by generalized force

136. The Hamiltonian, $H = T + V$ gives total energy :

(1) when Cartesian and generalized coordinates do not depend on time explicitly

(2) when only generalized coordinates do depend on time explicitly

(3) when only Cartesian coordinates do not depend on time explicitly

(4) when Cartesian and generalized coordinates depend on time explicitly

137. Any field, \vec{A} is said to solenoid field if :

(1) $\vec{A} = \nabla \times \vec{V}$ and $\nabla \cdot \vec{A} = 0$

(2) $\vec{A} = \nabla \times \vec{V}$ and $\nabla \cdot \vec{A} = 0$

(3) $\vec{A} = \nabla \times \vec{V}$ and $\nabla \times \vec{A} = 0$

(4) $\vec{A} = \nabla \cdot \vec{V}$ and $\nabla \times \vec{A} = 0$

138. The total charge enclosed by a given surface through which 15000 lines of force is incoming and that of outgoing lines of force is 25000 :

- (1) $13.275 \times 10^{-8} C$ (2) $8.85 \times 10^{-12} C$
(3) $8.85 \times 10^{-8} C$ (4) $8.85 \times 10^{-8} C / s$

139. Name of program which translates a high level language into machine language :

- (1) compiler (2) assembler
(3) register (4) converter

140. The area enclosed by a cycle represents net work done as well as net heat of interaction is :

- (1) P - V diagram (2) Carnot cycle
(3) T - S diagram (4) Triple point diagram

141. A real gas shows neither heating nor cooling in Joule - Thomson effect if the initial temperature is :

- (1) less than inversion temperature
(2) greater than inversion temperature
(3) equal to inversion temperature
(4) equal to 273K.

142. If p_1 and p_2 be the probability of two independent events, then the probability of two events to take place simultaneously is :

- (1) $p_1 + p_2$ (2) $p_1 \times p_2$
(3) p_1 / p_2 (4) $p_1 - p_2$

143. The two constraints used in determining the most probable macro-state are :

- (1) $\sum n_i = n$ and $\sum n_i u_i = u$ (2) $\sum n_i = n$ and $\sum n_i v_i = v$
(3) $\sum n_i = n$ and $\sum n_i v_i = v/n$ (4) $\sum n_i = n$ and $\sum n_i u_i = u/n$

144. The essential condition for Fermi - Dirac statistics is :

- (1) the particles are distinguishable
(2) the particles are indistinguishable
(3) there is no limit on the no. of particles present in a given energy state
(4) not more than one particle can be present in a given energy state

145. Boltzmann limit is given by

- (1) $(n_i / g_i) \ll 1$ and satisfied by all gases at ordinary temperature
(2) $(g_i / n_i) \ll 1$ and satisfied by all gases at absolute temperature
(3) $(n_i / g_i) \gg 1$ and satisfied by all gases at ordinary temperature
(4) $(n_i \times g_i) \ll 1$ and satisfied by all gases at 0K

146. The ratio of rms value to the average value of alternating current is called Form Factor (FF) and given by :

- (1) 1.21, peak of wave is flat if FF less than 1.21
(2) 1.11, peak of wave is sharp if FF greater than 1.11
(3) 1.11, peak of wave is flat if FF greater than 1.11
(4) 2.11, peak of wave is flat if FF greater than 2.11

147. The quality factor of a series resonant circuit is given by :

(1) $\frac{\omega L}{R}$ and depends on R only

(2) $\frac{\omega C}{R}$ and depends on R only

(3) $\frac{\omega R}{L}$ and depends on R only

(4) $\frac{\omega L}{R}$ and depends on L only

148. For a given transistor configuration if $I_c = 10.505\text{mA}$, $I_b = 100\mu\text{A}$ and $I_{CBO} = 5\mu\text{A}$, then value of α_{dc} and β_{dc} are :

(1) 100 and 0.95

(2) 0.99 and 100

(3) 105 and 1.05

(4) 101 and 99.0

149. Calculate the apparent length of a meter rod, when it is carried in a rocket moving with a speed of 2.9×10^8 m/s take $c = 3.0 \times 10^8$ m/s

(1) 0.254 m

(2) 0.52 m

(3) 0.359 m

(4) 1.0 m

150. The dirichlet conditions for an expandable function, $f(x)$ are :

(1) non-periodic, single valued, finite and continuous

(2) periodic, single valued, infinite and continuous

(3) periodic, single valued, finite and continuous

(4) periodic, single valued, infinite and in continuous

151. The necessary condition for achromatic combination is :
- (1) Two lenses should be of same materials
 - (2) Two lenses should be of different materials
 - (3) Two lenses should be of same focal length
 - (4) Two lenses should be of same radius of curvature
152. For Newton's ring due to transmitted light, the central maximum ($n=0$) is :
- (1) dark with zero diameter
 - (2) bright with zero diameter
 - (3) may be bright or dark
 - (4) None of above
153. The Young's double slit experiment is performed with blue and green light of wavelengths 4360 \AA and 5460 \AA respectively. If X is the distance of 4th maxima from the central maxima, then :
- (1) $X_{\text{blue}} = X_{\text{green}}$
 - (2) $X_{\text{blue}} > X_{\text{green}}$
 - (3) $X_{\text{blue}} < X_{\text{green}}$
 - (4) $X_{\text{blue}} / X_{\text{green}} = \lambda_{\text{green}} / \lambda_{\text{blue}}$
154. The angular half width of the principal maxima of a plane diffraction grating is :
- (1) very narrow and sharp
 - (2) very broad and dim
 - (3) very narrow and dim
 - (4) very broad and sharp
155. A polarimeter suitable for color blind persons is :
- (1) bi-quartz polarimeter
 - (2) half shade polarimeter
 - (3) saccharimeter
 - (4) None of above

156. The cubic lattice most densely packed is :

- (1) BCC with packing factor 0.680 (2) SC with packing factor 0.524
(3) HCP with packing factor 0.740 (4) FCC with packing factor 0.740

157. X-Ray diffraction method used for structure determination of single crystal is :

- (1) Power crystal method (2) Rotating crystal method
(3) Laue method (4) None of above

158. Relation between volume of unit cell, UT [in direct lattice(DL)] and reciprocal lattice(RL) is :

- (1) $(\text{Volume of UT})_{\text{RL}} = 4\pi^2/(\text{Volume of UT})_{\text{DL}}$
(2) $(\text{Volume of UT})_{\text{DL}} = 4\pi^2/(\text{Volume of UT})_{\text{RL}}$
(3) $(\text{Volume of UT})_{\text{RL}} = 8\pi^3/(\text{Volume of UT})_{\text{DL}}$
(4) $(\text{Volume of UT})_{\text{DL}} = 8\pi^3/(\text{Volume of UT})_{\text{RL}}$

159. Phonons are defined as :

- (1) optical energy given to unit cell
(2) Lattice vibrations quantized energy
(3) Lattice vibrations continuous energy
(4) continuous heat energy given to lattice

160. The energy of gamma photon having a wavelength 1.5 \AA (take $h = 6.634 \times 10^{-34} \text{ Js}$)
- (1) $8.275 \times 10^3 \text{ eV}$ (2) $13.24 \times 10^{-4} \text{ eV}$
(3) $10.24 \times 10^{-3} \text{ eV}$ (4) $1.6 \times 10^{-19} \text{ eV}$
161. The ratio of kinetic energy of proton to that of α -particle, when a proton and an α -particle have equal de-Broglie wavelengths is :
- (1) 1 : 2 (2) 2 : 1
(3) 1 : 1 (4) 4 : 1
162. In Schrodinger's equation, eigen values means :
- (1) value of energy (2) value of position
(3) value of frequency (4) none of above
163. Zero-point energy of an oscillator is given by :
- (1) $h\nu$ (2) zero
(3) infinite (4) $\left(\frac{1}{2}\right)h\nu$
164. The factors that control the allowed values of energy of a particle in a potential well are :
- (1) width and depth of potential well
(2) time and energy of potential well
(3) depth and energy of potential well
(4) time and width of potential well

165. In Moseley's law which leads to correct sequence of putting the elements in periodic chart, frequency of X-ray spectral line depends on :

(1) Z

(2) $(Z)^2$

(3) $(Z)^{1/2}$

(4) $(Z)^3$

(Z = Atomic No. of Element)

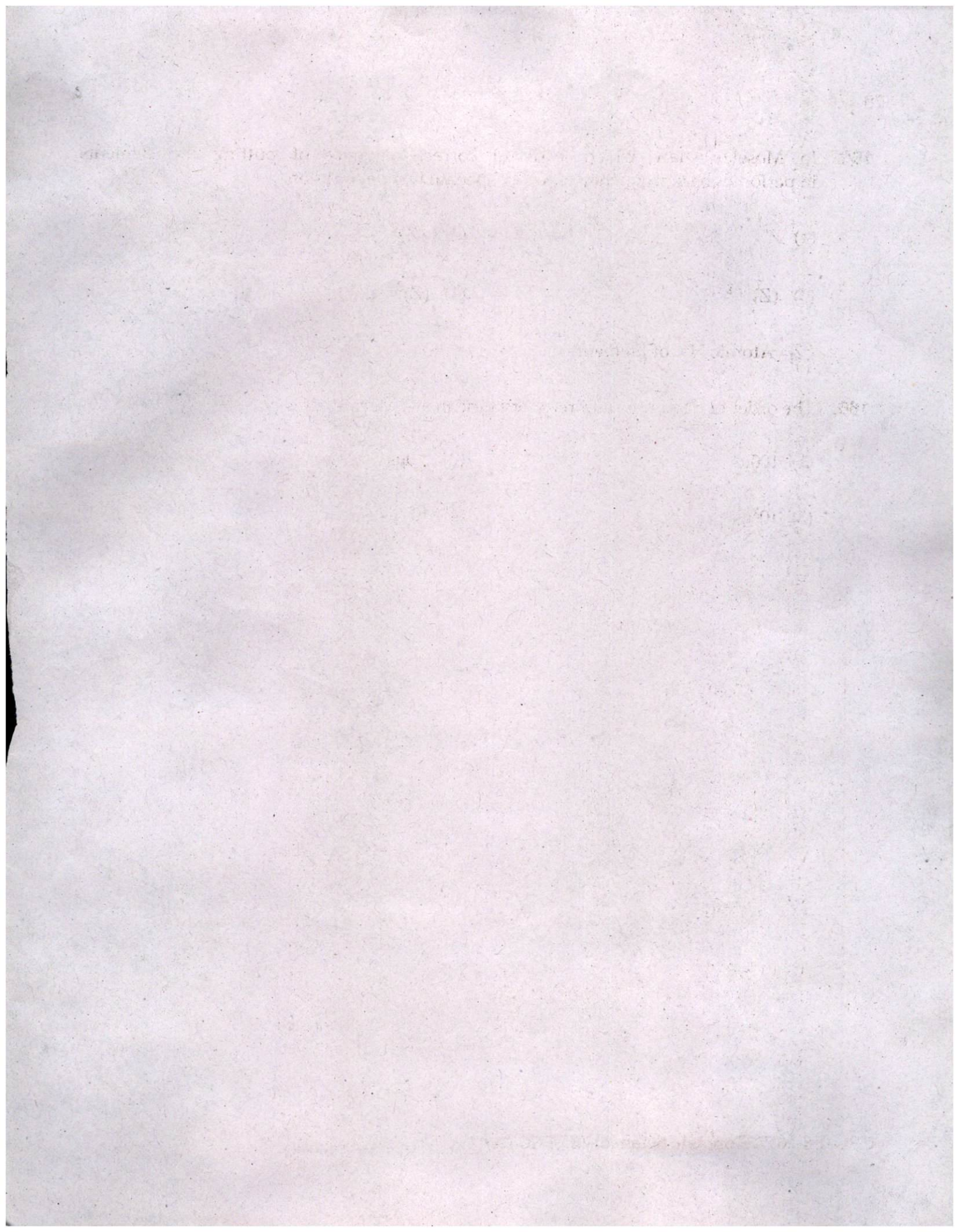
166. The order of dead time and recovery time in a G.M. counter is :

(1) $100\mu\text{s}$

(2) $10\mu\text{s}$

(3) $10^3\mu\text{s}$

(4) $10^{-3}\mu\text{s}$



SEAL

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

CPG-EE-2017 (Forensic Science)-(SET-B)

B

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Sr. No.

Time : 1½ Hours

Total Questions : 166

Max. Marks : 100

Roll No. (in figures) _____ (in words) _____

Candidate's Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Exam : _____

(Signature of the Candidate)

(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

SEAL

1. All questions of **Section-"A"** are **compulsory**. Students are required to attempt either **Section "B"** or **Section "C"**. Students of *Medical Group* are required to attempt **Section "B"**. Students of *Non-Medical Group* are required to attempt **Section "C"**. All questions carry equal marks i.e. one mark each.
2. The candidates **must return** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself.
4. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing **within two hours** after the test is over. No such complaint(s) will be entertained thereafter.
5. **Use only blue or black ball point pen of good quality in the OMR Answer-Sheet.**
6. There will be **negative** marking. Each correct answer will be awarded **one** full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
7. **Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after the start of examination.**

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SECTION - A

1. IUPAC name of $[\text{Cr}(\text{CO})_5\{\text{P}(\text{C}_6\text{H}_5)_3\}]$ is :
- (1) Triphenylphosphine pentacarbonyl chromium (0)
 - (2) Pentacarbonyl triphenylphosphine chromium (0)
 - (3) Pentacarbonyl triphenylphosphine chromate (III)
 - (4) Triphenylphosphine pentacarbonyl chromate (III)
2. Which one of the following ions is colourless ?
- (1) U^{3+}
 - (2) Cm^{4+}
 - (3) Th^{4+}
 - (4) Pu^{4+}
3. Solubility of iodine in liquid SO_2 is increased on addition of KI . This is attributed to the formation of :
- (1) KI_3
 - (2) $\text{I}_2 \cdot \text{SO}_2$
 - (3) $\text{KI} \cdot 4\text{SO}_2$
 - (4) SOI_2
4. $\text{PbI}_2 + \text{KNH}_2 \xrightarrow{\text{liq. NH}_3}$
- Products of the Reaction are :
- (1) $\text{PbNH}_2 \downarrow + \text{I}_2 + \text{KI}$
 - (2) $\text{PbNH} \downarrow + \text{HI} + \text{KI}$
 - (3) $\text{PbNH}_2 \downarrow + \text{KI}_3$
 - (4) None of the above
5. Which gives red colour with Fehling solution ?
- (1) Glucose
 - (2) Cellulose
 - (3) Benzaldehyde
 - (4) Cane sugar
6. Compound A undergoes formation of cyanohydrin which on hydrolysis gives lactic acid. Therefore, compound A is :
- (1) formaldehyde
 - (2) acetaldehyde
 - (3) acetone
 - (4) benzaldehyde
7. Which of the following polymer is thermosetting polymer ?
- (1) Nylon-6
 - (2) Nylon-6,6
 - (3) Bakelite
 - (4) None of these

8. Which of the following is useful in treatment of cyanide poisoning ?
- (1) Amyl nitrite (2) Sodium nitrite
(3) Nitrite thiosulphate (4) All of the above
9. Enthalpies of combustion of methane, graphite and hydrogen are 890.2 kJ, 393.4 kJ and 285.7 kJ respectively. Enthalpy of formation of methane is :
- (1) $-211.1 \text{ kJ mol}^{-1}$ (2) $-890.2 \text{ kJ mol}^{-1}$
(3) $-74.6 \text{ kJ mol}^{-1}$ (4) 85.7 kJ mol^{-1}
10. Containers A, B and C of equal volume contain oxygen, neon and methane respectively at the same temperature and pressure. The correct order of their masses is :
- (1) $A < B < C$ (2) $B < C < A$ (3) $C < A < B$ (4) $C < B < A$
11. The difference between ΔH and ΔU at constant volume is equal to :
- (1) R (2) $p\Delta V$ (3) $V\Delta p$ (4) $3/2R$
12. The enthalpies of formation of gaseous N_2O and NO at 298K are 82 and 90 kJ mol^{-1} . The enthalpy of the reaction $N_2O(g) + \frac{1}{2}O_2 \rightarrow 2NO(g)$ is :
- (1) -8 kJ (2) 98 kJ (3) -74 kJ (4) 8 kJ
13. The overall energy change during Carnot cycle is :
- (1) equal to w (2) zero (3) maximum (4) equal to q
14. A process in which the system, after undergoing various processes, returns to its initial state is called a/an :
- (1) reversible process (2) irreversible process
(3) cyclic process (4) Hess law
15. The diameter of molecule B is half that of molecule A, the ratio of mean free path (λ_A/λ_B) will be :
- (1) $1/2$ (2) $1/4$ (3) 4 (4) 2

16. The SI units of the Vander Waals b term are :
- (1) $\text{m}^3 \text{mol}$ (2) m^2 / mol (3) m^3 / mol (4) $\text{m}^2 \text{mol}$
17. The law which relates the solubility of a gas to its pressure is called :
- (1) Raoult's law (2) The distribution law
 (3) Henry's law (4) Ostwald's law
18. By adding a non-volatile solute to a solvent, the boiling point of the solvent :
- (1) will increase (2) will decrease
 (3) will not change (4) may increase or decrease
19. If $2.303RT/F = 0.059$ and the activities of the solids are constant, then e.m.f. of the cell $\text{Zn} | \text{Zn}^{2+} (a_1) || \text{Cu}^{2+} (a_2) | \text{Cu}$ is :
- (1) $E = E^\circ - 0.059 \log (a_2 / a_1)$ (2) $E = E^\circ + 0.059 \log (a_2 / a_1)$
 (3) $E = E^\circ - \frac{0.059}{2} \log (a_2 / a_1)$ (4) $E = E^\circ + \frac{0.059}{2} \log (a_2 / a_1)$
20. The hybridization of Xe in XeO_2F_2 is :
- (1) sp^3d (2) sp^3d^2 (3) sp^3d^3 (4) dsp^3
21. O_2^{2-} is isoelectronic with :
- (1) H_2 (2) N_2 (3) F_2 (4) S
22. Which one of the following species is paramagnetic ?
- (1) O_2^- (2) CN^- (3) CO (4) F_2
23. In NaCl type structure, the coordination numbers of cation and anion are :
- (1) 6 and 4 (2) 6 and 6 (3) 4 and 4 (4) 8 and 4
24. Which one of the following complex can exhibit coordination isomers ?
- (1) $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$ (2) $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$
 (3) $[\text{Co}(\text{en})_2 \text{Cl}_2]^+$ (4) $[\text{Cr}(\text{en})_2 \text{Cl}_2]^+$

25. $\text{Cr}(\text{CO})_x$ has EAN of Cr = 36, hence x = :
(1) 2 (2) 4 (3) 6 (4) 5
26. A substance which can act both as an antiseptic and disinfectant is :
(1) Aspirin (2) Phenol
(3) Analgin (4) Sodium pentothal
27. Out of the following which does *not* exhibit IR spectra ?
(1) O_2 (2) CO_2 (3) SO_2 (4) HBr
28. Hyperconjugation involves overlap of the following orbitals :
(1) $\sigma-\sigma$ (2) $\sigma-p$ (3) $p-p$ (4) $\pi-\pi$
29. The correct order of reactivity towards electrophilic substitution of the compound amongst the following aniline (I), benzene (II) and nitrobenzene (III) is :
(1) $\text{II} > \text{III} > \text{I}$ (2) $\text{I} < \text{II} > \text{III}$ (3) $\text{I} > \text{II} > \text{III}$ (4) $\text{III} > \text{II} > \text{I}$
30. Vitamin B_{12} contains :
(1) cobalt (2) magnesium (3) iron (4) nickel
31. The root mean square velocity of an ideal gas at constant pressure varies with density 'd' is :
(1) d^2 (2) $b.d$ (3) \sqrt{d} (4) $1/\sqrt{d}$
32. For the reaction $2\text{Cl}(\text{g}) + \text{Cl}_2(\text{g})$ the signs of ΔH and ΔS respectively are :
(1) +, - (2) +, + (3) -, - (4) -, +
33. The principal buffer present in human blood is :
(1) $\text{H}_3\text{PO}_4 + \text{NaH}_2\text{PO}_4$ (2) $\text{CH}_3\text{COOH} + \text{CH}_3\text{COONa}$
(3) $\text{Na}_2\text{HPO}_4 + \text{Na}_3\text{PO}_4$ (4) $\text{H}_2\text{CO}_3 + \text{HCO}_3^-$
34. If a neutral solution has $\text{pK}_w = 13.36$ at 50°C , then pH of the solution is :
(1) 6.68 (2) 7 (3) 7.63 (4) 13.5

SECTION - B

35. Coeloblastula is blastula of :
- (1) Insect (2) Frog (3) Bird (4) Lizard
36. Blastodisc of chick is united with the yolk mass in chick by :
- (1) Epiblast (2) Mesoblast
(3) Endoblast (4) Periblast
37. Which of the following extra-embryonic membrane serves as urinary bladder ?
- (1) Amnion (2) Chorion
(3) Allantois (4) Yolk sac
38. Which of the following are correctly matched for their centers of origin ?
- (A) Americas - Potato, Corn
(B) China Center - Soyabean
(C) Near East - Chick pea, Barley
(D) India Center - Rice, Mango
- The *correct* answer is :
- (1) A and B only (2) A, B and C only
(3) A, B, C and D (4) B and D only
39. The family and generic name of flax-seed plant is :
- (1) Linaceae, Linum (2) Camelliaceae, Camellia
(3) Malvaceae, Chorchorus (4) Euphorbiaceae, Hevea
40. Which of the following combination is *not* correct ?
- (1) Cinchona, Rauwolfia, Withania (2) Gram, Arhar, Pea
(3) Rice, Wheat, Maize (4) Coriander, Ginger, Cannabis
41. Which one of the following combinations are *not* correctly matched ?
- (1) Catla, Labeo - Major freshwater carps
(2) Silver carp, Grass carp - Major exotic carps
(3) *Clarias batrachus*, *Heteropneustus* - Air breathing carnivores
(4) Bombay Duck, Hilsa - Marine food fishes

42. Which of the following is a crop pest ?
- (1) *Spodoptera* (2) *Trogoderma*
(3) *Rhizopertha* (4) *Sitophilus*
43. Which of the following statement is wrong ?
- (1) *Pyrilla perpusilla* is a bug
(2) Adults of red pumpkin beetles attack vegetables
(3) The name Gandhibug of *Lepocorisa Oratorius* is derived from its unpleasant odour
(4) *Tribolium castanneum* is known as lesser grain borer.
44. Hadda beetles usually prefer to feed on :
- (1) Brinjal (2) Brinjal and Potato
(3) Citrus fruits (4) Sugarcane
45. The pigments found in polysiphonia (algae) are :
- (1) Chlorophyll only (2) Phycocyanin only
(3) Phycocyanin and chlorophyll (4) Phycocyanin and phycoerythrine
46. Life cycle which contain a dominant multicellular diploid stage, are called :
- (1) Gametic type (2) Zygotic type
(3) Sporic type (4) Gametophytic type
47. Which of the following statements are *correct* ?
- (A) *Puccinia graminis* is known as stem-rust of wheat
(B) D-glutamic acid and D-lysin are found in bacterial cell wall
(C) 80s ribosomes are found in bacteria
(D) *E. Coli.* is found in cluster form
- The correct answer is :
- (1) A and B (2) B and C (3) C and D (4) B, C and D
48. Which of the following cells are involved in fight against cancer ?
- (1) B Cells (2) Natural killer cells
(3) Memory cells (4) Plasma cells

49. Which of the following cancers are associated with Human Papilloma virus ?
- (1) Lung (2) Cervical
(3) Ovarian (4) Liver
50. The true skeleton of a cell is formed by :
- (1) Actin filaments (2) Microtubules
(3) Intermediate filaments (4) Actin filaments and microtubules
51. When in a eukaryotic cell all the copies of its mitochondrial DNA are identical, it is called :
- (1) Homoplasmy (2) Heteroplasmy
(3) Apospory (4) None of the above
52. Oxydative phosphorylation enzyme system is found in which part of the mitochondria ?
- (1) Cytosol (2) Outer membrane of mitochondria
(3) Inner membrane of mitochondria (4) Mitochondrial fluid
53. The main function of peroxisome is :
- (1) Catabolism of very long chain fatty acids
(2) Glyoxylate cycle in seeds
(3) Phosphorespiration in leaves
(4) Glycolysis in Trypanosomes
54. In Bryophytes, heterothallic condition is :
- (1) When male sex organs are not formed
(2) When male and female sex organs are found in the same individual
(3) When male and female sex organs are found in separate individuals
(4) When two different forms of thallus occur
55. Which of the following statements are *not* correct ?
- (1) *Funaria hygrometrica* is a common moss on Indian hills
(2) The adult plant body of *Anthoceros* is a sporophyte
(3) *Selaginella* bears spores of two types
(4) Apogamy is a type of reproduction in some ferns in which sporophyte develops from the gametophyte without fusion of gametes

56. In which of the following animals sex is determined by hormones ?
- (1) Hippocampus (2) Alligator
(3) Bonellia (4) Cobra
57. Which of the following types of inheritance is *not* found in ciliate protozoa ?
- (1) Chloroplast inheritance (2) Mendalian inheritance
(3) Cortical inheritance (4) Cytoplasmic inheritance
58. The cytoplasmic factors responsible for male sterility in maize plants, are located in :
- (1) Nucleus (2) Mitochondria
(3) Chloroplast (4) Cytosol
59. Mitochondrial DNA is *not* associated with which of the following ?
- (1) Regulation of apoptosis (2) Generation of reactive oxygen species
(3) Energy production (4) Regulation of cellular transport
60. Which of the following is a chaperone ?
- (1) Nucleoplasmin (2) Chromatosome
(3) Histone H_1 and H_2 (4) Histone H_3 and H_4
61. Unexplained substantial variation in the haploid nuclear DNA content even between closely related species is called :
- (1) Kinetic complexity (2) Haploidy
(3) Aneuploidy (4) C-value paradox
62. Which of the following disease is *not* spread by housefly ?
- (1) Amoebic dysentery (2) Cholera
(3) Typhoid (4) Plague
63. Coelomic cavity of Balanoglossus is made up of how many parts ?
- (1) One (2) Two
(3) Four (4) Five

64. Which of the following pairs are correctly matched ?

- (A) Trochophore – Balanoglossus
- (B) Bipinnaria–Asterias
- (C) Holothuria – Auricularia
- (D) Fasciola – Cercaria

The *correct* answer is :

- (1) A and B only
- (2) B and D only
- (3) C and D only
- (4) B, C and D only

65. The early seed fern *Ekinsia* evolved in :

- (1) Late Devonian
- (2) Early Devonian
- (3) Carboniferous
- (4) Triassic

66. Coralloid roots are found in :

- (1) Lycopodium
- (2) Pinus
- (3) Cycas
- (4) Dryopteris

67. Which of the following is *not* correctly matched ?

- (1) Marigold – Capitulum
- (2) Mimosa – Corymb
- (3) Brassica – Spike
- (4) Anthurium – Spadix

68. Synandrous condition is found in the family :

- (1) Cucurbitaceae
- (2) Ranunculaceae
- (3) Leguminosae
- (4) Liliaceae

69. Which of the following statements are *not* correct ?

- (A) Spike inflorescence is found in Acalypha.
- (B) Fruit of family ranunculaceae is etaerio.
- (C) The inflorescence which appear like a single bisexual flower is cyathium.
- (D) Almost all plants have latex in family euphorbiaceae.

The *correct* answer is :

- (1) A and D
- (2) B and C
- (3) A only
- (4) C only

70. In the secondary steles of *Boerhaavia* :
- (1) Xylem surrounds phloem (2) Phloem surrounds xylem
(3) Both are parallel (4) Both are alternate
71. In which of the following plants secondary growth occurs ?
- (1) Yucca (2) Dracaena (3) Oryza (4) Triticum
72. Which of the following is *not* a part of periderm of a plant ?
- (1) Phellogen (2) Phelloderm
(3) Phellem (4) Phloem
73. Path of pollen tubes in the pistil is guided by :
- (1) Enzymes of the pollen apparatus (2) Stigmatic fluid
(3) Tissues of the style (4) Secration of ovule
74. Which of the following type of the fruit, strawberry is ?
- (1) Drupe (2) Berry (3) Achene (4) Follicle
75. In which of the following animals, blood flows in both the directions (reverse also) ?
- (1) Petromyzon (2) Fish
(3) Herdmania (4) Branchistoma
76. Respiration of the cephalochordates occurs through which of the following ?
- (1) Lungs (2) Gills
(3) Fins (4) General body surface
77. Which of the following pairs are correctly matched ?
- (A) *Alytes* – midwife toad
(B) *Petromyzon* – male is parasite on female
(C) Bony fish – cycloid scale
(D) Ichthyophis – apoda
- The answer is :
- (1) A, B, C and D (2) B, C and D only
(3) A and B only (4) A and D only

78. Which of the following is *not* a flight muscle ?
- (1) Coraco-brachialis brevis (2) Coraco-brachialis langus
(3) Gastronemius (4) Pectoralis major
79. Non-renal and pronephric head kidneys are found in :
- (1) *Rana* (2) *Hemidactylus*
(3) *Labeo* (4) Alligator
80. The optimum pH for action of pancreatic amylase is :
- (1) 3.7 (2) 5.4 (3) 6.2 (4) 7.1
81. For the digestion of fatty acids, which of the following are required ?
- (1) Alpha-lipase only (2) Colipase only
(3) Alpha-lipase + Colipase (4) Alpha-lipase + Colipase + bile salts
82. Which of the following statements are *not* true ?
- (A) Autonomic nervous system controls smooth muscles.
(B) Sympathetic nervous system is voluntarily controlled via fore-brain.
(C) The action potential a neuron is terminated by efflux of potassium.
(D) Schwan cell is responsible for myelin secretion on the peripheral nerves.

The answer is :

- (1) B only (2) B and C only
(3) C and D only (4) A, C and D only

83. Which of the following are *not* matched correctly ?
- (A) Hypoxia – deficiency of O_2 in the tissues
(B) Tidal volume in normal man – 0.5 liters
(C) Proximal convoluted kidney tubule – reabsorption
(D) Stomach – cholecystokinin secretion

The answer is :

- (1) A and B only (2) A and C only
(3) B only (4) D only

84. Which of the following statements are *not* correct ?
- (A) Testosterone acts by a second messenger system.
 - (B) Triiodothyronine binds to intracellular receptors.
 - (C) Epinephrine is not a neurotransmitter.
 - (D) A steroid hormone enters the target cell and alters its gene expression.
- The answer is :
- (1) A and C only
 - (2) A and D only
 - (3) B and C only
 - (4) C and D only
85. The enzyme that fixes atmospheric carbon dioxide in C₄ plants is :
- (1) Hydrogenase
 - (2) PEP carboxylase
 - (3) RuBP Oxygenase
 - (4) Hydrolase
86. Which of the following statements are *incorrect* about movement of water through xylem of plant ?
- (1) Root pressure plays important role
 - (2) Transpiration pull has no role
 - (3) Capillary action has no role
 - (4) Hydrogen ion/AT Pase pump at the xylem element membrane plays a role
87. Most of the plant cytokinins are synthesized in :
- (1) Flowers
 - (2) Roots
 - (3) Leaves
 - (4) Stem
88. Phytochrome plays a key role in :
- (1) Photomorphogenesis
 - (2) Water transport
 - (3) Electrolyte balancing
 - (4) Stomatal movement
89. Most of the CO₂ generated on the earth is absorbed by :
- (1) Green plants
 - (2) Green plants and Oceans
 - (3) Lime stones
 - (4) All of these

90. Which one of the following is *not* a characteristic of an ecosystem ?
- (1) It is self regulated
 - (2) It is leaky in relation to flow of matter and energy
 - (3) It has relations with the surrounding ecosystems
 - (4) It does not change with time
91. Green house effect is related to which of the following cycle ?
- (1) Carbon
 - (2) Nitrogen
 - (3) Oxygen
 - (4) Sulphur
92. Which of the following is *not* a grassland ?
- (1) Prairie
 - (2) Pampa
 - (3) Steppe
 - (4) Tundra
93. Which of the following statements about human evolution is *not* correct ?
- (1) The first species of genus *Homo* was *Homo habilis*
 - (2) Fossil of *Australopithecus anamensis* was found in Kenya
 - (3) *Homo erectus* was the first to move out of Africa
 - (4) *Sivapithecus* was ancestor of man
94. A bacterium that can cause tumors in plants and transfer its genes to them is :
- (1) *Bacillus thuriengensis*
 - (2) *Rhizobium*
 - (3) *Nitrobacterium*
 - (4) *Agrobacterium*
95. Which of the following vectors contain DNA sequences from lambda phage ?
- (1) Plasmid Ti
 - (2) Cosmid
 - (3) RNA phase
 - (4) Plasmid Ri

96. Michaelis-Menten rate equation is about :
- (1) Enzyme – substrate complex formation
 - (2) Rate of Krebs cycle
 - (3) Rate of oxidative phosphorylation
 - (4) Rate of reaction of an enzyme
97. The rate of regulatory enzymes is *not* modulated by which the following :
- (1) Feed-back inhibition
 - (2) Reversible covalent modification
 - (3) Irreversible covalent modification and activation of enzymes
 - (4) Coupling factors
98. The parts of genome which keep on changing their positions are known as :
- | | |
|---------------------------|----------------|
| (1) Exons | (2) Introns |
| (3) Transposable elements | (4) Repressors |
99. Which of the following are correctly matched ?
- (A) *Balanoglossus* – radial cleavage
 - (B) Chick – discoidal cleavage
 - (C) Cockroach – superficial cleavage
 - (D) *Ascaris* – spiral cleavage
- The answer is :
- | | |
|---------------------|-------------------|
| (1) A and B only | (2) C and D only |
| (3) A, B and D only | (4) A, B, C and D |
100. Which of the following statement is *false* ?
- (1) Sweet sorghum is used to obtain ethanol.
 - (2) Quinine is obtained from the bark of *Rauwolfia*.
 - (3) Sunflower is a source of edible oil.
 - (4) Morphine is obtained from opium plant.

SECTION - C

101. The necessary condition for achromatic combination is :
- (1) Two lenses should be of same materials
 - (2) Two lenses should be of different materials
 - (3) Two lenses should be of same focal length
 - (4) Two lenses should be of same radius of curvature
102. For Newton's ring due to transmitted light, the central maximum ($n=0$) is :
- (1) dark with zero diameter
 - (2) bright with zero diameter
 - (3) may be bright or dark
 - (4) None of above
103. The Young's double slit experiment is performed with blue and green light of wavelengths 4360 \AA and 5460 \AA respectively. If X is the distance of 4th maxima from the central maxima, then :
- (1) $X_{\text{blue}} = X_{\text{green}}$
 - (2) $X_{\text{blue}} > X_{\text{green}}$
 - (3) $X_{\text{blue}} < X_{\text{green}}$
 - (4) $X_{\text{blue}} / X_{\text{green}} = \lambda_{\text{green}} / \lambda_{\text{blue}}$
104. The angular half width of the principal maxima of a plane diffraction grating is :
- (1) very narrow and sharp
 - (2) very broad and dim
 - (3) very narrow and dim
 - (4) very broad and sharp
105. A polarimeter suitable for color blind persons is :
- (1) bi-quartz polarimeter
 - (2) half shade polarimeter
 - (3) saccharimeter
 - (4) None of above

106. The cubic lattice most densely packed is :

- (1) BCC with packing factor 0.680 (2) SC with packing factor 0.524
(3) HCP with packing factor 0.740 (4) FCC with packing factor 0.740

107. X-Ray diffraction method used for structure determination of single crystal is :

- (1) Power crystal method (2) Rotating crystal method
(3) Laue method (4) None of above

108. Relation between volume of unit cell, UT [in direct lattice(DL)] and reciprocal lattice(RL) is :

- (1) $(\text{Volume of UT})_{\text{RL}} = 4\pi^2/(\text{Volume of UT})_{\text{DL}}$
(2) $(\text{Volume of UT})_{\text{DL}} = 4\pi^2/(\text{Volume of UT})_{\text{RL}}$
(3) $(\text{Volume of UT})_{\text{RL}} = 8\pi^3/(\text{Volume of UT})_{\text{DL}}$
(4) $(\text{Volume of UT})_{\text{DL}} = 8\pi^3/(\text{Volume of UT})_{\text{RL}}$

109. Phonons are defined as :

- (1) optical energy given to unit cell
(2) Lattice vibrations quantized energy
(3) Lattice vibrations continuous energy
(4) continuous heat energy given to lattice

110. The energy of gamma photon having a wavelength 1.5 \AA (take $h = 6.634 \times 10^{-34} \text{ Js}$)
- (1) $8.275 \times 10^3 \text{ eV}$ (2) $13.24 \times 10^{-4} \text{ eV}$
(3) $10.24 \times 10^{-3} \text{ eV}$ (4) $1.6 \times 10^{-19} \text{ eV}$
111. The ratio of kinetic energy of proton to that of α -particle, when a proton and an α -particle have equal de-Broglie wavelengths is :
- (1) 1 : 2 (2) 2 : 1
(3) 1 : 1 (4) 4 : 1
112. In Schrodinger's equation, eigen values means :
- (1) value of energy (2) value of position
(3) value of frequency (4) none of above
113. Zero-point energy of an oscillator is given by :
- (1) $h\nu$ (2) zero
(3) infinite (4) $\left(\frac{1}{2}\right)h\nu$
114. The factors that control the allowed values of energy of a particle in a potential well are :
- (1) width and depth of potential well
(2) time and energy of potential well
(3) depth and energy of potential well
(4) time and width of potential well

115. In Moseley's law which leads to correct sequence of putting the elements in periodic chart, frequency of X-ray spectral line depends on :

- (1) Z (2) $(Z)^2$
 (3) $(Z)^{1/2}$ (4) $(Z)^3$

(Z = Atomic No. of Element)

116. The product of the characteristic roots of the matrix :

$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix} \text{ is :}$$

- (1) 3 (2) 18 (3) 0 (4) 45

117. If the roots of equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A. P., then one of the root is :

- (1) 4 (2) 3 (3) -4 (4) 6

118. The radius of curvature of the hyperbola $r^2 = a^2 - b^2 + \frac{a^2b^2}{p^2}$ is :

- (1) $\frac{a^2b}{p^3}$ (2) $\frac{a^2b^2}{p^3}$
 (3) $\frac{ab^2}{p^3}$ (4) $\frac{a^2b^2}{p}$

119. $\int_0^1 \frac{x^3}{\sqrt{1-x^2}} dx$ is equal to :

- (1) $\frac{3}{2}$ (2) 0
 (3) $-\frac{3}{2}$ (4) $\frac{2}{3}$

120. The Co-ordinates of the centre of conic $x^2 + 12xy - 4y^2 - 6x + 4y + 9 = 0$ are :

(1) $\left(\frac{1}{2}, 0\right)$

(2) $\left(-\frac{1}{2}, 0\right)$

(3) $\left(0, \frac{1}{2}\right)$

(4) $\left(\frac{1}{2}, \frac{1}{2}\right)$

121. If $x = \cos\theta + i \sin\theta$, then $x^n + \frac{1}{x^n}$ is equal to :

(1) $2 \cos n\theta$

(2) $2i \cos n\theta$

(3) $\frac{\cos n\theta}{2}$

(4) $\cos 2n\theta$

122. The least positive integer (mod 11) to which 282 is congruent :

(1) 4

(2) 7

(3) 5

(4) 2

123. The integrating factor of differential equation $2 \cos(y^2) dx - xy \sin(y^2) dy = 0$ is :

(1) $\frac{1}{x^3}$

(2) x^2

(3) x^3

(4) $\frac{1}{x^2}$

124. Particular integral for the differential equation $(D^2 - 6D + 9)y = e^{3x}$ is :

(1) $\frac{e^{3x}}{2}$

(2) $x^2 e^{3x}$

(3) $\frac{e^{3x}}{x^2}$

(4) $\frac{x^2}{2} e^{3x}$

125. The value of λ so that the following vectors are coplanar $\vec{a} = 2\hat{i} - 7\hat{j} + \lambda\hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{c} = 3\hat{i} - 5\hat{j} + 2\hat{k}$ is :

(1) -3

(2) 3

(3) $\frac{1}{3}$

(4) $-\frac{1}{3}$

126. $\lim_{x \rightarrow \infty} x \tan \frac{1}{x}$ is :

- (1) 1 (2) -1
(3) 0 (4) 2

127. If $z = \tan^{-1}\left(\frac{x}{y}\right)$, then $\frac{\partial z}{\partial x}$ is :

- (1) 0 (2) $\frac{x}{x^2 + y^2}$
(3) $\frac{y}{x^2 + y^2}$ (4) $\frac{1}{x^2 + y^2}$

128. The partial differential equation $x \frac{\partial^2 z}{\partial x^2} + 2 \frac{\partial^2 z}{\partial y \partial x} + y \frac{\partial^2 z}{\partial y^2} + \frac{\partial z}{\partial x} = 0$ is parabolic if :

- (1) $xy \neq 1$ (2) $xy < 1$
(3) $xy > 1$ (4) $xy = 1$

129. The particular integral of the differential equation $\frac{\partial^3 z}{\partial x^3} - 3 \frac{\partial^3 z}{\partial x^2 \partial y} + 4 \frac{\partial^3 z}{\partial y^3} = e^{x+2y}$ is :

- (1) $\frac{e^x}{72}$ (2) $\frac{e^{x+2y}}{27}$
(3) $\frac{e^{x+2y}}{72}$ (4) $\frac{e^y}{27}$

130. Any wrench may be resolved into two wrenches, whose axes intersect at right angles in how many ways?

- (1) One way (2) Three ways
(3) Infinite number of ways (4) None of these

131. $\lim_{x \rightarrow \infty} \left(\frac{2}{1} \cdot \frac{3}{2} \cdot \frac{4}{3} \cdots \frac{n}{n-1} \right)^{\frac{1}{n}}$ is equal to :

- (1) 1 (2) -1 (3) 0 (4) $\frac{1}{2}$

132. The series $1^2 + 2^2 + 3^2 + \dots + n^2 + \dots$ diverges to :

- (1) $-\infty$ (2) $+\infty$
 (3) 0 (4) 1

133. The value of $H_{2n+1}(0)$ is :

- (1) 1 (2) -1
 (3) $\frac{1}{n}$ (4) 0

134. The inverse Laplace Transform of $\frac{1}{s^{7/2}}$ is :

- (1) $\sqrt{\frac{t}{\pi}}$ (2) $\frac{8}{15} \sqrt{\frac{t}{\pi}}$
 (3) $\frac{8t^2}{15} \sqrt{\frac{t}{\pi}}$ (4) 0

135. The operator $||$ means :

- (1) Logical OR (2) Logical AND
 (3) Logical NOT (4) None of these

136. Let (R, d) be the usual metric space. Then derived set of :

$$A = \left\{ \frac{1}{n} : n \in \mathbb{N} \right\} \text{ is :}$$

- (1) A (2) $\{0\}$ (3) ϕ (4) $\{1\}$

137. Let (X, d) be a metric space and A be any subset of X . Then A is open if and only if :
- (1) $A = -\overset{\circ}{A}$ (2) $A = \frac{1}{\overset{\circ}{A}}$
- (3) $\overset{\circ}{A} = A$ (4) None of these
138. If $G = \{1, \omega, \omega^2\}$ is the group of cube roots of unity, then order of ω^2 under the binary operation multiplication is :
- (1) 2 (2) 4
- (3) 1 (4) 3
139. A division ring has how many zero divisors ?
- (1) 1 (2) 3
- (3) 2 (4) None of these
140. "The rate of change of momentum is directly proportional to the impressed force and takes place in the direction of the force" is :
- (1) Newton's first law of motion
- (2) Newton's second law of motion
- (3) Newton's third law of motion
- (4) None of these
141. Time of flight of a projectile is given by :
- (1) $\frac{2u \sin \alpha}{g}$ (2) $\frac{u \sin \alpha}{g}$
- (3) $\frac{u \sin \alpha}{2g}$ (4) None of these

142. $T\left(\frac{1}{2}\right)$ is equal to :

- (1) e (2) π
 (3) $\sqrt{\pi}$ (4) \sqrt{e}

143. The fixed point of the Mobius transformation $w = \frac{3z-4}{z-1}$ is :

- (1) $z=1$ (2) $z=-1$
 (3) $z=-2$ (4) $z=2$

144. The set of vectors $\{(1,0), (0,1)\}$ in R^2 in :

- (1) Linearly dependent (2) Linearly independent
 (3) Not defined (4) None of these

145. If $T:V \rightarrow W$ is a linear transformation, then T is one-one iff $N(T)$ is :

- (1) $\{1\}$ (2) ϕ
 (3) 0 (4) None of these

146. For the table :

x	0	1	2	3	4	5
$f(x)$	0	3	8	15	24	25

$\Delta^3 f(x)$ is :

- (1) 3 (2) 0 (3) 2 (4) 7

147. For the data :

x	-1	1	2	3
$f(x)$	-21	15	12	3

$\Delta^2 f(x)$ are :

- (1) -7 and -3 (2) 7 and 3 (3) 7 and -3 (4) -7 and 3

148. Runge-Kutta method is a :

- (1) Single step method
- (2) Multiple step method
- (3) Method for solving cubic equation
- (4) None of these

149. The force acting on a system of n particles is conservative only if :

- (1) $\nabla \cdot \vec{F} = 0$
- (2) $\nabla \times \vec{F} = 0$
- (3) $\nabla \cdot \nabla \cdot \vec{F} = 0$
- (4) $\nabla \cdot \nabla \times \vec{F} = 0$

150. In Lagrangian's Equation Q_j represents :

- (1) Generalized force having dimensions of force explicitly
- (2) Quantized force having dimensions of force
- (3) Generalized force may or may not have dimensions of force
- (4) Work done by generalized force

151. The Hamiltonian, $H = T + V$ gives total energy :

- (1) when Cartesian and generalized coordinates do not depend on time explicitly
- (2) when only generalized coordinates do depend on time explicitly
- (3) when only Cartesian coordinates do not depend on time explicitly
- (4) when Cartesian and generalized coordinates depend on time explicitly

152. Any field, A^{\rightarrow} is said to solenoid field if :
- (1) $A^{\rightarrow} = \nabla \times V^{\rightarrow}$ and $\nabla \cdot A^{\rightarrow} = 0$
 - (2) $A^{\rightarrow} = \nabla \times V^{\rightarrow}$ and $\nabla \cdot A^{\rightarrow} = 0$
 - (3) $A^{\rightarrow} = \nabla \times V^{\rightarrow}$ and $\nabla \times A^{\rightarrow} = 0$
 - (4) $A^{\rightarrow} = \nabla \cdot V^{\rightarrow}$ and $\nabla \times A^{\rightarrow} = 0$
153. The total charge enclosed by a given surface through which 15000 lines of force is incoming and that of outgoing lines of force is 25000 :
- (1) $13.275 \times 10^{-8} C$
 - (2) $8.85 \times 10^{-12} C$
 - (3) $8.85 \times 10^{-8} C$
 - (4) $8.85 \times 10^{-8} C / s$
154. Name of program which translates a high level language into machine language :
- (1) compiler
 - (2) assembler
 - (3) register
 - (4) converter
155. The area enclosed by a cycle represents net work done as well as net heat of interaction is :
- (1) P - V diagram
 - (2) Carnot cycle
 - (3) T - S diagram
 - (4) Triple point diagram
156. A real gas shows neither heating nor cooling in Joule - Thomson effect if the initial temperature is :
- (1) less than inversion temperature
 - (2) greater than inversion temperature
 - (3) equal to inversion temperature
 - (4) equal to 273K.

157. If p_1 and p_2 be the probability of two independent events, then the probability of two events to take place simultaneously is :

(1) $p_1 + p_2$

(2) $p_1 \times p_2$

(3) p_1 / p_2

(4) $p_1 - p_2$

158. The two constraints used in determining the most probable macro-state are :

(1) $\sum n_i = n$ and $\sum n_i u_i = u$

(2) $\sum n_i = n$ and $\sum n_i v_i = v$

(3) $\sum n_i = n$ and $\sum n_i v_i = v / n$

(4) $\sum n_i = n$ and $\sum n_i u_i = u / n$

159. The essential condition for Fermi - Dirac statistics is :

(1) the particles are distinguishable

(2) the particles are indistinguishable

(3) there is no limit on the no. of particles present in a given energy state

(4) not more than one particle can be present in a given energy state

160. Boltzmann limit is given by

(1) $(n_i / g_i) \ll 1$ and satisfied by all gases at ordinary temperature

(2) $(g_i / n_i) \ll 1$ and satisfied by all gases at absolute temperature

(3) $(n_i / g_i) \gg 1$ and satisfied by all gases at ordinary temperature

(4) $(n_i \times g_i) \ll 1$ and satisfied by all gases at 0K

161. The ratio of rms value to the average value of alternating current is called Form Factor (FF) and given by :
- (1) 1.21, peak of wave is flat if FF less than 1.21
 - (2) 1.11, peak of wave is sharp if FF greater than 1.11
 - (3) 1.11, peak of wave is flat if FF greater than 1.11
 - (4) 2.11, peak of wave is flat if FF greater than 2.11
162. The quality factor of a series resonant circuit is given by :
- (1) $\frac{\omega L}{R}$ and depends on R only
 - (2) $\frac{\omega C}{R}$ and depends on R only
 - (3) $\frac{\omega R}{L}$ and depends on R only
 - (4) $\frac{\omega L}{R}$ and depends on L only
163. For a given transistor configuration if $I_c = 10.505\text{mA}$, $I_b = 100\mu\text{A}$ and $I_{CBO} = 5\mu\text{A}$, then value of α_{dc} and β_{dc} are :
- (1) 100 and 0.95
 - (2) 0.99 and 100
 - (3) 105 and 1.05
 - (4) 101 and 99.0
164. Calculate the apparent length of a meter rod, when it is carried in a rocket moving with a speed of $2.9 \times 10^8 \text{ m/s}$ take $c = 3.0 \times 10^8 \text{ m/s}$
- (1) 0.254 m
 - (2) 0.52 m
 - (3) 0.359 m
 - (4) 1.0 m

165. The dirichlet conditions for an expandable function, $f(x)$ are :

- (1) non-periodic, single valued, finite and continuous
- (2) periodic, single valued, infinite and continuous
- (3) periodic, single valued, finite and continuous
- (4) periodic, single valued, infinite and in continuous

166. The order of dead time and recovery time in a G.M. counter is :

- | | |
|-----------------------|--------------------------|
| (1) $100\mu\text{s}$ | (2) $10\mu\text{s}$ |
| (3) $10^3\mu\text{s}$ | (4) $10^{-3}\mu\text{s}$ |

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SEAL

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

CPG-EE-2017 (Forensic Science)-(SET-B)



Use for faculty

10179

Sr. No.

Time : 1½ Hours

Total Questions : 166

Max. Marks : 100

Roll No. (in figures) _____ (in words) _____

Candidate's Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Exam : _____

(Signature of the Candidate)

(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions of **Section-"A"** are **compulsory**. Students are required to attempt either **Section "B"** or **Section "C"**. Students of *Medical Group* are required to attempt **Section "B"**. Students of *Non-Medical Group* are required to attempt **Section "C"**. All questions carry equal marks i.e. one mark each.
2. The candidates **must return** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself.
4. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing **within two hours** after the test is over. No such complaint(s) will be entertained thereafter.
5. **Use only blue or black ball point pen of good quality in the OMR Answer-Sheet.**
6. There will be **negative** marking. Each correct answer will be awarded **one** full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
7. *Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after the start of examination.*

CPG-EE-2017(Forensic Science)-(SET-B)/(C)

SEAL

SECTION - A

- Compound A undergoes formation of cynohydrin which on hydrolysis gives lactic acid. Therefore, compound A is :
 - formaldehyde
 - acetaldehyde
 - acetone
 - benzaldehyde
- Which of the following polymer is thermosetting polymer ?
 - Nylon-6
 - Nylon-6,6
 - Bakelite
 - None of these
- Which of the following is useful in treatment of cyanide poisoning ?
 - Amyl nitrite
 - Sodium nitrite
 - Nitrite thiosulphate
 - All of the above
- Enthalpies of combustion of methane, graphite and hydrogen are 890.2 kJ, 393.4 kJ and 285.7 kJ respectively. Enthalpy of formation of methane is :
 - $-211.1 \text{ kJ mol}^{-1}$
 - $-890.2 \text{ kJ mol}^{-1}$
 - $-74.6 \text{ kJ mol}^{-1}$
 - 85.7 kJ mol^{-1}
- Containers A, B and C of equal volume contain oxygen, neon and methane respectively at the same temperature and pressure. The correct order of their masses is :
 - $A < B < C$
 - $B < C < A$
 - $C < A < B$
 - $C < B < A$
- A substance which can act both as an antiseptic and disinfectant is :
 - Aspirin
 - Phenol
 - Analgin
 - Sodium pentothal
- Out of the following which does *not* exhibit IR spectra ?
 - O_2
 - CO_2
 - SO_2
 - HBr
- Hyperconjugation involves overlap of the following orbitals :
 - $\sigma - \sigma$
 - $\sigma - p$
 - $p - p$
 - $\pi - \pi$

9. The correct order of reactivity towards electrophilic substitution of the compound amongst the following aniline (I), benzene (II) and nitrobenzene (III) is :
- (1) II > III > I (2) I < II > III
(3) I > II > III (4) III > II > I
10. Vitamin B₁₂ contains :
- (1) cobalt (2) magnesium (3) iron (4) nickel
11. IUPAC name of $[\text{Cr}(\text{CO})_5\{\text{P}(\text{C}_6\text{H}_5)_3\}]$ is :
- (1) Triphenylphosphine pentacarbonyl chromium (0)
(2) Pentacarbonyl triphenylphosphine chromium (0)
(3) Pentacarbonyl triphenylphosphine chromate (III)
(4) Triphenylphosphine pentacarbonyl chromate (III)
12. Which one of the following ions is colourless ?
- (1) U^{3+} (2) Cm^{4+} (3) Th^{4+} (4) Pu^{4+}
13. Solubility of iodine in liquid SO_2 is increased on addition of KI. This is attributed to the formation of:
- (1) KI_3 (2) $\text{I}_2 \cdot \text{SO}_2$ (3) $\text{KI} \cdot \text{ASO}_2$ (4) SOI_2
14. $\text{PbI}_2 + \text{KNH}_2 \xrightarrow{\text{liq. NH}_3}$
- Products of the Reaction are :
- (1) $\text{PbNH}_2 \downarrow + \text{I}_2 + \text{KI}$ (2) $\text{PbNH} \downarrow + \text{HI} + \text{KI}$
(3) $\text{PbNH}_2 \downarrow + \text{KI}_3$ (4) None of the above
15. Which gives red colour with Fehling solution ?
- (1) Glucose (2) Cellulose
(3) Benzaldehyde (4) Cane sugar
16. O_2^{2-} is isoelectronic with :
- (1) H_2 (2) N_2 (3) F_2 (4) S

17. Which one of the following species is paramagnetic ?
(1) O_2^- (2) CN^- (3) CO (4) F_2
18. In $NaCl$ type structure, the coordination numbers of cation and anion are :
(1) 6 and 4 (2) 6 and 6 (3) 4 and 4 (4) 8 and 4
19. Which one of the following complex can exhibit coordination isomers ?
(1) $[Co(NH_3)_6][Cr(CN)_6]$ (2) $[Cr(NH_3)_6]Cl_3$
(3) $[Co(en)_2Cl_2]^+$ (4) $[Cr(en)_2Cl_2]^+$
20. $Cr(CO)_x$ has EAN of Cr = 36, hence x = :
(1) 2 (2) 4 (3) 6 (4) 5
21. The SI units of the Vander Waals b term are :
(1) $m^3 \text{ mol}$ (2) m^2 / mol (3) m^3 / mol (4) $m^2 \text{ mol}$
22. The law which relates the solubility of a gas to its pressure is called :
(1) Raoult's law (2) The distribution law
(3) Henry's law (4) Ostwald's law
23. By adding a non-volatile solute to a solvent, the boiling point of the solvent :
(1) will increase (2) will decrease
(3) will not change (4) may increase or decrease
24. If $2.303RT/F = 0.059$ and the activities of the solids are constant, then e.m.f. of the cell $Zn | Zn^{2+} (a_1) || Cu^{2+} (a_2) | Cu$ is :
(1) $E = E^\circ - 0.059 \log (a_2 / a_1)$ (2) $E = E^\circ + 0.059 \log (a_2 / a_1)$
(3) $E = E^\circ - \frac{0.059}{2} \log (a_2 / a_1)$ (4) $E = E^\circ + \frac{0.059}{2} \log (a_2 / a_1)$
25. The hybridization of Xe in XeO_2F_2 is :
(1) sp^3d (2) sp^3d^2 (3) sp^3d^3 (4) dsp^3

26. The difference between ΔH and ΔU at constant volume is equal to :
(1) R (2) $p\Delta V$ (3) $V\Delta p$ (4) $3/2R$
27. The enthalpies of formation of gaseous N_2O and NO at 298K are 82 and 90 kJ mol^{-1} .
The enthalpy of the reaction $N_2O(g) + \frac{1}{2}O_2 \rightarrow 2NO(g)$ is :
(1) -8 kJ (2) 98 kJ (3) -74 kJ (4) 8 kJ
28. The overall energy change during Carnot cycle is :
(1) equal to w (2) zero (3) maximum (4) equal to q
29. A process in which the system, after undergoing various processes, returns to its initial state is called a/an :
(1) reversible process (2) irreversible process
(3) cyclic process (4) Hess law
30. The diameter of molecule B is half that of molecule A , the ratio of mean free path (λ_A/λ_B) will be :
(1) $1/2$ (2) $1/4$ (3) 4 (4) 2
31. The root mean square velocity of an ideal gas at constant pressure varies with density ' d ' is :
(1) d^2 (2) $b.d$ (3) \sqrt{d} (4) $1/\sqrt{d}$
32. For the reaction $2Cl(g) \rightarrow Cl_2(g)$ the signs of ΔH and ΔS respectively are :
(1) +, - (2) +, + (3) -, - (4) -, +
33. The principal buffer present in human blood is :
(1) $H_3PO_4 + NaH_2PO_4$ (2) $CH_3COOH + CH_3COONa$
(3) $Na_2HPO_4 + Na_3PO_4$ (4) $H_2CO_3 + HCO_3^-$
34. If a neutral solution has $pK_w = 13.36$ at 50°C , then pH of the solution is :
(1) 6.68 (2) 7 (3) 7.63 (4) 3.5

SECTION – B

35. Which one of the following is *not* a characteristic of an ecosystem ?
- (1) It is self regulated
 - (2) It is leaky in relation to flow of matter and energy
 - (3) It has relations with the surrounding ecosystems
 - (4) It does not change with time
36. Green house effect is related to which of the following cycle ?
- (1) Carbon
 - (2) Nitrogen
 - (3) Oxygen
 - (4) Sulphur
37. Which of the following is *not* a grassland ?
- (1) Prairie
 - (2) Pampa
 - (3) Steppe
 - (4) Tundra
38. Which of the following statements about human evolution is *not* correct ?
- (1) The first species of genus *Homo* was *Homo habilis*
 - (2) Fossil of *Australopithecus anamensis* was found in Kenya
 - (3) *Homo erectus* was the first to move out of Africa
 - (4) *Sivapithecus* was ancestor of man
39. A bacterium that can cause tumors in plants and transfer its genes to them is :
- (1) *Bacillus thuriengensis*
 - (2) *Rhizobium*
 - (3) *Nitrobacterium*
 - (4) *Agrobacterium*
40. Which of the following vectors contain DNA sequences from lambda phage ?
- (1) Plasmid Ti
 - (2) Cosmid
 - (3) RNA phase
 - (4) Plasmid Ri

53. Which of the following statement is wrong ?
- (1) *Pyrilla perpusilla* is a bug
 - (2) Adults of red pumpkin beetles attack vegetables
 - (3) The name Gandhibug of *Lepocorisa Oratorius* is derived from its unpleasant odour
 - (4) *Tribolium castanneum* is known as lesser grain borer.
54. Hadda beetles usually prefer to feed on :
- (1) Brinjal
 - (2) Brinjal and Potato
 - (3) Citrus fruits
 - (4) Sugarcane
55. The pigments found in polysiphonia (algae) are :
- (1) Chlorophyll only
 - (2) Phycocyanin only
 - (3) Phycocyanin and chlorophyll
 - (4) Phycocyanin and phycoerythrine
56. Life cycle which contain a dominant multicellular diploid stage, are called :
- (1) Gametic type
 - (2) Zygotic type
 - (3) Sporic type
 - (4) Gametophytic type
57. Which of the following statements are *correct* ?
- (A) *Puccinia graminis* is known as stem-rust of wheat
 - (B) D-glutamic acid and D-lysin are found in bacterial cell wall
 - (C) 80s ribosomes are found in bacteria
 - (D) *E. Coli.* is found in cluster form
- The correct answer is :
- (1) A and B
 - (2) B and C
 - (3) C and D
 - (4) B, C and D
58. Which of the following cells are involved in fight against cancer ?
- (1) B Cells
 - (2) Natural killer cells
 - (3) Memory cells
 - (4) Plasma cells
59. Which of the following cancers are associated with Human Papilloma virus ?
- (1) Lung
 - (2) Cervical
 - (3) Ovarian
 - (4) Liver

60. The true skeleton of a cell is formed by :
- (1) Actin filaments
 - (2) Microtubules
 - (3) Intermediate filaments
 - (4) Actin filaments and microtubules
61. When in a eukaryotic cell all the copies of its mitochondrial DNA are identical, it is called :
- (1) Homoplasmy
 - (2) Heteroplasmy
 - (3) Apospory
 - (4) None of the above
62. Oxydative phosphorylation enzyme system is found in which part of the mitochondria ?
- (1) Cytosol
 - (2) Outer membrane of mitochondria
 - (3) Inner membrane of mitochondria
 - (4) Mitochondrial fluid
63. The main function of peroxisome is :
- (1) Catabolism of very long chain fatty acids
 - (2) Glyoxylate cycle in seeds
 - (3) Phosphorespiration in leaves
 - (4) Glycolysis in Trypanosomes
64. In Bryophytes, heterothallic condition is :
- (1) When male sex organs are not formed
 - (2) When male and female sex organs are found in the same individual
 - (3) When male and female sex organs are found in separate individuals
 - (4) When two different forms of thallus occur
65. Which of the following statements are *not* correct ?
- (1) *Funaria hygrometrica* is a common moss on Indian hills
 - (2) The adult plant body of *Anthoceros* is a sporophyte
 - (3) *Selaginella* bears spores of two types
 - (4) Apogamy is a type of reproduction in some ferns in which sporophyte develops from the gametophyte without fusion of gametes
66. In which of the following animals sex is determined by hormones ?
- (1) Hippocampus
 - (2) Alligator
 - (3) Bonellia
 - (4) Cobra

67. Which of the following types of inheritance is *not* found in ciliate protozoa ?
- (1) Chloroplast inheritance
 - (2) Mendalian inheritance
 - (3) Cortical inheritance
 - (4) Cytoplasmic inheritance
68. The cytoplasmic factors responsible for male sterility in maize plants, are located in :
- (1) Nucleus
 - (2) Mitochondria
 - (3) Chloroplast
 - (4) Cytosol
69. Mitochondrial DNA is *not* associated with which of the following ?
- (1) Regulation of apoptosis
 - (2) Generation of reactive oxygen species
 - (3) Energy production
 - (4) Regulation of cellular transport
70. Which of the following is a chaperone ?
- (1) Nucleoplasmin
 - (2) Chromatosome
 - (3) Histone H_1 and H_2
 - (4) Histone H_3 and H_4
71. Unexplained substantial variation in the haploid nuclear DNA content even between closely related species is called :
- (1) Kinetic complexity
 - (2) Haploidy
 - (3) Aneuploidy
 - (4) C-value paradox
72. Which of the following disease is *not* spread by housefly ?
- (1) Amoebic dysentery
 - (2) Cholera
 - (3) Typhoid
 - (4) Plague
73. Coelomic cavity of Balanoglossus is made up of how many parts ?
- (1) One
 - (2) Two
 - (3) Four
 - (4) Five

74. Which of the following pairs are correctly matched ?

- (A) Trochophore – Balanoglossus
- (B) Bipinnaria–Asterias
- (C) Holothuria – Auricularia
- (D) Fasciola – Cercaria

The **correct** answer is :

- (1) A and B only
- (2) B and D only
- (3) C and D only
- (4) B, C and D only

75. The early seed fern *Ekinsia* evolved in :

- (1) Late Devonian
- (2) Early Devonian
- (3) Carboniferous
- (4) Triassic

76. Coralloid roots are found in :

- (1) Lycopodium
- (2) Pinus
- (3) Cycas
- (4) Dryopteris

77. Which of the following is **not** correctly matched ?

- (1) Marigold – Capitulum
- (2) Mimosa – Corymb
- (3) Brassica – Spike
- (4) Anthurium – Spadix

78. Synandrous condition is found in the family :

- (1) Cucurbitaceae
- (2) Ranunculaceae
- (3) Leguminosae
- (4) Liliaceae

79. Which of the following statements are **not** correct ?

- (A) Spike inflorescence is found in Acalypha.
- (B) Fruit of family ranunculaceae is etaerio.
- (C) The inflorescence which appear like a single bisexual flower is cyathium.
- (D) Almost all plants have latex in family euphorbiaceae.

The **correct** answer is :

- (1) A and D
- (2) B and C
- (3) A only
- (4) C only

80. In the secondary steles of *Boerhaavia* :
- (1) Xylem surrounds phloem (2) Phloem surrounds xylem
(3) Both are parallel (4) Both are alternate
81. In which of the following plants secondary growth occurs ?
- (1) Yucca (2) Dracaena
(3) Oryza (4) Triticum
82. Which of the following is *not* a part of periderm of a plant ?
- (1) Phellogen (2) Phelloderm
(3) Phellem (4) Phloem
83. Path of pollen tubes in the pistil is guided by :
- (1) Enzymes of the pollen apparatus (2) Stigmatic fluid
(3) Tissues of the style (4) Secration of ovule
84. Which of the following type of the fruit, strawberry is ?
- (1) Drupe (2) Berry
(3) Achene (4) Follicle
85. In which of the following animals, blood flows in both the directions (reverse also) ?
- (1) Petromyzon (2) Fish
(3) Herdmania (4) Branchistoma
86. Respiration of the cephalochordates occurs through which of the following ?
- (1) Lungs (2) Gills
(3) Fins (4) General body surface

87. Which of the following pairs are correctly matched ?

- (A) *Alytes* – midwife toad
- (B) *Petromyzon* – male is parasite on female
- (C) Bony fish – cycloid scale
- (D) *Ichthyophis* – apoda

The answer is :

- (1) A, B, C and D
- (2) B, C and D only
- (3) A and B only
- (4) A and D only

88. Which of the following is *not* a flight muscle ?

- (1) Coraco-brachialis brevis
- (2) Coraco-brachialis langus
- (3) Gastronemius
- (4) Pectoralis major

89. Non-renal and pronephric head kidneys are found in :

- (1) *Rana*
- (2) *Hemidactylus*
- (3) *Labeo*
- (4) Alligator

90. The optimum pH for action of pancreatic amylase is :

- (1) 3.7
- (2) 5.4
- (3) 6.2
- (4) 7.1

91. For the digestion of fatty acids, which of the following are required ?

- (1) Alpha-lipase only
- (2) Colipase only
- (3) Alpha-lipase + Colipase
- (4) Alpha-lipase + Colipase + bile salts

92. Which of the following statements are *not* true ?

- (A) Autonomic nervous system controls smooth muscles.
- (B) Sympathetic nervous system is voluntarily controlled via fore-brain.
- (C) The action potential a neuron is terminated by efflux of potassium.
- (D) Schwann cell is responsible for myelin secretion on the peripheral nerves.

The answer is :

- (1) B only
- (2) B and C only
- (3) C and D only
- (4) A, C and D only

93. Which of the following are *not* matched correctly ?

- (A) Hypoxia – deficiency of O_2 in the tissues
- (B) Tidal volume in normal man – 0.5 liters
- (C) Proximal convoluted kidney tubule – reabsorption
- (D) Stomach – cholecystokinin secretion

The answer is :

- (1) A and B only
- (2) A and C only
- (3) B only
- (4) D only

94. Which of the following statements are *not* correct ?

- (A) Testosterone acts by a second messenger system.
- (B) Triiodothyronine binds to intracellular receptors.
- (C) Epinephrine is not a neurotransmitter.
- (D) A steroid hormone enters the target cell and alters its gene expression.

The answer is :

- (1) A and C only
- (2) A and D only
- (3) B and C only
- (4) C and D only

95. The enzyme that fixes atmospheric carbon dioxide in C_4 plants is :

- (1) Hydrogenase
- (2) PEP carboxylase
- (3) RuBP Oxygenase
- (4) Hydrolase

96. Which of the following statements are *incorrect* about movement of water through xylem of plant ?

- (1) Root pressure plays important role
- (2) Transpiration pull has no role
- (3) Capillary action has no role
- (4) Hydrogen ion/ATPase pump at the xylem element membrane plays a role

97. Most of the plant cytokinins are synthesized in :

- (1) Flowers
- (2) Roots
- (3) Leaves
- (4) Stem

98. Phytochrome plays a key role in :

- (1) Photomorphogenesis
- (2) Water transport
- (3) Electrolyte balancing
- (4) Stomatal movement

99. Most of the CO_2 generated on the earth is absorbed by :
- (1) Green plants (2) Green plants and Oceans
(3) Lime stones (4) All of these
100. Which of the following statement is *false* ?
- (1) Sweet sorghum is used to obtain ethanol.
(2) Quinine is obtained from the bark of Rauwolfia.
(3) Sunflower is a source of edible oil.
(4) Morphine is obtained from opium plant.

SECTION - C

101. A real gas shows neither heating nor cooling in Joule - Thomson effect if the initial temperature is :
- (1) less than inversion temperature
(2) greater than inversion temperature
(3) equal to inversion temperature
(4) equal to 273K.
102. If p_1 and p_2 be the probability of two independent events, then the probability of two events to take place simultaneously is :
- (1) $p_1 + p_2$ (2) $p_1 \times p_2$
(3) p_1 / p_2 (4) $p_1 - p_2$
103. The two constraints used in determining the most probable macro-state are :
- (1) $\sum n_i = n$ and $\sum n_i u_i = u$ (2) $\sum n_i = n$ and $\sum n_i v_i = v$
(3) $\sum n_i = n$ and $\sum n_i v_i = v / n$ (4) $\sum n_i = n$ and $\sum n_i u_i = u / n$

104. The essential condition for Fermi - Dirac statistics is :

- (1) the particles are distinguishable
- (2) the particles are indistinguishable
- (3) there is no limit on the no. of particles present in a given energy state
- (4) not more than one particle can be present in a given energy state

105. Boltzmann limit is given by

- (1) $(n_i / g_i) \ll 1$ and satisfied by all gases at ordinary temperature
- (2) $(g_i / n_i) \ll 1$ and satisfied by all gases at absolute temperature
- (3) $(n_i / g_i) \gg 1$ and satisfied by all gases at ordinary temperature
- (4) $(n_i \times g_i) \ll 1$ and satisfied by all gases at 0K

106. The ratio of rms value to the average value of alternating current is called Form Factor (FF) and given by :

- (1) 1.21, peak of wave is flat if FF less than 1.21
- (2) 1.11, peak of wave is sharp if FF greater than 1.11
- (3) 1.11, peak of wave is flat if FF greater than 1.11
- (4) 2.11, peak of wave is flat if FF greater than 2.11

107. The quality factor of a series resonant circuit is given by :

- (1) $\frac{\omega L}{R}$ and depends on R only
- (2) $\frac{\omega C}{R}$ and depends on R only
- (3) $\frac{\omega R}{L}$ and depends on R only
- (4) $\frac{\omega L}{R}$ and depends on L only

108. For a given transistor configuration if $I_c = 10.505\text{mA}$, $I_b = 100\mu\text{A}$ and $I_{CBO} = 5\mu\text{A}$, then value of α_{dc} and β_{dc} are :
- (1) 100 and 0.95 (2) 0.99 and 100
(3) 105 and 1.05 (4) 101 and 99.0
109. Calculate the apparent length of a meter road, when it is carried in a rocket moving with a speed of $2.9 \times 10^8\text{ m/s}$ take $c = 3.0 \times 10^8\text{ m/s}$
- (1) 0.254 m (2) 0.52 m
(3) 0.359 m (4) 1.0 m
110. The dirichlet conditions for an expandable function, $f(x)$ are :
- (1) non-periodic, single valued, finite and continuous
(2) periodic, single valued, infinite and continuous
(3) periodic, single valued, finite and continuous
(4) periodic, single valued, infinite and in continuous
111. The necessary condition for achromatic combination is :
- (1) Two lenses should be of same materials
(2) Two lenses should be of different materials
(3) Two lenses should be of same focal length
(4) Two lenses should be of same radius of curvature
112. For Newton's ring due to transmitted light, the central maximum ($n=0$) is :
- (1) dark with zero diameter (2) bright with zero diameter
(3) may be bright or dark (4) None of above

113. The Young's double slit experiment is performed with blue and green light of wavelengths 4360 \AA and 5460 \AA respectively. If X is the distance of 4th maxima from the central maxima, then :

- (1) $X_{\text{blue}} = X_{\text{green}}$
- (2) $X_{\text{blue}} > X_{\text{green}}$
- (3) $X_{\text{blue}} < X_{\text{green}}$
- (4) $X_{\text{blue}} / X_{\text{green}} = \lambda_{\text{green}} / \lambda_{\text{blue}}$

114. The angular half width of the principal maxima of a plane diffraction grating is :

- (1) very narrow and sharp
- (2) very broad and dim
- (3) very narrow and dim
- (4) very broad and sharp

115. A polarimeter suitable for color blind persons is :

- (1) bi-quartz polarimeter
- (2) half shade polarimeter
- (3) saccharimeter
- (4) None of above

116. The cubic lattice most densely packed is :

- (1) BCC with packing factor 0.680
- (2) SC with packing factor 0.524
- (3) HCP with packing factor 0.740
- (4) FCC with packing factor 0.740

117. X-Ray diffraction method used for structure determination of single crystal is :

- (1) Power crystal method
- (2) Rotating crystal method
- (3) Laue method
- (4) None of above

118. Relation between volume of unit cell, UT [in direct lattice(DL)] and reciprocal lattice(RL) is :

(1) $(\text{Volume of UT})_{\text{RL}} = 4\pi^2/(\text{Volume of UT})_{\text{DL}}$

(2) $(\text{Volume of UT})_{\text{DL}} = 4\pi^2/(\text{Volume of UT})_{\text{RL}}$

(3) $(\text{Volume of UT})_{\text{RL}} = 8\pi^3/(\text{Volume of UT})_{\text{DL}}$

(4) $(\text{Volume of UT})_{\text{DL}} = 8\pi^3/(\text{Volume of UT})_{\text{RL}}$

119. Phonons are defined as :

(1) optical energy given to unit cell

(2) Lattice vibrations quantized energy

(3) Lattice vibrations continuous energy

(4) continuous heat energy given to lattice

120. The energy of gamma photon having a wavelength 1.5 \AA (take $h = 6.634 \times 10^{-34} \text{ Js}$)

(1) $8.275 \times 10^3 \text{ eV}$

(2) $13.24 \times 10^{-4} \text{ eV}$

(3) $10.24 \times 10^{-3} \text{ eV}$

(4) $1.6 \times 10^{-19} \text{ eV}$

121. The ratio of kinetic energy of proton to that of α -particle, when a proton and an α -particle have equal de-Broglie wavelengths is :

(1) 1:2

(2) 2:1

(3) 1:1

(4) 4:1

122. In Schrodinger's equation, eigen values means :

- (1) value of energy (2) value of position
(3) value of frequency (4) none of above

123. Zero-point energy of an oscillator is given by :

- (1) $h\nu$ (2) zero
(3) infinite (4) $\left(\frac{1}{2}\right)h\nu$

124. The factors that control the allowed values of energy of a particle in a potential well are :

- (1) width and depth of potential well
(2) time and energy of potential well
(3) depth and energy of potential well
(4) time and width of potential well

125. In Moseley's law which leads to correct sequence of putting the elements in periodic chart, frequency of X-ray spectral line depends on :

- (1) Z (2) $(Z)^2$
(3) $(Z)^{1/2}$ (4) $(Z)^3$

(Z = Atomic No. of Element)

126. The product of the characteristic roots of the matrix :

$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix} \text{ is :}$$

- (1) 3 (2) 18 (3) 0 (4) 45

127. If the roots of equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A. P., then one of the root is :

- (1) 4 (2) 3 (3) -4 (4) 6

128. The radius of curvature of the hyperbola $r^2 = a^2 - b^2 + \frac{a^2b^2}{p^2}$ is :

- (1) $\frac{a^2b}{p^3}$ (2) $\frac{a^2b^2}{p^3}$ (3) $\frac{ab^2}{p^3}$ (4) $\frac{a^2b^2}{p}$

129. $\int_0^1 \frac{x^3}{\sqrt{1-x^2}} dx$ is equal to :

- (1) $\frac{3}{2}$ (2) 0 (3) $-\frac{3}{2}$ (4) $\frac{2}{3}$

130. The Co-ordinates of the centre of conic $x^2 + 12xy - 4y^2 - 6x + 4y + 9 = 0$ are :

- (1) $\left(\frac{1}{2}, 0\right)$ (2) $\left(-\frac{1}{2}, 0\right)$
(3) $\left(0, \frac{1}{2}\right)$ (4) $\left(\frac{1}{2}, \frac{1}{2}\right)$

131. If $x = \cos\theta + i\sin\theta$, then $x^n + \frac{1}{x^n}$ is equal to :

- (1) $2 \cos n\theta$ (2) $2i \cos n\theta$
(3) $\frac{\cos n\theta}{2}$ (4) $\cos 2n\theta$

132. The least positive integer (mod 11) to which 282 is congruent :

- (1) 4 (2) 7 (3) 5 (4) 2

133. The integrating factor of differential equation $2 \cos(y^2) dx - xy \sin(y^2) dy = 0$ is :

- (1) $\frac{1}{x^3}$ (2) x^2
(3) x^3 (4) $\frac{1}{x^2}$

144. The inverse Laplace Transform of $\frac{1}{s^{7/2}}$ is :

(1) $\sqrt{\frac{t}{\pi}}$

(2) $\frac{8}{15} \sqrt{\frac{t}{\pi}}$

(3) $\frac{8t^2}{15} \sqrt{\frac{t}{\pi}}$

(4) 0

145. The operator $||$ means :

(1) Logical OR

(2) Logical AND

(3) Logical NOT

(4) None of these

146. Let (R, d) be the usual metric space. Then derived set of :

$$A = \left\{ \frac{1}{n} : n \in \mathbb{N} \right\} \text{ is :}$$

(1) A

(2) $\{0\}$

(3) ϕ

(4) $\{1\}$

147. Let (X, d) be a metric space and A be any subset of X. Then A is open if and only if :

(1) $A = -A^\circ$

(2) $A = \frac{1}{A}^\circ$

(3) $A = A^\circ$

(4) None of these

148. If $G = \{1, w, w^2\}$ is the group of cube roots of unity, then order of w^2 under the binary operation multiplication is :

(1) 2

(2) 4

(3) 1

(4) 3

149. A division ring has how many zero divisors ?

- (1) 1 (2) 3
(3) 2 (4) None of these

150. "The rate of change of momentum is directly proportional to the impressed force and takes place in the direction of the force" is :

- (1) Newton's first law of motion
(2) Newton's second law of motion
(3) Newton's third law of motion
(4) None of these

151. Time of flight of a projectile is given by :

- (1) $\frac{2u \sin \alpha}{g}$ (2) $\frac{u \sin \alpha}{g}$
(3) $\frac{u \sin \alpha}{2g}$ (4) None of these

152. $T\left(\frac{1}{2}\right)$ is equal to :

- (1) e (2) π
(3) $\sqrt{\pi}$ (4) \sqrt{e}

153. The fixed point of the Mobius transformation $w = \frac{3z-4}{z-1}$ is :

- (1) $z = 1$ (2) $z = -1$
(3) $z = -2$ (4) $z = 2$

154. The set of vectors $\{(1, 0), (0, 1)\}$ in R^2 is :

- (1) Linearly dependent (2) Linearly independent
(3) Not defined (4) None of these

155. If $T : V \rightarrow W$ is a linear transformation, then T is one-one iff $N(T)$ is :

- (1) $\{1\}$ (2) ϕ
 (3) 0 (4) None of these

156. For the table :

x	0	1	2	3	4	5
$f(x)$	0	3	8	15	24	25

$\Delta^3 f(x)$ is :

- (1) 3 (2) 0
 (3) 2 (4) 7

157. For the data :

x	-1	1	2	3
$f(x)$	-21	15	12	3

$\Delta^2 f(x)$ are :

- (1) -7 and -3 (2) 7 and 3
 (3) 7 and -3 (4) -7 and 3

158. Runge-Kutta method is a :

- (1) Single step method
 (2) Multiple step method
 (3) Method for solving cubic equation
 (4) None of these

159. The force acting on a system of n particles is conservative only if :

(1) $\nabla \cdot F \rightarrow = 0$

(2) $\nabla \times F \rightarrow = 0$

(3) $\nabla \cdot \nabla \cdot F \rightarrow = 0$

(4) $\nabla \cdot \nabla \times F \rightarrow = 0$

160. In Lagrangian's Equation Q_j represents :

(1) Generalized force having dimensions of force explicitly

(2) Quantized force having dimensions of force

(3) Generalized force may or may not have dimensions of force

(4) Work done by generalized force

161. The Hamiltonian, $H = T + V$ gives total energy :

(1) when Cartesian and generalized coordinates do not depend on time explicitly

(2) when only generalized coordinates do depend on time explicitly

(3) when only Cartesian coordinates do not depend on time explicitly

(4) when Cartesian and generalized coordinates depend on time explicitly

162. Any field, $A \rightarrow$ is said to solenoid field if :

(1) $A \rightarrow = \nabla \times V \rightarrow$ and $\nabla \cdot A \rightarrow = 0$

(2) $A \rightarrow = \nabla \times V \rightarrow$ and $\nabla \cdot A \rightarrow = 0$

(3) $A \rightarrow = \nabla \times V \rightarrow$ and $\nabla \times A \rightarrow = 0$

(4) $A \rightarrow = \nabla \cdot V \rightarrow$ and $\nabla \times A \rightarrow = 0$

163. The total charge enclosed by a given surface through which 15000 lines of force is incoming and that of outgoing lines of force is 25000 :

(1) $13.275 \times 10^{-8} C$

(2) $8.85 \times 10^{-12} C$

(3) $8.85 \times 10^{-8} C$

(4) $8.85 \times 10^{-8} C / s$

164. Name of program which translates a high level language into machine language :
- (1) compiler (2) assembler
(3) register (4) converter
165. The area enclosed by a cycle represents net work done as well as net heat of interaction is :
- (1) P - V diagram (2) Carnot cycle
(3) T - S diagram (4) Triple point diagram
166. The order of dead time and recovery time in a G.M. counter is :
- (1) $100\mu\text{s}$ (2) $10\mu\text{s}$
(3) $10^3\mu\text{s}$ (4) $10^{-3}\mu\text{s}$

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(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

CPG-EE-2017 (Forensic Science)-(SET-B)

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Sr. No.

Time : 1½ Hours

Total Questions : 166

Max. Marks : 100

Roll No. (in figures) _____ (in words) _____

Candidate's Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Exam : _____

(Signature of the Candidate)

(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions of **Section-"A"** are **compulsory**. Students are required to attempt either **Section "B"** or **Section "C"**. Students of *Medical Group* are required to attempt **Section "B"**. Students of *Non-Medical Group* are required to attempt **Section "C"**. All questions carry equal marks i.e. one mark each.
2. The candidates **must return** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself.
4. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing **within two hours** after the test is over. No such complaint(s) will be entertained thereafter.
5. **Use only blue or black ball point pen of good quality in the OMR Answer-Sheet.**
6. There will be **negative** marking. Each correct answer will be awarded **one** full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
7. *Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after the start of examination.*

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Handwritten scribbles and faint markings in the center of the page.

Faint, illegible text is visible throughout the page, appearing to be bleed-through from the reverse side. The text is organized into several sections, some of which are numbered:

- Section 1: (1) ... (2) ...
- Section 2: (1) ... (2) ...
- Section 3: (1) ... (2) ...
- Section 4: (1) ... (2) ...
- Section 5: (1) ... (2) ...
- Section 6: (1) ... (2) ...
- Section 7: (1) ... (2) ...
- Section 8: (1) ... (2) ...
- Section 9: (1) ... (2) ...

SECTION - A

- A substance which can act both as an antiseptic and disinfectant is :
 - Aspirin
 - Phenol
 - Analgin
 - Sodium pentothal
- Out of the following which does *not* exhibit IR spectra ?
 - O_2
 - CO_2
 - SO_2
 - HBr
- Hyperconjugation involves overlap of the following orbitals :
 - $\sigma-\sigma$
 - $\sigma-p$
 - $p-p$
 - $\pi-\pi$
- The correct order of reactivity towards electrophilic substitution of the compound amongst the following aniline (I), benzene (II) and nitrobenzene (III) is :
 - $II > III > I$
 - $I < II > III$
 - $I > II > III$
 - $III > II > I$
- Vitamin B_{12} contains :
 - cobalt
 - magnesium
 - iron
 - nickel
- The difference between ΔH and ΔU at constant volume is equal to :
 - R
 - $p\Delta V$
 - $V\Delta p$
 - $3/2R$
- The enthalpies of formation of gaseous N_2O and NO at 298K are 82 and 90 kJ mol^{-1} .
The enthalpy of the reaction $N_2O(g) + \frac{1}{2}O_2 \rightarrow 2NO(g)$ is :
 - 8 kJ
 - 98 kJ
 - 74 kJ
 - 8 kJ
- The overall energy change during Carnot cycle is :
 - equal to w
 - zero
 - maximum
 - equal to q
- A process in which the system, after undergoing various processes, returns to its initial state is called a/an :
 - reversible process
 - irreversible process
 - cyclic process
 - Hess law

10. The diameter of molecule B is half that of molecule A , the ratio of mean free path (λ_A/λ_B) will be :
- (1) $1/2$ (2) $1/4$ (3) 4 (4) 2
11. The SI units of the Vander Waals b term are :
- (1) $\text{m}^3 \text{mol}$ (2) m^2/mol (3) m^3/mol (4) $\text{m}^2 \text{mol}$
12. The law which relates the solubility of a gas to its pressure is called :
- (1) Raoult's law (2) The distribution law
(3) Henry's law (4) Ostwald's law
13. By adding a non-volatile solute to a solvent, the boiling point of the solvent :
- (1) will increase (2) will decrease
(3) will not change (4) may increase or decrease
14. If $2.303RT/F = 0.059$ and the activities of the solids are constant, then e.m.f. of the cell $\text{Zn} | \text{Zn}^{2+} (a_1) || \text{Cu}^{2+} (a_2) | \text{Cu}$ is :
- (1) $E = E^\circ - 0.059 \log (a_2/a_1)$ (2) $E = E^\circ + 0.059 \log (a_2/a_1)$
(3) $E = E^\circ - \frac{0.059}{2} \log (a_2/a_1)$ (4) $E = E^\circ + \frac{0.059}{2} \log (a_2/a_1)$
15. The hybridization of Xe in XeO_2F_2 is :
- (1) sp^3d (2) sp^3d^2 (3) sp^3d^3 (4) dsp^3
16. Compound A undergoes formation of cyanohydrin which on hydrolysis gives lactic acid. Therefore, compound A is :
- (1) formaldehyde (2) acetaldehyde
(3) acetone (4) benzaldehyde
17. Which of the following polymer is thermosetting polymer ?
- (1) Nylon-6 (2) Nylon-6,6
(3) Bakelite (4) None of these

18. Which of the following is useful in treatment of cyanide poisoning ?

- (1) Amyl nitrite (2) Sodium nitrite
(3) Nitrite thiosulphate (4) All of the above

19. Enthalpies of combustion of methane, graphite and hydrogen are 890.2 kJ, 393.4 kJ and 285.7 kJ respectively. Enthalpy of formation of methane is :

- (1) $-211.1 \text{ kJ mol}^{-1}$ (2) $-890.2 \text{ kJ mol}^{-1}$
(3) $-74.6 \text{ kJ mol}^{-1}$ (4) 85.7 kJ mol^{-1}

20. Containers A, B and C of equal volume contain oxygen, neon and methane respectively at the same temperature and pressure. The correct order of their masses is :

- (1) $A < B < C$ (2) $B < C < A$ (3) $C < A < B$ (4) $C < B < A$

21. IUPAC name of $[Cr(CO)_5\{P(C_6H_5)_3\}]$ is :

- (1) Triphenylphosphine pentacarbonyl chromium (0)
(2) Pentacarbonyl triphenylphosphine chromium (0)
(3) Pentacarbonyl triphenylphosphine chromate (III)
(4) Triphenylphosphine pentacarbonyl chromate (III)

22. Which one of the following ions is colourless ?

- (1) U^{3+} (2) Cm^{4+} (3) Th^{4+} (4) Pu^{4+}

23. Solubility of iodine in liquid SO_2 is increased on addition of KI. This is attributed to the formation of :

- (1) KI_3 (2) $I_2 \cdot SO_2$ (3) KI_4SO_2 (4) SOI_2

24. $PbI_2 + KNH_2 \xrightarrow{\text{liq. } NH_3}$

Products of the Reaction are :

- (1) $PbNH_2 \downarrow + I_2 + KI$ (2) $PbNH \downarrow + HI + KI$
(3) $PbNH_2 \downarrow + KI_3$ (4) None of the above

25. Which gives red colour with Fehling solution ?
(1) Glucose (2) Cellulose
(3) Benzaldehyde (4) Cane sugar
26. O_2^{2-} is isoelectronic with :
(1) H_2 (2) N_2 (3) F_2 (4) S
27. Which one of the following species is paramagnetic ?
(1) O_2^- (2) CN^- (3) CO (4) F_2
28. In NaCl type structure, the coordination numbers of cation and anion are :
(1) 6 and 4 (2) 6 and 6 (3) 4 and 4 (4) 8 and 4
29. Which one of the following complex can exhibit coordination isomers ?
(1) $[Co(NH_3)_6][Cr(CN)_6]$ (2) $[Cr(NH_3)_6]Cl_3$
(3) $[Co(en)_2Cl_2]^+$ (4) $[Cr(en)_2Cl_2]^+$
30. $Cr(CO)_x$ has EAN of Cr = 36, hence x = :
(1) 2 (2) 4 (3) 6 (4) 5
31. The root mean square velocity of an ideal gas at constant pressure varies with density 'd' is :
(1) d^2 (2) $b.d$ (3) \sqrt{d} (4) $1/\sqrt{d}$
32. For the reaction $2Cl(g) \rightleftharpoons Cl_2(g)$ the signs of ΔH and ΔS respectively are :
(1) +, - (2) +, + (3) -, - (4) -, +
33. The principal buffer present in human blood is
(1) $H_3PO_4 + NaH_2PO_4$ (2) $CH_3COOH + CH_3COONa$
(3) $Na_2HPO_4 + Na_3PO_4$ (4) $H_2CO_3 + HCO_3^-$
34. If a neutral solution has $pK_w = 13.36$ at $50^\circ C$, then pH of the solution is :
(1) 6.68 (2) 7 (3) 7.63 (4) 3.5

SECTION - B

35. The optimum pH for action of pancreatic amylase is :
- (1) 3.7 (2) 5.4 (3) 6.2 (4) 7.1
36. For the digestion of fatty acids, which of the following are required ?
- (1) Alpha-lipase only (2) Colipase only
(3) Alpha-lipase + Colipase (4) Alpha-lipase + Colipase + bile salts
37. Which of the following statements are *not* true ?
- (A) Autonomic nervous system controls smooth muscles.
(B) Sympathetic nervous system is voluntarily controlled via fore-brain.
(C) The action potential a neuron is terminated by efflux of potassium.
(D) Schwann cell is responsible for myelin secretion on the peripheral nerves.
- The answer is :
- (1) B only (2) B and C only
(3) C and D only (4) A, C and D only
38. Which of the following are *not* matched correctly ?
- (A) Hypoxia - deficiency of O_2 in the tissues
(B) Tidal volume in normal man - 0.5 liters
(C) Proximal convoluted kidney tubule - reabsorption
(D) Stomach - cholecystokinin secretion
- The answer is :
- (1) A and B only (2) A and C only
(3) B only (4) D only
39. Which of the following statements are *not* correct ?
- (A) Testosterone acts by a second messenger system.
(B) Triiodothyronine binds to intracellular receptors.
(C) Epinephrine is not a neurotransmitter.
(D) A steroid hormone enters the target cell and alters its gene expression.
- The answer is :
- (1) A and C only (2) A and D only
(3) B and C only (4) C and D only

40. The enzyme that fixes atmospheric carbon dioxide in C4 plants is :
- (1) Hydrogenase (2) PEP carboxylase
(3) RuBP Oxygenase (4) Hydrolase
41. Which of the following statements are *incorrect* about movement of water through xylem of plant ?
- (1) Root pressure plays important role
(2) Transpiration pull has no role
(3) Capillary action has no role
(4) Hydrogen ion/AT Pase pump at the xylem element membrane plays a role
42. Most of the plant cytokinins are synthesized in :
- (1) Flowers (2) Roots
(3) Leaves (4) Stem
43. Phytochrome plays a key role in :
- (1) Photomorphogenesis (2) Water transport
(3) Electrolyte balancing (4) Stomatal movement
44. Most of the CO₂ generated on the earth is absorbed by :
- (1) Green plants (2) Green plants and Oceans
(3) Lime stones (4) All of these
45. Which one of the following is *not* a characteristic of an ecosystem ?
- (1) It is self regulated
(2) It is leaky in relation to flow of matter and energy
(3) It has relations with the surrounding ecosystems
(4) It does not change with time
46. Green house effect is related to which of the following cycle ?
- (1) Carbon (2) Nitrogen
(3) Oxygen (4) Sulphur

47. Which of the following is *not* a grassland ?
- (1) Prairie (2) Pampa
(3) Steppe (4) Tundra
48. Which of the following statements about human evolution is *not* correct ?
- (1) The first species of genus *Homo* was *Homo habilis*
(2) Fossil of *Australopithecus anamensis* was found in Kenya
(3) *Homo erectus* was the first to move out of Africa
(4) *Sivapithecus* was ancestor of man
49. A bacterium that can cause tumors in plants and transfer its genes to them is :
- (1) *Bacillus thuriensis* (2) *Rhizobium*
(3) *Nitrobacterium* (4) *Agrobacterium*
50. Which of the following vectors contain DNA sequences from lambda phage ?
- (1) Plasmid Ti (2) Cosmid
(3) RNA phage (4) Plasmid Ri
51. Michaelis-Menten rate equation is about :
- (1) Enzyme – substrate complex formation
(2) Rate of Krebs cycle
(3) Rate of oxidative phosphorylation
(4) Rate of reaction of an enzyme
52. The rate of regulatory enzymes is *not* modulated by which the following :
- (1) Feed-back inhibition
(2) Reversible covalent modification
(3) Irreversible covalent modification and activation of enzymes
(4) Coupling factors

53. The parts of genome which keep on changing their positions are known as :

- (1) Exons (2) Introns
(3) Transposable elements (4) Repressors

54. Which of the following are correctly matched ?

- (A) *Balanoglossus* – radial cleavage
(B) Chick – discoidal cleavage
(C) Cockroach – superficial cleavage
(D) *Ascaris* – spiral cleavage

The answer is :

- (1) A and B only (2) C and D only
(3) A, B and D only (4) A, B, C and D

55. Coeloblastula is blastula of :

- (1) Insect (2) Frog (3) Bird (4) Lizard

56. Blastodisc of chick is united with the yolk mass in chick by :

- (1) Epiblast (2) Mesoblast
(3) Endoblast (4) Periblast

57. Which of the following extra-embryonic membrane serves as urinary bladder ?

- (1) Amnion (2) Chorion
(3) Allantois (4) Yolk sac

58. Which of the following are correctly matched for their centers of origin ?

- (A) Americas – Potato, Corn
(B) China Center – Soyabean
(C) Near East – Chick pea, Barley
(D) India Center – Rice, Mango

The *correct* answer is :

- (1) A and B only (2) A, B and C only
(3) A, B, C, and D (4) B and D only

59. The family and generic name of flax-seed plant is :
- (1) Linaceae, *Linum* (2) Camelliaceae, *Camellia*
(3) Malvaceae, *Chorchorus* (4) Euphorbiaceae, *Hevea*
60. Which of the following combination is *not* correct ?
- (1) *Cinchona*, *Rauwolfia*, *Withania* (2) Gram, Arhar, Pea
(3) Rice, Wheat, Maize (4) Coriander, Ginger, Cannabis
61. Which one of the following combinations are *not* correctly matched ?
- (1) Catla, Labeo – Major freshwater carps
(2) Silver carp, Grass carp – Major exotic carps
(3) *Clarias batrachus*, *Heteropneustus* – Air breathing carnivores
(4) Bombay Duck, Hilsa – Marine food fishes
62. Which of the following is a crop pest ?
- (1) *Spodoptera* (2) *Trogoderma*
(3) *Rhizopertha* (4) *Sitophilus*
63. Which of the following statement is wrong ?
- (1) *Pyrilla perpusilla* is a bug
(2) Adults of red pumpkin beetles attack vegetables
(3) The name Gandhibug of *Lepocorisa Oratorius* is derived from its unpleasant odour
(4) *Tribolium castanneum* is known as lesser grain borer
64. Hadda beetles usually prefer to feed on :
- (1) Brinjal (2) Brinjal and Potato
(3) Citrus fruits (4) Sugarcane
65. The pigments found in polysiphonia (algae) are :
- (1) Chlorophyll only (2) Phycocyanin only
(3) Phycocyanin and chlorophyll (4) Phycocyanin and phycoerythrine

66. Life cycle which contain a dominant multicellular diploid stage, are called :
- (1) Gametic type (2) Zygotic type
(3) Sporic type (4) Gametophytic type
67. Which of the following statements are *correct* ?
- (A) *Puccinia graminis* is known as stem-rust of wheat
(B) D-glutamic acid and D-lysine are found in bacterial cell wall
(C) 80s ribosomes are found in bacteria
(D) *E. Coli.* is found in cluster form
- The correct answer is :
- (1) A and B (2) B and C (3) C and D (4) B, C and D
68. Which of the following cells are involved in fight against cancer ?
- (1) B Cells (2) Natural killer cells
(3) Memory cells (4) Plasma cells
69. Which of the following cancers are associated with Human Papilloma virus ?
- (1) Lung (2) Cervical
(3) Ovarian (4) Liver
70. The true skeleton of a cell is formed by :
- (1) Actin filaments (2) Microtubules
(3) Intermediate filaments (4) Actin filaments and microtubules
71. When in a eukaryotic cell all the copies of its mitochondrial DNA are identical, it is called :
- (1) Homoplasmy (2) Heteroplasmy
(3) Apospory (4) None of the above
72. Oxydative phosphorylation enzyme system is found in which part of the mitochondria ?
- (1) Cytosol (2) Outer membrane of mitochondria
(3) Inner membrane of mitochondria (4) Mitochondrial fluid

73. The main function of peroxisome is :
- (1) Catabolism of very long chain fatty acids
 - (2) Glyoxylate cycle in seeds
 - (3) Phosphorespiration in leaves
 - (4) Glycolysis in Trypanosomes
74. In Bryophytes, heterothallic condition is :
- (1) When male sex organs are not formed
 - (2) When male and female sex organs are found in the same individual
 - (3) When male and female sex organs are found in separate individuals
 - (4) When two different forms of thallus occur
75. Which of the following statements are *not* correct ?
- (1) *Funaria hygrometrica* is a common moss on Indian hills
 - (2) The adult plant body of *Anthoceros* is a sporophyte
 - (3) *Selaginella* bears spores of two types
 - (4) Apogamy is a type of reproduction in some ferns in which sporophyte develops from the gametophyte without fusion of gametes
76. In which of the following animals sex is determined by hormones ?
- | | |
|-----------------|---------------|
| (1) Hippocampus | (2) Alligator |
| (3) Bonellia | (4) Cobra |
77. Which of the following types of inheritance is *not* found in ciliate protozoa ?
- | | |
|-----------------------------|-----------------------------|
| (1) Chloroplast inheritance | (2) Mendalian inheritance |
| (3) Cortical inheritance | (4) Cytoplasmic inheritance |
78. The cytoplasmic factors responsible for male sterility in maize plants, are located in :
- | | |
|-----------------|------------------|
| (1) Nucleus | (2) Mitochondria |
| (3) Chloroplast | (4) Cytosol |
79. Mitochondrial DNA is *not* associated with which of the following ?
- | | |
|-----------------------------|---|
| (1) Regulation of apoptosis | (2) Generation of reactive oxygen species |
| (3) Energy production | (4) Regulation of cellular transport |

80. Which of the following is a chaperone ?
- (1) Nucleoplasmin (2) Chromatosome
(3) Histone H_1 and H_2 (4) Histone H_3 and H_4
81. Unexplained substantial variation in the haploid nuclear DNA content even between closely related species is called :
- (1) Kinetic complexity (2) Haploidy
(3) Aneuploidy (4) C-value paradox
82. Which of the following disease is *not* spread by housefly ?
- (1) Amoebic dysentery (2) Cholera
(3) Typhoid (4) Plague
83. Coelomic cavity of Balanoglossus is made up of how many parts ?
- (1) One (2) Two
(3) Four (4) Five
84. Which of the following pairs are correctly matched ?
- (A) Trochophore – Balanoglossus
(B) Bipinnaria–Asterias
(C) Holothuria – Auricularia
(D) Fasciola – Cercaria
- The *correct* answer is :
- (1) A and B only (2) B and D only
(3) C and D only (4) B, C and D only
85. The early seed fern *Ekinsia* evolved in :
- (1) Late Devonian (2) Early Devonian
(3) Carboniferous (4) Triassic
86. Coralloid roots are found in :
- (1) Lycopodium (2) Pinus
(3) Cycas (4) Dryopteris

87. Which of the following is *not* correctly matched ?

- (1) Marigold – Capitulum (2) Mimosa – Corymb
(3) Brassica – Spike (4) Anthurium – Spadix

88. Synandrous condition is found in the family :

- (1) Cucurbitaceae (2) Ranunculaceae
(3) Leguminosae (4) Liliaceae

89. Which of the following statements are *not* correct ?

- (A) Spike inflorescence is found in Acalypha.
(B) Fruit of family ranunculaceae is etaerio.
(C) The inflorescence which appear like a single bisexual flower is cyathium.
(D) Almost all plants have latex in family euphorbiaceae.

The *correct* answer is :

- (1) A and D (2) B and C
(3) A only (4) C only

90. In the secondary steles of *Boerhaavia* :

- (1) Xylem surrounds phloem (2) Phloem surrounds xylem
(3) Both are parallel (4) Both are alternate

91. In which of the following plants secondary growth occurs ?

- (1) Yucca (2) Dracaena
(3) Oryza (4) Triticum

92. Which of the following is *not* a part of periderm of a plant ?

- (1) Phellogen (2) Phelloderm
(3) Phellem (4) Phloem

93. Path of pollen tubes in the pistil is guided by :

- (1) Enzymes of the pollen apparatus (2) Stigmatic fluid
(3) Tissues of the style (4) Secration of ovule

94. Which of the following type of the fruit, strawberry is ?
(1) Drupe (2) Berry
(3) Achene (4) Follicle
95. In which of the following animals, blood flows in both the directions (reverse also) ?
(1) Petromyzon (2) Fish
(3) Herdmania (4) Branchistoma
96. Respiration of the cephalochordates occurs through which of the following ?
(1) Lungs (2) Gills
(3) Fins (4) General body surface
97. Which of the following pairs are correctly matched ?
(A) *Alytes* – midwife toad
(B) *Petromyzon* – male is parasite on female
(C) Bony fish – cycloid scale
(D) Ichthyophis – apoda
The answer is :
(1) A, B, C and D (2) B, C and D only
(3) A and B only (4) A and D only
98. Which of the following is *not* a flight muscle ?
(1) Coraco-brachialis brevis (2) Coraco-brachialis langus
(3) Gastronemius (4) Pectoralis major
99. Non-renal and pronephric head kidneys are found in :
(1) *Rana* (2) *Hemidactylus*
(3) *Labeo* (4) Alligator
100. Which of the following statement is *false* ?
(1) Sweet sorghum is used to obtain ethanol.
(2) Quinine is obtained from the bark of Rauwolfia.
(3) Sunflower is a source of edible oil.
(4) Morphine is obtained from opium plant.

SECTION - C

101. For the table :

x	0	1	2	3	4	5
$f(x)$	0	3	8	15	24	25

 $\Delta^3 f(x)$ is :

- (1) 3 (2) 0
(3) 2 (4) 7

102. For the data :

x	-1	1	2	3
$f(x)$	-21	15	12	3

 $\Delta^2 f(x)$ are :

- (1) -7 and -3 (2) 7 and 3
(3) 7 and -3 (4) -7 and 3

103. Runge-Kutta method is a :

- (1) Single step method
(2) Multiple step method
(3) Method for solving cubic equation
(4) None of these

104. The force acting on a system of n particles is conservative only if :

- (1) $\nabla \cdot F \rightarrow = 0$ (2) $\nabla \times F \rightarrow = 0$
(3) $\nabla \cdot \nabla \cdot F \rightarrow = 0$ (4) $\nabla \cdot \nabla \times F \rightarrow = 0$

105. In Lagrangian's Equation Q_j represents :
- (1) Generalized force having dimensions of force explicitly
 - (2) Quantized force having dimensions of force
 - (3) Generalized force may or may not have dimensions of force
 - (4) Work done by generalized force
106. The Hamiltonian, $H = T + V$ gives total energy :
- (1) when Cartesian and generalized coordinates do not depend on time explicitly
 - (2) when only generalized coordinates do depend on time explicitly
 - (3) when only Cartesian coordinates do not depend on time explicitly
 - (4) when Cartesian and generalized coordinates depend on time explicitly
107. Any field, $A \rightarrow$ is said to solenoid field if :
- (1) $A \rightarrow = \nabla \times V \rightarrow$ and $\nabla \cdot A \rightarrow = 0$
 - (2) $A \rightarrow = \nabla \times V \rightarrow$ and $\nabla \cdot A \rightarrow = 0$
 - (3) $A \rightarrow = \nabla \times V \rightarrow$ and $\nabla \times A \rightarrow = 0$
 - (4) $A \rightarrow = \nabla \cdot V \rightarrow$ and $\nabla \times A \rightarrow = 0$
108. The total charge enclosed by a given surface through which 15000 lines of force is incoming and that of outgoing lines of force is 25000 :
- (1) $13.275 \times 10^{-8} C$
 - (2) $8.85 \times 10^{-12} C$
 - (3) $8.85 \times 10^{-8} C$
 - (4) $8.85 \times 10^{-8} C / s$

109. Name of program which translates a high level language into machine language :
- (1) compiler (2) assembler
(3) register (4) converter
110. The area enclosed by a cycle represents net work done as well as net heat of interaction is :
- (1) P - V diagram (2) Carnot cycle
(3) T - S diagram (4) triple point diagram
111. A real gas shows neither heating nor cooling in Joule - Thomson effect if the initial temperature is :
- (1) less than inversion temperature
(2) greater than inversion temperature
(3) equal to inversion temperature
(4) equal to 273K.
112. If p_1 and p_2 be the probability of two independent events, then the probability of two events to take place simultaneously is :
- (1) $p_1 + p_2$ (2) $p_1 \times p_2$
(3) p_1 / p_2 (4) $p_1 - p_2$
113. The two constraints used in determining the most probable macro-state are :
- (1) $\sum n_i = n$ and $\sum n_i u_i = u$ (2) $\sum n_i = n$ and $\sum n_i v_i = v$
(3) $\sum n_i = n$ and $\sum n_i v_i = v / n$ (4) $\sum n_i = n$ and $\sum n_i u_i = u / n$

114. The essential condition for Fermi - Dirac statistics is :
- (1) the particles are distinguishable
 - (2) the particles are indistinguishable
 - (3) there is no limit on the no. of particles present in a given energy state
 - (4) not more than one particle can be present in a given energy state
115. Boltzmann limit is given by
- (1) $(n_i / g_i) \ll 1$ and satisfied by all gases at ordinary temperature
 - (2) $(g_i / n_i) \ll 1$ and satisfied by all gases at absolute temperature
 - (3) $(n_i / g_i) \gg 1$ and satisfied by all gases at ordinary temperature
 - (4) $(n_i \times g_i) \ll 1$ and satisfied by all gases at 0K
116. The ratio of rms value to the average value of alternating current is called Form Factor (FF) and given by :
- (1) 1.21, peak of wave is flat if FF less than 1.21
 - (2) 1.11, peak of wave is sharp if FF greater than 1.11
 - (3) 1.11, peak of wave is flat if FF greater than 1.11
 - (4) 2.11, peak of wave is flat if FF greater than 2.11
117. The quality factor of a series resonant circuit is given by :
- (1) $\frac{\omega L}{R}$ and depends on R only
 - (2) $\frac{\omega C}{R}$ and depends on R only
 - (3) $\frac{\omega R}{L}$ and depends on R only
 - (4) $\frac{\omega L}{R}$ and depends on L only

123. The Young's double slit experiment is performed with blue and green light of wavelengths 4360 \AA and 5460 \AA respectively. If X is the distance of 4th maxima from the central maxima, then
- (1) $X_{\text{blue}} = X_{\text{green}}$
 - (2) $X_{\text{blue}} > X_{\text{green}}$
 - (3) $X_{\text{blue}} < X_{\text{green}}$
 - (4) $X_{\text{blue}} / X_{\text{green}} = \lambda_{\text{green}} / \lambda_{\text{blue}}$
124. The angular half width of the principal maxima of a plane diffraction grating is :
- (1) very narrow and sharp
 - (2) very broad and dim
 - (3) very narrow and dim
 - (4) very broad and sharp
125. A polarimeter suitable for color blind persons is :
- (1) bi-quartz polarimeter
 - (2) half shade polarimeter
 - (3) saccharimeter
 - (4) None of above
126. The cubic lattice most densely packed is :
- (1) BCC with packing factor 0.680
 - (2) SC with packing factor 0.524
 - (3) HCP with packing factor 0.740
 - (4) FCC with packing factor 0.740
127. X-Ray diffraction method used for structure determination of single crystal is :
- (1) Power crystal method
 - (2) Rotating crystal method
 - (3) Laue method
 - (4) None of above

128. Relation between volume of unit cell, UT [in direct lattice(DL)] and reciprocal lattice(RL) is :

(1) $(\text{Volume of UT})_{\text{RL}} = 4\pi^2/(\text{Volume of UT})_{\text{DL}}$

(2) $(\text{Volume of UT})_{\text{DL}} = 4\pi^2/(\text{Volume of UT})_{\text{RL}}$

(3) $(\text{Volume of UT})_{\text{RL}} = 8\pi^3/(\text{Volume of UT})_{\text{DL}}$

(4) $(\text{Volume of UT})_{\text{DL}} = 8\pi^3/(\text{Volume of UT})_{\text{RL}}$

129. Phonons are defined as :

(1) optical energy given to unit cell

(2) Lattice vibrations quantized energy

(3) Lattice vibrations continuous energy

(4) continuous heat energy given to lattice

130. The energy of gamma photon having a wavelength 1.5 \AA (take $h = 6.634 \times 10^{-34} \text{ Js}$)

(1) $8.275 \times 10^3 \text{ eV}$

(2) $13.24 \times 10^{-4} \text{ eV}$

(3) $10.24 \times 10^{-3} \text{ eV}$

(4) $1.6 \times 10^{-19} \text{ eV}$

131. The ratio of kinetic energy of proton to that of α -particle, when a proton and an α -particle have equal de-Broglie wavelengths is :

(1) 1 : 2

(2) 2 : 1

(3) 1 : 1

(4) 4 : 1

132. In Schrodinger's equation, eigen values means :

- (1) value of energy (2) value of position
(3) value of frequency (4) none of above

133. Zero-point energy of an oscillator is given by :

- (1) $h\nu$ (2) zero
(3) infinite (4) $\left(\frac{1}{2}\right)h\nu$

134. The factors that control the allowed values of energy of a particle in a potential well are :

- (1) width and depth of potential well
(2) time and energy of potential well
(3) depth and energy of potential well
(4) time and width of potential well

135. In Moseley's law which leads to correct sequence of putting the elements in periodic chart, frequency of X- ray spectral line depends on :

- (1) Z (2) $(Z)^2$
(3) $(Z)^{1/2}$ (4) $(Z)^3$

(Z = Atomic No. of Element)

136. The product of the characteristic roots of the matrix :

$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix} \text{ is :}$$

- (1) 3 (2) 18 (3) 0 (4) 45

137. If the roots of equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A. P., then one of the root is :

- (1) 4 (2) 3 (3) -4 (4) 6

138. The radius of curvature of the hyperbola $r^2 = a^2 - b^2 + \frac{a^2b^2}{p^2}$ is :

- (1) $\frac{a^2b}{p^3}$ (2) $\frac{a^2b^2}{p^3}$ (3) $\frac{ab^2}{p^3}$ (4) $\frac{a^2b^2}{p}$

139. $\int_0^1 \frac{x^3}{\sqrt{1-x^2}} dx$ is equal to :

- (1) $\frac{3}{2}$ (2) 0 (3) $-\frac{3}{2}$ (4) $\frac{2}{3}$

140. The Co-ordinates of the centre of conic $x^2 + 12xy - 4y^2 - 6x + 4y + 9 = 0$ are :

- (1) $\left(\frac{1}{2}, 0\right)$ (2) $\left(-\frac{1}{2}, 0\right)$
 (3) $\left(0, \frac{1}{2}\right)$ (4) $\left(\frac{1}{2}, \frac{1}{2}\right)$

141. If $x = \cos\theta + i\sin\theta$, then $x^n + \frac{1}{x^n}$ is equal to :

- (1) $2\cos n\theta$ (2) $2i\cos n\theta$
 (3) $\frac{\cos n\theta}{2}$ (4) $\cos 2n\theta$

142. The least positive integer (mod II) to which 282 is congruent :

- (1) 4 (2) 7 (3) 5 (4) 2

143. The integrating factor of differential equation $2\cos(y^2)dx - xy\sin(y^2)dy = 0$ is :

- (1) $\frac{1}{x^3}$ (2) x^2
 (3) x^3 (4) $\frac{1}{x^2}$

144. Particular integral for the differential equation $(D^2 - 6D + 9)y = e^{3x}$ is :

(1) $\frac{e^{3x}}{2}$

(2) $x^2 e^{3x}$

(3) $\frac{e^{3x}}{x^2}$

(4) $\frac{x^2}{2} e^{3x}$

145. The value of λ so that the following vectors are coplanar $\vec{a} = 2\hat{i} - 7\hat{j} + \lambda\hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{c} = 3\hat{i} - 5\hat{j} + 2\hat{k}$ is :

(1) -3

(2) 3

(3) $\frac{1}{3}$

(4) $-\frac{1}{3}$

146. $\lim_{x \rightarrow \infty} x \tan \frac{1}{x}$ is :

(1) 1

(2) -1

(3) 0

(4) 2

147. If $z = \tan^{-1}\left(\frac{x}{y}\right)$, then $\frac{\partial z}{\partial x}$ is :

(1) 0

(2) $\frac{x}{x^2 + y^2}$

(3) $\frac{y}{x^2 + y^2}$

(4) $\frac{1}{x^2 + y^2}$

148. The partial differential equation $x \frac{\partial^2 z}{\partial x^2} + 2 \frac{\partial^2 z}{\partial y \partial x} + y \frac{\partial^2 z}{\partial y^2} + \frac{\partial z}{\partial x} = 0$ is parabolic if :

(1) $xy \neq 1$

(2) $xy < 1$

(3) $xy > 1$

(4) $xy = 1$

149. The particular integral of the differential equation $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$ is :

(1) $\frac{e^x}{72}$

(2) $\frac{e^{x+2y}}{27}$

(3) $\frac{e^{x+2y}}{72}$

(4) $\frac{e^y}{27}$

150. Any wrench may be resolved into two wrenches, whose axes intersect at right angles in how many ways ?

(1) One way

(2) Three ways

(3) Infinite number of ways

(4) None of these

151. $\lim_{x \rightarrow \infty} \left(\frac{2}{1} \cdot \frac{3}{2} \cdot \frac{4}{3} \cdots \frac{n}{n-1} \right)^{\frac{1}{n}}$ is equal to :

(1) 1

(2) -1

(3) 0

(4) $\frac{1}{2}$

152. The series $1^2 + 2^2 + 3^2 + \dots + n^2 + \dots$ diverges to :

(1) $-\infty$

(2) $+\infty$

(3) 0

(4) 1

153. The value of $H_{2n+1}(0)$ is :

(1) 1

(2) -1

(3) $\frac{1}{n}$

(4) 0

154. The inverse Laplace Transform of $\frac{1}{s^{7/2}}$ is :

(1) $\sqrt{\frac{t}{\pi}}$

(2) $\frac{8}{15} \sqrt{\frac{t}{\pi}}$

(3) $\frac{8t^2}{15} \sqrt{\frac{t}{\pi}}$

(4) 0

155. The operator $||$ means :

- (1) Logical OR (2) Logical AND
 (3) Logical NOT (4) None of these

156. Let (R, d) be the usual metric space. Then derived set of :

$$A = \left\{ \frac{1}{n} : n \in N \right\} \text{ is :}$$

- (1) A (2) $\{0\}$
 (3) ϕ (4) $\{1\}$

157. Let (X, d) be a metric space and A be any subset of X. Then A is open if and only if :

- (1) $A = -A^\circ$ (2) $A = \frac{1}{A}^\circ$
 (3) $A = A^\circ$ (4) None of these

158. If $G = \{1, w, w^2\}$ is the group of cube roots of unity, then order of w^2 under the binary operation multiplication is :

- (1) 2 (2) 4
 (3) 1 (4) 3

159. A division ring has how many zero divisors ?

- (1) 1 (2) 3
 (3) 2 (4) None of these

160. "The rate of change of momentum is directly proportional to the impressed force and takes place in the direction of the force" is :

- (1) Newton's first law of motion
- (2) Newton's second law of motion
- (3) Newton's third law of motion
- (4) None of these

161. Time of flight of a projectile is given by :

- (1) $\frac{2u \sin \alpha}{g}$
- (2) $\frac{u \sin \alpha}{g}$
- (3) $\frac{u \sin \alpha}{2g}$
- (4) None of these

162. $T\left(\frac{1}{2}\right)$ is equal to :

- (1) e
- (2) π
- (3) $\sqrt{\pi}$
- (4) \sqrt{e}

163. The fixed point of the Mobius transformation $w = \frac{3z-4}{z-1}$ is :

- (1) $z = 1$
- (2) $z = -1$
- (3) $z = -2$
- (4) $z = 2$

164. The set of vectors $\{(1, 0), (0, 1)\}$ in R^2 is :

- (1) Linearly dependent
- (2) Linearly independent
- (3) Not defined
- (4) None of these

165. If $T: V \rightarrow W$ is a linear transformation, then T is one-one iff $N(T)$ is :

(1) $\{1\}$

(2) ϕ

(3) 0

(4) None of these

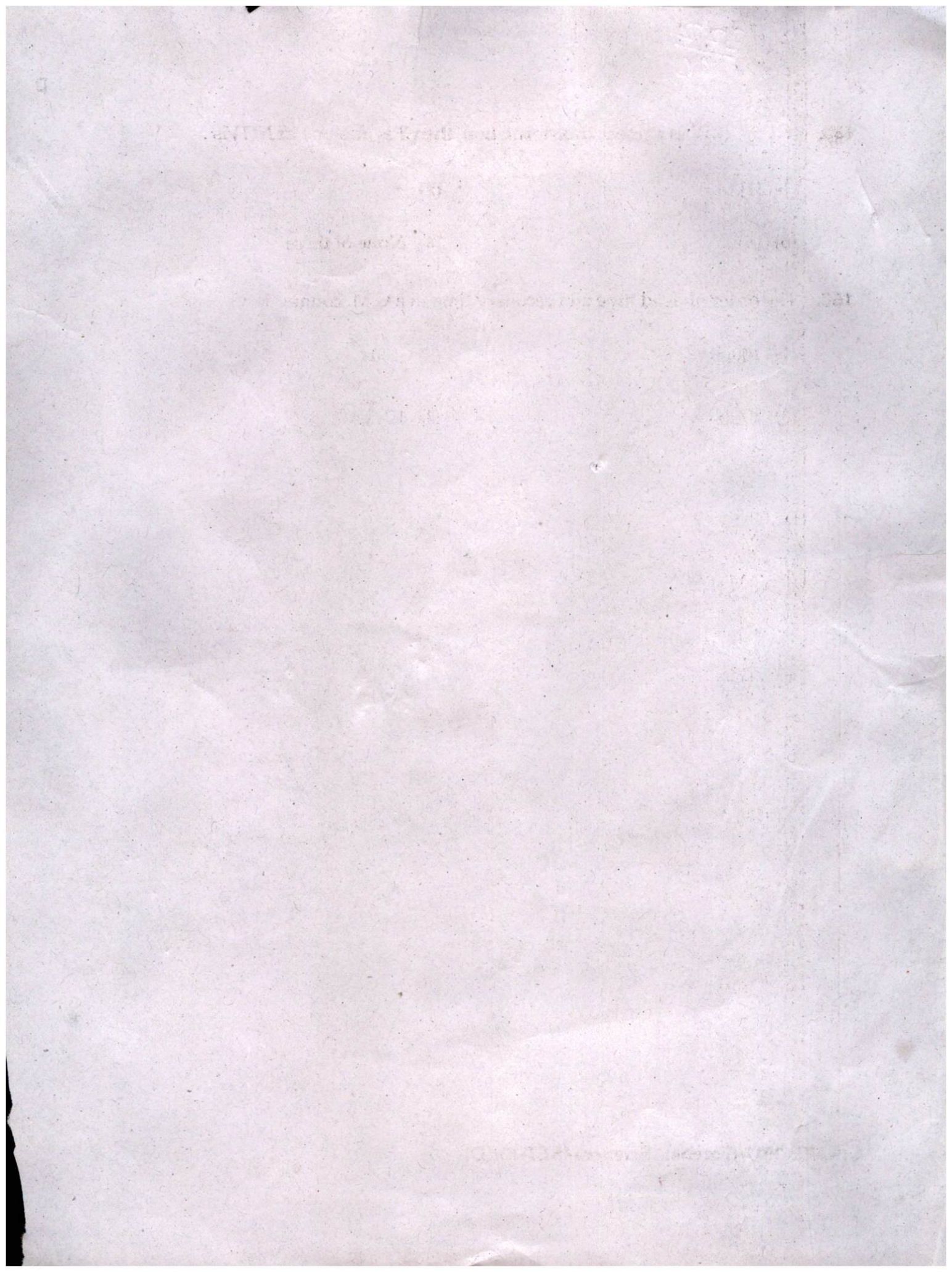
166. The order of dead time and recovery time in a G.M. counter is :

(1) $100\mu\text{s}$

(2) $10\mu\text{s}$

(3) $10^3\mu\text{s}$

(4) $10^{-3}\mu\text{s}$



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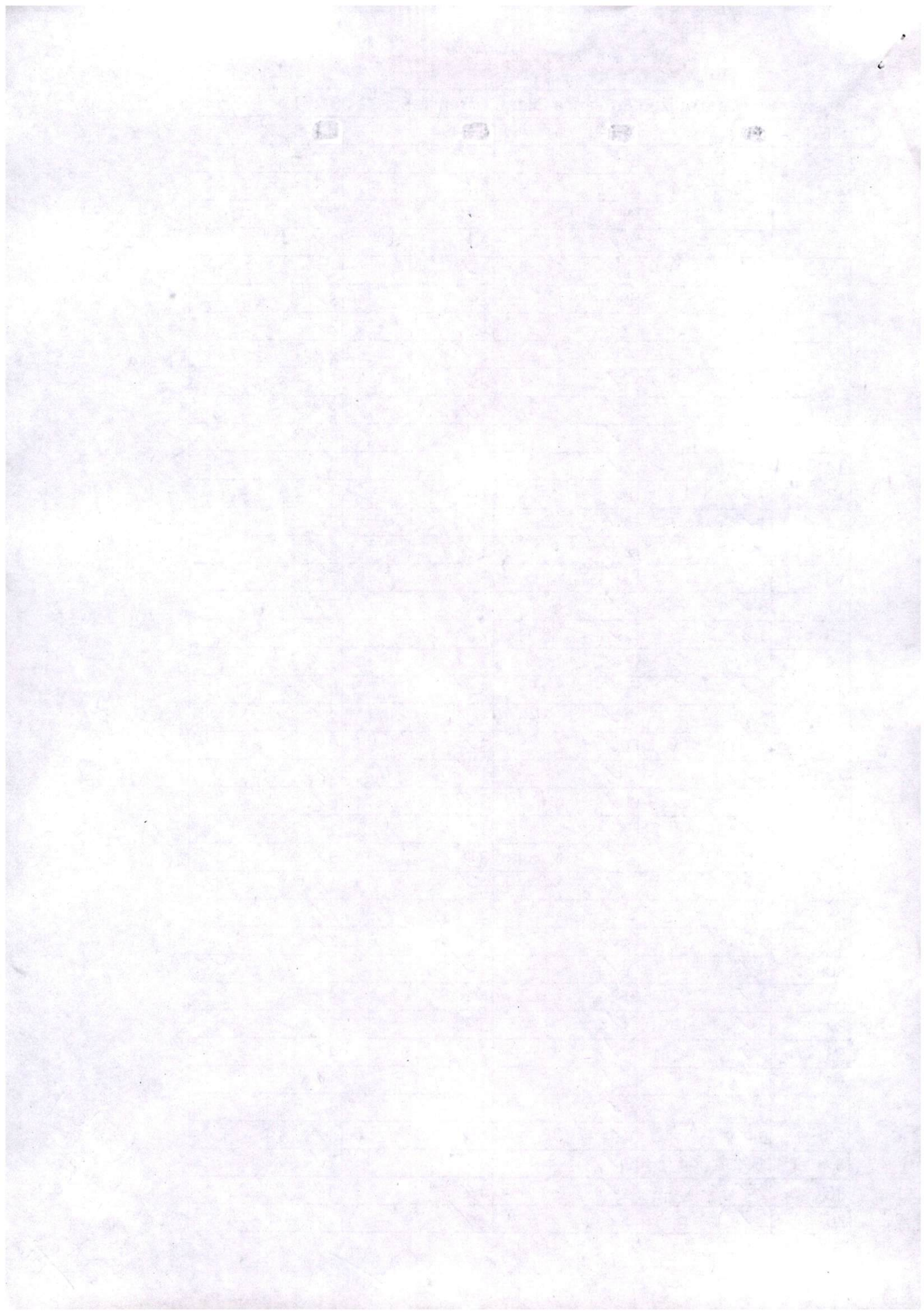
66

SEAL

Answer Key Centralized Entrance Exam. Forensic Sc. 22-06-2017				
S.No	A	B	C	D
1	3✓	2✓	2✓	2✓
2	2✓	3✓	3✓	1✓
3	2✓	1✓	4✓	2✓
4	3✓	2✓	3✓	3✓
5	2✓	1✓	4✓	1✓
6	3✓	2✓	2✓	3✓
7	3✓	3✓	1✓	2✓
8	1✓	4	2✓	2✓
9	3✓	3✓	3✓	3✓
10	1✓	4✓	1✓	2✓
11	3✓	3✓	2✓	3✓
12	1✓	2✓	3✓	3✓
13	2✓	2✓	1✓	1✓
14	1✓	3✓	2✓	3✓
15	3✓	2✓	1✓	1✓
16	2✓	3✓	3✓	2✓
17	3✓	3✓	1✓	3✓
18	1✓	1✓	2✓	4✓
19	2✓	3✓	1✓	3✓
20	1✓	1✓	3✓	4✓
21	2✓	3✓	3✓	2✓
22	1✓	1✓	3✓	3✓
23	2✓	2✓	1✓	1✓
24	3✓	1✓	3✓	2✓
25	1✓	3✓	1✓	1✓
26	2✓	2✓	3✓	3✓
27	3✓	1✓	2✓	1✓
28	4✓	2✓	2✓	2✓
29	3✓	3✓	3✓	1✓
30	4✓	1✓	2✓	3✓
31	4✓	4✓	4✓	4✓
32	3✓	3✓	3✓	3✓
33	4✓	4✓	4✓	4✓
34	1✓	1✓	1✓	1✓
35	4✓	2✓	4✓	4✓
36	2✓	4✓	1✓	4✓
37	1✓	3✓	4✓	1✓
38	2✓	3✓	4✓	4✓
39	2✓	1✓	4✓	1✓

M. Anshu
23.6.17

Answer Key
verified
23/7/17

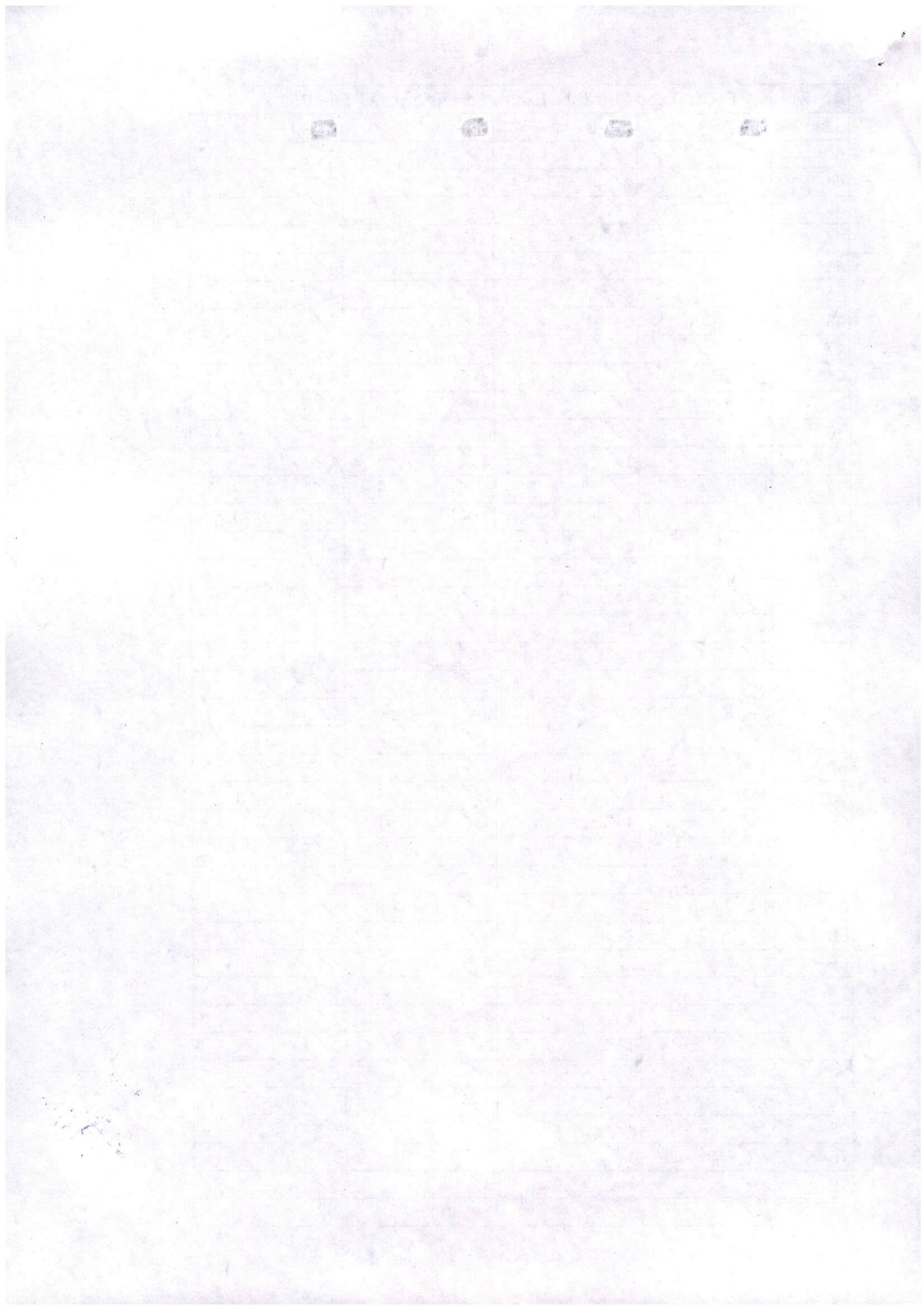


Answer Key Centralized Entrance Exam. Forensic Sc. 22-06-2017				
S.No	A	B	C	D
40	3✓	4✓	2✓	2✓
41	1✓	4✓	4✓	2✓
42	3✓	1✓	4✓	2✓
43	1✓	4✓	3✓	1✓
44	3✓	2✓	4✓	4✓
45	2✓	4✓	2✓	4✓
46	3✓	2✓	4✓	1✓
47	1✓	1✓	3✓	4✓
48	2✓	2✓	3✓	4✓
49	4✓	2✓	1✓	4✓
50	1✓	3✓	4✓	2✓
51	4✓	1✓	4✓	4✓
52	4✓	3✓	1✓	4✓
53	4✓	1✓	4✓	3✓
54	4✓	3✓	2✓	4✓
55	1✓	2✓	4✓	2✓
56	3✓	3✓	2✓	4✓
57	3✓	1✓	1✓	3✓
58	1✓	2✓	2✓	3✓
59	3✓	4✓	2✓	1✓
60	1✓	1✓	3✓	4✓
61	2✓	4✓	1✓	4✓
62	4✓	4✓	3✓	1✓
63	4✓	4✓	1✓	4✓
64	3✓	4✓	3✓	2✓
65	3✓	1✓	2✓	4✓
66	4✓	3✓	3✓	2✓
67	1✓	3✓	1✓	1✓
68	3✓	1✓	2✓	2✓
69	3✓	3✓	4✓	2✓
70	4✓	1✓	1✓	3✓
71	4✓	2✓	4✓	1✓
72	1✓	4✓	4✓	3✓
73	4✓	4✓	4✓	1✓
74	1✓	3✓	4✓	3✓
75	2✓	3✓	1✓	2✓
76	2✓	4✓	3✓	3✓
77	2✓	1✓	3✓	1✓
78	1✓	3✓	1✓	2✓

Chelu 21/6/17

 23/6/17

✓ Mukherjee
 23-6-17




Answer Key Centralized Entrance Exam. Forensic Sc. 22-06-2017

S.No	A	B	C	D
79	4 ✓	3 /	3 /	4 /
80	4 ✓	4 /	1 /	1 /
81	1 ✓	4 /	2 /	4 /
82	4 ✓	1 /	4 /	4 /
83	4 ✓	4 /	4 /	4 /
84	4 ✓	1 /	3 /	4 /
85	2 ✓	2 /	3 /	1 /
86	4 ✓	2 /	4 /	3 /
87	4 ✓	2 /	1 /	3 /
88	3 ✓	1 /	3 /	1 /
89	4 ✓	4 /	3 /	3 /
90	2 ✓	4 /	4 /	1 /
91	4 ✓	1 /	4 /	2 /
92	3 ✓	4 /	1 /	4 /
93	3 ✓	4 /	4 /	4 /
94	1 ✓	4 /	1 /	3 /
95	4 ✓	2 /	2 /	3 /
96	4 ✓	4 /	2 /	4 /
97	1 ✓	4 /	2 /	1 /
98	4 ✓	3 /	1 /	3 /
99	2 ✓	4 /	4 /	3 /
100	2 ✓	2 /	2 /	2 /
101	3 ✓	2 /	3 /	2 /
102	1 ✓	2 /	2 /	1 /
103	2 ✓	3 /	1 /	1 /
104	4 ✓	1 /	4 /	2 /
105	3 ✓	2 /	1 /	3 /
106	1 ✓	4 /	2 /	1 /
107	2 ✓	2 /	1 /	1 /
108	3 ✓	3 /	2 /	3 /
109	4 ✓	2 /	1 /	1 /
110	2 ✓	1 /	3 /	3 /
111	1 ✓	4 /	2 /	3 /
112	3 ✓	1 /	2 /	2 /
113	4 ✓	4 /	3 /	1 /
114	2 ✓	1 /	1 /	4 /
115	3 ✓	2 /	2 /	1 /
116	1 ✓	3 /	4 /	2 /
117	2 ✓	1 /	2 /	1 /

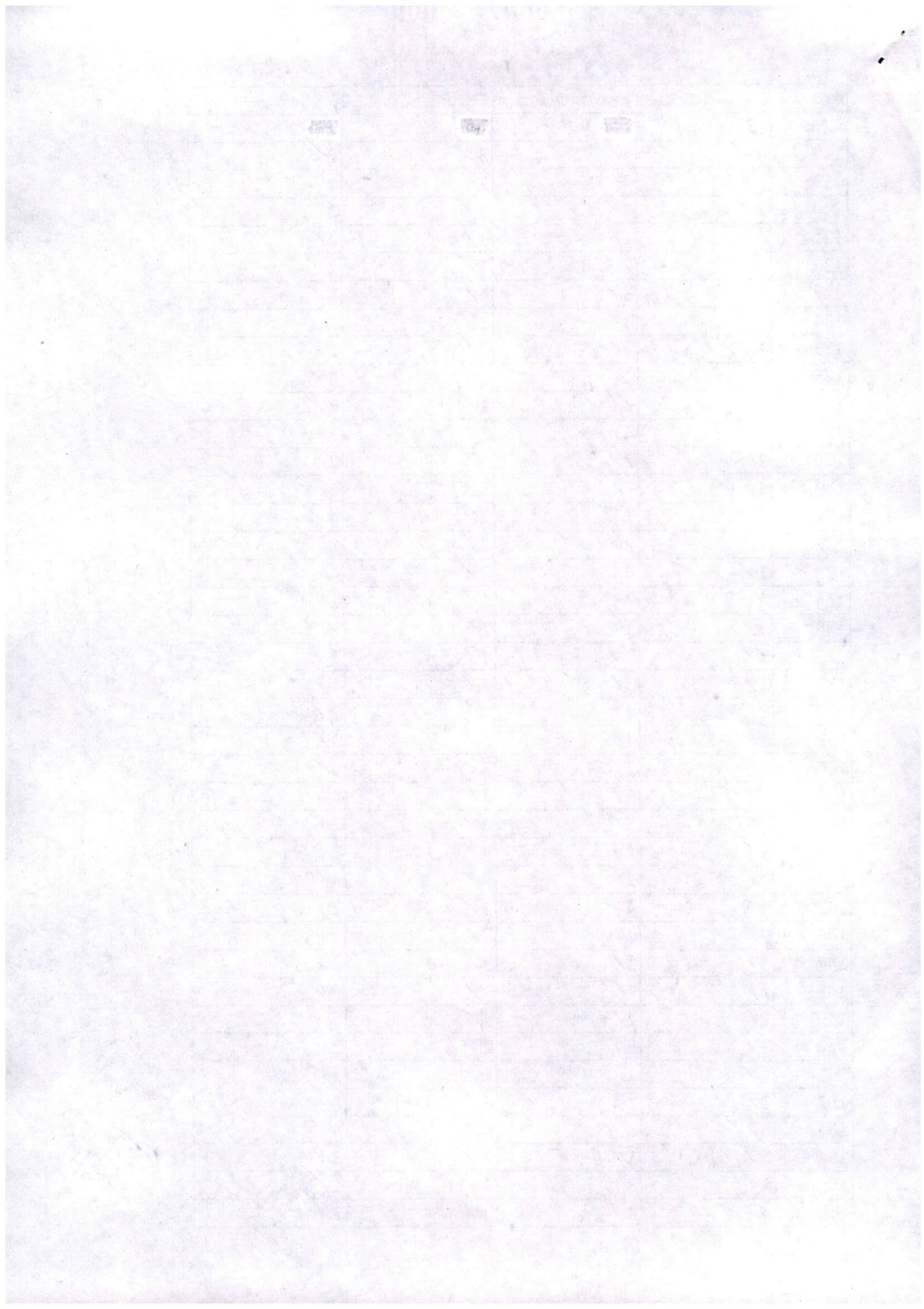
Checked & Verified
23/6/17

V. Mahesh
23-6-17

Answer Key Centralized Entrance Exam. Forensic Sc. 22-06-2017				
S.No	A	B	C	D
118	4 ✓	2 ✓	3 ✓	2 ✓
119	3 ✓	4 ✓	2 ✓	1 ✓
120	1 ✓	3 ✓	1 ✓	3 ✓
121	2 ✓	1 ✓	4 ✓	2 ✓
122	3 ✓	2 ✓	1 ✓	2 ✓
123	4 ✓	3 ✓	4 ✓	3 ✓
124	4 ✓	4 ✓	1 ✓	1 ✓
125	2 ✓	2 ✓	2 ✓	2 ✓
126	1 ✓	1 ✓	3 ✓	4 ✓
127	3 ✓	3 ✓	1 ✓	2 ✓
128	4 ✓	4 ✓	2 ✓	3 ✓
129	2 ✓	2 ✓	4 ✓	2 ✓
130	4 ✓	3 ✓	3 ✓	1 ✓
131	2 ✓	1 ✓	1 ✓	4 ✓
132	1 ✓	2 ✓	2 ✓	1 ✓
133	1 ✓	4 ✓	3 ✓	4 ✓
134	2 ✓	3 ✓	4 ✓	1 ✓
135	3 ✓	1 ✓	2 ✓	2 ✓
136	1 ✓	2 ✓	1 ✓	3 ✓
137	1 ✓	3 ✓	3 ✓	1 ✓
138	3 ✓	4 ✓	4 ✓	2 ✓
139	1 ✓	4 ✓	2 ✓	4 ✓
140	3 ✓	2 ✓	3 ✓	3 ✓
141	3 ✓	1 ✓	1 ✓	1 ✓
142	2 ✓	3 ✓	2 ✓	2 ✓
143	1 ✓	4 ✓	4 ✓	3 ✓
144	4 ✓	2 ✓	3 ✓	4 ✓
145	1 ✓	4 ✓	1 ✓	2 ✓
146	2 ✓	2 ✓	2 ✓	1 ✓
147	1 ✓	1 ✓	3 ✓	3 ✓
148	2 ✓	1 ✓	4 ✓	4 ✓
149	1 ✓	2 ✓	4 ✓	2 ✓
150	3 ✓	3 ✓	2 ✓	3 ✓
151	2 ✓	1 ✓	1 ✓	1 ✓
152	2 ✓	1 ✓	3 ✓	2 ✓
153	3 ✓	3 ✓	4 ✓	4 ✓
154	1 ✓	1 ✓	2 ✓	3 ✓
155	2 ✓	3 ✓	4 ✓	1 ✓
156	4 ✓	3 ✓	2 ✓	2 ✓


 23/6/17

✓ Marked
 23.6.17



Answer Key Centralized Entrance Exam. Forensic Sc. 22-06-2017

S.No	A	B	C	D
157	2 /	2 /	1 /	3 /
158	3 /	1 /	1 /	4 /
159	2 /	4 /	2 /	4 /
160	1 /	1 /	3 /	2 /
161	4 /	2 /	1 /	1 /
162	1 /	1 /	1 /	3 /
163	4 /	2 /	3 /	4 /
164	1 /	1 /	1 /	2 /
165	2 /	3 /	3 /	4 /
166	1 /	1 /	1 /	1 /

Checked by
M. S. S. S.
23/6/17

✓ M. S. S. S.
23-6-17

