

Choose the correct answer :

1. Name of the physicist who said first the charge on a glass rod rubbed with silk as positive charge and charge on the rubber rod rubbed with fur as negative charge.

- (1) Benjamin Franklin
- (2) Henry Cavendish
- (3) Charles Augustin de Coulomb
- (4) Millikan

2. The ratio of electric force of interaction to gravitational force of interaction between two protons is of the order of ($m_p = 1.67 \times 10^{-27}$ kg)

- (1) 10^{36}
- (2) 10^{38}
- (3) 10^{42}
- (4) 10^{43}

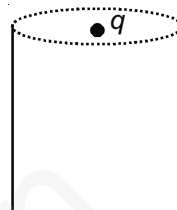
3. n small drops of mercury, each of radius r and charge q , coalesce to form a big drop. The ratio of surface charge density of small drop with that of the big drop is

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

4. Four equal charges Q are placed at the four corners of a square and a charge q is at its centre. If the system is in equilibrium the value of q is

- (1) $\frac{Q}{4}(1+2\sqrt{2})$
- (2) $-\frac{Q}{4}(1+2\sqrt{2})$
- (3) $\frac{Q}{2}(1+2\sqrt{2})$
- (4) $-\frac{Q}{2}(1+2\sqrt{2})$

5. Find the flux of the electric field through the surface of the vessel, as shown in figure if a charge q is placed at centre of the open end of cylindrical vessel.

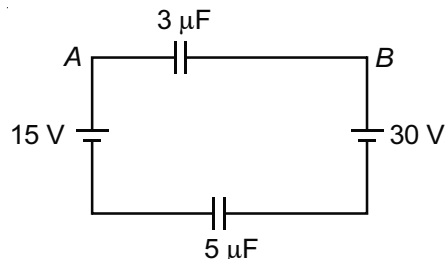


- (1) Zero
- (2) $\frac{q}{\epsilon_0}$
- (3) $\frac{q}{2\epsilon_0}$
- (4) $\frac{q}{3\epsilon_0}$

6. Electric potential at any point is given by $v = -4x + 5y + \sqrt{15}z$ then magnitude of the electric field is

- (1) $\sqrt{56}$
- (2) $\sqrt{40}$
- (3) $\sqrt{41}$
- (4) 6

7. In the given figure find $V_A - V_B$.



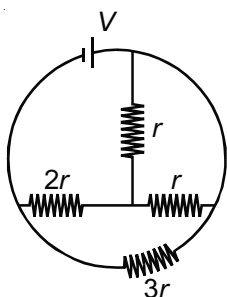
- (1) 7 V
- (2) -7 V
- (3) 8 V



8. A capacitor of capacity $5 \mu\text{F}$ is charged to 20 volt and a second capacitor of capacity $8 \mu\text{F}$ is charged to 15 V. If they are connected in parallel then amount of charge that flows from the $5 \mu\text{F}$ capacitor to $8 \mu\text{F}$ capacitor is

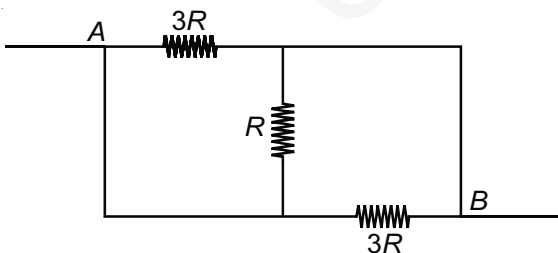
- (1) $\frac{200}{13} \mu\text{C}$ (2) $\frac{-46}{3} \mu\text{C}$
(3) $10 \mu\text{C}$ (4) $-10 \mu\text{C}$

9. The total current supplied to the circuit by the battery is



- (1) $\frac{11V}{15r}$ (2) $\frac{2V}{3r}$
(3) $\frac{3V}{2r}$ (4) $\frac{13V}{11r}$

10. Resultant resistance of the circuit between point A and B is



- (1) $\frac{R}{2}$ (2) $\frac{3R}{5}$
(3) $\frac{4R}{3}$

11. Two bulbs of rating 500 W and 200 W are manufactured to operate on 220 V line. The ratio of heat produced in 500 W and 200 W bulb when they are connected in series.

- (1) $\frac{5}{2}$ (2) $\frac{2}{5}$
(3) $\frac{5}{7}$ (4) $\frac{2}{7}$

12. A proton moving with a velocity of 10^6 m/s describes a circle of radius R in a magnetic field. What will be the speed of an α -particle to describe a circle of same radius in the same magnetic field?

- (1) 2×10^6 m/s (2) 0.5×10^6 m/s
(3) 4×10^5 m/s (4) 6×10^5 m/s

13. The sensitivity of a moving coil galvanometer increases with the decrease in

- (1) Number of turns
(2) Area of coil
(3) Magnetic field
(4) Torque required for unit twist

14. Which of the following property makes soft iron as the suitable core for transformers?

- (1) High hysteresis loss, low permeability
(2) High hysteresis loss, high permeability
(3) Low hysteresis loss, low permeability
(4) Low hysteresis loss, high permeability

15. A current of 4000 A is flowing at 220 V in the primary coil of a transformer. The voltage across the secondary is 10000 V and 10% of power is lost. What is the current through secondary?

- (1) 88 A (2) 88 A
(3) 79.2 A (4) 80 A



16. Self inductance of the motor of an electric fan is 10 H. In order to impart maximum power at 50 Hz, it should be connected to a capacitance of (approximately)
- (1) $4 \mu\text{F}$
 - (2) $2 \mu\text{F}$
 - (3) $1 \mu\text{F}$
 - (4) $8 \mu\text{F}$
17. A photosensitive metallic surface has work function $h\nu_0$. If photons of energy $2h\nu_0$ fall on this surface, the electrons come out with a maximum velocity of $4 \times 10^6 \text{ ms}^{-1}$. When the photon energy is increased to $5h\nu_0$, then maximum velocity of photoelectrons will be
- (1) $2 \times 10^7 \text{ ms}^{-1}$
 - (2) $2 \times 10^6 \text{ ms}^{-1}$
 - (3) $8 \times 10^5 \text{ ms}^{-1}$
 - (4) $8 \times 10^6 \text{ ms}^{-1}$
18. If the critical angle be θ , then the Brewster's angle is
- (1) $\sin^{-1}[\cot \theta]$
 - (2) $90 - \theta$
 - (3) $\tan^{-1}[\text{cosec } \theta]$
 - (4) $\sin^{-1}[\tan \theta]$
19. To achieve good contrast between maxima and minima in the interference pattern of Young's double slit experiment, the ratio of intensity of light emerging out of the two slits should be
- (1) 1
 - (2) 2
 - (3) 3
 - (4) 4

20. A plano-convex lens is made of refractive index 1.6. The radius of curvature of curved surface is 60 cm. Focal length of the lens is
- (1) 200 cm
 - (2) 100 cm
 - (3) 50 cm
 - (4) 400 cm
21. Refracting angle of a prism is θ and refractive index of the material of the prism is $\cot \frac{\theta}{2}$. The angle of minimum deviation is
- (1) $180^\circ - 2\theta$
 - (2) $90^\circ - \theta$
 - (3) $180^\circ + 2\theta$
 - (4) $180^\circ - 3\theta$
22. For hydrogen atom if the energy of n^{th} orbit is E_n , then energy in the n^{th} orbit of a doubly ionized lithium atom will be
- (1) $4 E_n$
 - (2) $9 E_n$
 - (3) $\frac{E_n}{9}$
 - (4) $\frac{E_n}{4}$
23. Two radioactive materials A and B have decay constants 5λ and λ respectively. If initially they have the same number of nuclei, then the ratio of the number of nuclei of A to B will be $\frac{1}{e^2}$ after a time
- (1) $\frac{1}{\lambda}$
 - (2) $\frac{1}{2\lambda}$
 - (3) $\frac{3}{4\lambda}$
 - (4) $\frac{1}{4\lambda}$

24. Number of NaCl molecules present in the per unit cell of rock-salt is

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

25. The solutions of KCl, BaCl₂ and FeCl₃ each one of 0.5 m molality show boiling points T₁, T₂ and T₃. How are these temperatures related to one another?

- (1) T₃ < T₂ < T₁ (2) T₂ < T₁ < T₃
(3) T₂ < T₃ < T₁ (4) T₁ < T₂ < T₃

26. Which of the following relation is correct?

- (1) Molar Conductivity = $\frac{\text{Conductivity}}{\text{Cell constant}}$
(2) Conductivity = Conductance × Cell constant
(3) Conductance = Conductivity × Cell constant
(4) Eq. conductivity = Conductivity × Cell constant

27. Cottrell precipitator is used to

- (1) Remove carbon from the smoke
(2) Burn the waste gases
(3) Study suspended particles in a gas
(4) Purifying city water supply

28. The spin only magnetic moment of an element can be calculated by (n = number of unpaired electron)

- (1) $\mu = \sqrt{n(n-2)} \frac{h}{2\pi}$
(2) $\mu^2 = \sqrt{n(n+2)} \frac{h}{2\pi}$
(3) $\mu = \sqrt{n(n+2)} \frac{h}{2\pi}$
(4) $\frac{\mu^2}{n} = \sqrt{n+2} \frac{h}{2\pi}$

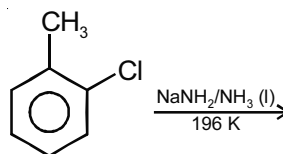
29. Which of the following will oxidise KI to KIO₃?

- (1) KMnO₄/H⁺
(2) KMnO₄/OH⁻
(3) K₂Cr₂O₇/H⁺
(4) MnO₂

30. M in [ML₆]³⁺ has (n - 1)d⁶ configuration and +3 oxidation state. L is a strong ligand. The complex is likely to be

- (1) Paramagnetic due to 1-unpaired electron
(2) Paramagnetic due to 2-unpaired electrons
(3) Paramagnetic due to 4-unpaired electrons
(4) Diamagnetic

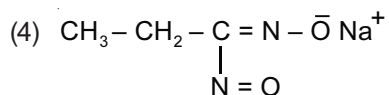
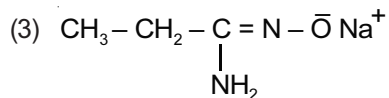
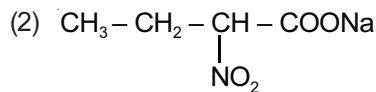
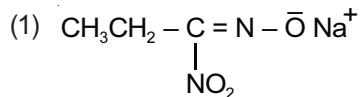
31. What is the product of the following reaction?



- (1)
- (2)
- (3)
- (4) Both (2) & (3)



32. In the Victor Meyer's test of alcohols, $\text{CH}_3 - \text{CH}_2 - \text{OH}$ gives red colour due to the formation of the product



33. The number of isomers possible (structural only) for $\text{C}_4\text{H}_{11}\text{N}$ is

(1) 4 (2) 8

(3) 6 (4) 7

34. The ease of hydrolysis of the acid derivatives is in the order

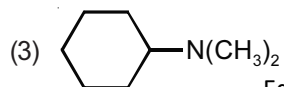
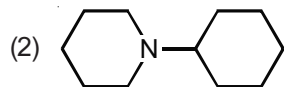
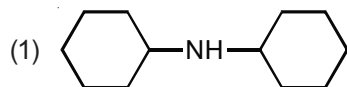
(1) $\text{RCOCl} > \text{RCONH}_2 > (\text{RCO})_2\text{O} > \text{RCOOR}'$

(2) $(\text{RCO})_2\text{O} > \text{RCOCl} > \text{RCONH}_2 > \text{RCOOR}'$

(3) $(\text{RCO})_2\text{O} > \text{RCOOR}' > \text{RCOCl} > \text{RCONH}_2$

(4) $\text{RCOCl} > (\text{RCO})_2\text{O} > \text{RCOOR}' > \text{RCONH}_2$

35. Which of the following gives precipitates with Hinsberg reagent?



(4) $(\text{CH}_3)_3\text{N}$

36. Mendius reaction converts acetonitrile into

(1) Methanamine

(2) Ethanamine

(3) Propan-1-amine

(4) Propan-2-amine

37. The class of polymers that has weakest intermolecular forces is

(1) Fibres

(2) Elastomers

(3) Thermosetting polymers

(4) Thermoplastic polymers

38. Out of the following, select the derivative of carbohydrates

(1) Penicillin

(2) Cephalosporin

(3) Streptomycin

(4) Chloromycetin

39. Reaction of which of the chemical with glucose shows the ring structure of glucose and absence of CHO group?

(I) NH_2OH , (II) NaHSO_3 , (III) Schiff's reagent

(1) I only

(2) II only

(3) Both I and II

(4) I, II and III

40. Which of the following method can be used for the reduction of aldehydes to hydrocarbons?

(1) Zn-Hg/HCl

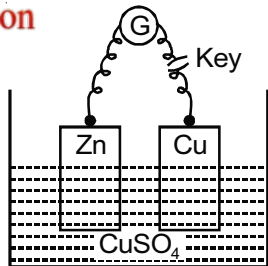
(2) $\text{NH}_2 - \text{NH}_2/\text{KOH}/\text{glycol}/\Delta$

(3) $\text{HI}/\text{Red}/\text{P}/\Delta$

(4) All of these

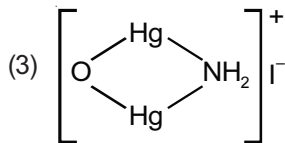


41. In the arrangement shown below, what will happen when the key is pressed to on-position?



- (1) Current will flow in the wire from Zn to Cu
 - (2) Current will flow in the wire from Cu to Zn
 - (3) Cu^{2+} ions will move towards Cu metal
 - (4) No current will flow
42. The presence of NH_3 or NH_4^+ can be detected by using test with Nessler's reagent, whereby brown ppt. of Millon's base are produced. The formula of compound appearing as brown ppt. is

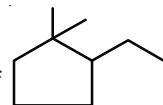
- (1) $\text{K}_2\text{HgI}_4/\text{KOH}$
- (2) HgI_2

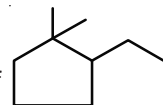


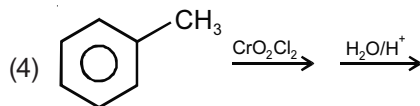
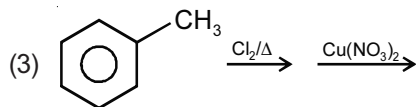
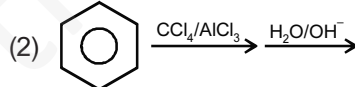
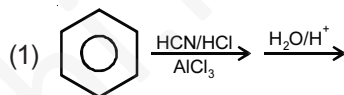
- (4) All of these

43. Which of the following statement is incorrect?

- (1) Cl in ClO_3^- is sp^3 hybridised
- (2) Xe in XeO_3 is sp^2 hybridised
- (3) S in H_2SO_4 is sp^3 hybridised
- (4) P in PCl_5 is sp^3d hybridised



44. IUPAC name of  is
- (1) 1-Ethyl-2,2-dimethylcyclopentane
 - (2) 2-Ethyl-1,1-dimethylcyclohexane
 - (3) 2-Ethyl-1,1-dimethylcyclopentane
 - (4) 1-Ethyl-2,2-dimethylcyclohexane
45. Which of the following will not give benzaldehyde?



BIOLOGY

46. Potato is multiplied vegetatively by

- (1) Rhizome
- (2) Tuber
- (3) Bulb
- (4) Sucker

47. Identify the **incorrect** statement.

- (1) All organisms have to reach a certain stage of growth and maturity in their life before they reproduce sexually. That period of growth is called reproductive phase
- (2) Gametes are haploid though the parent plant body from which they arise may be either haploid or diploid

(3) In algae, bryophytes and pteridophytes, water is the medium through which the gamete transfer takes place

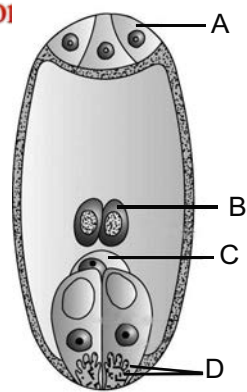
(4) Further development of the zygote depends on the type of life cycle the organism has and the environment it is exposed to

48. The wall of microsporangium which nourishes the developing pollen grains is

- (1) Epidermis
- (2) Endothecium
- (3) Middle layer
- (4) Tapetum



49. Identify A, B, C and D in the given diagram w.r.t. embryo sac.



- (1) A–Antipodal cells
B–Central cell
C–Egg
D–Synergids
- (2) A–Egg apparatus
B–Polar nuclei
C–Antipodal cell
D–Filliform apparatus
- (3) A–Antipodal cells
B–Polar nuclei
C–Egg
D–Filliform apparatus
- (4) A–Antipodal cells
B–Secondary nucleus
C–Egg
D–Synergids

50. Pollination by water is quite rare in flowering plants and is limited to about

- (1) 40 genera
- (2) 30 genera
- (3) 35 genera
- (4) 25 genera

- 51. All seeds are albuminous, **except**
 - (1) Wheat, Maize
 - (2) Barley, Castor
 - (3) Sunflower, Cocount
 - (4) Pea, Groundnut
- 52. Mendel crossed pure tall (dominant) plant with pure dwarf (recessive) plant. The F₂ generation from the cross should show
 - (1) 50% tall and 50% dwarf
 - (2) All tall plants
 - (3) 75% tall plants and 25% dwarf plants
 - (4) All dwarf plants

- 53. Given below are the few characteristic features of a genetic disorder
 - a. Short statured with small round head
 - b. Furrowed tongue
 - c. Partially open mouth
 - d. Retarded physical, psychomotor and mental development

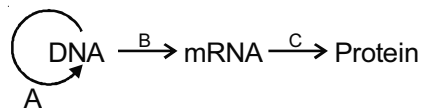
The genetic disorder is

- (1) Sickle cell anaemia
- (2) Down's syndrome
- (3) Turner's syndrome
- (4) Phenyl ketonuria

54. A man with blood group AB, marries a woman with blood group O. The possible blood group of the offsprings is/are

- (1) AB, O
- (2) A, B
- (3) A, B, AB
- (4) A, B, O

55. Identify A, B and C w.r.t. the central dogma of molecular biology.



- | A | B | C |
|------------------|----------------|---------------|
| (1) Replication | Translation | Transcription |
| (2) Transduction | Transformation | Translation |
| (3) Reverse | Transcription | Translocation |



56. DNA dependent DNA polymerases catalyse polymerisation in _____ direction.

FREE Education (1) $5' \rightarrow 3'$

- (2) $3' \rightarrow 5'$
- (3) Both $5' \rightarrow 3'$ & $3' \rightarrow 5'$
- (4) Either $5' \rightarrow 3'$ or $3' \rightarrow 5'$

57. Match the following

Column-I **Column-II**

- | | |
|--|---------------------|
| a. One codon codes for only one amino acid | (i) Universal |
| b. Same from bacteria to humans | (ii) No punctuation |
| c. Some amino acids are coded by more than one codon | (iii) Unambiguous |
| d. Codon is read in mRNA in a contiguous fashion | (iv) Degenerate |
- (1) a(iii), b(iv), c(i), d(ii) (2) a(iv), b(i), c(iii), d(ii)
 (3) a(iv), b(ii), c(iii), d(i) (4) a(iii), b(i), c(iv), d(ii)

58. Identify the **incorrect** statement w.r.t. Human Genome Project.

- (1) The average gene consists of 3000 bases
- (2) More than 2 percent of the genome codes for proteins
- (3) The functions are unknown for over 50 percent of the discovered genes
- (4) 1.4 million locations are there with single base DNA differences

59. The variety of wheat resistance to leaf and stripe rust is

- | | |
|------------------|------------------|
| (1) Pusa Swarnim | (2) Himgiri |
| (3) Pusa Komal | (4) Pusa Shubhra |

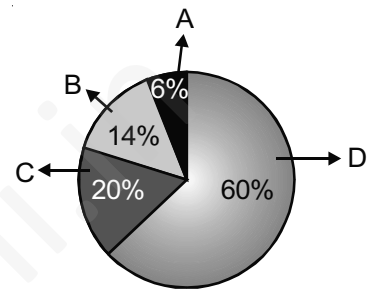
60. Virus-free plants can be obtained from

- (1) Apical and axillary meristem culture
- (2) Embryo culture
- (3) Pollen culture
- (4) Organ culture

61. Statins, blood-cholesterol lowering agents, are produced by

- (1) *Monascus purpureus*
- (2) *Trichoderma polysporum*
- (3) *Aspergillus niger*
- (4) *Acetobacter aceti*

62. Given below is the relative contribution of various green house gases to total global warming. Identify A, B, C & D.



A	B	C	D
(1) CO ₂	CH ₄	CFC	N ₂ O
(2) N ₂ O	CFC	CH ₄	CO ₂
(3) CFC	N ₂ O	CO ₂	CH ₄
(4) CH ₄	CO ₂	N ₂ O	CFC

63. The blend of polyblend and bitumen, when used to lay roads, enhanced road life by a factor of

- | | |
|----------|-----------|
| (1) Two | (2) Three |
| (3) Four | (4) One |

64. Given below is an equation describing increase or decrease in population size (N) during a unit time period t [dN/dt]

$$\frac{dN}{dt} = rN \left[\frac{K-N}{K} \right]$$

It represents

- (1) Logistic growth
- (2) Exponential growth



65. Which of the following is not an example of Commensalism?
- (1) Orchid growing on a mango branch
 - (2) Sea anemone and clown fish
 - (3) Barnacles growing on the back of a whale
 - (4) In South American lakes between visiting flamingoes and resident fishes
66. The pyramid of biomass in sea is generally
- (1) Upright
 - (2) Inverted
 - (3) Spindle
 - (4) Triangular
67. Identify the correct statement
- (1) A community that is in near equilibrium with the environment is called climax community
 - (2) In the successive seral stages there is an increase in the number of species but there is decrease in total biomass
 - (3) Primary succession begins in area where natural biotic communities have been destroyed
 - (4) Secondary succession is slower than primary succession
68. Match the following:
- | Column-I | Column-II |
|-------------------------|-------------------------|
| a. The Earth Summit | (i) Canada |
| b. World Summit | (ii) Johannesburg |
| c. Montreal Protocol | (iii) Rio de Janeiro |
| (1) a(i), b(iii), c(ii) | (2) a(iii), b(ii), c(i) |
| (3) a(ii), b(iii), c(i) | (4) a(iii), b(i), c(ii) |
69. Meiocytes are diploid in nature but gametes are haploid. What will be the chromosomes number in butterfly meiocyte cell?
- (1) 380
 - (2) 8
 - (3) 46
 - (4) 12

70. Which of the following structure does not participate in the formation of male sex accessory ducts system?
- (1) Rete testis
 - (2) Epididymis
 - (3) Vas deferens
 - (4) Urethra
71. The funnel shaped part of human female fallopian tube, which is present closer to the ovary is called
- (1) Fimbriae
 - (2) Foreskin
 - (3) Fornix
 - (4) Infundibulum
72. Which hormone released from corpus luteum is essential for maintenance of the endometrium of human female?
- (1) Estrogen
 - (2) Progesteron
 - (3) Relaxin
 - (4) Testosteron
73. During embryonic development of human embryo, heart is formed at
- (1) Fourth month
 - (2) Sixth month
 - (3) First month
 - (4) Third month
74. Which of the following is used as barrier method in human family planning program?
- (1) Vaults
 - (2) LNG-20
 - (3) Saheli pills
 - (4) Multiload 375 IUDs
75. Who amongst the following demonstrated through the experiments that life comes only from pre-existing life?
- (1) Oparin
 - (2) Haldane
 - (3) Louis Pasteur
 - (4) S.L. Miller
76. Darwin was influenced by reading the book "An essays on Population", which was written by
- (1) Charles Lyell
 - (2) Thomas Rev Malthus
 - (3) Hugo de Vries
 - (4) Hardy-Weinberg
77. The Neanderthal man lived in near east and central Asia between 1,00,000 – 40,000 years back and had a brain size of
- (1) 1100 cc
 - (2) 1650 cc
 - (3) 900 cc
 - (4) 1400 cc



78. Which of the following is considered to be in direct line of human evolution and was more man like?
(1) *Proconsul* (2) *Dryopithecus*
(3) *Ramapithecus* (4) *Australopithecus*
79. *Plasmodium* is responsible for causing malaria. Out of different type of malaria, the malignant malaria is caused by
(1) *Plasmodium vivax*
(2) *Plasmodium malariae*
(3) *Plasmodium ovale*
(4) *Plasmodium falciparum*
80. *Wuchereria bancrofti* cause a slowly developing chronic inflammation of the organs in which they live for many years, usually the lymphatic vessels and the disease is called
(1) Elephantiasis (2) Ascariasis
(3) Amoebiasis (4) Typhoid
81. Which of the following statement is/are true?
a. Insulin chains and antibody monomer chains are attached through disulphide bond
b. Virus-infected cells secrete proteins called interferons which protect non-infected cells from further viral infection
c. Acid in stomach, saliva in the mouth, tears work as physiological barriers in innate immunity
(1) a & b (2) b & c
(3) a & c (4) All of these
82. Which of the following is chemically known as diacetyl morphine?
(1) Heroin (2) Cocaine
(3) Hashish (4) LSD
83. Marijuana effects on cardiovascular system of the body. Marijuana is obtained from which plant?
(1) *Erythroxylum coca* (2) *Cannabis sativa*
(3) *Papaver somniferum* (4) *Atropa belladonna*

84. Prolonged intake of alcohol can cause
(1) Emphysema (2) Cirrhosis
(3) Tuberculosis (4) Mumps
85. At what stage, fertilized eggs are recovered non surgically and transferred to surrogate mothers?
(1) 32 cell stage (2) 100-112 cell stage
(3) 8-32 cell stage (4) After implantation
86. Which of the following is **not** marine fish?
(1) *Catla* (2) *Hilsa*
(3) Sardines (4) Pomfrets
87. Those enzymes which cut DNA at specific locations are called restriction endonuclease or molecular scissors. Which of the following restriction endonuclease is the first to be discovered?
(1) EcoR I (2) BamH I
(3) Hind II (4) Sal I
88. What is the correct sequence done during amplification of gene by PCR method?
(1) Annealing → Denaturation → Extension
(2) Extension → Annealing → Denaturation
(3) Denaturation → Annealing → Extension
(4) Annealing → Extension → Denaturation
89. During downstream processing which process can not be done?
(1) Separation and purification
(2) Product has to be formulated with suitable preservatives
(3) Quality control testing for each product
(4) Separation and isolation of DNA fragments by gel electrophoresis
90. Which nematode infects the roots of tobacco plants and causes a great reduction in yield?
(1) *Meloidogyne incognitia*
(2) *Bacillus thuringiensis*
(3) *Ancylostoma duodenale*
(4) *Trichuris trichura*