CSIR NET – LIFE SCIENCE

MOCK TEST PAPER

- *This paper contains 75 Multiple Choice Questions*
- *part A 15, part B 35 and part C 25*
- *Each question in Part 'A' carries two marks*
- *Part 'B' carries 2 marks*
- *Part 'C' carries 4 marks respectively.*
- *There will be negative marking @ 25% for each wrong answer.*
- *Pattern of questions : MCQs*
- *Total marks : 200*
- *Duration of test : 3 Hours*

PART A (1-15)

1 Twenty four clerk can clear 180 files in 15 days. Number of clerk required to clear 240 files in 12 days is

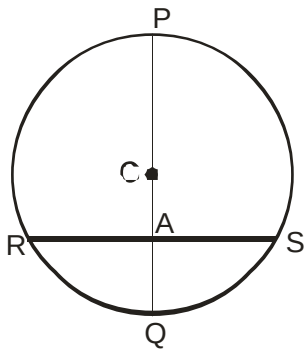
(1) 38

(2) 39

(3) 40

(4) 42

2. In the given figure, RA = SA = 9cm and QA = 7cm. If PQ is the diameter, then radius is



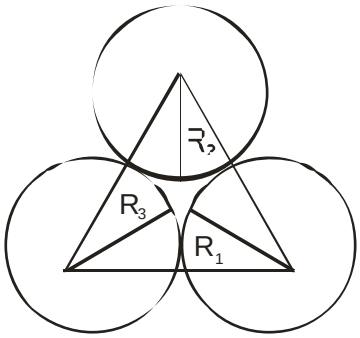
(1) $\frac{65}{7}$ cm

(2) $\frac{130}{7}$ cm

(3) 8 cm

(4) None

3. If the circles are drawn with radii R1, R2, R3 with centre at the vertices of a triangle as shown in figure. Side of triangle is a, b, c respectively, then R1 + R2 + R3 is equal to



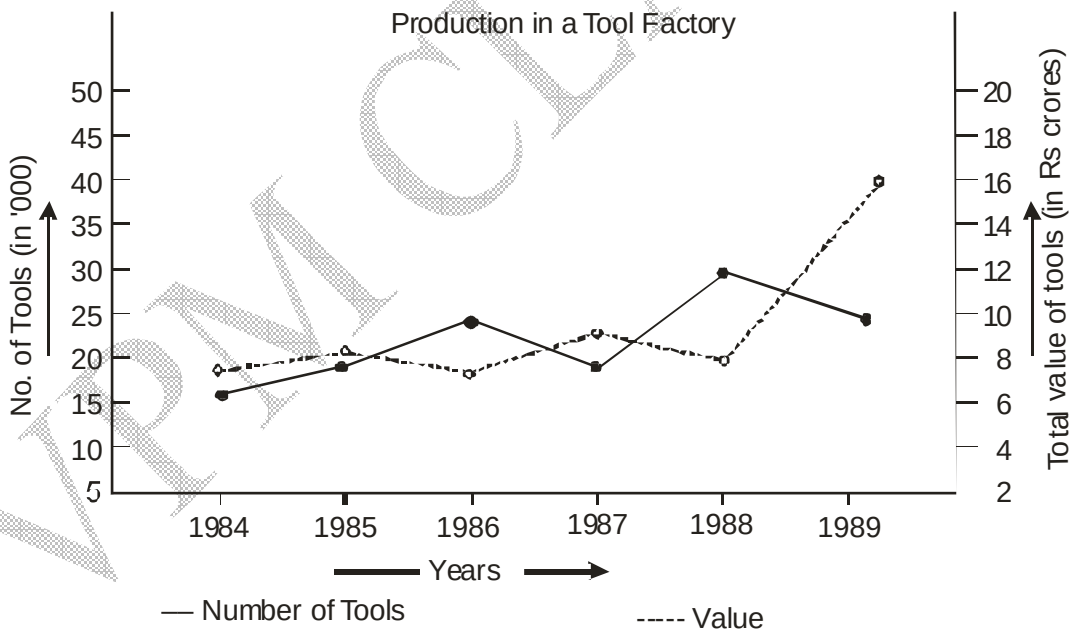
3(a + b + c)

$\frac{1}{3}(a + b + c)$

$\frac{1}{2}(a + b + c)$

(4) 2(a + b + c)

4. Study the following graph and answer the question given below it



What was the value of each tool in 1985?

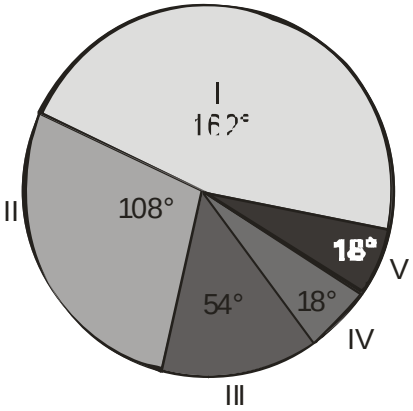
(1) Rs $5\frac{1}{3}$ thousand

(2) Rs 50 thousand

(3) Rs 5, 103

(4) $5\frac{5}{9}$

5. The total adults in a city is 60000. The various sections of them are indicated below in the circle



I → employees in the public sector
II → employees in the private sector
III → employees in the corporate sector
IV → self employed
V → unemployed

What percentage of the employed persons is self employed?

(1) $5\frac{5}{19}$

(2) $19\frac{1}{5}$

(3) 20

(4) 5

6. Look at this series: 14, 28, 20, 40, 32, 64, ... What number should come next?

(1) 52

(2) 56

(3) 96

(4) 128

7. A car owner buys petrol at Rs.7.50, Rs. 8 and Rs. 8.50 per liter for three successive years. What approximately is the average cost per liter of petrol if he spends Rs. 4000 each year?

(1) Rs. 7.98

(2) Rs. 8

(3) Rs. 8.50

(4) Rs. 9

8. In a certain store, the profit is 320% of the cost. If the cost increases by 25% but the selling price remains constant, approximately what percentage of the selling price is the profit?

(1) 30%

(2) 70%

(3) 100%

(4) 250%

9. Today is Friday after 62 days, it will be :

(1) Thursday

(2) Friday

(3) Wednesday

(4) Tuesday

10. A car travelling with of its actual speed covers 42 km in 1 hr 40 min 48 sec. Find the actual speed of the car.

(1) $17\frac{6}{7}$ km/hr

(2) 25 km/hr

(3) 30 km/hr

(4) 35 km/hr

11. P is a working and Q is a sleeping partner. P puts in Rs. 3400 and Q puts Rs.6500. P receives 20% of the profits for managing. The rest is distributed in proportion to their capitals. Out of a total profit of Rs.990, how much did P get ?

(1) 460

(2) 470

(3) 450

(4) 480

12. A lawn is the form of a rectangle having its side in the ratio 2:3 The area of the lawn is 1/6 hectares. Find the length and breadth of the lawn.

(1) 25m

(2) 50m

(3) 75m

(4) 100 m

13. An aeroplane covers a certain distance at a speed of 240 kmph in 5 hours. To cover the same distance in 1 hours, it must travel at a speed of:

(1) 300 kmph

(2) 360 kmph

(3) 600 kmph

(4) 720 kmph

14. Find out the missing number of the given question:

2	7	4
5	2	3
1	?	6
10	42	72

(1) 2

(2) 4

(3) 5

(4) 3

15. All of the following are the same in a manner. Find out the one which is different among them:

(1) BFJQ

(2) RUZG

(3) GJOV

(4) ILQX

PART B (16-50)

16. Free fatty acids are transported in the blood

(1) Combined with albumin

(2) Combined with fatty acid binding protein

(3) Combined with-lipoprotein

(4) In unbound free state

17. In most experimental model systems, the amino acid, show greatest tendency to form α helices?

(1) Alanine

(2) Serine

(3) Threonine

(4) Cysteine

18. The Z-DNA helix

(1) Has fewer base pairs per turn than the B-DNA

(2) Is favored by an alternating GC sequence

(3) Tends to be found at the 3'-end of genes

(4) Is inhibited by methylation of the bases

19. Choose the mismatch

(1) D–glucose and D–fructose : anomer

(2) D–glucose and D-mannose : epimer

(3) α – D–glucose and β–D–glucose : anomer

(4) D–glucose and L–glucose : enantiomer

20. Lumirhodopsin is stable only at temperature below

(1) –10°C

(2) –20°C

(3) –40°C

(4) –50°C

21. Serum acid phosphatase level increases in

(1) Metastatic carcinoma of prostate

(2) Myocardial infarction

(3) Wilson's disease

(4) Liver diseases

22. Ionophores are

(1) The gating mechanisms associated with the transport of ions

(2) Intrinsic proteins that passively transport ions

(3) Chemicals that form pores in the plasma membrane and allow ions to cross

(4) Intrinsic proteins that actively transport ions

23. The decline of MPF (M phase promoting factor or M Phase kinase) at the end of mitosis I caused by

(1) The destruction of protein cyclin dependent kinase

(2) Decreased synthesis of cyclin

(3) The enzymatic destruction

(4) Synthesis of DNA

24. The shine-Dalgrano sequence is responsible for

(1) Binding of RNA polymerase to gene during transcription

(2) Binding of DNA polymerase to origin of replication during DNA replication

(3) Binding of riosomes to mRNA during initiation of translation

(4) Binding of snURPs during splicing

25. Which of the following is least likely to lead to autoimmunity?

(1) Loss of suppressor T cells

(2) Release of sequestered self antigen

(3) Genetic predisposition

(4) Increased clearance of immune complexes

26. A 12 year old boy develops a disorder also present in his father. No one else in the family is known to be affected. Which of the following modes of inheritance is least likely?

(1) Autosomal recessive

(2) Autosomal dominant

(3) X - linked recessive

(4) Y-linked

27. Lipid rafts are membrane micro domains that are enriched with?

(1) Phosphatidylcholine

(2) Chloesterol

(3) Glycosphingolipids

(4) Cardiolipin

(1) 1, 2

(2) 2, 4

(3) 1, 4

(4) 2, 3

28. Precursor of ACTH is

(1) Cholesterol

(2) Pregnenolone

(3) Corticotropin

(4) Pro-piomelanocortin

29. A differential medium is one in which

(1) Fungi and viruses grow differently

(2) Two different bacteria can be distinguished

(3) A particular nutrient is used differently by two different bacteria

(4) Two different temperatures are utilized in the incubation period.

30. Viroids have

(1) Single stranded RNA not enclosed by protein coat

(2) Single stranded DNA not enclosed by protein coat

(3) Double stranded RNA not enclosed by protein coat

(4) Single stranded DNA not enclosed by protein coat

31. The difference between transfection and transductions

(1) In transfection, the transgene is inserted in a plasmid, while in transduction; the transgene is inserted in a viral genome

(2) Transfection involves the transfer of naked DNA into the cell while transduction involves packaging of the DNA into a virus particle, which then infects the cell

(3) There is no difference - the terms are synonymous

(4) None

32. Consider the following statements:

Tissue culture is recommended for,

1. Multiplication of elite genotypes of useful trees.
2. Developing virus-free plants.
3. Production of secondary metabolites.
4. Induction of polyploidy.

of these statements :

(1) 1, 2 and 4 are correct

(2) 1, 2, and 3 are correct

(3) 1, 3 and 4 are correct

(4) 2, 3 and 4 are correct

33. Which of the following partial amino acid sequence from a protein whose gene you wish to clone would be most useful in designing an oligonucleotide probe to screen a cDNA library?

(1) Met – Leu – Arg – Leu

(2) Met – Trp Cys – Trp

(3) Met – Arg – Arg – Val

(4) Met – Leu – Gly – Leu

34. The coefficient of correlation r satisfies

(1) $0 < r < 1$

(2) $|r| > 1$

(3) $|r| \leq 1$

(4) $-1 < r < 0$

35. In Scanning Electron Microscope (SEM), to form an image of the specimen

(1) Electron should pass through the specimen

(2) Electrons are scattered from the surface of the specimen

(3) A thin film of heavy metal is evaporated

(4) Specimens are stained

36. Sephadex has an exclusion limit of 80, 000 molecular weight for globular proteins. When this material was used to separate alcohol dehydrogenase (MW 150, 000) from β amylase (MW 200, 000) the result will be?

(1) Alcohol dehydrogenase elutes first

(2) β amylase elutes first

(3) β amylase will not elute

(4) No separation.

37. An enzyme is discovered that catalyzes the chemical reaction.

$$A \rightleftharpoons B$$

Researchers find that the K_{cat} is 400 S^{-1} If [Et] = 300 nm and concentration of substrate A = 400 µm, the reaction velocity is 8.0 µm s^{-1} calculate the K_m for substrate A?

(1) 10 µm

(2) 0.20 µm

(3) 20 µm

(4) 0.10 µm

38. PROSITE is a database used for?

(1) Nucleotide sequencing

(2) Protein sequencing

(3) 2-D electrophoresis

(4) Sequence Tagged site

39. Match the following

(P) Flippase (1) move any membrane phospholipids across the bilayer down its concentration gradient

(Q) Floppase (2) transport glycrophospholipid from the outer monolayer to the cytoplasmic surface of the plasma membrane.

(R) Scramblase (3) move plasma membrane phospholipids from cytosolic to the extracellular leaf

	P	Q	R
(1)	2	3	1
(2)	1	2	3
(3)	3	2	1
(4)	1	3	2

40. Vincristin and Vinblastin, the chemical substances that can cure leukemia, are obtained from

(1) Rauwolfia serpentina
(2) Catharanthus roseus
(3) Withania somnifera
(4) Strychnos nux-vomica

41. Which of the following pairs are correctly matched?

P. 2,4-dinitrophenol	–	Uncoupling agent in oxidative phosphorylation
Q. Oligomycin	–	Inhibitor of ATP formation in oxidative phosphorylation
R. Valinomycin	–	Ionophore carries potassium through the mitochondrial menbrane
S. Iodoacetate	–	Separates the phosphorylating F_1-ATPase from the inner Mitochondrial membrane

Select the correct answer from the codes given below Codes:
(1) P, Q and S
(2) P, R and S
(3) Q, R and S
(4) P, Q and R

42. Which of the following plant hormones is incorrectly paired with its function?
(1) Auxins –– responsible for apical dominance
(2) Abscisic acid –– regulates the rate of transpiration
(3) Cytokinins –– delays senescence (aging and decay)
(4) Gibberellins –– promotes bud and seed dormancy

43. I place a cell in a solution. Over a period of time, I notice that the cell shrinks, as if it is losing water. Which of the following seems likely?
(1) The solution is a strong buffer
(2) The solution is an acid
(3) The solution has more dissolved solutes than the cell does
(4) The solution has fewer dissolved solutes than the cell does

44. Which of the following plants show resistance to heavy metal?
(1) Viola calaminaria
(2) Thlaspi alpestre
(3) Minuartia verna
(4) All the above

45. Chemotropic movement of pollen tubes towards the micropylar end of the ovules in many cases has been attributed to the presence of?

(1) Mucilaginous substances on stigmatic papillae

(2) Auxins gradient through stylar tissue

(3) Gibberellin gradient through stigmatic and stylar tissue upto embryo sac

(4) Calcium gradient through stylar tissue upto embryo sac

46. Which of the following statements gives a correct explanation for the use of vectors containing drug resistance genes in the cloning of recombinant DNA (cDNA) molecules?

(1) The products of the drug resistance genes protect the cDNA from destruction by the host cell

(2) The drug resistance genes provide additional base sequences that enable the vector to accommodate larger inserts of cDNA

(3) Entry of the vector containing the cDNA and the drug resistance genes into the host cell renders the later identifiable as it is now resistant to antibiotic drugs

(4) The cloned cDNA imparts drug resistance upon any cellular system with which it is used

47. A coronary sulcus is found?

(1) Upon surface of liver between right and left liver lobes

(2) Upon heart surface between right and left auricles

(3) Upon heart surface between ventricle and atrium

(4) Upon heart surface between right and left ventricles.

48. Mechanism by which Antidiuretic hormone increases water reabosorption in kidneys is?

(1) By directly acting on luminal membrane

(2) It acts on reticular structures in cytoplasm

(3) It activates enzyme guanyl cyclase

(4) It activates enzyme adenyl cyclase

49. In which of the following combination the name of hormone, its chemical type & its tissue of origin correctly matched?

(1) Aldosterone, Peptide, Pancreas

(2) Glucagon, peptide, cortex Adrenal

(3) ACTH, peptide, adrenal cortex

(4) Vasopressin, Peptide, posterior pituitary.

50. The "Master Regulatory Gene" is located on which chromosomes in humans?

(1) x chromosome
(2) Y chromosome
(3) Both X, Y chromosome
(4) Autosomes

PART – C (51-75)

51. Match the following:

(P) Metaxenia	(I) When extra embryos are developing in one embryosac other than the one in which zygotic embryo is developed
(Q) True polyembryony	(II) More than one embryo are formed by splitting of normal zygote
(R) Xenia	(III) Effect of pollen on character of the seed coat or pericarp
(S) False polyembryony	(VI) Effect of female gamete on character of seed coat
	(V) Influence of male gamete on the development of endosperm.
	(VI) When embryos arise in the same embryosac in which zygotic embryo has developed.

	P	Q	R	S
(1)	V	I	IV	VI
(2)	IV	I	III	II
(3)	III	VI	V	I
(4)	V	I	III	IV

52. Gene for an enzyme which catalysis synthesis of a secondary metabolite in an angiosperm was transferred to a bacterial expression vector. But it was found that transgene was expressed but a functional enzyme was not synthesized which could be the best possible explanation?
(1) Plant enzyme was not stable in bacteria
(2) Post translational modification did not occur
(3) The promoter used were not appropriate
(4) Both B and C

53. Amino acid residues present in silk fibroin, permitting a close packing of β sheets and an interlocking arrangement of R groups?
(1) Gly, Val

(2) Leu, Arg

(3) Ala, Gly

(4) Gly, His

54. Choose the mismatch.

(1) Rotenone — inhibits the transfer of electron the NADH–CoQ reductare

(2) Piericidin A –– Compete with Cyt (a.a_3).

(3) Antimycin A –– block electron transport at the level of complex III.

(4) Cyanide — binds with cytochrome oxidase complex.

55. A radiolabelled Co_2 will release in which of the following case

(1) When acetyl Co-A entering Kreb cycle has radio labelled

(2) Glycine entering glycine decarboxylase system has radiolabelled α C

(3) Glycine entering glycine decorboxylase system has radiolabelled C at the coo-group

(4) When γ' (gamma) c of acetoacetate is radiolabelled during formation of ketone bodies

56. Pure water does not conduct electricity because it

(1) Has low boiling water

(2) Is almost unionised

(3) Is neutral

(4) Is readily decomposed

57. Match the following products with the microbes which produce them on large scale and find the correct combination

Product		**Microbe**
(P) Lysine	—	*Brevibacterium* spp.
(Q) Glutamic acid	—	*Corynebacterium glutamicum*
(R) Gibbellic acid	—	*Fusarium mohiliforme*
(S) Riboflavin	—	*Eremothecium ashbyi*

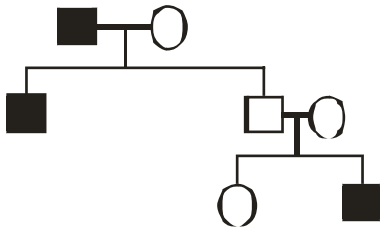
(1) Q, R

(2) P, Q

(3) R, S

(4) R, S

58.



The pattern of inheritance of the trait will be

(1) Autosomal dominant

(2) Recessive

(3) Mitochondrial inheritance

(4) X-linked recessive

59. In which of the following molecular markers, gel electrophoresis is not required

(1) VNTR

(2) RAPD

(3) SNP

(4) None

60. Which of the following period corresponds to temperature fall and a cold and dry climate on earth for the first time?

(1) Ordovician period

(2) Silurian period

(3) Carboniferous period

(4) Devonian period

61. Match the following.

(P) Tricuspid valve	(I) at the entrance to the pulmonary trunk.
(Q) Mitral value	(II) Right atrio - ventricular valve
(R) Semilunar Value	(III) at the entrance to the aorta
	(IV) Left - atrio - ventricular

P Q R

(1) IV II I
(2) III IV II
(3) II IV III
(4) I III IV

62. After the formation of primitive streak, the trophoblasts around the anterior and posterior margins of embryonic disc rise up as folds which grow over and enclose the embryo from above. The outer wall of each fold is called _____(X) and inner one _____ (Y).
Choose the correct option for X and Y.
(1) X - chorion and Y - amnion
(2) X - allantois and Y - chorion
(3) X - amnion and Y - Yolk sac
(4) X - amnion and Y - allantois

63. Which of the following is false for photorespiration?
(1) It gives an idea about evolution of plants
(2) It cannot occur in very low $O_{2\ concentration}$
(3) It occurs in green cell of petunia
(4) Release of CO_2 occurs from C_1 of glycolate

64. Which of the following statements are true regarding *Agrobacterium*?
(1) All genes are not transcribed during vegetative growth
(2) Some chromosomal genes contribute to virulence
(3) T DNA region contains a 25 bp conserved region only in case of T_i plasmids.
(4) Octapine catabolism is controlled by noc loci

65. Which of the following is not correctly matched?
(1) Aminoglycoside antibiotics –– inhibitors of protein synthesis in bacteria
(2) Penicillin — inhibit the enzymes catalyzing the transpeptidation reaction
(3) Sulfonamides — inhibit protein synthesis
(4) All are correctly matched.

66. Which of the following is not chemotropic nitrogen fixing bacteria?
(1) Chromatium venous

(2) Bacillus macerans

(3) Xanthobacter autotrophicus

(4) Enterobacter aerogenes

67. The proteins synthesized in translation are subjected to post - translational modification. During the formation of collagen, the amino acids proline and lysin are respectively converted to hydroxyproline and hydroxylysin. This hydroxylation occurs in the ____(x) and requires ___(Y).

(1) X - Golgi apparatus, and Y - Vit C

(2) X - mitochondria and Y - vit B_1

(3) X - Endoplasmic reticulum and Y - Vit C

(4) X - ribosome and Y - Vit. C.

68. In prokaryotes, each subunit of DNA polymerase III has different function which of the following gene transcribes a subunit which interacts with the SSB in (*E.coli*)

(1) hol C

(2) pol C

(3) dna X

(4) mut D

69. Which of the following contributes to cell signaling in bacteria, plants and mammals?

(1) Phosphatidylinositol kinesis

(2) Trimesic G proteins

(3) 2 component His kinases

(4) None

70. Lectins are used as probe to purify specific biomolecules of Jacalin is used in an experiment, which of the following suggests the interaction occurring and the corresponding antibody which can be purified

(1) Protein – protein interaction, IgG

(2) Protein – mannose interaction, IgA

(3) Protein – glucose interaction, IgG

(4) Protein – galactose interaction, IgA

71. Choose the mismatch of the cell line and its origin

(1) Pt k1 – rat kangaroo – epithelial cell

(2) COS – monkey – kidney

(3) SP2 – mouse – plasma cell

(4) L6 - fibroblast – rat

72. An aliquot of a solution containing a light absorbing substance at a concentration of 5 gdm^{-3} was placed in a 2 cm light path cuvette. The cuvette was placed in a spectrophotometer and a beam of light of wavelength λ was passed through the cuvette containing the solution. If the absorbance of the solution is 0.0969 then calculate the molar extinction coefficient in (mol dm^{-3}) cm^{-1}. (molecular weight of substance is 580).

(1) 9.7×10^{-3}

(2) 5.62

(3) 1.6×10^{-5}

(4) None

73. Which of the following is true for RecA Proteins?

(P) Ability to polymerize single strands

(Q) Ability to incorporate DNA into filaments

(R) The product of RecA sponsored reaction of a circular DNA molecule will be a chi (x) structure

(S) 5'GCT GG TGG3' sequence stimulates recombination in its vicinity

(1) Q, R

(2) R, S

(3) P, Q, R

(4) P, Q, R, S

74. During electrophoresis, ethidium bromide is used as a stain to visualize DNA. Which of the following is doesn't occur when it binds to the DNA

(1) It unwinds the DNA

(2) t increases the normal rotation per bp in DNA

(3) it increases the helical pitch

(4) Its fluorescence increases after intercalation

75. Which of the following is not true about the embryogenesis of Drosophila?

(1) A cell signaling molecule controls nuclear transport of the dorsal protein

(2) Loss of Hox gene causes the appearance of a normal appendage at an inappropriate body position

(3) Bicoid mRNA is located on the posterior pole and nanos mRNA is located on the anterior pole during fertilization

(4) Nanos are RNA binding proteins

ANSWER KEY

Que.	Ans.	Que.	Ans.	Que.	Ans.	Que.	Ans.	Que.	Ans.
1	3	**16**	1	**31**	2	**46**	3	**61**	3
2	1	**17**	2	**32**	2	**47**	3	**62**	1
3	3	**18**	2	**33**	2	**48**	4	**63**	2
4	4	**19**	1	**34**	3	**49**	4	**64**	2
5	1	**20**	4	**35**	2	**50**	1	**65**	3
6	2	**21**	1	**36**	4	**51**	3	**66**	1
7	1	**22**	3	**37**	3	**52**	2	**67**	3
8	2	**23**	3	**38**	2	**53**	3	**68**	1
9	4	**24**	3	**39**	1	**54**	2	**69**	3
10	4	**25**	2	**40**	2	**55**	3	**70**	4
11	2	**26**	3	**41**	4	**56**	2	**71**	4
12	2	**27**	4	**42**	4	**57**	3	**72**	2
13	4	**28**	4	**43**	3	**58**	2	**73**	4
14	4	**29**	2	**44**	4	**59**	3	**74**	2
15	1	**30**	1	45	4	**60**	4	**75**	3

PART A (1-15)

1.(3) $\frac{m_1 D_1}{w_1} = \frac{m_2 D_2}{w_2}$

$$\frac{24 \times 15}{180} = \frac{m_2 \times 12}{24}$$

$m_2 = 40$

2.(1) $\frac{RA \times SA}{QA} = PA \Rightarrow \frac{9 \times 9}{7} = PA$

Diameter = PA + AQ

$$\frac{81}{7} + 7 = \frac{130}{7}$$

$$\text{Radius} = \frac{\text{Diameter}}{2} \quad \therefore \quad \text{Radius} = \frac{65}{7}$$

3.(3) $R_1 + R_2 = a$

$R_2 + R_3 = b$

$R_3 + R_1 = c$

$R_1 + R_2 + R_2 + R_3 + R_3 + R_1 = a + b + c$

$$\Rightarrow \quad R_1 + R_2 + R_3 = \frac{a + b + c}{2}$$

4. (4) Value of each tool in 1985

$$= \frac{10 \times 10^7}{18 \times 10^3} \qquad [\text{Since 1 crore} = 10^7]$$

$$= 5\frac{5}{9} \text{ Thousand}$$

5.(1) The required percentage $= \dfrac{18}{(360 - 18)} \times 100$

(since total employed $= 360 -$ unemployed)

$$= \frac{18}{342} \times 100 = 5\frac{5}{19}\%$$

6.(2) This is an alternating multiplication and subtracting series: First, multiply by 2 and then subtract 8.

7.(1) Total quantity of petrol $= \left(\dfrac{4000}{7.50} + \dfrac{4000}{8} + \dfrac{4000}{8.50}\right)$ litres

consumed in 3 years $4000\left(\dfrac{2}{15} + \dfrac{1}{8} + \dfrac{2}{17}\right)$ liters

$$=\left(\frac{76700}{51}\right)\text{litres}$$

Total amount spent = Rs. (3 x 4000) = Rs. 12000.

Average cost = $\left(\frac{12000\times 51}{76700}\right)=\text{Rs.}\frac{6120}{767}=\text{Rs.}7.98$

8.(2) Let C.P.= Rs. 100. Then, Profit = Rs. 320, S.P. = Rs. 420.

New C.P. = 125% of Rs. 100 = Rs. 125

New S.P. = Rs. 420.

Profit = Rs. (420 - 125) = Rs. 295.

Required percentage = $\left(\frac{295}{420}\times 100\right)_{\%}=\frac{1475}{21}\%=70\%$ (approximately)

A student multiplied a number by $\frac{3}{5}$ instead of $\frac{5}{3}$

9.(4) Each day of the week is repeated after 7 days.

So, after 63 days, it will be Friday. Hence after 63 days,

it will be Thursday.

Therefore the required day is Thursday.

10 .(4) $40\frac{4}{5}\text{min}=1\frac{51}{75}\text{hrs}=\frac{126}{75}\text{hrs.}$

Time taken = 1 hr 40 min 48 sec = 1 hr

Let the actual speed be x km/hr.

Then, $\frac{5}{7}x\times\frac{126}{75}=42$

$x=\left(\frac{42\times 7\times 75}{5\times 126}\right)=35\text{km/hr.}$

11.(2) Given, Total profit = Rs. 990

Ration of their capitals = 34 : 65.

Now, profit amount got by P = 20% of total profit + P's share in balance 80% profit for his capital

$$\left[0.2+0.8\times\frac{34}{34+65}\right]=\ 470$$

12.(2) Now area = (1/6 × 1000)sq m = 5000/3 sq m

$2x \times 3x = 5000/3 \Rightarrow x \times x = 2500/9$

$x = 50/3$

length = 2x = 100/3 m and breadth = 3x = 3× (50/3) = 50m

13. (4) Distance = (240 x 5) = 1200 km.

Speed = Distance/Time

Speed = 1200/(5/3) km/hr. [We can write 1 hours as 5/3 hours]

Required speed = 1200 x 3 km/hr = 720 km/hr.

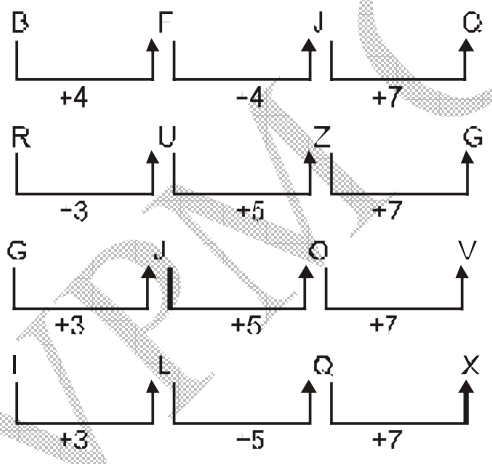
14.(4) As, $2 \times 5 \times 1 = 20$

and $4 \times 3 \times 6 = 72$

Similarly, $7 \times 2 \times ? = 42$

$\therefore \quad ?=\frac{42}{14}=3$

15.(1) According to question,



Therefore, B F J Q is odd.

PART B (16-50)

16. (1) Free fatty acids pass from the adipocyte into the blood, where they bind to the blood protein serum albumin and are carried to the tissues such as skeletal muscle, heart and renal cortex.

17. (1) Alanine shows the greatest tendency to form α helices in most experimental model system. The bulk and shape of ser, Thr, cys residues can destabilize a α helix if they are close together.

18. (2) The Z-DNA helix is favoured by an alternating GC sequence. Z-DNA can form in regions of alternating purine - pyrimidine sequence; $(GC)_n$ sequences form Z-DNA most easily. $(AT)_n$ sequences generally does not form Z-DNA since it easily forms cruciforms.

19. (1) D-glucose and D-fructose are not anomers. Isomeric forms of monosaccharides that differ only in their configuration about the hemiacetal or hemiketal carbon atom are called anomers.

20. (4) Lumirhodopin is stable only at temperature below – 50°C.

21. (1) Serum acid phosphatase concentration level increases in metastatic carcinome of prostate.

22. (3) Ionophores are chemicals that form pores in the plasma membrane and allow ion to cross. In other words, Ionophores are small hydrophobic molecules that dissolve in lipid bilayers and increase their permeability to specific inorganic ions.

23. (3) The decline of MPF at the end of mitosis I is caused by enzymatic destruction of mitotic cyclin. Anaphase - promoting complex (APC) directs ubiquitin mediated proteasomal degradation of mitotic cyclin (proteolytic degradation).

24. (3) Shine - Dalgarno sequence is responsible for binding of ribosome to mRNA during initiation of translation. It is a short polypurine sequence centered about 10bp upstream of the initiation codon. The shine-dalgarno sequence is complementary to a region at the 3' end of the 16S rRNA, and it is thought that base-paring between the two is involved in the attachment of the small subunit of the mRNA.

25. (2) Release of sequestered self antigen is least likely which lead to auto-immunity.

26. (3) Because only boy and father develop the disorder then X-linked recessive inheritance is least likely.

27. (4) Lipid rafts are membrane micro domains that are enriched with cholesterol and glycosphingolipids.

28. (4) Precursor of adrenocorticotropin hormone (ACTH) is propiomelanocortin.

29. (2) A differential medium is one which allows the investigator to distinguinsh between different types of bacteria based on some observable trait in their pattern of growth on the medium. Thus, two different bacteria can be distinguished.

30. (1) Viroids are small circular molecules of single stranded RNA without a capsid (do not possess a protein coat) that can cause many plant diseases.

31. (2) Transfection involves the transfer of naked DNA into the cell while transduction, involves packaging the DNA into a virus particle, which then infects the cell.

32. (2) Tissue culture is recommended for - multiplication of elite genotype of useful trees, developing virus-free plants and production of secondary metabolites but not for induction of polyploidy.

33.(2) Met – Trp Cys – Trp

34. (3) If we write $E(x) = \mu_x$ and $E(Y) = \mu_y$, then

$$E\left[\left(\frac{X-\mu_x}{\sigma_x}\right) \pm \left(\frac{y-\mu_y}{\sigma_y}\right)\right]^2 \geq 0$$

$$E\left(\frac{x-\mu_x}{\sigma_x}\right)^2 + E\left(\frac{y-\mu_y}{\sigma_y}\right)^2 \pm \frac{E\left[(x-\mu_x)(y-\mu_y)\right]}{\sigma_x\sigma_y} \geq 0 \qquad \Rightarrow 1+1 \pm 2r(x, y) \leq 0$$

$$\therefore -\leq r(x, y) \leq 1 \text{ or } |r| \leq 1$$

Hence, correlation coefficient cannot exceed unity. Numerically, It always lies between – 1 and +1.

35. (2) In scanning electron microscope (SEM), to form an image of the specimen electrons are scattered from the surface of the specimen. In SEM the specimen is subjected to a narrow electrons beam which repidly moves over (scans) the surface of the specimen.

36. (4) No separation occurs because in size exclusion chromatography small molecules can enter the pores in the beads where as larger molecules can not. So, larger molecules move faster and elute first. But in this case, exclusion limit of sephadex is 80,000 molecular weight and molecular weight of both alcohol dehydrogenase and β amylase is higher than the exclusion limit. Thus, both are elute simultaneously without entering in the beads.

37. (3) $Vo = \frac{V_{max} \times [S]}{K_m + [S]}$

As we know $K_{cat} = \frac{V_{max}}{E_t}$

$$V_0 = \frac{K_{cat} \times [E_t] \times [S]}{K_m + [S]}$$

$$8.0 \mu m s^{-1} = \frac{\left(400\, s^{-1}\right) \times (0.030 \mu m)(40 \mu m)}{K_m + 40 \mu m}$$

$$K_m = 20\ \mu m.$$

38. (2) PROSITE is a database used for protein sequencing.

39. (1) Flippase – transport glycerophospholipid from outer monolayer to the cytoplasmic surface of the plasma membrane.
Floppase – move plasma membrane phospholipids from cytosolic to extracellular leaflet.
Scramblase – move any phospholipid across the bilayer down its concentration gradient.

40. (2) Vincristin and Vinblastin, the chemical substances that can cure leukemia are obtained from *Catharanthus roseus*.

41. (4) correctly matched
(P) 2, 4 dinitrophenol –– uncoupling agent in oxidative phosphorylation.
(Q) Oligomycin — Inhibitor of ATP formation in oxidative phosphorylation. It completely blocks ATP synthesis by blocking the flow of protons through Fo of ATP synthase.
(R) Valinomycin — Ionophore carries potassium through the mitochondrial membrane.
(S) Iodoacetate –– is not involved in separation of F_1 - ATPase rather it is a potent inhibitor of glyceraldehyde – 3 phosphate dehydrogenase (glycolytic enzyme).

42. (4) Gibberellin causes seed germination by promoting the synthesis of variety of hydrolytic enzymes that are involved in the solubilization of endosperm reserves. It breaks dormancy of seeds and buds.

43. (3) If the cell shrinks that means the solution has more dissolved solutes than the cell does. If a cell kept in a solution of higher concentration water diffuse out of the cell. This is called exosmosis.

44. (4) Viola *calaminaria, Thlaspi alpestre and Minuartia verna-show* resistance to heavy metal.

45. (4) Chemotropic movement of pollen tubes toward the micropylar end of the ovules in many cases has calcium gradient through stylar tissue upto embryo sac. A growing pollen tube shows a tip-focused gradient of free Ca^{+2} ions. Conditions which inhibit pollen tube growth block influx of Ca^{+2}, reducing the intracellular Ca^{+2} gradient at the tip.

46.(3) Entry of the vector containing the cDNA and the drug resistance genes into the host cell renders the later identifiable as it is now resistant to antibiotic drugs.

47. (3) Coronary sulcus is found upon heart surface between vertricle and atrium. It is also known as atrioventricular sulcus.

48. (4) Antidiuretic hormone is a protein hormone which cannot diffuse through the lipid layer of plasma membrane. Receptor protein of this hormone is large transmembrane integral proteins of the plasma membrane of target cell. As the molecule of a receptor protein binds with the hormone, it gets stimulated. In turn it stimulates a molecule of enzyme adenyl cyclase.

49. (4) Vasopressin also known as anti-diuretic hormone is a peptide hormone which is secreted from posterior pituitary.

50.(1) The "master Regulatory gene " is located on Y chromosome in humans, Sex determining region, Y (SRY) gene is the only gene on Y chromosome that is necessary to initiate testies development.

PART– C (51-75)

51. (3) Metaxenia → effect of pollen on the character of the seed coat or pericarp
True polyembryony → when embryo arises in the same embryosac in which zygotic embryo has developed.
Xenia → Influence of male gamete on the development of endosperm
False Polyembryony → When extra embryos are developing in one embryosac other than the one in which zygotic embryo is developed.

52. (2) Transegene was expressed but a functional enzyme was not synthesized which means post translational modification did not occur in the products encoded by transcend.

53.(3) Silk fibrion is rich in Ala and Gly residues, permitting a close packing of β sheets and an interlocking arrangements of R groups.

54. (2) Pierididin A competes with Q (ubiquinone) and blocks the transfer of electrons at the NADH-CoQ reductase complex.

55. (3) A radiolabelled CO_2 will release if glycine has radiolabelled C at the $-COO^-$ group enter into glycine decarboxylase system because during decarboxylation CO_2 is released from carboxylic group of glycine.

56. (2) Pure water does not conduct electricity because it is almost unionised.

57. (3) Correct combination
Glutamic acid — *Corynebacterium glutamicum*.
Riboflavin –– *Eremothecium ashbyi*.

58. (2) The pattern of inheritance of the trait will recessive because in autosomal recessive inheritance traits often skips generations and an equal number of affected males and females.

59. (3) SNP are described as the third generation molecular marker. In RAPD, VNTR gel-based assay are necessary that are time consuming. Single nucleotide polymorphisms (SNPs) represent sites, where DNA sequences differs by a single base. Several non-gel based methods are available for SNP detection.

60. (4) Temperature fall and a cold and dry dimate on earth for the first time corresponds to devonian period.

61. (3) Tricuspid valve → Right atrio - ventricular valve
Bicuspid or mitral valve → Left atrio - ventricular valve
Semilunar valve → at the entrance to the aorta.

62. (1) After the formation of primitive streak, the trophoblast around the anterior (head region) and posterior (tail region) margins of embryonic disc rises up as folds which grow over and endose the embryo from above. The outer wall of each fold is called chorion and inner one amnion.

63. (2) The statement which is false for photorespiration is that it cannot occur in very low O_2 concentration.

64. (2) No chromosomal gene contribute to virulance in *Agrobacterium*. The gene system necessary for TDNA transfer encoded by the Ti plasmid.

65. (3) Sulfonamides competes with p - aminobenzoic acid for the active site. Result in decrease in folate concentration. Decline of folic acid is detrimental to the bacterium because folic acid is essential for the synthesis of purines and pyrimidines.

66. (1) *Chromatiumvenous* is not a chemotropic nitrogen fixing bacteria.

67. (3) Hydroxylation of proline and lysine occurs in the endoplasmic reticulum and require Vitamin C.

68. (1) In prokaryotes, gene holC transcribe the X subunit of DNA polymerase III which interacts with SSB.

69. (3) Two-component His kinases are signaling component present in mammals, plants and bacteria.

70. (4) Lectins are glycoproteins, which bind specific carbohydrate such as galactose or fucose. Thus, if lectins are used as probe to purify specific biomolecules, then IgA is purified.

71. (4) L6 cells $\rightarrow$ skeletal cells $\rightarrow$ mouse.

72. (2) From Bear – Lambert law

$A = \varepsilon cl$

Where A = absorbance

ε = extinction coefficient

c = concentration of absorbing material in sample

l = path length (cm).

$0.969 = \varepsilon \times 5\,g\,dm^{-3} \times 2cm \quad \Rightarrow \varepsilon = 9.69\,g^{-1}\,dm^{3}\,cm^{-1}$

molar extinction coefficient is obtained by multiplying the relative molecular mass.

Hence, $\varepsilon_s \times 580 = \varepsilon\lambda$

$\varepsilon\lambda = 9.69 \times 10^{-3} \times 580 = 5.62\,(mol\,dm^{-3})^{-1}\,cm^{-1}$

73. (4) RecA proteins have the ability to polymerize single strands, ability to incorporate DNA into filaments. The product of RecA sponsored reaction of a circular DNA molecule will be a chi structure. Sequence 5' – GCTGGTGG – 3' stimulates frequency of recombination about 5 to 10 fold.

74. (2) During electrophoresis, ethidium bromide unwinds the DNA and increase the normal rotation per bp in DNA but it does not increase the helical pitch. One molecule of ethidium bromide creates about 27° of unwinding affecting the hydrodynamic properties of circular DNA..

75. (3) Bicoid gene product is a major anterior morphogen and the nanos gene product is major posterior morphogen.