

GATE PY - 2005

Q.1 — 30 Carry One Mark Each.

1. If the Carr's index of a powder is 10% then the type of powder flow is

- (A) poor
- (B) excellent
- (C) very poor
- (D) good

2. Mixing of semisolids is carried out using

- (A) double cone mixer
- (B) rotating cube mixer
- (C) planetary mixer
- (D) fluidized bed mixer

3. In the preparation of small pox vaccine, the drying process used is

- (A) spray drying
- (B) Vacuum drying
- (C) drum drying
- (D) freeze drying

4. In cosmetic preparations, an antioxidant used in an aqueous system, is

- (A) Sodium formaldehyde sulfoxylate
- (B) c - Tocopherol
- (C) Methyl paraben
- (D) Phenol

5. In the tablet coating process, inadequate spreading of the coating solution before drying causes

- (A) Orange peel effect
- (B) Sticking effect
- (C) Blistering effect
- (D) Picking effect

6. Presence of one of the following characteristics show that the Rauwolfia serpentina is adulterated with other species of Rauwolfia.

- (A) Compound starch grains
- (B) Cluster crystals of calcium oxalate
- (C) Lignified sclereids (D) Unlignified pericyclic fibres

7. Chinese rhapontic rhubarb can be distinguished from Indian rhubarb by fluorescence developed in UV light which is:

- (A) Deep yellow
- (B) Deep violet
- (C) Green (D) Blue

8. Citrus flavonoids are rich in

- (A) Aesculetin
- (B) Fraxin
- (C) Hesperidin
- (D) Scopoletin

9. The quantitative values determined for the identification of leaf drugs remain constant throughout the age of the plant EXCEPT

- (A) Stomatal number
- (B) Veinlet termination number
- (C) Veinlet number
- (D) Stomatal index

10. The alkaloid which inhibits the cholinesterase undergoes hydrolysis in solution to give methyl carbamic acid and eseroline is:

- (A) Scopolamine
- (B) Pyridostigmine
- (C) Neostigmine
- (D) Physostigmine

11. Luminescence is the term applied to

- (A) absorbed radiation
- (B) re-emission of previously absorbed radiation
- (C) excited radiation
- (D) transmitted radiation

12. Polarogram of a solution containing an electro-reducible substance is obtained by plotting

- (A) Current Vs Volume
- (B) Current Vs Potential
- (C) Resistance Vs Time
- (D) Potential Vs Volume

13. Silica gel used in most of the adsorbent columns contains — OH groups. So it is

- (A) Basic
- (B) Neutral
- (C) Acidic
- (D) Both acidic and basic

14. The electronic transition possible in Br_2 is:

- (A) $u \rightarrow u$
- (B) $\pi \rightarrow \pi^*$
- (C) $u \rightarrow r$ and $r \rightarrow r$
- (D) $n \rightarrow i$ and $u \rightarrow r$

15. Ferrous ion is very weakly coloured for calorimetric analysis. It can be converted into a highly coloured complex using

- (A) H_2SO_4
- (B) PDAB
- (C) Thymol blue
- (D) 1:10 - Phenanthroline

16. Prazepam, Oxazepam, Clonazepam are structurally similar and have the system

- (A) 5H-Dibenz(b,f)azepine
- (B) 1,2,4 - Benzothiadiazine
- (C) Benzodiazepine
- (D) Phenothiazine

17. 11 3, 21-Dihydroxypregn-4 ene-3,18,20-trione is

- (A) Aldosterone
- (B) Progesterone
- (C) Cholesterol
- (D) Cortisone

18. 4, 7 – Dichloroquinoline on treatment with 4-amino phenol gives

- (A) 7-chloro-2-(2-hydroxy phenyl amino) quinoline
- (B) 7-chloro-4-(4-amino phenyl amino) quinoline
- (C) 7-chloro-4-(4-hydroxy phenyl amino) quinoline
- (D) 4-chloro-7-(4-hydroxy phenyl amino) quinoline

19. Eegonine, a hydrolytic product of cocaine on treatment with chromium trioxide gives a keto acid, which on thermal decarboxylation results in

- (A) Atropic acid
- (B) Tropic acid
- (C) Pseudo cocaine
- (D) Tropinone

20. A natural product derivative developed as an antimalarial is

- (A) Artemether
- (B) Paludrine
- (C) Pyrimethamine
- (D) Haloffantrine

21. 'Ternary complex' refers to the state when

- (A) an enzyme forms a covalent complex with its substrate
- (B) an enzyme forms a non-covalent complex with either a substrate or a product
- (C) an enzyme that catalyses a reaction with two or more substrates, is concurrently complexed with both substrates.
- (D) an enzyme complexed to a product, just after catalysis

22. The most important clue that helped in the determination of the double helical structure of DNA came from

- (A) Chargaff's rules
- (B) Hershey-Chase experiment
- (C) A very MacLeod – McCarty experiment
- (D) Nirenberg and Khorana's codon assignments.

23. Diversity in antibody molecules is brought about by

- (A) Post-translational modifications
- (B) Gene rearrangements
- (C) Usage of special genetic codes
- (D) Multiple mutations in the polypeptide

24. The etiological agent of infectious mononucleosis, also associated with a form of Burkitt's lymphoma is:

- (A) Varicella Zoster Virus
- (B) Epstein Barr Virus
- (C) Picorna Virus
- (D) Papovavirus

25. Tissue plasminogen activator that disperses blood clots, is beneficial if it is given within

- (A) 3 days
- (B) 9 hours
- (C) 3 hours
- (D) 24 hours

26. An anticholinesterase which is useful in Alzheimer's disease is

- (A) Arecolin
- (B) Donepezil
- (C) Isoproterenol
- (D) Clioquinol

27. A drug used as an ophthalmic solution in Herpes keratitis is

- (A) Zalcitabine
- (B) Trifluridine
- (C) Ritonavir
- (D) Stavudine

28. A macrolide antibiotic used as a powerful immunosuppressive agent is:

- (A) Erythromycin
- (B) Azithromycin
- (C) Tacrolimus
- (D) Clarithromycin

29. Cytosine arabinoside acts on this phase of the cell cycle

- (A) G1
- (B) G2
- (C) M
- (D) S

30. The Chairman of the Drugs Technical Advisory Board is

- (A) The Drugs Controller of India
- (B) The Director, Central Drugs Laboratory, Kolkata
- (C) The President, Pharmacy Council of India
- (D) The Director General of Health Services

Q.31 — 80 Carry Two Marks Each.

31. Predict the product obtained by treating 6-chloro-3, 5-diamino pyrazin-2-methyl carboxylate with Guanidine

- (A) Amiloride
- (B) Hydrochlorothiazide
- (C) Triamterene
- (D) Furosemide

32. 2-hydroxy-5, 9-dimethyl-6, 7- benzomorphone derivative is

- (A) Pentazocine
- (B) Hydrocodone
- (C) Codeine

(D) Buprenorphine

33. The raw materials used for the synthesis of Sulfalen are

- (A) 4-acetamido benzene sulfonyl chloride and 2-amino-4-methyl pyrimidine
- (B) 4-acetamido benzene sulfonyl chloride and 5-amino-2-ethyl-1,3,4 thiadiazole
- (C) 4-acetamido benzene sulfonyl chloride and 5-amino-3,4-dimethyl isoxazole
- (D) 4-acetamido benzene sulfonyl chloride and 3-amino-2-methoxy pyrazine

34. Phenoxybenzamine can be prepared from

- (A) Phenol and Propylene oxide
- (B) 3-phenyl propanol
- (C) Phthalic anhydride
- (D) 3-phenyl succinic acid

35. Glycyrrhizin, a sweet principle of liquorice is

- (A) K and Mg salts of glycyrrhizinic acid
- (B) Na and Mg salts of glycyrrhetic acid
- (C) K and Ca salts of glycyrrhizinic acid
- (D) Na and Ca salts of glycyrrhetic acid

36. Allopolyploids are polyploids derived from

- (A) a single parental species genome
- (B) more than one parental species genomes
- (C) a plant with haploid number of chromosomes
- (D) a plant with diploid number of chromosomes

37. The most effective method of producing virus-free plants is:

- (A) Root culture
- (B) Meristem culture
- (C) Somatic embryogenesis
- (D) Floriculture

38. A person taking organic nitrate has to avoid one of the following drugs as it can cause severe hypotension

- (A) Aspirin
- (B) Cholestyramine
- (C) Warfarin
- (D) Sildenafil

39. To avoid lithium toxicity, a patient using lithium carbonate for mood disorders should not be prescribed

- (A) Acetazolamide
- (B) Hydrochlorothiazide
- (C) Mannitol
- (D) Propranolol

40. A selective serotonin reuptake inhibitor used as an antidepressant is

- (A) Venlafaxine
- (B) Selegiline
- (C) Phenelzine

(D) Amoxapine

41. A patient receiving Digoxin for CCF is found to have elevated serum cholesterol. Which hypolipidemic agent should not be prescribed?

- (A) Clofibrate
- (B) Cholestyramine
- (C) Lovastatin
- (D) Niacin

42. In the study of enzyme kinetics, V_{max} is said to be attained when

- (A) there is an excess of free enzyme as compared to the substrate
- (B) virtually all of the enzyme is present as the enzyme-substrate complex and concentration of the free enzyme is vanishingly small
- (C) the maximum velocity of the reaction in the presence of low substrate concentration
- (D) when the concentration of free enzyme equals that of the enzyme-substrate complex

43. Serum sample of a patient shows elevated levels of γ -glutamyl transferase. The patient could be suffering from

- (A) Kidney disorder (B) Liver disease
- (C) Parkinson's disease (D) Myocardial infarction

44. Acidfast organisms are seen in the sputum of a 48-year old alcoholic man. A test to confirm whether he needs long term multi-drug treatment for tuberculosis is:

- (A) Chest X-ray
- (B) Ziehl-Neelsen stain of the sputum
- (C) Sputum cytology
- (D) Mycobacterial cultures of the sputum

45. The distinguishing features in IR spectra between propionaldehyde and acetone is

- (A) Weak-CH stretching and out of plane bending in propionaldehyde
- (B) Keto group in acetone
- (C) Two methyl groups in acetone
- (D) -CH₂ group in propionaldehyde

46. Nephelometric measurements are most sensitive for

- (A) Clear solution (B) Concentrated solution
- (C) Thick suspensions (D) Very dilute suspensions

47. The number of peaks shown by diethyl ether in an NMR spectrum are

- (A) Four (B) Two (C) One (D) Five

48. The half-life for a zero order reaction is calculated using

- (A) $t_{1/2} = 0.693/k$
- (B) $t_{1/2} = 2.303/k$
- (C) $t_{1/2} = 1/ak$
- (D) $t_{1/2} = a/2k$

49. The biological half-life of procaine in a patient was 35 minutes and its volume of distribution was estimated to be 60 L. The total clearance rate of Procaine is

- (A) 1.188L/min

- (B) 0.115L/min
- (C) 11.5L/min
- (D) 5.75L/min

50. The ratio of the void volume to the bulk volume of the packing of the powder is called as

- (A) Porosity
- (B) True density
- (C) Granular density
- (D) Bulk density

51. A co-solvent used in the preparation of parenteral products is:

- (A) Benzyl alcohol
- (B) Methyl alcohol
- (C) Dimethyl acetamide (D) Phenol

Q.52-58 are multiple selection items. P, Q, R, S are the options. Two of these options are correct. Choose the correct combination among A, B, C and D.

52. In mass spectroscopy, positively charged ions can be produced by

- (P) Heating of the sample
 - (Q) Bombarding the sample with high energy electrons
 - (R) Bombarding the sample with high energy protons
 - (S) Chemical ionization
- (A) Q, S (B) Q, R (C) P, R (D) P, S

53. A plastisizer and a high boiling point solvent used in the preparation of nial lacquers are

- (P) Butyl stearate (Q) Ethyl lactate (R) Ethyl alcohol (S) Acetone
- (A) P, Q (B) Q, S (C) R, S (D) Q, R

54. Two of the following attributes are true for describing the mechanism of action of Thiabendazole.

- (P) Neuromuscular blocking causing spastic paralysis
 - (Q) Blocks the response of the Ascaris muscle to ACH, causes flaccid paralysis in the worms
 - (R) Inhibits the Helminth specific enzyme fumarate reductase
 - (S) Arrest nematode cell divisions in metaphase by interfering with microtubule assembly
- (A) P, Q (B) R, S (C) Q, S (D) Q, R

55. The colour and flavour of Saffron are due to --

- (P) Crocin (Q) Crocetin (R) Safranal
 - (S) Crepenylic acid
- (A) R, S (B) P, R (C) Q, S (D) Q, P

56. Predict the two impurities which are likely to be present in Glipizide

- (P) 5-methyl-N-[2-(4-sulphamoyl phenyl) ethyl] pyrazine-2-carboxamide.
 - (Q) 5-methyl-N-[2-(2-sulphamoyl phenyl) ethyl] pyrazine-2-carboxamide.
 - (R) Cyclohexanamine
 - (S) Cyclohexane
- (A) P, R (B) P, Q (C) R, Q (D) R, S

57. Calcipotriene, a synthetic Vitamin D3 analogue has the following attributes

- (P) Pronounced antirachitic activity
 (Q) Inhibits epidermal cell proliferation and enhances cell differentiation
 (R) Used as a topical application in the treatment of moderate plaque psoriasis
 (S) Effect on calcium metabolism is 200 times more than Ergocalciferol
 (A) Q, R (B) P, Q (C) R, S (D) Q, S

58. Insulin when released from the pancreatic β cells

- (P) Can sequester blood glucose by forming a complex with it.
 (Q) gets fully conjugated with glucuronic acid immediately, to be released upon suitable stimuli in normal health.
 (R) Acts on the transporter molecules to facilitate glucose movement across the cell membranes.
 (S) Increases storage of glucose to glycogen in the liver.
 (A) P, R (B) R, S (C) P, S (D) Q, S

Q.59-65 ARE "MATCHING" exercises. Match Group I with Group II. Choose the correct combination among the alternatives A, B, C and D.

59.

- (A) P-1Q-4R-3S-2 (B) P-2Q-3R-4S-1
 (C) P-4Q-2R-1S-3 (D) P-3Q-2R-4S-1

Group I Drugs	Group II Titrants used in IP assays
(P) Ascorbic acid	(1) TBAH
(Q) Pyridoxine HCl	(2) Iodine
(R) Dapsone	(3) HClO ₄
(S) Fluorouracil	(4) Sodium nitrite

60.

- (A) P-1Q-4R-3S-2 (B) P-2Q-3R-4S-1
 (C) P-4Q-2R-1S-3 (D) P-3Q-2R-4S-1

Group I Umbelliferous fruit	Group II Diagnostic character
(P) Fenel	(1) Wavy sclerenchyma
(Q) Indian Dill	(2) Branched and unbranched vittae
(R) Coriander	(3) Reticularly lignified parenchyma
(S) Anise	(4) Lateral ridges with vascular bundles

61.

- (A) P-1Q-4R-3S-2 (B) P-2Q-3R-4S-1
 (C) P-4Q-2R-1S-3 (D) P-3Q-2R-4S-1

Group I Enzyme systems responsible for phase 2 conjugation pathways	Group II Types
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(P) UDP – glucuronosyl transferase	(1) N-methylation
(Q) ATP-sulfurylase & APS-phosphokinase	(2) Sulphate conjugation
(R) Acly synthatase & transacetylase	(3) Glucuronidation
(5) ATP-methionine adenosine transferase	(4) Amino acid conjugation

62.

- (A)P-1Q-4R-35-2 (B)P-2Q-3R-4S-1
(C)P-4Q-2R-1S-3 (D)P-3Q-2R-45-1

Group I Drugs	Group II Titrants used in IP assays
(P) Ascorbic acid	(1) TBAH
(Q) Pyridoxine HCl	(2) Iodine
(R) Dapsone	(3) HClO ₄
(S) Fluorouracil	(4) Sodium nitrite

63.

- (A)P-2Q-4R-1S-3
(B)P-4Q-1R-3S-2
(C)P-3Q-2R-45-1
(D)P-3Q-1R-25-4

Group I Terms	Group II Explanation
(P) Saturated air	(1) Pounds of water vapour carried by one pound of dry air under any given set of conditions
(Q) Dew point	(2) The water vapour is in equilibrium with liquid water at the given conditions of temperature and pressure
(R) Humid volume	(3) The volume in cubic feet occupied by one pound dry of air and its accompanying water vapour
(S) Humidity	(4) Temperature to which a mixture of air and water vapour must be cooled in order to become saturated.

64.

- (A) P – 1 Q – 2 R – 4 S – 3
(B) P – 3 Q – 1 R – 2 S – 4

Group I Antibiotic	Group II Test organism for microbiological assay IP
(P) Bleomycin	(1) Pseudomonas aeruginosa
(Q) Nystatin	(2) Mycobacterium smegmatis

(R) Carbenicillin	(3) Bacillus subtilis
(S) Streptomycin	(4) Saccharomyces cerevisiae

Data for Q.66 – 80 are based on the statement/problem. Choose the correct answer for each question from among the options A, B, C and D.

Common data for questions 66 and 67:

A sample of *Cinnamomum zeylanicum* purchased from the market was evaluated for its authenticity.

66. It shows

- (A) presence of cork and cortex (B) absence of cork and cortex
(C) absence of phloem fibres (D) presence of xylem parenchyma

67. Volatile oil should not be less than

- (A) 0.05°h (B) 0.20°h (C) 0.50°h (D) 1.00°h

Common data for questions 68, 69 and 70:

Chloroacetic acid and hydrazine are treated together with X to get semicarbazido acetic acid in which ring closure takes place to 1-amino hydantoin. It is subsequently treated with 2-diacetoxy methyl-5-nitrofurane to get Nitrofurantoin.

68. Reagent 'X' is

- (A) Cuprous chloride (B) Potassium cyanate
(C) Silver nitrate (D) Mercurous chloride

69. Its IUPAC name is

- (A) 1-(5-nitrofurfuryl) hydantoin
(B) 1-(5-nitrofurfurylidene hydroxyl)hydantoin
(C) 1-(5-nitrofurfurylidine amino) hydantoin
(D) 1-(5-aminofurfurylidine nitro) hydantoin

70. Its gastrointestinal tolerance can be improved without interfering with oral absorption by preparing a

- (A) solid dispersion (B) prodrug
(C) large crystalline form (Macrochantin) (D) suspension

Common data for questions 71 and 72:

A compound 'X' with molecular formula C_2H_4O exhibits a strong absorption band at 1730 cm^{-1} in IR spectrum. On reduction, it is converted into 'Y' which shows a strong band at 3640 cm^{-1} .

71. Assign the band in X to

- (A) CH_3 (B) $\text{C}=\text{C}$ (C) $\text{C}=\text{O}$ (D) $\text{CH}_2\text{C}=\text{O}$

72. The strong band in Y is due to

- (A) $-\text{C}-\text{C}$ (B) $-\text{C}-\text{O}-\text{C}-$ (C) $=\text{CH}_2$ (D) $-\text{OH}$

Common data for questions 73, 74 and 75:

In the management of asthma, the drugs used are Salmeterol, Zafirlukast, Budesonide,

Nedocromil sodium and Bambuterol.

73. Zafirlukast acts as

- (A) 2 adrenoceptor agonist
- (B) Cysteinyl-leukotriene receptor antagonist
- (C) uscarinic receptor antagonist
- (D) Antihistamine

74. A prodrug of terbutaline is

- (A) Zafirlukast (B) Salmeterol
- (C) Bambuterol (D) Nedocromil sodium

75. Warfarin interacts with this antiasthmatic drug and increases prothrombin time

- (A) Budesonide (B) Zafirlukast (C) Salmeterol (D) Bambuterol

Common data for questions 76, 77 and 78:

In a pharmaceutical industry, batch filtration of liquids where the proportion of solids to liquids is high is to be carried out. The complete recovery of solids is required. After filtration, the filtrate, which is corrosive, gives a crystalline product on evaporation. The liquid tends to deposit scales or crystals on the heating surface during evaporation.

76. A suitable filtration equipment is

- (A) Plate and frame filter press (B) Leaf filters
- (C) Meta filters (D) Membrane filters

77. The filter aid used in the above filtration is

- (A) Sand (B) Nylon fibre cloth
- (C) Activated carbon (D) Filter paper

78. A suitable evaporator is

- (A) falling film evaporator (B) forced circulation evaporator
- (C) vertical evaporator (D) horizontal tube evaporator

Common data for questions 79 and 80:

Isoprenoid biosynthesis is involved in the production of many biologically important compounds such as Cholesterol, Steroid Hormones, Vitamin K, Vitamin E and bile acids.

79. HMG-Co A reductase, a key enzyme in the pathway, catalyzes

- (A) side chain cleavage in the conversion of cholesterol to steroid hormones
- (B) the reduction of the thio-ester group to an alcohol in mevalonate biosynthesis.
- (C) the reduction of the hydroxyl group of mevalonate to Vitamin D.
- (D) steroid condensation reaction in the biosynthesis of bile acids.

80. The inhibition of HMG-C0A teductase is a strategy used in the treatment of

- (A) Familia hyperchlesterolemia (B) Vitamin K deficiency
- (C) Inflammation in the joints (D) Hepatic parenchymal disease

Linked Answer Questions: Q.81a to Q85b Carry Two Marks Each. Statement for Linked Answer Questions 81a to 81b:

81. (A) The selective COX-2 inhibitor is

- (A) Ketorolac (B) Rofecoxib (C) Indomethacin (D) Naproxen

- (B) The drug selected is not to be given, if the patient is already taking
(A) Antiallergic drugs (B) Anxiolytic drugs
(C) Antihypertensive drugs (D) Oral antidiabetic agents

Statement for Linked Answer Questions 82a to 82b:

A drug solution has an initial potency of 300 mg/10ml. When stored in a refrigerator for 30 days, its potency was found to be 100 mg/10ml.

- 82. (A) The rate constant, assuming that the drug solution undergoes first order kinetics, is:**
(A) 0.0366 day⁻¹ (B) 0.0074 day⁻¹ (C) 0.0174 day⁻¹ (D) 0.0506 day⁻¹
(B) Half-life of the drug solution, under these conditions is:
(A) 9.4 days (B) 19 days (C) 47 days (D) 4.7 days

Statement for Linked Answer Questions 83a to 83b:

Ginger is a widely used herbal drug, containing many chemical constituents.

- 83. (A) The pungent principle present in it, is**
(A) Zingiberol (B) Zingiberene (C) Gingerol (D) Cineole
(B) It's decomposition product, on boiling with 2nd KOH is
(A) Zingiberone (B) Shogaol
(C) Gingediol (D) Gingediol acetate

Statement for Linked Answer Questions 84a to 84b:

2, 6-dimethyl phenol and chloroacetone on reaction gives 'X', which on treatment with hydroxylamine and hydrochloric acid gives an intermediate product. This on further treatment with Raney nickel in acid, gives the final product.

84. (A) The product 'X' is:

- (A) 1-(2, 6-Dimethyl phenoxy)-2-propanone
(B) 1-(2, 6-Dimethyl phenoxy)-2-butanone
(C) 1-(2, 6-Dimethyl phenoxy)-2-isopropanone
(D) 1-(2, 6-Dimethyl phenoxy)-2-pentanone
(B) The final product is
(A) 1-methyl-2-(2, 6-xilyloxy)isopropylamine
(B) 1-methyl-2-(2, 6-xilyloxy)ethylamine
(C) 1-methyl-2-(2, 6-xilyloxy)butylamine
(D) 1-methyl-2-(2, 6-xilyloxy)pentylamine

Statement for Linked Answer Questions 85a to 85b:

An organic compound 'X' has an absorption maxima at 217 nm. Its E_{max} is 16,000. the absorbance is 0.64 when the cell length is 1 cm.

85. (A) The molar concentration of 'X' is

- (A) 5x10⁻⁵ (B) 4x10⁻⁵ (C) 4x10⁻⁴ (D) 5x10⁻²
(B) If the molecular weight is 56.06, its concentration in gms/ml is:
(A) 2.5x10⁻⁶ (B) 0.25x10⁻⁶ (C) 5x10⁻⁶ (D) 2.24x10⁻⁶