Duration : 3 hours **Total Marks : 80**

Q. 1 a. Attempt all questions **16M**

i. Give the functions of astrocytes and Schwann Cells.
ii. Write in short about stroke.
iii. Name the layers of Skin.
Iv. Define a) Tidal Volume b) Vital Capacity
V. Enlist the secretions of pituitary gland.
Vi. Name conditions associated with hypo and hyper secretion of thyroid hormones.
Vii. What is cellular Atrophy?
Viii. What is respiratory Alkalosis

Q. 1 b. Attempt all questions **4 M**

i. Give examples of any two neurotransmitters.
ii. The basic color of skin is due to the presence of _____ pigment.
Iii. ---------- Hormone is secreted by Pancreas
Iv. …….. number of oxygen molecules can bind to one hemoglobin molecule.

Q 2 a. Attempt any two of the following questions **8 M**

i. Write a note on Hyperplasia.
ii. Discuss classification of malignant tumors.
iii. Describe cellular atrophy and hypertrophy.

Q 2 b. Attempt any one of the following questions **4 M**

I. Explain the biological effects of X rays.
Ii. Define radioactivity and explain biological effects of nuclear radiation.

Q 3 a. Attempt any two of the following questions **8 M**

i. Describe the structure of a neuron elaborate on its types.
ii. Define reflex and elaborate on Stretch reflex.
iii. Describe the structural features of blood brain barrier and give its significance

Q 3 b.Attempt any one of the following questions **4 M**

I. Describe in detail the pathophysiology of Parkinson disease.
ii. Describe in detail the pathophysiology of Schizophrenia.

Q 4 a. Attempt any two of the following questions **8 M**

i. Explain the factors affecting pulmonary ventilation.
ii. Explain the role of the respiratory center in the control of respiration.
iii. Ii. Discuss in detail the transport of oxygen by blood.

Q 4 b. Attempt any one of the following questions **4 M**

i. Write a note on respiratory acidosis.
ii. Write a note on pathophysiology of asthma.

Q 5 a. Attempt any two of the following questions **8 M**

I. Explain the synthesis storage and release of thyroid hormone

Ii. Write a note on hormones of adrenal gland.

Iii. Write a note on hormones of the posterior pituitary lobe.

Q 5b. Attempt any one of the following questions **4 M**

I. Write a note on Thyrotoxicosis

Ii. Write a note on consequences of hypo secretions from the anterior lobe of pituitary gland.

Q 6 a. Attempt any one of the following questions **4 M**

i. Explain the physiology of gustation.

ii. Write in detail about function of Skin.

Q 6 b. Attempt any one of the following questions **4 M**

i. Give the effect of parasympathetic and sympathetic stimulation on the following:

a) Eye b) Heart

ii. Elaborate on preganglionic, postganglionic neurons and autonomic ganglia of sympathetic division.

Q 6 C. Attempt any one of the following questions **4 M**

i. Draw a neat labeled diagram of anatomy of the ear.

Ii .Elaborate on the structure of Eye**.**

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Time: 3 Hours **Marks: 75**

Q.I Choose the appropriate option **20 Marks**

Q. No	Description

1 The arithmetic mean of the following distribution of number of accidents **x** on week working days is –

X = 2, 4, 6, 8, 10

Frequency = 5, 4, 3, 2, 4, 1

a. 4.666
b. 6.666
c. 7.666
d. 5.666

2. The sum of the frequency of class and all classes below it in a frequency distribution is ---

a. Frequency distribution curve
b. Histogram
c. Cumulative frequency distribution
d. Cumulative frequency of a class

3. For the data 10,5,3,8,6,9,7 the median value is ---

a. 3
b. 5
c. 6
d. 7

4. With respect to the question number 3 the range of the data is ----

a. 3
b. 5
c. 6
d. 7

5. If variance of the data is 36 what is the standard deviation?

a. 3
b. 4
c. 5
d. 6

6. The values of coefficient of correlation are --

a. equal to 1
b. can be either -1 or +1
c. can be any value between -1 to +1
d. must be -1

7. The relationship between x and y is given by the following regression equation
$Y = 0.018\ x$
The above equation implies that:
   a. for each unit increase in value of x the value of y varies by 1%
   b. on average it takes 1.8 x to increase y value by 1%
   c. For each unit increase in Y, the X increases by 1.8%
   d. For each unit increase in X, the Y increases by exactly 0.018

8. Mean drug content of powder in a capsule product is observed to be 105 mg with standard deviation of 8 mg. What is the percentage of capsules with the content of the drug below 105 mg. Assume that the drug content of capsule is normally distributed.
   a. 20
   b. 40
   c. 50
   d. 60

9. If the mean of Poisson distribution is 9 then its variance is equal to ---
   a. 3
   b. 6
   c. 9
   d. 81

10. Binomial distribution is applicable to ----
   a. Dichotomous data
   b. Continuous data
   c. Ordinal data
   d. Discrete data

11. Area under curve for Normal distribution is ---
   a. 1
   b. 1.5
   c. 2
   d. ∞

12. To conclude if a drug is effective in reducing body mass index, a clinical trial was conducted by administering the drug to 10 individuals with high body mass index. Considering the data is normally distributed, which of the following tests is suitable?
   a. One tail paired t test
   b. Two tail paired t test
   c. Two tail unpaired t test
   d. One tail unpaired t test

13. The calculated t value = 2.59 and the critical t value is 1.54 at $\alpha = 0.01$. In such case which of the following statement is true?
   a. Null hypothesis is accepted
   b. The mean values of the two sets are significantly different at $P<0.01$
   c. The mean values of the two sets are significantly different at $P>0.01$
   d. The mean values of the two sets are equal at $P<0.01$

14. In histogram the width of the bar is proportional to
    a. Frequency
    b. Number of classes
    c. Class interval
    d. Cumulative frequency

15 In case of same slope, the contour lines are---
    a. Widely spaced from each other
    b. Spaced very close to each other
    c. Parallel to each other
    d. Intersecting each other

16 Mann Whitney U test is applied for
    a. Unpaired data following Normal Distribution
    b. Unpaired data following Non-Normal Distribution
    c. Paired data following Normal Distribution
    d. Paired data following Non-Normal Distribution

17. Cohort Studies generally look at which of the following?
    a. Determining the sensitivity and specificity of diagnostic methods
    b. Identifying patient characteristics or risk factors associated with a disease or outcome
    c. Variations among the clinical manifestations of patients with a disease
    d. The impact of blinding or masking a study population

18 Which of the following software requires writing of script
    a. Excel
    b. SPSS
    c. R Online
    d. Design of Experiments

19. What is the appropriate statistical test for a factorial design?
    a. the Modes t
    b. ANOVA
    c. t-test
    d. chi-square

20 Select the correct probability sampling method from the list below
    a. Judgment
    b. Quota
    c. Simple random
    d. Convenience

Q.II Answer the following (ANY TWO) **20 Marks**

A. i) Metabolite levels in (mcg/ ml) of a drug in young adult and elderly volunteers in urine are given below . Assume that the data is normally distributed. Apply suitable statistical test and state if there is difference in the levels of the metabolite in young and elderly populations. (5)

Young	9.6	8.5	9.8	12.2	9.8	11.7	8.7
Elderly	12.3	16	17.8	20.1	18.5	14	20.6

ii. Haemoglobin levels (% g) in school kids fed with three different diets was studied with 11 students in each category of diet. The results are as follows. Fill in the blank spaces and calculate the least significant difference and state if the levels of haemoglobin are different with respect to the diet. (5)

Variation	Degrees of Freedom	Sum of Squares	Mean Sum of squares	F value
Between the groups	-----	32.81	-----	----
Within the groups	------	-----	-----	
Total	-----	62.57		

B. I) Write a short note on factorial design (5)

ii) In an experiment investigating breakdown of aspirin in a pharmaceutical product stored at 25^{O} C, the following data is obtained. Calculate linear regression equation and coefficient of correlation for the same. Calculate the concentration of aspirin at zero min (5)

Time (Min)	18	35	51	68	85	101
Conc of Aspirin remaining (mg)	603.6	601.1	597.9	594.3	591.4	587.3

C. i) Write a note on different methods of graphical presentation of data (5)

ii) A tablet manufacturer produces paracetamol tablets with a label claim of 500 mg. Assume that the data is normally distributed with the mean of 502 mg and variance of 50 mg^2. Find – (5)

- What proportion of the tablets contain less than 500 mg of the drug?
- What proportion of the tablets contains drug less than 490 mg and more than 510 mg of paracetamol?

QIII Answer the following (**any seven**) 35 Marks

A. Give a detailed account of blocking and confounding system
B. Enlist steps in hypothesis testing. Write a note on Type I and Type II errors.
C. i. In a certain area the local authority wants immunization coverage to be 90% with precision within 5% at 95 % confidence interval (z= 1.96). Calculate the sample size

ii. What do you mean by research? Enlist different types of research with suitable examples.
D. Discuss different methods of sampling
E. Concentration in mcg/ml of therapeutic agent in saliva at defined intervals after attachment of a drug polymeric film to the outer surface of the tooth is given below. It is hypothesized that the release of the drug into the oral cavity is constant over four days. Using Friedman test , state if the hypothesis is true. ($\chi^2_{critical} = 7.60$)

Patient Number	Time after attachment			
	Day 1	Day 2	Day 3	Day 4
1	25.45	23.47	20.77	20.87
2	39.57	35.78	34.99	34.90
3	15.42	13.21	12.24	10.16
4	7.19	5.99	5.93	6.06
5	58.23	49.27	42.58	44.53
6	25.60	23.64	21.58	21.89

F. Three different kinds of food regimen are tested on three groups of rats for 5 weeks. The objective is to check the difference in mean weight (in grams) of the rats per week. Apply one-way ANOVA using a 0.05 significance level to the following data:

Food Regimen I	Food Regimen II	Food Regimen III
8	4	8
12	6	7
15	7	11

G. Write short notes on
   a. Report writing in research
   b. Cohort Studies
H. i. In the manufacture of glassware, bubbles can occur in the glass which reduces the status of the glassware to that of a 'second'. If, on average, one in every 1000 items produced has a bubble, calculate the probability that exactly 6 items in a batch of 3000 are seconds.
   ii. Explain the terms contour plots and surface response plots.

I. It is hypothesized that the replacement of Talc by a hydrophilic excipient like lactose improves the dissolution, hence the two tablet formulations were prepared and the time taken (mins) for dissolution of 50% of the drug is noted. The results are as follows. Apply Mann Whitney Test and state if the hypothesis is true. $U_{critical} = 3$

Formulation with Talc	50	42	39	45	52	57
Formulation with Lactose	32	35	42	34	30	

t Table

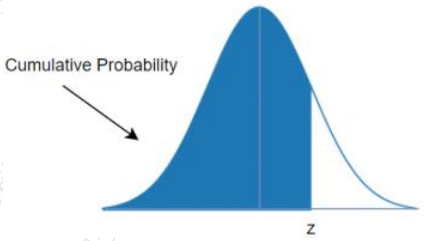
cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02
df								
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528

F table (5% significance)

	V2				
V1	1	2	3	4	5
1	39.86	49.50	53.59	55.83	57.24
2	8.53	9.00	9.16	9.24	9.29
3	5.54	5.46	5.39	5.34	5.31
4	4.54	4.32	4.19	4.11	4.05
5	4.06	3.78	3.62	3.52	3.45
6	3.78	3.46	3.29	3.18	3.11
7	3.59	3.26	3.07	2.96	2.88
8	3.46	3.11	2.92	2.81	2.73
9	3.36	3.01	2.81	2.69	2.61
10	3.29	2.92	2.73	2.61	2.52
11	3.23	2.86	2.66	2.54	2.45
12	3.18	2.81	2.61	2.48	2.39
13	3.14	2.76	2.56	2.43	2.35
14	3.10	2.73	2.52	2.39	2.31
15	3.07	2.70	2.49	2.36	2.27
16	3.05	2.67	2.46	2.33	2.24
17	3.03	2.64	2.44	2.31	2.22
18	3.01	2.62	2.42	2.29	2.20
19	2.99	2.61	2.40	2.27	2.18

Standard normal distribution table

	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952



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Time: 3 Hours **Max. Marks: 75**

Note:

1. **Draw net labeled diagrams wherever applicable**

I.	**Multiple choice questions**	**20M**
1.	The following quantitation methods in UV - Visible spectroscopy need a reference standard except	1M
a.	Standard curve method	
b.	Single point standardization	
c.	Double point standardization	
d.	Use of standard absorptivity	
2.	Molar absorptivity is expressed as?	1M
a.	Gram/100 ml	
b.	Gram/litre	
c.	Moles/ml	
d.	Moles/litre	
3.	Which one of the following is an example of wavelength selector in uv-visible spectroscopy?	1M
a.	Detector	
b.	Monochromator	
c.	Light source	
d.	Amplifier	
4.	Paracetamol and Ibuprofen combination can be analyzed by using the following method?	
a.	Difference spectroscopy	
b.	Simultaneous equation	
c.	Calibration graph method	
d.	Use of standard absorptivity value	

5.	IR spectrum is a plot of?	1M
a.	% Transmittance versus wavenumber	
b.	Absorbance versus wavelength	
c.	Peak area versus retention time	
d.	Absorbance versus concentration	
6.	Stretching vibration is associated with?	1M
a.	Change in bond rotation	
b.	Change in bond angle	
c.	Change in bond length	
d.	Change in chemical composition	
7.	Which of the following is used in preparation of solid sample for IR spectroscopy	1M
a.	Potassium carbonate	
b.	Potassium bromide	
c.	Potassium hydroxide	
d.	Potassium nitrate	
8.	In flame photometry, as the energy gap between excited and unexcited metal atoms increases, the proportion of atoms in the ground state	1M
a.	Increases	
b.	Decreases	
c.	Remains unaffected	
d.	Increases or decreases	
9.	Atomic absorption spectroscopy involves?	1M
a.	Measurement of concentration of elements	
b.	Measurement of concentration of molecules	
c.	Measurement of molecular mass	
d.	Measurement of degree of crystallinity	

10.	Nephelometry is based on?	1M
a.	Light scattering	
b.	Light transmission	
c.	Light absorption	
d.	Light reflection	
11.	The term _____is independent of the flow rate of mobile phase in column chromatography	1M
a.	HETP	
b.	Mass transfer	
c.	Longitudinal diffusion	
d.	Eddy diffusion	
12.	In paper chromatography, separation is based on the principle of ____phenomenon	1M
a.	Partition	
b.	Adsorption	
c.	Size Exclusion	
d.	Ion exchange	
13.	In electrophoresis, as the ionic strength of the buffer is decreased,	1M
a.	rate of migration of charged particle decreases	
b.	rate of migration of the charged particle increases	
c.	No change in the migration rate of the charge particle	
d.	Particle becomes immobile	
14.	In Gas chromatography, derivatization of a sample is carried out to:	1M
a.	increase polarity of the analytes	
b.	increase volatility of the analytes	
c.	decrease solubility	
d.	Decrease detector response	

15.	Parameter used for the qualitative analysis by HPLC is	1M
a.	Retention time	
b.	Peak height	
c.	Peak Area	
d.	Width at the base	
16.	Selectivity Factor in column chromatography is associated with	1M
a.	Ability of the column to hold the sample component of a mixture	
b.	Ability of the column to efficiently separate components of a mixture	
c.	Presence of an asymmetric peak in the chromatogram	
d.	Selection of polarity of the mobile phase used for separation	
17.	A mixture of compounds X, Y , Z and M after separation by RP HPLC using mobile phase methanol : water (50:50) showed retention times of 2.5min, 2.8min, 12 min and 15 min respectively. Following is the most non polar component	1M
a.	X	
b.	Y	
c.	Z	
d.	M	
18.	Resin of ion exchange are formed by polymerization of styrene and ?_____	1M
a.	Benzene	
b.	Chlorobenzene	
c.	Divinylbenzene	
d.	Bromobenzene	

19. Separation based on molecular size occurs in _____ chromatographic technique 1M

a. Ion-exchange

b. Gel

c. Affinity

d. Gas

20. The chromatographic method of separating biological mixtures based on specific biological interactions is? 1M

a. Gel

b. TLC

c. Affinity

d. Ion exchange

II. Long answer questions (Attempt <u>any two</u> out of three) 20M

1. a. State Beer Lambert's law. Give its derivation. 5M

b. Explain the principle for IR spectroscopy. Give any two applications for IR spectroscopy 5M

2. a. Explain the term Radial Chromatography with a suitable diagram. Give one spraying agent used in paper chromatography. 5M

b. Classify the different types of ion exchange resins. Give suitable examples for each type. 5M

3. a. Enlist any four detectors used in Gas chromatography. Explain any one detector in detail. Support your answer with a suitable diagram 5M

b. An analyte X when passed through column A of length 12 cm showed a retention time of 7 mins with peak width of 0.54 mins at half the peak height. The same analyte X when subjected to chromatographic analysis on column B of length a 25cm, eluted out at a retention time of 12 mins and had a peak width of 0.72 mins at the base. Which column is more efficient for the separation of analyte X and why ? 5M

III.	**Short answer questions (Attempt <u>any seven</u> out of nine)**	**35M**
1.	Enlist the methods for multicomponent analysis in UV - Visible spectroscopy. If a 12µg/ml solution of molecule $C_8H_9NO_2$ gives an absorbance of 0.86 at its λ_{max} in a 1cm cell, what is its molar absorptivity?	5M
2.	Explain the terms: i. Fluorescence ii. Phosphorescence. Enlist any four factors affecting fluorescence intensity.	5M
3.	Write two points of distinction between atomic absorption spectroscopy and flame photometry. Explain principle of atomic absorption spectroscopy.	5M
4.	Enlist the detectors used in uv-visible spectroscopy. Write a detailed note on any one of them.	5M
5.	Give the principle of separation of compounds using thin layer chromatography. Give a detailed account of the methods used for detection of separated compounds in thin layer chromatography	5M
6.	Discuss guard column in HPLC. Explain the term isocratic elution and give one advantage and disadvantage of the Isocratic elution.	5M
7.	Write a note on paper electrophoresis. Give any two applications of paper electrophoresis.	5M
8.	Explain the term headspace analysis. Give its application. Enlist the carrier gases used in gas chromatography	5M
9.	Write a note on stationary phase and mobile phase employed in affinity chromatography	5M

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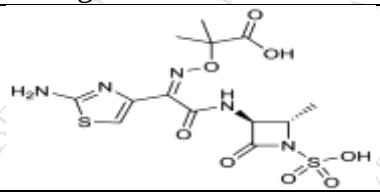
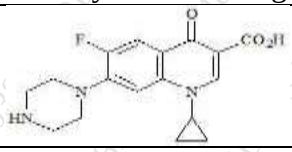
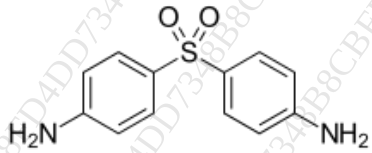
Time: 3 Hrs **Marks: 75**

Q.I Answer the following Multiple Choice Questions. Select the most appropriate option for each statement. **20M**

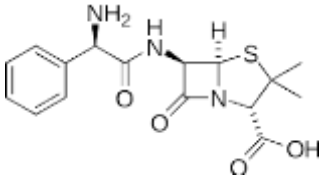
Sr No	Questions		Options
1	What crucial feature of a penicillin is involved in its mechanism of action?	a	Carboxylic acid
		b	β-lactam ring
		c	Acyl side chain
		d	Thiazolidine ring
2	Which of the following is not the degradation product of penicillin?	a	Penillic acid
		b	Penicilloic acid
		c	Penicillin V
		d	Penicillamine
3	Identify the target for clavulanic acid?	a	The transpeptidase enzyme
		b	L-ala racemase
		c	β-lactamase
		d	Penicillin acylase
4	In tetracycline, the pka value of conjugated trione system is in the range of	a	7.2-7.8
		b	9.1-9.7
		c	2.8-3.3
		d	6.4-6.8
5	To which class does the following drug belong 	a	Cephalosporins
		b	Aminoglycoside
		c	Tetracycline
		d	Monobactams
6	Endoperoxide 1, 2, 4-trioxane ring is responsible for the antimalarial action of	a	Artemether
		b	Primaquine
		c	Pyrimethamine
		d	Quinacrine
7	Identify the following structure 	a	Ciprofloxacin
		b	Nalidixic Acid
		c	Lomefloxacin
		d	Ofloxacin
8	Two pharmacologically active agents coupled together are called as	a	Mutual prodrug
		b	Bioprecursor

		c	Polymeric prodrug
		d	Biotransformation
9	Identify the enantiomer of ethambutol which shows selective & powerful antitubercular activity	a	S, R (+) enantiomer
		b	R, S (+) enantiomer
		c	S, S (+) enantiomer
		d	R, R (-) enantiomer
10	N-acetyl isoniazid is the major metabolite of isoniazid produced by acetylation by	a	Amidase
		b	N-acetyl transferase
		c	Esterase
		d	Hydrolysis
11	……..antibiotic was obtained by fermentation from cultures of *Streptomyces mediterranei*	a	Rifabutin
		b	Cycloserine
		c	Isoniazid
		d	Rifampicin
12	Which one of the following antiviral agent exhibits the greatest selective toxicity for the invading virus?	a	Amantadine
		b	Acyclovir
		c	Rimantadine
		d	Zidovudine
13	Identify an inhibitor of viral protease	a	Saquinavir
		b	Acyclovir
		c	Zalcitabine
		d	Lamivudine
14	Identify antifungal antibiotic with heterocyclic benzofuran moiety	a	Amphotericin-B
		b	Nystatin
		c	Natamycin
		d	Griseofulvin
15	Drug of choice for the treatment of filariasis is	a	Diethyl carbamazine(DEC)
		b	Praziquantel
		c	Niclosamide
		d	Mebendazole
16	Identify the given drug	a	Dapsone
		b	Sulfanilamide
		c	Sulfamethoxazole
		d	sulfone
17	Sulfonamide used for burn therapy	a	Sulfamethoxazole
		b	Sulfacetamide
		c	Silver sulfadiazine
		d	Sulfasalazine

18	The term used for drug discovered by accident or conventional approach	a	Drug discovery by serendipity
		b	Rational drug design
		c	HTS
		d	CADD
19	Lipinki's rule of 5 is used for	a	Docking
		b	Drug likenees
		c	Dynamic simulation
		d	Similarity search
20	Identify the QSAR parameter, which is a measure of electron withdrawing or electron donating ability of a substituent.	**a**	Hammett constant
		b	Taft constant
		c	Molar refractivity
		d	Partition coefficient

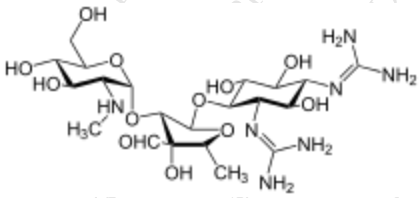
Q.II Attempt <u>ANY TWO</u> of the following. Draw structures wherever required. 20M

Q1. a. Identify following drug and explain acid stability in detail of the same. **4M**



b. Identify the class of following antibiotic and write three structural features for the same.

4M

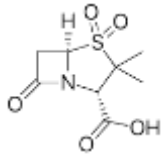


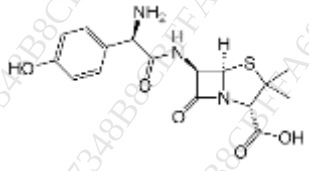
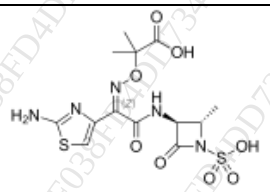
c. Explain two structural features of macrolide antibiotic and write names of two antibiotics from this class. **2M**

Q2.

a. Discuss classification of cefalosporins with examples for each. Write appropriate structures wherever needed. **4M**

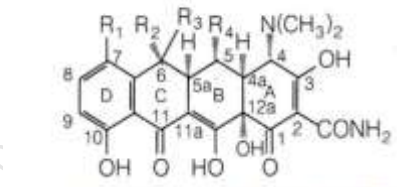
b. Match the following pairs **4M**

Sr No.	**Name**	**Structure**	**Mechanism of action**
1	a. Aztreonam	i. 	x. Inhibition of mucopeptide synthesis

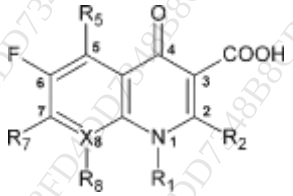
2	b. Sulbactam	ii. 	y. Inhibition of β-lactamase
		iii. 	z. Inhibition of transpeptidase

c. Explain any one DHFR inhibitor with structure and mechanism of action. **2M**

Q. 3. a. Write degradation reaction and products for following scaffold in acidic as well as basic medium . **4M**



b. With reference to the following scaffold, answer the following questions: **4M**



By substituting appropriate groups at positions R_7 and R_1 explain effects on antibacterial activityin detail along with respective structure. (**One for each**.)

c. Explain importance of Prodrugs in biological activity of the drugs. Write example of carrier linked prodrug with it's use. **2M**

Q III Answer <u>Any 7</u> of the following questions: (35 M)

Q1. Match the following. **(5M)**

Generic name	Chemical class	Mechanism of action
Ethionamide	an aminoglycoside antibiotic	blocking the ability of 30S ribosomal subunits to make proteins
PAS	An antibiotic	Competitive inhibitor of PABA
Pyrazinamide	Salicylic acid derivative	D-alanyl- ligase inhibitor
Streptomycin	Thioamide analogue of isoniazid	Mycolic acid synthesis inhibitor
Cycloserine	Pyrazine derivative	FASI (Fatty acid synthase inhibitor)

Q2.A. Give the synthetic scheme for synthesis of Ciprofloxacin. **(4M)**

B. Write name and structure of fluoroquinolone that reduces phototoxicity. (**1M)**

Q3.A. Give the synthetic scheme for acyclovir mentioning reagents & reaction conditions. **(4M)**

B. Write MOA of Ribavirin. (**1M)**

Q4. Classify antifungal agents given below based on chemistry, explain MOA in brief with structure(any two): Griseofulvin, Clotrimazole, Tolnaftate **(5M)**

Q5.A. Give the synthetic scheme for Dapsone mentioning reagents & reaction conditions. **(3M)**

B. Name the target for sulphonamides drugs. Write the structure of sulphonamides used for ulcerative colitis. **(2M)**

Q6. Write class. Structure, and mechanism for the following.(Any Two) **(5M)**

i. Sulphamethoxazole
ii. Diloxanide
iii. Mebendazole

Q7. A. Indicate to which mechanistic & therapeutic class the following drugs belongs to (Structures to be written) **(5M)**

a) Chloramphenicol
b) Diethyl carbamazine citrate

Q8. Enlist Physicochemical parameters used in QSAR? Explain application of any two parameters. **(5M)**

Q9. Define combinatorial chemistry & write its applications.Explain solution phase synthesis. **(5M)**

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Time:3 Hours **Max. Marks: 80**

Note: - i) Write answers to sub questions together
ii) Figures to the right indicate full marks

Q.I Multiple Choice Questions (All Questions Compulsory)
(Each Question Carry One Mark) **20M**

1. In Raman specroscopy ____is used as a detector
   a. Charge Coupled Device
   b. Barrier layer cell
   c. Golay cell
   d. Bolometer
2. Following is the commonly used light source for atomic absorption spectroscopy
   a. Deuterium Lamp
   b. The Globar source
   c. Hollow cathode lamp
   d. The Nernst Glower
3. As per Bragg's Law For constructive interference to occur the path difference between two waves should be
   a. $(n+1)/\lambda$
   b. $n\lambda$
   c. n/λ
   d. $(n-1)/\lambda$
4. For collection of X-rays by detector at an angle 2θ, as the crystal rotates through an angle θ, detector is mounted on table known as
   a. Rotameter
   b. Galvanometer
   c. Ammeter
   d. Goniometer
5. _____ is unit of radioactivity which equates to one disintegration per second
   a. Gray
   b. Curie
   c. Becquerel
   d. Marie
6. The electrode potentials are calculated by
   a. Ilkovic Equation
   b. Stokes Law
   c. Nernst Equation
   d. Ohms Law

7. Identify stepwise degradation pathway of calcium oxalate monohydrate in thermogravimetry
   a. step 1 :CaC2O4.H2O, step 2: CaC2O4, step 3:CaCO, step 4: CaO
   b. step 1 :CaC2O4.H2O, step 2:CaCO3, step 3:CaC2O4, step 4:CaO
   c. step 1 :CaC2O4.H2O, step 2: CaC2O4, step 3:CaO, step 4:CaCO3
   d. step 1: CaC2O4.H2O, step 2:CaC2O4, step 3:CaCO3, step 4:CaO
8. Sample related factor which affect thermal methods of analysis is
   a. Heating rate
   b. furnace atmosphere
   c. particle size of sample
   d. geometry of pan and furnace
9. _____ test is used for rejection of objectional observations during the experiment
   a. Q test
   b. F test
   c. Coefficient of correlation
   d. t test
10. For " n" number of observations, number of degrees of freedom are given by the formula
    a. n+1
    b. n-1
    c. n square
    d. square root of n
11. Which one of the following quantitation methods in UV - Visible spectroscopy does not need a reference standard?
    a. Standard curve method
    b. Standard absorptivity value
    c. Single point standardization
    d. Double point standardization
12. For Beer Lambert's law to be followed,_____ should be constant
    a. Concentration
    b. Pathlength
    c. Absorptivity
    d. Absorbance
13. The transition which requires least energy is
    a. n to σ*
    b. n to π*
    c. σ to σ*
    d. π to π*
14. Which of the following is an example of a pure auxophore
    a. –CN
    b. Ar-
    c. –C=O
    d. –O-H

15. Hypsochromic shift is_____
    a. Increase in Absorptivity
    b. shift of λmax to longer wavelength
    c. Decrease in Absorptivity
    d. shift of λmax to shorter wavelength
16. Generally, in fluorescence, the emitted wavelengths are
    a. Shorter or equal to absorbed wavelengths
    b. Equal to absorbed wavelengths
    c. Equal to or longer than absorbed wavelengths
    d. Shorter or longer than absorbed wavelength
17. Fluorescence involves conversion from
    a. Ground state to triplet excited state
    b. Singlet excited state to ground state
    c. Triplet excited state to ground state
    d. Ground state to singlet excited state
18. This material is transperent to IR radiation
    a. Glass
    b. Alkali metal hydroxides
    c. Quartz
    d. Alkali metal halides
19. The essential component of a Fourier transform spectrometer is:
    a. Prisms (Cornu/ Littrow)
    b. Michelson interferometer
    c. Diffraction gratings
    d. Reflection gratings
20. In Raman specroscopy ____is used as a detector
    a. Charge Coupled Device
    b. Barrier layer cell
    c. Golay cell
    d. Bolometer

Q. II Answer any one question

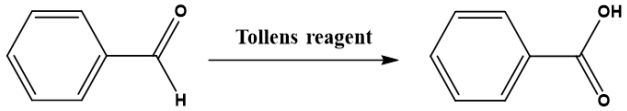
1. a. An analytical method was employed for the analysis of samples of Iron compounds. Set A is the results obtained before acidification of the samples and set B is the results for samples analysed after acidification .The percentage iron content in each of the five samples for set A and B is given below. Determine with the help of a suitable method. If there is any significant difference between the two sets of results. **6M**

Tabulated t value for the 4 degrees of freedom at 95% C.L is 2.78

Method A	Method B
17.6	17.9
6.8	7.1
14.2	13.8
20.5	20.3
9.7	10.2

1. b. Enlist the detectors used in XRD. Explain any one detector with a well Labeled diagram. **6M**

2.a. A chemist synthesized benzoic acid using the following reaction: **6M**



Predict the prominent IR bands that will be visible in the IR spectrum of the reactant and the product. Choose the wavenumber/s from this data, presence/absence of which will indicate completion of reaction.

2.b. What is Radionuclidic impurity? Explain the direct isotope dilution technique. **6M**

Q. III. Attempt Any Four of the following

1. a. The Molar Absorptivity of a drug X at its wavelength maxima is 10000 and its molecular weight is 200. A solution of X gives an absorbance of 0.8 at its wavelength maxima in a 1cm cell. Calculate concentration of X in the solution. Report answer in %w/v. **6M**

1. b. Enlist various methods for the measurement of radioactivity and explain any one in detail. **6M**

2. a. Write a note on the types of molecular vibrations. Which of these will be IR active in a molecule like CO_2? What are the factors influencing vibrational frequency? **6M**

2. b. Discuss the determination of pKa of a weak monobasic acid using pH meter. **6M**

3. a. Give one difference between a photometer and spectrophotometer. **6M**
Draw a neat labelled diagram of a double beam UV-Visible spectrophotometer.

3. b. Explain the principle involved in DTA.
Give any two of its pharmaceutical applications. **6M**

4. a. Enlist different factor affecting fluorescence intensity and discuss any Four. **6M**

4. b. Draw a block diagram of Raman Spectrometer and Describe advantages of Raman Spectroscopy over IR Spectroscopy. **6M**

5. a. Enlist the different atomizers used in AAS. Explain any one atomizer in detail. **6M**

5. b. Enlist the methods used for single component analysis using UV-Visible spectroscopy. Discuss any two in detail. **6M**

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Duration :3Hours **Marks :80**

Check whether you got right question paper

1) **All question papers are compulsory**
2) **Draw neat diagram wherever necessary**
3) **Figure to the right indicate full marks**

1)	(i) Give the structure of ecosystem	1
	(ii)Define Environmental resources	1
	(iii)Give two examples of reuse.	1
	(iv)Enlist Source of air pollution	1
	(v)Give Limitations of conventional sources of Energy.	2
	(vi)Define ecosystem	2
	(vii) What do you mean by renewable sources give an example	2
	(viii) State the need of environmental education	2
	(ix) What do you mean by Need for Public Awareness.	2
	(x)Explain primary air pollution with example	2
	(xi)What do you mean by E-pollution	2
	(xii) Elaborate the powers of state Control Pollution Board.	2
2)	(i). Explain in details Ecological Pyramids	4
	(ii) Define Green Buildings. Elaborate the same.	4
	OR	
	(ii) Write a note on Earthquake in Japan	4
	(iii) Write a note on Sources and Effects Noise Pollution.	4
3)	(i) Discuss in detail about Hydropower generation	4
	(ii) Give the Functions and powers of Central Control Pollution Board.	4
	(iii) Write a note on Environmental Protection Act.	4
	OR	
	(iii) Write a note on Minamata Disease	4

4) (i) Differentiate the Renewable and non- renewable resources. Give the Limitations of conventional sources of Energy. 4

(ii) Brief Concept of waste waters - Domestic & Industrial and also elaborate on its treatment. 4

(iii) Write a note on Venturi scrubber 4

OR

(iii) Explain the constitution of Ministry of environment and forest. Enlist their roles and duties. 4

5) (i) Elaborate on Ozone Layer Depletion 4

(ii) Write a note on overview of Food chain and Food web. 4

OR

(ii) Write a short note on Wildlife Protection act 1972. 4

(iii) Define sustainable development. Write a note on Environmental aspect of sustainable development. 4

6) I) Write a note on Bhopal Gas Tragedy 4

ii) Write a note on"Global Warming" 4

iii) What is a solar cell? Explain the principle and working of Photo Voltaic cell 4

OR

iii) Write a Note on Desert Ecosystem 4

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Duration: 3 Hours **Total marks: 75**

N.B.: 1. All questions are compulsory
2. Figures to right indicate full marks.

Q.I	**Multiple Choice Questions (Answer all)**	**20**
1	**Which of the following is not scale up process**	**1**
a)	Laboratory to pilot scale	
b)	Pilot to industrial scale	
c)	Industry to pilot scale	
d)	Laboratory to industrial scale	
2	**Rapid mixer granulators are used in**	**1**
a)	Wet granulation	
b)	Dry granulation	
c)	Compression granulation	
d)	Direct compression	
3	**Changes in the technical grade of excipients, comes under _____as per SUPAC guidelines**	**1**
a)	Level 1	
b)	Level 2	
c)	Level 3	
d)	Level 4	

4	**A group of Technologies that are used as base upon which other technologies or processes are developed is**	**1**
a)	PAT Technology	
b)	QBD Technology	
c)	Platform Technology	
d)	Platinum Technology	
5	**Slugging is used for**	**1**
a)	Ingredients which can be directly compresses	
b)	Ingredients which cannot be directly compressed	
c)	Ingredients which are stable to heat and moisture	
d)	Ingredients with excellent flow property	
6	**Technology transfer guidelines issued by**	**1**
a)	MHRA	
b)	WHO	
c)	FDA	
d)	CSCO	
7	**BMR stands for**	**1**
a)	Batch Manufacturing Record	
b)	Batch Marketing Record	
c)	Batch Marketing Report	
d)	Batch Manufacturing Report	
8	**Following ICH guideline mentions about product development**	**1**
a)	Q4	
b)	Q8	
c)	Q9	
d)	Q10	

9	**NRDC implies**	**1**
a)	National Revenue Development Council	
b)	National Research Development Council	
c)	National Research Design Council	
d)	National Revenue Design Council	
10	**Module 3 of NDA dossier as per CTD format includes**	**1**
a)	Clinical study reports	
b)	Quality overall summary	
c)	Preclinical study reports	
d)	Administrative information	
11	**The objective of Phase III clinical trial study is**	**1**
a)	To assess safety of drug	
b)	To assess efficacy of drug	
c)	To assess bioavailability of drug	
d)	To assess safety and efficacy of drug	

12	**Safety Pharmacology studies are part of**	**1**
a)	Clinical study	
b)	Preclinical study	
c)	Bioequivalence study	
d)	Bioavailability study	
13	**In Clinical Research CRF implies**	**1**
a)	Clinical Report Form	
b)	Case Report form	
c)	Compliance report form	
d)	Candidate report form	
14	**Institutional Ethics Committee approves**	**1**
a)	Protocol involving study on animals	
b)	Protocol involving study on cell lines	
c)	Protocol involving study on humans	
d)	Protocol involving study on pathogens	
15	**In QbD the term CQA stands for**	**1**
a)	Critical Quantitative Attainment	
b)	Cumulative Quality Attributes	
c)	Critical Quality Attributes	
d)	Cumulative Quantitative Attributes	

16 **Which of the following parameters relates to the "Six sigma approach"** **1**

a) Errors

b) Cost

c) Safety

d) Defects

17 **_____ is a series of certification for international environmental management standards** **1**

a) ISO 9000

b) ISO 14000

c) ISO 27000

d) ISO 13000

18 **In CTD which of the following Modules is region specific** **1**

a) Module 1

b) Module 2

c) Module 3

d) Module 4

19 **DCGI stands for** **1**

a) Deputy Commissioner General of India

b) Drug Controller General of India

c) Drug Commissioner General of India

d) Deputy Controller General of India

20	**Which one of the following is the first document of submissions made in approval of a new drug**	**1**
a)	Post marketing surveillance data	
b)	Bioequivalence studies	
c)	Chemistry, manufacturing and controls	
d)	Onsite visit of facility	
QII	**Answer the following (any two)**	**20**
1	Give the detailed account of Pilot plant scale up of Tablet.	10
2	Describe in details the goals and phases of technology transfer	10
3	Differentiate between NDA and ANDA. Describe in details contents of ANDA	10
QIII	**Answer the following (any seven)**	**35**
1	Explain the SUPAC guidelines for the change of manufacture site for immediate release products.	5
2	Mention in brief the role and responsibilities of Sending unit in technology transfer	5
3	Enlist different technology transfer agencies in India and describe objectives and functions of any one agency	5
4	Describe in brief the scope and contents of Investigator's brochure	5
5	Elaborate on the elements of QbD as a part of QMS	5
6	Explain the objective and principles of GLP	5
7	Define OOS and explain methods to handle or investigate an OOS	5
8	What is CDSCO and explain in brief its organization and responsibilities.	5
9	Discuss the importance of Certificate of Pharmaceutical Product	5

X----------X----------X

Duration: 3 HOURS **Total marks: 80 Marks**

N.B.: 1. All questions are compulsory
2. Draw relevant chemical strictures and diagrams wherever applicable

Que 1. a) Answer the following: **10 M**

i. Give any two examples of substitution of crude drugs.
ii. Give biological source and uses of aldehyde containing volatile oil drug.
iii. Write the biological source of any one natural colorant with uses.
iv. Give biological source and commercial significance of Tea tree oil.
v. Give example of hydrolysable tannin containing drug with its biological source.
vi. Give one confirmatory test for Colophony.
vii. Give biological source and uses of any one organo sulphur containing drug.
viii. Give example of naphthoquinone containing drug with its chemical constituents.
ix. Enlist methods for extraction of volatile oils.
x. Write the names of acetate mevalonate pathway precursors

b) Answer the following **10 M**

i. Discuss in short Adulteration of crude drugs.
ii. Describe continues hot percolation method extraction of crude drugs.
iii. Write in brief about processing and preparation of Ginger for market.
iv. Write in brief about preparations containing tannins in healthcare with examples
v. Give biological source and uses of Asafoetida

Que 2. i) Discuss source, chemistry, cultivation and collection of Cardamom **4 M**
ii) Give detail outline and illustrate Shikimic acid Pathway **4 M**
iii) Give a detailed account of curcuminoids. **4 M**

Que 3. i) Discuss in details chemical methods of evaluation of crude Drugs. **4 M**
ii) Write note on isolation, identification and analysis of Menthol. **4 M**
iii) What are edible vaccines? Give an example with use. **4 M**

Que 4. i)	Explain the principle, procedure and applications of Supercritical Fluid Extraction	**4 M**
ii)	With respect to sources, composition and applications, discuss any 2 tannins fruit drugs	**4 M**
iii)	What are terpeneless volatile oils? Give the method of preparation and applications	**4 M**
Que 5. i)	Give an account on Picrorrhiza.	**4 M**
ii)	Give source, chemistry, chemical test and uses of 'Lemongrass' and 'Peppermint'	**4 M**
iii)	Write a note on the biopotential of carotenoids	**4 M**
Que 6. i)	Write a note Comparative study of Umbelliferous fruits	**4 M**
ii)	Give an account on green tea with particular reference to its biopotential	**4 M**
iii)	Write a note on colorants of natural origin	**4 M**

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Time: 3 Hours **Total Marks: (75)**

Q I. Choose the ONE best answer and write it down **20 Marks**

1. Montelukast inhibits _____ receptors.
A. Histamine
B. Leukotriene
C. PAF
D. Bradykinin

2. The first choice drug for nonsteroidal antiinflammatory drug-induced gastric ulcer is:
A. Ranitidine
B. Omeprazole
C. Sucralfate
D. Misoprostol

3. Which of the following is an example of Osmotic Purgative?
A. Psyllium
B. Phenolphathalein
C. Lactulose
D. Ispaghula

4. The following 5HT3 antagonist is used as anti-emetic?
A. Hyoscine
B. Ondansetrone
C. Haloperidol
D. Chlorpromazine

5 Cotrimoxazole is a combination of:
A. Sulphadoxine + Trimethoprim
B. Sulphamethoxazole + Pyrimethamine
C. Sulphamethoxazole + Trimethoprim
D. Sulphamethoxazole + Ictaprim

6. Which of the following antibiotic may cause tooth discoloration as a side effect?
A. Tetracycline
B. Penicillin
C. Sulphonamides
D. Macrolides

7. Which of the following drugs is penicillinase resistant:
A. Oxacillin
B. Amoxicillin
C. Bicillin-5
D. Penicillin G

8. Cephalosporins are drugs of choice for treatment of:

A. Gram-positive microorganism infections
B. Gram-negative microorganism infections
C. Gram-negative and gram-positive microorganism infections, if penicillins have no effect
D. Only bacteroide infections

9. The anthelmintic drug piperazine:

A. Inhibits tubulin polymerization
B. Acts as a GABA agonist to paralyze the worms
C. Inhibits glucose uptake
D. Uncouples oxidative phosphorylation

10. A side effect of ethambutol is

A. Neurotoxicity
B. Nausea, vomiting and diarrhea
C. Hypersensitivity and urticarial
D. Loss of color vision due to optic neuritis

11. Which of the following is Phenazine derivative used for the treatment of leprosy?:

A. Clofazimine
B. Dapsone
C. Ethionamide
D. Rifamycin

12. Nevirapine belongs to _____:

A. Non-Nucleoside reverse transcriptase inhibitor
B. Nucleoside reverse transcriptase inhibitor
C. Protease Inhibitor
D. Non-selective antiviral drug

13. The antineoplastic agent that is classified as an alkylating agent is:

A. Vincristine
B. Tamoxifen
C. Bleomycin
D. Busulfan

14. Sirolimus is inhibitor of _____:

A. Calcineurin
B. Choline Esterase
C. m-TOR
D. Protease

15. Which of the following antineoplastic drug is a mitotic inhibitor and causes metaphase arrest?

A. Busulfan
B. Vincristine
C. Cytarabine
D. Procarbazine

16. The BCG vaccine contains:

A. Attenuated culture of *Mycobacterium tuberculosis*
B. Live culture of *Mycobacterium leprae*
C. Attenuated culture of *Mycobactwerium bovis*
D. Killed culture of *Mycobacterium tuberculosis*

17. A drug used for the treatment of organophosphorus poisoning is:

A. Parathion
B. Malathion
C. Pralidoxime
D. Phenytoin

18. Melatonin plays a role in:

A. Sleep cycle
B. Hunger
C. Digestion
D. Growth

19. Which of the following toxicity can occur due to single exposure?

A. Acute toxicity
B. Sub-acute toxicity
C. Sub-Chronic toxicity
D. Chronic toxicity

20. A selective antidote for organophosphate poisoning is

A. Fentanyl
B. Pralidoxime
C. Codeine
D. Methadone

Q.II Answer ANY TWO of the following 20 M

1. Classify anti-ulcer drugs with examples. Explain the detailed pharmacology of proton pump inhibitors.
2. Classify penicillins with examples. Explain the mechanism of action of beta lactam antibiotics and add a short note on resistance development against beta lactam antibiotics.
3. Write a short note on treatment of amoebiasis.

Q.III Answer ANY SEVEN of the following 35 M

1. Explain any two classes of drugs used in the treatment of inflammatory bowel disease
2. Write a short note on bulk laxatives.
3. Write a short note on the mechanism of action and adverse effects of sulphonamides.
4. Write a note on the mechanism of action, adverse effects and uses of 4-aminoquinoline drugs.
5. Write a note on the mechanism of action, adverse effects and uses of rifampin.
6. Classify anticancer agents with two examples of each class.
7. Write a note on Calcineurin inhibitors.
8. Write a short note on genotoxicity.
9. Describe the symptoms and management of lead poisoning.

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Time: 3 Hours **Marks: 100**

ALL QUESTIONS ARE COMPULSORY

Q. 1.

a. ……Numbers of ATP are produced when two molecules of acetyl CoA are consumed in TCA cycle. 1

b. Name any one regulatory enzyme for TCA cycle. 1

c. Name the prostaglandin inhibitor drugs. 1

d. Write the name of branching enzyme involved in glycogenesis. 1

e. Enlist the precursors used for purine biosynthesis 1

f. Name the drug which modulate uric acid synthesis. 1

g. State significance of pentose phosphate pathway. 2

h. Calculate the total ATPs obtained in β-oxidation of palmitic acid. 2

i. Draw the structure of cholesterol. 2

j. Give the regulation of pyrimidine nucleotide biosynthesis. 2

k. Give name of enzyme and its deficiency disorders involved in purine salvage pathway. 2

l. Enlist ketone bodies with their structure. 2

m. Define Glycolysis and give the ATP consumption in preparatory phase of Glycolysis. 2

Q 2. (a) Give the names and structures of substrate and product, coenzymes for the following enzyme catalyzed reactions (Any Four) 8

1. Glyceraldehyde dehydrogenase
2. Pyruvate kinase
3. Fumarase
4. HMG CoA synthase
5. B-ketoacyl ACP reductase

(b) Give the name of the enzyme catalyzing the following conversions 4

1. Malate to oxaloacetate 2. Acetyl CoA to malonyl CoA

3. Glucose -6-phosphate to Fructose -6- phosphate 4. Succinate to Fumarate

Q. 3	a. Depict schematically electron transport chain.	3
	b. Write the three irreversible reaction of glycolysis.	3
	c. Write the importance of ketone bodies.	2
	d. Explain proton motive force.	2
	e. Explain glycogenesis.	2
Q.4	a. Give the reactions involved in conversion isocitrate to succinate.	3
	b. Explain the β-oxidation of odd number carbon containing fatty acids.	3
	c. Discuss substrate level phosphorylation.	2
	d. Mention drugs modulating cholesterol synthesis.	2
	e. Give regulation for DENOVO biosynthesis of purine nucleotide.	2
Q.5	a. Write short note on TriCarboxylic Acid cycle	3
	b. Differentiate β-oxidation and biosynthesis of fatty acid.	3
	c. Outline the various steps involved in mevalonate pathway.	2
	d. Discuss in brief oxidative phosphorylation.	2
	e. Discuss drugs modulating purine and pyrimidine biosynthesis.	2
Q. 6	a. Explain the Salvage pathway for purine metabolism	3
	b. Give the reaction catalyzed by transketolase.	3
	c. Outline the steps involved in oxidation of fatty acid.	2
	d. Outline the steps involved in synthesis of AMP from IMP.	2
	e. What is the source of the precursor for PRPP? Give the reaction involved in synthesis of PRPP.	2

****

(3 Hours) **Total Marks: 80**

N.B.: **1. All question are compulsory**
2. Figures to right indicate full marks.

Q1. A Answer the following **16M**

i Enlist ANY TWO role and responsibilities of hospital pharmacist

ii Enlist ANY TWO strategies for improving patient compliance.

iii Define Type C Adverse Drug Reaction.

iv Write in brief about drug-food interaction with any two examples.

v State any two effects on the pharmacokinetics of drugs due to change in body fluid volume in Pregnant patients.

vi Justify: Therapeutic drug monitoring is required for Phenytoin.

vii Describe in brief BA/BE studies.

viii Define the term Pharmacoeconomics

Q1. B Fill in the Blanks **04 M**

i Idiosyncrasy represents _____ type of ADR.

ii _____ is defined as the science and activities relating to the detection, assessment, understanding and prevention of adverse effects

iii Concurrent use of Alprazolam and opioids like oxycodone can result in severe respiratory _____.

iv Thiazide diuretics in gout patient cause _____

Q2 Attempt any three **12 M**

i Discuss various functions of the clinical pharmacist.

ii Describe the responsibilities of pharmacist in direct patient care areas of the hospital.

iii Describe the methods of assessment of patient compliance.

iv Write a short note on reasons for patient non-compliance.

Q3 Answer the following (Attempt any three) **12 M**

i Write a short note on Naranjo Adverse Drug Reaction (ADR) Probability Scale.

ii Explain how the prescription errors can contribute to adverse drug reactions.

iii Which factors can predispose an individual to a higher risk of experiencing drug interactions?

iv Write a note on drug interactions altering the mechanisms of action of index drugs.

Q4	**Answer the following (Attempt any three)**	**12 M**
i	Write a note on alteration in pharmacokinetics of drugs in Geriatric Patients.	
ii	Write a note on routes of administration of drugs used in Paediatric patients.	
iii	How does TDM contribute to the management of chronic diseases and conditions where drug therapy plays a crucial role?	
iv	What are the advantages and limitations of TDM in different clinical settings and for various drugs or drug classes?	

Q 5	**Answer the following (Attempt any three)**	**12 M**
i	What is hit to lead finding? Add a note on lead optimization	
ii	Write a short note on Pharmacovigilance	
iii	What is independent ethics committee. Add a note on Belmont Report 1979	
iv	Discuss Phase I and Phase II clinical Trials	

Q 6	**Answer the following (Attempt any three)**	**12 M**
i	Explain analysis of secular trend design of pharmacoepidemiology	
ii	Discuss cohort studies of Pharmacoepidemiology.	
iii	Write a short note on different methods of Pharmacoeconomic evaluation	
iv	Discuss applications of Pharmacoeconomics	

(Time: 3 Hours) **(Total Marks: 75)**

Note : **i) All questions are compulsory.**
ii) Figures to the right indicate full Marks.

Q.I	**Choose the correct Answer and write it down**	**20**
i	Which department in a hospital is responsible for managing patient admissions and ensuring proper utilization of beds?	
Alternative 1	Radiology Department	
Alternative 2	Dietary Services	
Alternative 3	Medical Records Department	
Alternative 4	Human Resources Department	
ii	Community pharmacists often play a key role in identifying and preventing drug interactions and adverse effects. What is this practice known as?	
Alternative 1	Pharmacoeconomics	
Alternative 2	Medication reconciliation	
Alternative 3	Medication therapy management	
Alternative 4	Drug compounding	
iii	What document serves as a written prescription for a patient's inpatient medications and includes the drug, dose, frequency, and route of administration?	
Alternative 1	Patient insurance card	
Alternative 2	Medication discharge plan	
Alternative 3	Medication order or chart	
Alternative 4	Physician's license	
iv	Grapefruit juice is known to interact with various medications, especially those metabolized by the liver. What is the mechanism of this interaction?	
Alternative 1	It enhances drug metabolism	
Alternative 2	It inhibits drug metabolism	
Alternative 3	It has no impact on drug metabolism	
Alternative 4	It reduces drug-protein binding	
v	Why is it crucial for healthcare professionals to consider drug-drug interactions during patient care?	
Alternative 1	To minimize the cost of medications for patients	
Alternative 2	To avoid adverse effects and ensure optimal therapy	
Alternative 3	To determine which drugs are most effective	
Alternative 4	To improve the taste of oral medications	

vi	Which of the following is an example of an idiosyncratic adverse drug reaction?
Alternative 1	Nausea and vomiting after chemotherapy
Alternative 2	Allergic skin rash after taking an antibiotic
Alternative 3	Drowsiness as a result of an antihistamine
Alternative 4	Gastric irritation due to non-steroidal anti-inflammatory drugs
vii	When was the International level convention held to exercise control on the use of narcotics?
Alternative 1	1930
Alternative 2	1919
Alternative 3	1940
Alternative 4	1945
viii	In hospitals where a catalogue has been published, what type of requisition form is recommended?
Alternative 1	Pre-printed requisition form
Alternative 2	Handwritten requisition form
Alternative 3	Online requisition form
Alternative 4	Special requisition form
ix	Which of the following is a manual containing clinically oriented summaries of pharmacological information about some of the selected drugs?
Alternative 1	Drug formulary
Alternative 2	Drug list
Alternative 3	Loose leaf formulary
Alternative 4	Ancillary formulary
x	Prescriptions and _____ are the principal ways through which the prescribers and the pharmacists communicate with each other concerning the desired treatment regimen for a patient.
Alternative 1	Medication orders
Alternative 2	Dosage instructions
Alternative 3	Treatment plans
Alternative 4	Medication recommendations
xi	_____ is the process in which the professionals in different departments report to each other regarding the care provided to the patients.
Alternative 1	Cross-functional collaboration
Alternative 2	Patient care coordination
Alternative 3	Multidisciplinary information sharing
Alternative 4	Interdepartmental communication

xii _____ contains current news about devices and health industries.

Alternative 1 Pharmaceutical News Index (PNI)
Alternative 2 MICRODEX
Alternative 3 MEDLINE
Alternative 4 Drug abuse warning network

xiii Preparation of budget is _____ which calls for the compilation of all relevant facts and figures.

Alternative 1 Forecasting
Alternative 2 Planning
Alternative 3 Organizing
Alternative 4 Preparing Questions

xiv Usually at least _____ward round is conducted every day to review the progress of each patient.

Alternative 1 One
Alternative 2 Two
Alternative 3 Five
Alternative 4 Seven

xv TDM is very essential for those drugs with ____therapeutic index.

Alternative 1 Wide
Alternative 2 Narrow
Alternative 3 Large
Alternative 4 Small

xvi OTC drugs are_____.

Alternative 1 Ethical Drugs
Alternative 2 Prescription Drugs
Alternative 3 Non-Prescription Drugs
Alternative 4 Ethical & Prescription Drug

xvii F S N in the layout of the drug store stands for_____ .

Alternative 1 Fast moving, slow moving, non-moving material
Alternative 2 First, Six, Nine
Alternative 3 Fast moving, storing, net quantity
Alternative 4 Fast Moving, Slow Moving, New material

xviii VED analysis stands for_____ .

Alternative 1 Very essential deal
Alternative 2 Vital essential desirable
Alternative 3 Very essential desirable
Alternative 4 Vital essential deal

xix	A ledger or bin card has ___codes.
Alternative 1	1
Alternative 2	2
Alternative 3	3
Alternative 4	4

xx	Westergren and Wintrob are the methods for the determination of _____.
Alternative 1	Anaemia
Alternative 2	Hb
Alternative 3	ESR
Alternative 4	Blood sugar

Q.II	**Answer the following (Any two out of three)**	**20**
i	Draw a well-labelled layout of the community Pharmacy. Discuss legal requirements and maintenance of various records for Community Pharmacy.	
ii	Define the Hospital Formulary, and describe the objectives and contents of the Hospital Formulary.	
ii	Describe in brief the policies of the Pharmacy and Therapeutic Committee in in-patient and out-patient prescription.	

Q.III	**Answer the following (Any seven out of nine)**	**35**
i	Discuss various mechanisms of drug interactions altering the absorption of drugs with suitable examples.	
ii	Describe the dispensing of controlled drugs.	
iii	Explain the interview process in the medication history interview.	
iv	Describe the drug information services.	
v	Describe various modes of communication with patients.	
vi	Elaborate budget preparation and its implementation.	
vii	Describe Pharmacist Intervention in drug therapy monitoring.	
viii	Explain in detail the Purchase procedure.	
ix	Explain three distinct testing phases of urine analysis.	

Duration: 3hrs **Total Marks: 75**

Note: All Questions are Compulsory.
Figures to the right indicate full marks.
Draw diagrams wherever required.
Use of Scientific calculator is permitted

Q. 1 Choose the appropriate option for following multiple choice based questions. **20**

1 The use of pharmacokinetic principles in optimising the drug dosage to suit individual patient needs and achieving maximum therapeutic utility is called as _____ 1

a clinical pharmacokinetics.
b dosage regimen
c individualization
d population pharmacokinetics

2 Select a passive absorption process 1
a pore transport
b active transport
c pinocytosis
d phagocytosis

3 poorly developed BBB is observed in 1
a infants
b adults of age more than 20 years
c elderly
d children at puberty

4 Unit of perfusion rate is 1
a min/ml/ml
b ml/lit
c ml/min/ml
d mg.hr/lit

5 Carrier mediated absorption process can be described by 1
a Fick's first law of diffusion
b Michaelis-Menten equation
c Noyes Whitney's equation
d Nernst and Bruner equation

6	Probenecid act as uricosuric agent as it	1
a	inhibits glomerular filtration of uric acid	
b	competitively inhibit active secretion of uric acid	
c	has structural similarity with uric acid	
d	competitively inhibit active reabsorption of uric acid	
7	Hepatic clearance is said to be perfusion rate limited, if	1
a	it undergoes high metabolism	
b	it escapes metabolism	
c	it is metabolized to poor extent	
d	it shows intermediate metabolism rate	
8	Select the dissolution apparatus working on sink condition	1
a	paddle type	
b	basket type	
c	flow through cell	
d	paddle over disk	
9	BCS class III drugs have	1
a	high solubility, high permeability	
b	high solubility, low permeability	
c	low solubility, high permeability	
d	low solubility, low permeability	
10	_____ form of drug will be comparatively more soluble.	1
a	crystalline	
b	amorphous	
c	hydrate	
d	solvate	
11	Select the Pharmacodynamic method of studying bioavailability	1
a	acute pharmacologic response	
b	plasma-level time studies	
c	urinary excretion studies	
d	stool excretion studies	
12	What is the equation of bioavailable fraction	1
a	bioavailable dose/Administered dose	
b	1/Administered dose	
c	1/Bioavailable dose	
d	administered dose/Bioavailable dose	

13	Elimination half-life is time taken for half of the amount of drug to get eliminated from	1
a	body	
b	liver	
c	kidney	
d	organ	
14	Name the model in which compartments are joined in series	1
a	mammillary model	
b	distributed parameter model	
c	physiologic model	
d	catenary model	
15	In case of multiple IV injections, the ratio of steady state concentration to initial concentration is called as	1
a	absorption factor	
b	maxima	
c	minima	
d	accumulation factor	
16	Select the cause for nonlinearity in drug distribution	1
a	saturation of binding sites on plasma proteins	
b	when a presystemic gut wall or hepatic metabolism attains saturation	
c	when absorption involves carrier-mediated transport systems	
d	when absorption is solubility or dissolution rate-limited	
17	Induction of drug metabolism leads to _____ in half-life of drug	1
a	unpredictable	
b	increase	
c	decrease	
d	remain constant	
18	While designing dosage regimen for narrow therapeutic index drug, the preferred method is	1
a	administered twice a day	
b	small doses administered at frequent intervals	
c	larger doses administered at relatively longer intervals	
d	small doses administered at longer interval	

19	The word "open" in the one compartment open model means	1
a	the input and output are unidirectional	
b	not applicable for administration of a single dose of a drug	
c	drug concentration in plasma is equal to that in other body tissues	
d	easy absorption	
20	Mechanism of drug absorption in rectal route is	1
a	passive diffusion	
b	pore transport	
c	endocytosis	
d	carrier mediated transport	
Q.II a	**Attempt any 2**	**2x10**
1	A drug following one compartment kinetics, after IV bolus administration of 250mg gave instantaneous plasma concentration of 34 mg/L. If half life of drug is 3.5 hrs, calculate,	
	i) Elimination rate constant and apparent volume of distribution	2
	ii) Total systemic clearance and AUC (Zero to infinity)	2
	iii) Plasma concentration after 1.5 hrs of administration.	2
	iv) Time required to eliminate 45% of dose	2
	v) What would be the new Co achieved if dose is changed to 400mg	2
2	Write a note on the concept of loading dose and maintenance dose.	10
3	Explain Carrier mediated absorption mechanism.	10
Q.II b	**Attempt any 7**	**7x5**
1	Write a note on gastric emptying.	5
2	Write assumptions of one compartment open model.	5
3	Explain the effect of active tubular reabsorption on the excretion of drugs with a suitable example.	5
4	Explain effect of compression force and method of granulation on drug absorption.	5
5	Discuss displacement interaction with any one suitable example.	5
6	Enlist various methods of measurement of bioavailability, discuss any one in detail.	5
7	Explain enzyme inhibition.	5
8	Explain how different parameters affect dissolution with the help of Noyes Whitney's equation.	5
9	Explain absorption and metabolism related causes for nonlinearity in pharmacokinetics.	5

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Duration: 3 Hours **Total marks: 80**

N.B. : 1. All questions are compulsory
2. Draw neat labelled diagrams wherever necessary.

Q. 1	**Answer the following questions.**	**20**
a	Explain Bioavailabilty and Bioequivalnce	**2**
b	Discuss on passage of drugs across cell membrane	**2**
c	Draw and discuss Physiology of cell membrane	**2**
d	Enlist factors affecting distribution with example	**2**
e	Distinguish between induction and inhibition	**2**
f	Define 1. Renal excretion 2. Renal Clerance	**2**
g	Draw labelled diagram of Biopharmaceutical Classification System of drugs	**2**
h	Define Pharmacodynamics and zero order rate kinetics	**2**
i	Explain in brief concept of First order	**2**
j	Discuss concept relative bioavailability	**2**
Q. 2	**Answer the following questions.**	**12**
a	Discuss different mechanism of Drug absorption.	**4**
b	Enlist and explain parenteral dosage form can cross the biological membrane	**4**
c	Write a note on Hepatic clearance	**4**
Q. 3	**Answer the following questions.**	**12**
a	Define apparent volume of distribution and give the mathematical equation to calculate it.	**4**
b	Explain factors affecting protein-drug binding.	**4**
c	What is type of Compartment model and explain various types of compartment model	**4**
	OR	
c	Explain One compartment open model extravascular dosing.	**4**
Q. 4	**Answer the following questions.**	**12**
a	Explain in details First-Pass Metabolism.	**4**
b	Explain Pulmonary excretion and Skin excretion	**4**
c	Define excretion and explain gastrointestinal clearance	**4**
Q. 5	**Answer the following questions.**	**12**
a	Discuss official methods of dissolution rate testing	**4**
b	Explain applications of different dosage forms	**4**
c	Discuss methods for enhancement of bioavailability	**4**

Q. 6	**Answer the following questions.**	**12**
a	Mathematical treatment of pharmacokinetics upon One compartment open model IV bolus dosing.	**4**
	OR	
a	Explain accumulation, fluctuation and steady state levels	**4**
b (i)	Maria Johnson age 55 yrs was given an intravenous bolus of an antibiotic, Following the IV Dose of the antibiotic Cp at 2 and 5 Hrs found to be C2= 1.2 µg/mL C5= 0.3 µg/mL What is the plasma half life	**4**
b (ii)	A single oral dose of 200mg of antibiotic was given to patient. The equation that describes the plasma concentration profile is: Cp = 50 (e -0.17t - e -1.5t) Calculate: a. t max = hr b. C max = mg / L c. t 1⁄2 = hr	**4**

Duration: 3 Hrs **Total marks: 80**

N.B.: 1. All questions are compulsory
2. Figures to right indicate full marks

Q. 1. Answer the Following: (14)
a) Write in brief about market segmentation. (3)
b) What stages are involved in product life cycle. (3)
c) Differentiate between perfect and imperfect competition. (2)
d) Write in brief about the responsibilities of Quality Assurance department in pharma industry. (3)
e) Government of India has taken multiple initiatives to increase foreign trade of pharmaceutical sector- Explain. (3)

Q. 2. a) Write note on growth of Indian Pharma industries in post COVID – 19 pandemics (4)
b) Write a note on generic medicines. (3)
c) What are causes of organizational conflict? Explain the methods to resolve it (4)

Q.3. a) What is leadership? Explain leadership using one management theory. (4)
b) Define the following terms- A. Production cost B.Selling cost C.Overhead cost. (3)
c) How DPCO is helpful to control the prices of medicines in India? Explain (4)

Q. 4. a) Motivation can be driving force to achieve an organizational objective. Explain (4)
b) Write a difference between quality assurance and quality control. (3)
c) What do you understand by market segmentation. (4)

Q. 5. a) How human relation movement played significant role in industrial psychology? (4)
b) Write in brief about challenges faced by pharmaceutical industries in India. (3)
c) Explain- Maslow's theory of need of hierarchy. (4)

Q. 6. a) Write a note on new product development cycle. (4)
b) Enlist different quadrants in BCG matrix. Explain any one in detail. (3)
c) Explain in brief about Porters 5 force model (4)

Q. 7. a) How Six Sigma technique is helpful in improving efficiency of an organization? (4)
b) Write a note on QC standards for raw material. (3)
c) Write a note on components of balance sheet. (4)

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Duration: 3 Hours **Total marks: 75**

N.B.: 1. All questions are compulsory
2. Figures to the right indicate full marks.

Question No.	Question	Max. Marks
Q.I	**Multiple Choice Questions (Answer all of the following):**	**20**
1	The physicochemical factor to be considered in selection of a drug candidate to be formulated as a sustained release drug delivery system is:	**1**
a)	partition coefficient	
b)	half-life	
c)	absorption	
d)	distribution	
2	The following equation under sink condition depicts the importance of drug solubility in the context of drug release from solute particles:	**1**
a)	Higuchi equation	
b)	Noyes-Whitney equation	
c)	Fick's law	
d)	Dalton's law	
3	A polymer used in dissolution controlled release formulations is	**1**
a)	Ethylcellulose	
b)	Polyethylene	
c)	Polyvinyl pyrrolidone	
d)	Polyurethane	
4	A feature of synthetic polymers is	**1**
a)	Polymer properties cannot be controlled	
b)	Large scale production is difficult	
c)	Low immunogenicity	
d)	Degradation rate can be controlled	
5	Following is the method used for preparation of microcapsules:	**1**
a)	Multiorifice centrifugal technique	
b)	Shaking method	
c)	Reverse Phase evaporation	
d)	Freeze drying method	
6	Bitter taste of the drug can be avoided by forming	**1**
a)	Microcapsules	
b)	Niosomes	
c)	Liposomes	
d)	Aquasomes	

7	The most common route for drug permeation through the buccal mucosa is by _____ pathway	**1**
a)	Carrier mediated	
b)	Intracellular	
c)	Precellular	
d)	Pinocytosis	
8	Chitosan is a _____ mucoadhesive polymer.	**1**
a)	Cationic	
b)	Anionic	
c)	Synthetic	
d)	Non-ionic	
9	Osmotic drug delivery systems have the following characteristic:	**1**
a)	have a membrane that is soluble at intestinal pH	
b)	the membrane is impermeable to GI fluids	
c)	the membrane is permeable to water	
d)	the membrane must swell	
10	Copper-T is a following type of implant:	**1**
a)	Intra-uterine	
b)	Buccal	
c)	Osmotic-pump based	
d)	Ocular	
11	An advantage of the transdermal route is:	**1**
a)	used only for hydrophilic drugs	
b)	prevents first pass metabolism	
c)	used for drugs with high doses	
d)	produces high levels of drug in plasma	
12	A backing used for transdermal patches is	**1**
a)	Methyl cellulose	
b)	Polyacrylate	
c)	Polyisobutylene	
d)	Polyethylene terephthalate	
13	Factors affecting floating of a GRDDS include all, except	**1**
a)	Size	
b)	Posture	
c)	Buoyancy	
d)	Volume of fluid	
14	Alginate beads for gastroretention are prepared using	**1**
a)	alginic acid and calcium sulphate	
b)	magnesium sulphate and sodium alginate	
c)	alginic acid and sodium chloride	
d)	sodium alginate and calcium chloride	

15	Pulmonary drug delivery system based on use of piezoelectric crystal is characteristic of one of the following:	**1**
a)	Ultrasonic nebulizer	
b)	Jet nebulizer	
c)	Aerosol	
d)	MDI	
16	Oropharynx is a part of	**1**
a)	Left Lung	
b)	Nasal Region	
c)	Right lung	
d)	Tracheal Region	
17	Which scientist gave the concept of "The Magic Bullet"?	**1**
a)	Paul Ehrlich	
b)	Arthur Noyes	
c)	Willis Whitney	
d)	Gordon Amidon	
18	Lecithins are also called:	**1**
a)	Phosphatidyl serine	
b)	Phosphatidyl choline	
c)	Phosphatidyl ionositol	
d)	Phosphatidyl ethanolamine	
19	In Ocusert the two outer layers of EVA enclosing the inner core of drug gelled with polymer plays the following role:	**1**
a)	helps in handling and inserting the system	
b)	acts as drug reservoir	
c)	acts as a rate controlling membrane	
d)	helps in absorption of lachrymal fluid	
20	The polymer used to construct a Soluble Ocular Drug Insert is designated as:	**1**
a)	PVA	
b)	HPMC	
c)	CAP	
d)	ABE	
QII	**Answer any Two questions of the following:**	**20**
1	Elaborate in detail on the physicochemical properties of API related to design of controlled release formulations.	**10**
2	State the various advantages and applications of microencapsulation. Explain fluidized bed coating process for microencapsulation.	**10**
3	Provide the rationale for design of ocular inserts. Elaborate in detail on Ocusert.	**10**

QIII	**Answer any Seven questions of the following:**	**35**
1	Give a brief account of controlled release formulations based on the principle of ion-exchange.	**5**
2	Write a note on the types of polymers used for controlled release drug delivery systems.	**5**
3	Enlist various tests for evaluation of the mucoadhesive strength of a mucoadhesive drug delivery system. Write in detail about any two of them.	**5**
4	Discuss the formulation of Dry Powder Inhalers.	**5**
5	Briefly describe the various medicated and non-medicated intra-uterine devices.	**5**
6	Describe the membrane permeation controlled systems for transdermal delivery of drugs.	**5**
7	Explain the need to modulate gastric residence time of drugs. Elaborate on the various approaches to do so.	**5**
8	Elaborate on the solvent evaporation method for preparation of liposomes.	**5**
9	Write a short note on New Ophthalmic Delivery system.	**5**

****

Time: 2Hours **Marks: 40**

N.B.: 1. All questions are compulsory
2. Figures to right indicate full marks

Q. 1 MCQ **(10 M)**

1. To prevent the accumulation of lactate ----------
   a) low glutamine concentration is required
   b) high glutamine concentration is required
   c) low glucose concentration is required
   d) high glucose concentration is required

2. The foundation for the development of cell culture technique was laid by
   a) Roux
   b) Arnold
   c) Ross
   d) Harrison

3. Who is regarded as the father of tissue culture
   a) Harrison
   b) Arnold
   c) Ross
   d) Roux

4. Which of the following virus is used for cell fusion
   a) poliomyelitis virus
   b) Influenza virus
   c) Rabies virus
   d) Sendai virus

5. _____is the primary equipment required for animal tissue culture laboratories.
   a) Glassware
   b) Laminar flow
   c) Incubator
   d) Water bath

6. The ratio of CO2: O2 used in cell culture system should be
   a) 1:5
   b) 1:13
   c) 1:19
   d) 1:25

7. What is animal tissue culture?
   a) Growth and maintenance of animal cells
   b) Growth and selling of animal cells
   c)only maintenance of animal cells
   d) destruction of animal cells

8. The human fibroblast is a classical example of ----------
   a) stable primary cell lines
   b) established cell lines
   c) cell transformations
   d)secondary cell lines

9. Which of the following is easy and rapid method to interpret viability of cells in culture system
   a) Trypan blue dye exclusion
   b) Neutral red assay
   c) Fluorescein dye assay
   d) All of the following

10. pH of culture medium is initially controlled by
   a) presence of CO_2
   b) presence of bicarbonate buffer
   c) addition of bases
   d) addition of acids

DESCRIPTIVE QUESTIONS

Q I: Answer any one of the following 10

A. Explain in detail contamination by Mycoplasma in animal cell culture.

B. Write in detail about different components and ingredients of culture media used in Animal tissue culture.

Q II Answer any FOUR of the following 20

A. Write a note on techniques used in cell separation.

B. Draw a layout of large size tissue culture lab and explain in brief.

C. Write a note on gene therapy along with its applications

D. Write a note on cryopreservation of cells and cryopreservative agents.

E. Write in detail about limitations of animal Tissue culture.

****

Time: 3 Hrs **Marks: 75**

N.B. : 1. All questions are compulsory
2. Figures to right indicate full marks

Q. 1 MCQ 20 M

1) Vector is required in rDNA technology to
a) amplify the foreign gene
b) transfer a gene from animal to another
c) isolate the foreign gene
d) join the foreign gene

2) Salk polio vaccine is type of
a) Inactivated vaccine
b) Live attenuated vaccine
c) Recombinant DNA vaccine
d) Toxoid vaccine

3) Which of the following hypersensitivity occurs via IgE antibody?
a) Type I
b) Type II
c) Type III
d) Type IV

4) Restriction enzymes are used for
a) Cutting DNA
b) Joining genes
c) Isolation of proteins
d) Isolation of enzymes

5) Which of the following role is performed by a bacteriophage in transduction?
a) vector
b) donor
c) recipient
d) Eepisome

6) Enzyme immobilization is done
a) to reduce the activity of the enzyme
b) to protect the enzyme
c) to degrade the enzyme at a faster rate
d) to deactivate the enzyme

7) The extension temperature in the PCR is
a) 25^0c
b) 44^0c
c) 65^0c
d) 72^0c

8) In a Biosensor the bioreceptor cannot be _____
a) enzyme
b) cell
c) antigen
d) a non biochemical substance

9) Air-lift is a _____ type of fermentor.
a) Mechanically stirred
b) Forced conviction
c) Pneumatic
d) Tray

10) Which of the following is not correct sentence about protein engineering
a) It is the study of structure of proteins
b) It is the study of amino acid sequence
c) It is the study of nucleotide sequence
d) It is the study of function of proteins

11) Function of MHC molecule is
a) to kill the antigen.
b) to produce antibodies against antigen.
c) to present the antigenic determinant peptide to immunological cells.
d) to neutralize the antigenic material

12) Active immunity is induced by

a) Infection
c) injection of antibodies
b) Placental transfer of antibodies
d) Injection of gamma- globulins

13) Sera are_____ types of Immunity

a) Naturally acquired active
b) Naturally acquired passive
c) Artificially acquired active
d) Artificially stimulated passive

14) Applications of southern blotting include

a) RFLP and DNA Fingerprinting
c) Separation of amino-acids
b) Identification of proteins
d) Isolation of proteins

15) _____ mutants show a change in the surface structure and composition of the microbial cell.

a) Metabolic mutants
c) Regulatory mutant
b) Antigenic mutants
d) Cryptic mutant

16) While naming the RE the first letter use of _____ name

a) strain
c) Species
b) Genus
d) Scientist

17) Shelf life of Whole human blood is _____

a) 3 days
c) 3 months
b) 5 years
d) 21 days

18) Microorganism used for the production of Vitamin B12 by fermentation method is

a) Penicillium chrysogenum
c) Pseudomonas denitrificans
b) Aspergillus niger
d) Saccharomyces cerevisiae

19) _____ is used as a monitoring device in the fermenter to measure agitator speed.

a) Flow meter
c) Pressure gauze
b) Rota meter
d) Tachometer

20) _____ prevents vortex formation in fermenter

a) Baffles
c) Propeller
b) Impellers
d) Shaft

Q.2 Answer any two of the following (10X2 =20 M)

1) Enlist and explain methods of Enzyme immobilization with suitable diagrams and examples.
2) Explain the detail process of insulin production by recombinant DNA technology
3) Define fermentation, draw a neat labeled diagram of the ideal fermentor and write a short note on Penicillin production by fermentation.

Q.3) Answer any seven out of nine of the following (7X5=35 M)

1) Explain the method of production of Monoclonal antibodies and write its applications.
2) Explain in detail any one method of DNA sequencing
3) Write a note on transgenic plants
4) Draw and explain structure of MHC class-I and Class-II molecules.
5) What do you mean by Plasma Substitutes? enlist their properties.
6) Enlist the types of mutation and explain any one in detail.
7) Explain the process of production of Sera.
8) Differentiate between Humoral and Cellular immunity.
9) Define Biotransformation and Explain types of microbial biotransformation with suitable examples.

****

Duration: 2 Hours **Total marks: 40**

N.B.: 1. All questions are compulsory
2. Figures to right indicate full marks

Q. 1	**Answer the following questions.**	**8**
1)	Give the role of activated charcoal in the treatment of poisoning.	2
2)	Write in brief about Acute toxicity guidelines.	2
3)	Define genotoxicity and give example of a genotoxic agents	2
4)	Write a note on local drug regulatory agencies.	2
Q. 2	**Answer the following questions (Any 2)**	**8**
1)	Explain the factors influencing toxicity.	4
2)	Write a short note on general management of poisoning.	4
3)	Explain how a free radical elicits its toxicity.	4
Q. 3	**Answer the following questions (Any 2)**	**8**
1)	Explain neurotoxicity and nephrotoxicity with examples	4
2)	Explain Hepatotoxicity with examples.	4
3)	Explain in detail the symptoms of alcohol poisoning & how they can be managed.	4
Q. 4	**Answer the following questions (Any 2)**	**8**
1)	Explain the alternatives animal models for toxicity testing.	4
2)	Explain acute toxicity study and OECD guidelines 423 in detail.	4
3)	Write a note on long term toxicity testing studies.	4
Q. 5	**Answer the following questions (Any 2)**	**8**
1)	Write a note on ICH guidelines.	4
2)	What is Schedule Y and what are the toxicity data required as per Schedule Y for application of Phase I clinical trial?	4
3)	Define risk and hazard. Explain the concept of risk assessment and management.	4

****

Duration: 2 Hours **Total marks: 40**

N.B.: 1. All questions are compulsory
2. Figures to right indicate full marks

Q1 Solve the following

a) Enlist the categories of excipients used in dosage forms. (2)
b) Define Disintegrating agents. (1)
c) Mention the role and function of i) Wool fat (II) Tween (2)
d) Why organoleptic additives are added in the formulation? (1)
e) Give the need of solubility enhancers in dosage forms. (1)
f) Enlist various approaches for development of new improved polymers. (1)
g) Define antimicrobial with suitable example (1)
h) Define chelating agent with suitable example. (1)

Q2. Solve the following

a) Write a note on flavours as an organoleptic additive. (3)
b) State the need of new polymers. Add a note on co processed polymer (3)

Q3. Solve following

a) Define & classify polymers. Write in detail about HPMC as a polymer (3)
b) Enlist the categories of excipients used in pharmaceutical preparations. Add a note on antioxidant agents. (3)

Q4. Solve the following

a) Define binders. Give classification and purpose of different types of binders with suitable example (3)

OR

Define lubricant and glidant. Give the role of lubricant with example (3)
b) Give significance of solubility enhancement. How excipients are useful in solubility enhancement. (3)

Q5. Solve the following

a) Write a note on Regulatory guidelines for Pharmaceutical Excipients (3)
b) Write a note on Wool fat and Arachis oil with respect to their source and function (3)

OR

Classify preservatives and explain why a combination of preservatives is used in pharmaceutical formulations. (3)

Q6. Solve the following

a) Write in brief different penetration enhancers used in formulations (3)

OR

Why solubility enhancement is important. (3)
b) Write a note on HPMC and Gelatine with respect to their source and function and uses. (3)

****

Time: 3 Hours **Total Marks: (75)**

Q I. Choose the ONE best answer and write it down **20 Marks**

1. Montelukast inhibits _____ receptors.
A. Histamine
B. Leukotriene
C. PAF
D. Bradykinin

2. The first choice drug for nonsteroidal antiinflammatory drug-induced gastric ulcer is:
A. Ranitidine
B. Omeprazole
C. Sucralfate
D. Misoprostol

3. Which of the following is an example of Osmotic Purgative?
A. Psyllium
B. Phenolphathalein
C. Lactulose
D. Ispaghula

4. The following 5HT3 antagonist is used as anti-emetic?
A. Hyoscine
B. Ondansetrone
C. Haloperidol
D. Chlorpromazine

5 Cotrimoxazole is a combination of:
A. Sulphadoxine + Trimethoprim
B. Sulphamethoxazole + Pyrimethamine
C. Sulphamethoxazole + Trimethoprim
D. Sulphamethoxazole + Ictaprim

6. Which of the following antibiotic may cause tooth discoloration as a side effect?
A. Tetracycline
B. Penicillin
C. Sulphonamides
D. Macrolides

7. Which of the following drugs is penicillinase resistant:
A. Oxacillin
B. Amoxicillin
C. Bicillin-5
D. Penicillin G

8. Cephalosporins are drugs of choice for treatment of:

A. Gram-positive microorganism infections
B. Gram-negative microorganism infections
C. Gram-negative and gram-positive microorganism infections, if penicillins have no effect
D. Only bacteroide infections

9. The anthelmintic drug piperazine:

A. Inhibits tubulin polymerization
B. Acts as a GABA agonist to paralyze the worms
C. Inhibits glucose uptake
D. Uncouples oxidative phosphorylation

10. A side effect of ethambutol is

A. Neurotoxicity
B. Nausea, vomiting and diarrhea
C. Hypersensitivity and urticarial
D. Loss of color vision due to optic neuritis

11. Which of the following is Phenazine derivative used for the treatment of leprosy?:

A. Clofazimine
B. Dapsone
C. Ethionamide
D. Rifamycin

12. Nevirapine belongs to _____:

A. Non-Nucleoside reverse transcriptase inhibitor
B. Nucleoside reverse transcriptase inhibitor
C. Protease Inhibitor
D. Non-selective antiviral drug

13. The antineoplastic agent that is classified as an alkylating agent is:

A. Vincristine
B. Tamoxifen
C. Bleomycin
D. Busulfan

14. Sirolimus is inhibitor of _____:

A. Calcineurin
B. Choline Esterase
C. m-TOR
D. Protease

15. Which of the following antineoplastic drug is a mitotic inhibitor and causes metaphase arrest?

A. Busulfan
B. Vincristine
C. Cytarabine
D. Procarbazine

16. The BCG vaccine contains:

A. Attenuated culture of *Mycobacterium tuberculosis*
B. Live culture of *Mycobacterium leprae*
C. Attenuated culture of *Mycobactwerium bovis*
D. Killed culture of *Mycobacterium tuberculosis*

17. A drug used for the treatment of organophosphorus poisoning is:

A. Parathion
B. Malathion
C. Pralidoxime
D. Phenytoin

18. Melatonin plays a role in:

A. Sleep cycle
B. Hunger
C. Digestion
D. Growth

19. Which of the following toxicity can occur due to single exposure?

A. Acute toxicity
B. Sub-acute toxicity
C. Sub-Chronic toxicity
D. Chronic toxicity

20. A selective antidote for organophosphate poisoning is

A. Fentanyl
B. Pralidoxime
C. Codeine
D. Methadone

Q.II Answer ANY TWO of the following 20 M

1. Classify anti-ulcer drugs with examples. Explain the detailed pharmacology of proton pump inhibitors.
2. Classify penicillins with examples. Explain the mechanism of action of beta lactam antibiotics and add a short note on resistance development against beta lactam antibiotics.
3. Write a short note on treatment of amoebiasis.

Q.III Answer ANY SEVEN of the following 35 M

1. Explain any two classes of drugs used in the treatment of inflammatory bowel disease
2. Write a short note on bulk laxatives.
3. Write a short note on the mechanism of action and adverse effects of sulphonamides.
4. Write a note on the mechanism of action, adverse effects and uses of 4-aminoquinoline drugs.
5. Write a note on the mechanism of action, adverse effects and uses of rifampin.
6. Classify anticancer agents with two examples of each class.
7. Write a note on Calcineurin inhibitors.
8. Write a short note on genotoxicity.
9. Describe the symptoms and management of lead poisoning.

****

Time: 3 Hrs **Marks: 75**

Note:

1. **Draw net labeled diagrams wherever applicable**
2. **Marks to the right indicate full marks**

I.	**Multiple choice questions**	**20M**
1.	Number of signals in NMR spectrum indicates	**1M**
a.	Number of different kinds of the proton present in different environment	
b.	Electronic environment of each kind of proton	
c.	Relative number of protons of each kind	
d.	Number of neighboring proton present	
2.	Thermogravimetric analysis is used to measure _____	**1M**
a.	Change in temperature	
b.	Change in pressure	
c.	Change in mass	
d.	Change in polarity	
3.	Which of the following is used as a standard for calibration of 'limit of stray light' in UV-visible spectrophotometry	**1M**
a.	Potassium chloride	
b.	Potassium nitrate	
c.	Potassium sulphate	
d.	Potassium permanganate	
4.	Solid phase extraction is carried out in following sequence	**1M**
a.	1. Conditioning 2. sample Loading 3. Washing 4. elution	
b.	1. Washing 2. sample Loading 3. Conditioning 4. elution	
c.	1. sample Loading 2. Conditioning 3. Washing 4. elution	
d.	1.Conditioning 2. elution 3. sample Loading 4. Washing	

5.	Thermospray technique depends on the thermal generation of	**1M**
a.	Molecules	
b.	Particles	
c.	Spray	
d.	Liquid	
6.	Isotopic abundance of ^{13}C in carbon is	**1M**
a.	1.1%	
b.	1.6%	
c.	10%	
d.	0.99%	
7.	DSC is used for?	**1M**
a.	Drug-excipient compatibility studies	
b.	Identification of functional groups	
c.	Separation of compounds	
d.	Determination of weight of a compound	
8.	_____ is used as a calibration standard for IR spectrophotometry?	**1M**
a.	Polyvinyl pyrrolidone	
b.	Polystyrene	
c.	Polyvinyl alcohol	
d.	Divinyl benzene	
9.	Following Radioisotopes are commonly used in RIA except	**1M**
a.	Carbon-12	
b.	Phosphorus -32	
c.	Iodine-125	
d.	Sulphur-35	

10.	Which of the following interface of GCMS works on the theory of permeation of molecules through silicon rubber membrane?	**1M**
a.	Open split interface	
b.	molecular Jet separator	
c.	Capillary direct interface	
d.	Permeation interface	
11.	The spin-spin splitting pattern for $–CH_2$ group protons of ethanol NMR spectrum appears as a	**1M**
a.	Doublet	
b.	Triplet	
c.	Quartet	
d.	Quintet	
12.	Thermal analysis is:	**1M**
a.	Measurement of physical & chemical properties as a function of temperature	
b.	Measurement of concentration of materials as a function of temperature	
c.	Measurement of solubility of materials as a function of temperature	
d.	Measurement of line positions of crystals as a function of temperature	
13.	As per ICH guidelines, ___ is used as the statistical parameter to evaluate accuracy of an analytical method	**1M**
a.	% RE	
b.	% RSD	
c.	Mean	
d.	Median	
14.	MAX SPE cartridges are used for sample preparation of _____	**1M**
a.	Acidic analyte	
b.	Neutral analyte	
c.	Strong Basic analyte	
d.	Weak Basic analyte	

15.	The following ionization methods in mass spectrometry can give quasi molecular ion peak in the mass spectrum except	**1M**
a.	electron impact ionization	
b.	chemical ionization	
c.	MALDI	
d.	fast atom bombardment	
16.	Degree of crystallinity in a solid sample can be determined by?	**1M**
a.	X-ray diffractometry	
b.	Mass spectrometry	
c.	NMR spectroscopy	
d.	Thermogravimetry	
17.	Analytical method validation is covered under which of the following 'Quality' guidelines of ICH?	**1M**
a.	Q3	
b.	Q4	
c.	Q1	
d.	Q2	
18.	Mass spectrum is a plot of	**1M**
a.	% transmittance Vs mass to velocity ratio	
b.	% relative abundance Vs mass to volume ratio	
c.	% relative abundance Vs mass to charge ratio	
d.	% relative abundance Vs charge to mass ratio	
19.	Which of the following is associated with X-ray diffractometry	**1M**
a.	Retention Indices	
b.	Miller’s indices	
c.	Precessional frequency	
d.	Electron bombardment	

20. The closeness of agreement (degree of scatter) between a series of measurements obtained from multiple sampling of the same homogeneous sample under the prescribed conditions is defined as _____ **1M**

a. Specificity

b. LOQ

c. Linearity

d. Precision

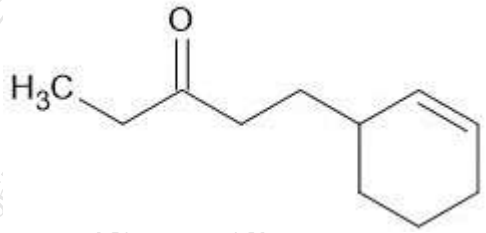
II. Long answer questions (Attempt <u>any two</u> out of three) **20M**

1. a. i) Explain the role of external magnetic field and radiofrequency waves in NMR spectroscopy. **5M**
ii) An organic compound with molecular formula **$C_6H_{10}O_3$** gives the following spectral data;
IR: 2900 cm^{-1}; 1710 cm^{-1}: 1610 cm^{-1}
^{1}H-NMR (δ) = 1.2, triplet (12.4 squares); 2.2, singlet (12.7 squares), 3.2, singlet (8.2squares); 4.1, quartet (8.4 squares)
Determine the structural formula and justify your answer.

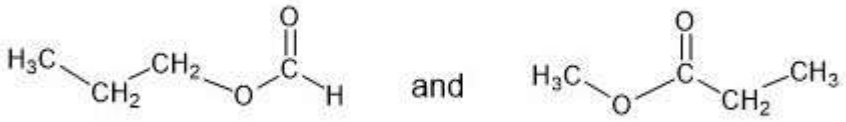
b. Enlist different types of peaks that can be observed in a mass spectrum. Explain construction and working of Quadrapole mass analyzer. **5M**

2. a. Explain the concept of chemical and magnetic non-equivalence with one suitable example for each. Explain spin-spin splitting in ^{1}H-NMR spectroscopy with reference to NMR spectrum of 1-propanol. **5M**

b. Write a note on chemical ionization in mass spectrometry. Give mechanism for formation of fragment ion for the following molecule by McLafferty rearrangement. **5M**



3. a. Explain the concept of chemical shift and enlist any four factors affecting it. Explain How you will distinguish between the following compounds using NMR spectroscopy. **5M**



b. Explain fragmentation pathways involving homolytic and heterolytic fission with an example. Enlist advantages and disadvantages of Mass spectrometry as an analytical tool. **5M**

III. Short answer questions (Attempt <u>any seven</u> out of nine) **35M**

1. Define the term validation as per ICH guidelines. Explain the terms: **5M**
   a. Specificity b. Linearity

2. What is an 'Endothermic peak'. With the help of a thermogram explain the principle of working of DSC **5M**

3. Discuss principle involved in X-ray diffraction technique. State Bragg's law and its equation. Describe rotating crystal technique used in X ray Crystallography. **5M**

4. Explain the principle and working of thermogravimetric analysis. **5M**

5. Enlist the validation parameters as per ICH. Write a detailed note on how LOD is to be performed. **5M**

6. Discuss calibration of HPLC **<u>OR</u>** calibration of UV-visible spectrophotometer in detail **5M**

7. Explain Principle of Radioimmunoassay. Write applications of RIA **5M**

8. Write a note on solid phase extraction. Give advantages of SPE over LLE **5M**

9. Explain principle and working of APPI interface. Give applications of LC/MS/sMS **5M**

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Duration: 3 Hours **Total Marks: 80**

N.B. : (1) All questions are Compulsory

(2) Answer all sub questions together.

(3) Draw neat labeled diagram wherever necessary.

Q.1A) Answer the following. **16M**

i. Define Cardiac output.
ii. Explain the significance of segments and peaks in normal ECG.
iii. What is counter current exchange in nephron
iv. What are the aggressive and defensive factors secreted in the stomach?
v. What are the functions of gallbladder?
vi. What is the composition and function of saliva?
vii. Enlist different organs of male reproductive system.
viii. Give any 2 functions of kidney.

Q.1B) Answer the following. **4M**

i. _____part of the cardiovascular system which helps carry oxygenated blood away from the heart to the body, and returns deoxygenated blood back to the heart.
ii. A low sperm count is also called **…….**
iii. _____ is an indicator of diastolic dysfunction.
iv. Ovum is released from the …… follicle.

Q.2 A) Answer <u>any TWO</u> of the following. **8M**

i. Discuss various factors regulating blood pressure.
ii. Discuss the structures of cardiac tissue. State the function of the SA node.
iii. Discuss various factors regulating blood pressure.

B) Answer <u>any ONE</u> of the following. **4M**

i. Write a short note on hypertension.
ii. Define congestive heart failure and discuss its signs and symptoms.

Q.3 A) Answer <u>any TWO</u> of the following. **8M**

i. Describe the anatomy of the liver. Discuss liver enzymes and their functions.
ii. Describe the anatomy and physiology of the tongue.
iii. Write a note on the large intestine.

B) Answer <u>any ONE</u> of the following. **4M**

i. Explain pathophysiology of reflux esophagitis.
ii. Discuss the pathophysiology of peptic ulcer in detail.

Q.4 A) Answer <u>any TWO</u> of the following. **8M**

i. Draw neat, labelled diagram of organs of urinary system. Give any 2 functions of kidney.
ii. Give detailed note on extracellular fluid.
iii. Give in detail the role of hormones in regulation of kidney function.

B) Answer <u>any ONE</u> of the following. **4M**

i. Write a note on renal failure.

ii. What does renal calculi mean? Give types of calculi found in kidney.

Q.5 A) Answer <u>any TWO</u> of the following. **8M**

i. Explain the conduction system of the heart.

ii. Discuss in detail baroreceptor reflex.

iii. Discuss various factors regulating blood pressure.

B) Answer <u>any ONE</u> of the following. **4M**

i. Discuss in detail cardiac arrhythmias.

ii. Write a short note on Congestive heart failure.

Q.6 A) Answer <u>any TWO</u> of the following. **8M**

i. Discuss anatomy and physiology of testis.

ii. Write a detailed note on female reproductive system

iii. Discuss the process of spermatogenesis in detail.

B) Answer <u>any ONE</u> of the following. **4M**

i. Write a note on sexually transmitted diseases.

ii. What are different causes and symptoms of infertility?

****

Duration: 2 Hrs **Total marks: 40**

N.B.: 1. All questions are compulsory
2. Figures to right indicate full marks

Q.1	Answer the following Questions	**Marks**
(a)	Draw structure of two purine bases present in RNA.	**1M**
(b)	Give role of DNA Ligase enzyme in replication.	**1M**
(c)	Enlist enzymes involved in Prokaryotic replication.	**1 M**
(d)	What is DNA Polymorphism? Enlist types of SNP's.	**1 M**
(e)	Name any two inhibitors for protein synthesis.	**2 M**
(f)	Explain semiconservative replication.	**2 M**
Q.2 (a)	Explain initiation step in prokaryotic transcription.	**3 M**
	OR	
(a)	Write a note on inhibitors of transcription.	**3 M**
(b)	Write a note on Lac- Operon.	**3 M**
(c)	Explain nucleotide excision process for DNA repair.	**2 M**
Q.3 (a)	Write short note on Post translational modification.	**3 M**
(b)	Describe the initiation step in the process of prokaryotic translation.	**3 M**
	OR	
(b)	What is the role of mRNA in the process of translation? Discuss codon-anticodon recognition in brief.	**3 M**
(c)	Draw a well labelled diagram of structure of DNA.	**2 M**
Q.4 (a)	Write short note on telomerase.	**3 M**
(b)	Differentiate between prokaryotic and Eukaryotic Replication Process.	**3 M**
	OR	
(b)	Discuss the solid phase peptide synthesis in detail.	**3 M**
(c)	List the types of mutations and illustrate with suitable examples of mutagens.	**2 M**
Q.5 (a)	Define polymorphism and enlist the disease states caused by polymorphism.	**2 M**
	OR	
(a)	Mention drugs modulating DNA replication	**2 M**
(b)	Explain bi-directional replication.	**2 M**
(c)	Describe the process of mismatch repair in brief.	**2 M**
(d)	Discuss the importance of post translational modifications of proteins.	**2 M**

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Time: 3 Hours **Marks: 100**

ALL QUESTIONS ARE COMPULSORY

Q. 1.

a. ……Numbers of ATP are produced when two molecules of acetyl CoA are consumed in TCA cycle. 1

b. Name any one regulatory enzyme for TCA cycle. 1

c. Name the prostaglandin inhibitor drugs. 1

d. Write the name of branching enzyme involved in glycogenesis. 1

e. Enlist the precursors used for purine biosynthesis 1

f. Name the drug which modulate uric acid synthesis. 1

g. State significance of pentose phosphate pathway. 2

h. Calculate the total ATPs obtained in β-oxidation of palmitic acid. 2

i. Draw the structure of cholesterol. 2

j. Give the regulation of pyrimidine nucleotide biosynthesis. 2

k. Give name of enzyme and its deficiency disorders involved in purine salvage pathway. 2

l. Enlist ketone bodies with their structure. 2

m. Define Glycolysis and give the ATP consumption in preparatory phase of Glycolysis. 2

Q 2. (a) Give the names and structures of substrate and product, coenzymes for the following enzyme catalyzed reactions (Any Four) 8

1. Glyceraldehyde dehydrogenase
2. Pyruvate kinase
3. Fumarase
4. HMG CoA synthase
5. B-ketoacyl ACP reductase

(b) Give the name of the enzyme catalyzing the following conversions 4

1. Malate to oxaloacetate 2. Acetyl CoA to malonyl CoA

3. Glucose -6-phosphate to Fructose -6- phosphate 4. Succinate to Fumarate

Q. 3	a. Depict schematically electron transport chain.	3
	b. Write the three irreversible reaction of glycolysis.	3
	c. Write the importance of ketone bodies.	2
	d. Explain proton motive force.	2
	e. Explain glycogenesis.	2
Q.4	a. Give the reactions involved in conversion isocitrate to succinate.	3
	b. Explain the β-oxidation of odd number carbon containing fatty acids.	3
	c. Discuss substrate level phosphorylation.	2
	d. Mention drugs modulating cholesterol synthesis.	2
	e. Give regulation for DENOVO biosynthesis of purine nucleotide.	2
Q.5	a. Write short note on TriCarboxylic Acid cycle	3
	b. Differentiate β-oxidation and biosynthesis of fatty acid.	3
	c. Outline the various steps involved in mevalonate pathway.	2
	d. Discuss in brief oxidative phosphorylation.	2
	e. Discuss drugs modulating purine and pyrimidine biosynthesis.	2
Q. 6	a. Explain the Salvage pathway for purine metabolism	3
	b. Give the reaction catalyzed by transketolase.	3
	c. Outline the steps involved in oxidation of fatty acid.	2
	d. Outline the steps involved in synthesis of AMP from IMP.	2
	e. What is the source of the precursor for PRPP? Give the reaction involved in synthesis of PRPP.	2

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