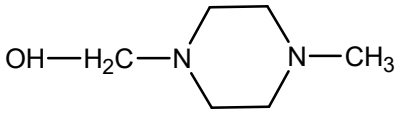
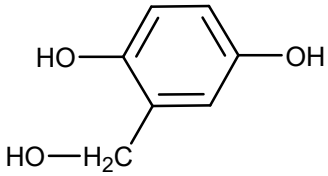
PHARMACEUTICAL SCIENCE

Time : 3 hours **Maximum Marks : 150**

(Q. 1 - 20) CARRY ONE MARK EACH

1. Different species of Ephedra can be identified by observing the nature of
   (a) Inner surface (b) Outer surface
   (c) Trichomes (d) Scaly leaves
2. Indian Rhubarb can be distinguished from Rhapontic Rhubarb by the fluorescenceit emits under UV light. Indian Rhubarb gives
   (a) Deep yellow (b) Deep violet
   (c) Orange (d) Pale green
3. Genetically modified species of Papaver namely *Papaver bracteatum* and *Papaver orientale* contain the predominant alkaloid
   (a) Morphine (b) Codeine (c) Thebaine (d) Narcotine
4. Increased risk of atherosclerosis is associated with decreased serum levels of
   (a) LDL (b) HDL (c) Triglycerides (d) VLDL
5. A peptide hormone which inhibits bone resorption and given as nasal spray is
   (a) Cortisol (b) Alendronate (c) Calcitonin (d) Calcitriol
6. An inorganic ion which is used prophylactically in bipolar depression is
   (a) Valproate (b) Lithium (c) Chromium (d) Valium
7. A β-lactamase inhibitor which contains an 1-oxopenam structure is
   (a) Tazobactam sodium (b) Clavulanate potassium
   (c) Sulbactam sodium (d) Thienamycin
8. Salbutamol is prepared from

(a) 

(b) 

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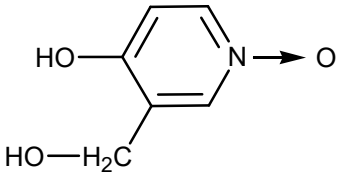
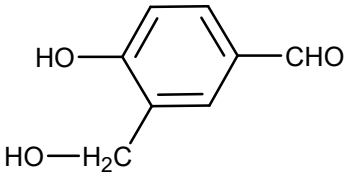
(c) 

(d) 

9. Antihypothrombinemic effect of one stereochemical form is two to five timesmore than others
   (a) (S)-(+) - Warfarin
   (b) R-(+) - Warfarin
   (c) (S)-(-) – Warfarin
   (d) (RS)- Warfarin
10. Some of the organic reactions are catalysed by a product obtained from starch ontreatment with amylase from *Bacillus macerans*. It is
   (a) Amylopectin (b) Amylose (c) Cellulose (d) Cyclodextrin
11. Florentine receiver is used to separate the liquids based on
   (a) Molecular weight
   (b) Sedimentation rate
   (c) Density
   (d) Freezing point
12. The official dissolution test apparatus contains cylindrical vessel and lower edgeof the blade is positioned from inside bottom vessel at
   (a) 18 to 22 mm
   (b) 23 to 27 mm
   (c) 20 to 24 mm
   (d) 25 to 29 mm
13. As per Drugs and Cosmetics Act and Rules, the Good Manufacturing Practice isincluded under schedule
   (a) W (b) P (c) S (d) M
14. A substance used for modification of silica gel for reversed-phase TLC is
   (a) Benzene
   (b) Glycerine
   (c) Silicone oil
   (d) Ether
15. In IR spectrum, the functional group region is from
   (a) 4000 $cm^{-1}$to 900 cm^{-1}
   (b) 4000 cm^{-1} to 1400 cm^{-1}
   (c) 1400 cm^{-1} to 900 cm^{-1}
   (d) 40000 cm^{-1} to 660 cm^{-1}
16. The equation $E = E^{o} + \frac{RT}{nF} \ln aM^{n+}$ is used to measure the
   (a) Conductance
   (b) Potential difference
   (c) Resistance
   (d) Current
17. Intermediates in the biosynthesis of cholesterol are
   (a) Mevalonic acid and isopentenyl pyrophosphate
   (b) Mevalonic acid and aldosterone
   (c) Isoprenaline and aldosterone
   (d) Isopranaline and isopentenyl pyrophosphate

18. A naturally occurring amino acid which does not have a chiral centre is

(a) Glycine (b) Alanine

(c) Tryptophan (d) Tyrosine

19. A given Gram-positive bacterium is differentiated from Gram-negative by Gramstaining. This is because its cell wall contains

(a) Lysozyme (b) Teichoic acid

(c) Membrane proteins (d) Lipid A

20. The drug which increases the plasma concentration of digoxin by a pharmacokineticmechanism is

(a) Lidocaine (b) Captopril (c) Quinidine (d) Hydrochlorthiazide

Q. No. 21 – 56 Carry Two Marks Each

21. Microscopic characters of ginger rhizome are

(a) Spindle shaped lignified fibers and sclereids

(b) Cluster crystals of calcium oxalate and sclereids

(c) Non-lignified vessels and sac shaped starch grains

(d) Non-lignified fibers and sclereids

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22. Klunge's test is for the identification of

(a) Barbaloin (b) Isobarbaloin (c) Aloinosides (d) Aloesin

23. 3, 4 Benzpyrene present in cigarette smoke reduces the therapeutic activity of Diazepam by

(a) Altering excretion

(b) Binding to plasma proteins

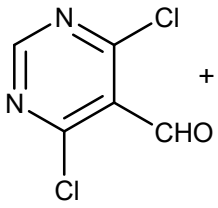
(c) Inhibiting metabolism

(d) Increasing the activity of liver microsomal enzymes

24. An NMDA antagonist introduced for treatment of Alzheimer's disease is

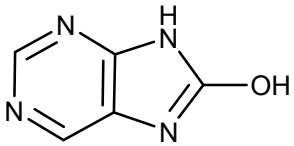
(a) Dopamine (b) Nor-epinephrine (c) Serotonin (d) Memantine

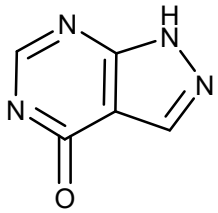
25.

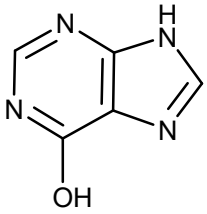


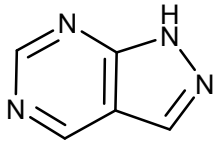
+ Hydrazine hydrate $\xrightarrow[\text{hr in pyridine}]{< 20^0\text{C for 1}}$ Resulting product treated with NaOH at 100^0C for 1 hr

gave an effective product for the treatment of Gout. Identity

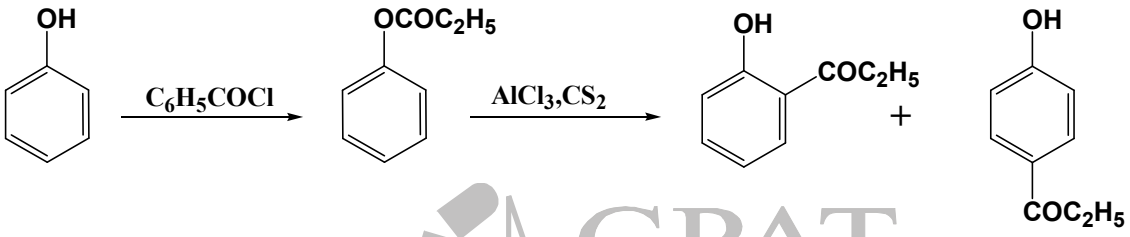
(a) 

(b) 

(c) 

(d) 

26. Phenol, an antiseptic when treated as follows



Gave the above two phenolic ketones. The Reaction is

(a) Hofmann rearrangement
(b) Fries Reaarrangement
(c) Kolbe's reaction
(d) Reimer- Tiemann Reaction

27. The quantity of drug required to make a 2% w/w solution in 240ml of alcohol is(The density of alcohol is 0.816 g/ml)

(a) 1.632g
(b) 2.400g
(c) 4.000g
(d) 4.800g

28. In multistation punching machine, the upper as well as lower punches are connected by

(a) Cams
(b) Turrets
(c) Wire meshes
(d) Revolving belts

29. As per the Drugs and Cosmetics Act, the HEPA filters are required to filter the air in the pharmaceuticalmanufacturing unit. Grade A filter is used for

(a) Aseptic preparation and filling
(b) Background room used for preliminary activities
(c) Filtering liquid preparations
(d) Handling of components after washing

30. The deflection of positive ions formed in a mass spectrometer by electric and magnetic fields depends upon its

(a) Mass
(b) Charge
(c) Velocity
(d) Mass, charge and velocity

31. Cyclohexane can be used as a solvent in UV spectrophotometric analysis because
    (a) It has a ring structure
    (b) Energy requirement for $\sigma - \sigma^*$ is in the range of 120-200nm
    (c) It is volatile
    (d) It is immiscible with water
32. Quaternary structure in protein molecules refers to the
    (a) Arrangement of multiple domains in a single polypeptide chain
    (b) Specific arrangement of multiple subunits in multi-subunit proteins
    (c) Formation of molten globules
    (d) Protein folding in single subunit proteins
33. Interleukins are
    (a) Polypeptide cytokines important in the inflammatory cascade
    (b) Prostaglandins that account for gastrointestinal disorders
    (c) Enkephalins which are specific for asthma
    (d) Dipeptides which have antimicrobial properties
34. Phase I clinical studies of a drug under development is generally carried out on
    (a) At least 10,000 people from different ethnic communities and a wide range of age groups
    (b) A medium sized group of 500-1000 patients suffering from the disease for which the drug is beingdeveloped
    (c) A small group of 20-100 healthy male and female volunteers
    (d) Reliable in-vintro cell-lines derived from people suffering with the disease
35. A young patient complains that he gets severe shortness of breath whenever he takes aspirin for headache. Increased levels of a substance responsible for aspirin hypersensitivity is
    (a) Prednisone
    (b) Prostacycline
    (c) Ibuprofen
    (d) Leukotriene LTC4

Q. 36 to 50 are Matching exercises.

Match group I with Group II andIdentify the correct combinations

36.

Group I	Group II
Glycoside	Type
(P) Gentisin	1. Flavonol
(Q) Genistein	2. Flavone
(R) Apigenin	3. Xanthone

(S) Quercetin

(a) P-4, Q-3, R-1, S-2
(b) P-1, Q-2, R-4, S-3
(c) P-3, Q-4, R-2, S-1
(d) P-2, Q-1, R-3, S-4

4. Isoflavon

37.

Group I	Group II
Bark Diagnostic	Microscopical Characters
(P) Kurchi	1. Heavily lignified phloem fibres with Y-shaped pits, secretory canals, microcrystals of calcium oxalate
(Q) Cascara	2. Pericycle with stone cells having horse-shoe shaped thickening, oil cells, minute needles of calcium oxalate
(R) Cinnamon	3. Alternating layers of stone cells and phloem, nonlignifiedpericyclicfibres, prismatic crystals of calcium oxalate
(S) Cinchona	4. Wavy medullary rays, groups of heavily lignified sclereids, crystal sheath of calcium oxalate

(a) P-2, Q-1, R-4, S-3
(b) P-4, Q-3, R-1, S-2
(c) P-3, Q-4, R-2, S-1
(d) P-1, Q-2, R-3, S-4

38.

Group I	Group II
Drug	Mechanism of action is by inhibition of
(P) Levofloxacin	1. DNA dependent RNA polymerase
(Q) Caspofungin	2. Topoisomerase II (DNA gyrase) the enzyme that Produces a negative supercoil
(R) Aztreonam	3. The synthesis of b(1-2) glycan
(S) Rifabutin	4. Cell wall synthesis preferentially binding to a Specific penicillin binding protein

(a) P-2,Q-3,R-4,S-1
(b) P-3,Q-4,R-1,S-2
(c) P-4,Q-1,R-2,S-3
(d) P-1,Q-2,R-3,S-4

39.

Group I	Group II
Drug	Receptor agonist/antagonist
(P) Granisetron	1. β_1 adrenergic receptor antagonist
(Q) Pirenzepine	2. GABA agonist
(R) Acebutalol	3. $5HT_3$ antagonist

(S) Baclofen

(a) P-1,Q-2,R-3,S-4 (b) P-3,Q-4,R-1,S-2

(c) P-2,Q-3,R-4,S-1 (d) P-4,Q-1,R-2,S-3

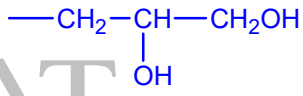
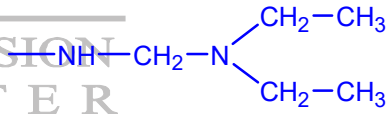
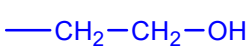
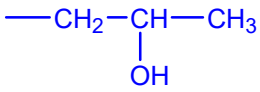
40.

Group I	Group II
Drug	Biotransformation
(P) Chlorpromazine	1. S-oxidation
(Q) Thioridazine	2. Microsomal hydroxylation
(R) Diazepam	3. Desulphuration
(S) Thiopentone	4. N-dealkylation

(a) P-4,Q-1,R-2,S-3 (b) P-2,Q-3,R-4,S-1

(c) P-4,Q-3,R-2,S-1 (d) P-4,Q-2,R-3,S-1

41.

Group I	Group II
Drug	7-Subtitution in 1, 3-dimethyl xanthine with
(P) Diprophylline	1. 
(Q) Ethophylline	2. 
(R) Etamiphylline	3. 
(S) Proxyphylline	4. 

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(a) P-3, Q-2, R-4, S-1 (b) P-2, Q-4, R-3,S-1

(c) P-1, Q-3, R-2, S-4 (d) P-1, Q-4,R-3, S-2

42.

Group I	Group II
Equipment	To determine
(P) Cascade Impactor	1. Flash point
(Q) Tag Open Cup apparatus	2. Sedimentation rate
(R) Pycnometer	3. Particle size
(S) Rheometer	4. Density of liquid

(a) P-3, Q-1, R-4, S-2 (b) P-1, Q-3, R-2, S-4

(c) P-4, Q-2, R-3, S-1 (d) P-2, Q-3, R-1, S-4

43. **Group I**

Classification

(P) Ionic surfactant

(Q) Nonionic surfactant

(R) Non surfactant

(S) Chelating agent

(a) P-3, Q-2, R-1, S-4

(c) P-3, Q-4, R-1, S-2

Group II

Penetration enhancer

1. Terpenes
2. Polyoxyethylene-20-cetyl ether
3. Polyethylene-9-lauryl ether
4. Citric acid

(b) P-2, Q-3, R-1, S-4

(d) P-4, Q-2, R-3, S-1

44. **Group I**

Transdermal drug delivery system

(P) Membrane modulated system

(Q) Diffusion controlled system

(R) Matrix dispersion system

(S) Microreservoir system

(a) P-2, Q-4, R-1, S-3

(c) P-1, Q-4, R-2, S-3

Group II

Method of penetration

1. Drug is homogenously dispersed in polymer and then moulded into a patch
2. Drug reservoir is encapsulated in rate controlling polymer patch
3. Drug is dispersed in hydrophilic polymer and then cross with lipophilic polymer by high shear mechanical force linked
4. Drug is directly dispersed in polymer patch

(b) P-1, Q-2, R-3, S-4

(d) P-4, Q-1, R-3, S-2

45. **Group I**

Term used

(P) Chromophore

(Q) Blue shift

(R) Auxochrome

(S) Red shift

(a) P-4, Q-3, R-1, S-2

(c) P-1, Q-2, R-3, S-4

Group II

Explanation

1. Amino group
2. Increase in wavelength of absorption
3. Decrease in wavelength of absorption
4. Carbonyl group

(b) P-3, Q-1, R-2, S-4

(d) P-2, Q-4, R-3, S-1

46. **Group I**

Symbol

(P) v

(Q) id

(R) δ

Group II

Description

1. Specific resistance
2. Chemical shift
3. Diffusion current

(S) ρ

(a) P-3, Q-4, R-1, S-2

(b) P-2, Q-1, R-4, S-3

(c) P-4, Q-3, R-2, S-1

(d) P-1, Q-2, R-4, S-3

47.

Group I	Group II
Type of inhibitor	Description
(P) Competitive inhibitors	1. Have affinity only for the [E-S] complex and not for the free [E]
(Q) Non-competitive inhibitors	2. Binding of the inhibitor and that of the natural substrate are mutually exclusive
(R) Uncompetitive inhibitors	3. Ultimately binds covalently to the enzyme
(S) Suicide inhibitors	4. Binds with the same affinity to [E] and [E-S]

(a) P-3, Q-2, R-1, S-4

(b) P-1, Q-3, R-2, S-4

(c) P-4, Q-1, R-3, S-2

(d) P-2, Q-4, R-1, S-3

48.

Group I	Group II
Process	Required molecules
(P) Post translation modification	1. Signal peptidase
(Q) DNA repair	2. Sigma factor
(R) Control of prokaryotic transcription	3. Proteasome complex
(S) Protein degradation	4. Photolyase

(a) P-1, Q-4, R-2, S-3

(b) P-2, Q-3, R-1, S-4

(c) P-3, Q-2, R-4, S-1

(d) P-2, Q-1, R-3, S-4

49.

Group I	Group II
Microorganism	Typical characteristics
(P) *Corynebacteriumdiptheriae*	1. Cells divide in three planes in an irregular pattern, Producing'bunches'
(Q) *Streptococcus pyogenes*	2. Cells are lined side by side like matchsticks and at angles to one another
(R) *Staphylococcus aureus*	3. Long, branched, multinuclear filaments called 'hyphae'
(S) *Streptomyces viridochroma*	4. Cells divide in one plane and remain attached to form chain

(a) P-3, Q-4, R-2, S-1

(b) P-4, Q-1, R-2, S-3

(c) P-2, Q-4, R-1, S-3

(d) P-3, Q-2, R-1, S-4

50. **Group I** — Condition

(P) Agranulocytosis
(Q) Anisocytosis
(R) Aplastic anemia
(S) Hemolytic anemia

Group II — Description

1. Reduced lifespan of erythrocytes
2. Lack of neutrophils
3. Abnormal variation in RBC size
4. Depression of synthesis of all cell types in bone marrow

(a) P-2, Q-3, R-4, S-1
(b) P-2, Q-4, R-3, S-1
(c) P-1, Q-2, R-4, S-3
(d) P-4, Q-2, R-1, S-3

Common Data Questions: 51 & 52

Transgenic plants are developed by genetic engineering techniques

51. The method involves

(a) Individual genes from one species inserted into another; the offspring will contain copies of new gene.
(b) By crossing two species or varieties differing at least in one set of characters
(c) Exposing the plant tissue to radiation
(d) Bioproduction of natural compounds under aseptic conditions

52. In the production of transgenic plants, the gene transfer is carried out by

(a) Induction of meristematic primordial
(b) Gel filtration
(c) Clonal propagation
(d) Silicon carbide whiskers

53. In the design of Captopril, the

(a) -COOH group is introduced in proline to enhance the binding capability at the receptor site
(b) -SH group is introduced to enhance the binding capability of the drug with cobalt ion of ACE
(c) -SH group is introduced to enhance the binding to the zinc ion of ACE
(d) -COOH and –SH groups to introduce hydrophilic pockets at the receptor site

54. Captopril IP is assayed by titration

(a) Against 0.1N sodium hydroxide using phenolphthalein indicator
(b) Of a solution in dimethylformamide with 0.1M of tetrabutyl ammonium hydroxide
(c) Of a solution in anhydrous formic acid and acetic anhydride with 0.1N perchloric acid
(d) Of a solution containing 1.8M sulphuric acid and potassium iodide with 0.025M potassium iodate using starch solution

Common Data Questions: 55 & 56

55. Lyposomes are used as carriers for drugs and macromolecules in pharmaceuticalformulations. They are
    (a) Phospholipids dispersed gently in aqueous medium to obtain multilamellar vesicles
    (b) Hydrophilic or lipophilic polymer matrix with a drug reservoir
    (c) A shallow compartment moulded from a drug impermeable system and rate controlling polymericmembrane
    (d) Microporous membrane made from ethylene / vinyl acetate polymer

56. They can interact by different mechanisms
    (a) Biological fluid diffuses into the matrix and causes erosion of polymer
    (b) Endocytosis by phagocytic cells of the reticuloendothelial system such as macrophages andNeutrophils
    (c) Magnetic beads dispersed throughout the polymer matrix. On exposure the drug is released slowly by diffusion
    (d) Receptor binding mediated by the peptide

Linked Answer Questions: (Q) 57 to (Q) 60 Carry Two Marks Each

Statement for Linked Answer Questions: 57 & 58

A Chinese tree *Camptotheca acuminate* is useful in cancer chemotherapy

57. The camptothecin present in the plant and useful in treating ovarian cancer is
    (a) Etoposide (b) Vincristine (c) Paclitaxel (d) Topotecan

58. The drug selected above acts by
    (a) Inhibiting topoisomerase I
    (b) Inhibiting topoisomerase II
    (c) Inhibiting thymidylate synthase
    (d) Forming hydrogen peroxide which generates free radicals

Statement for Linked Answer Questions: 59 & 60

The compound A combined with X to get converted into B, in the presence of an appropriate enzyme

59. The reaction can be described as
    (a) Bioactivation (b) Glucuronide conjugation
    (c) Beta-Oxidation (d) Stereospecific glycine conjugation

60. The significance of the above reaction in drug therapy is that the reaction
    (a) Converts water soluble compound into a lipid soluble compound, thereby increasing its potency
    (b) Converts an uncharged species into a charged species, increasing the shelf life of the compound

(c) Adds an ionic hydrophilic moiety, facilitating its urinary elimination

(d) Adds a bulky substituent to convert it into an active compound

End of paper

FOR GUIDANCE
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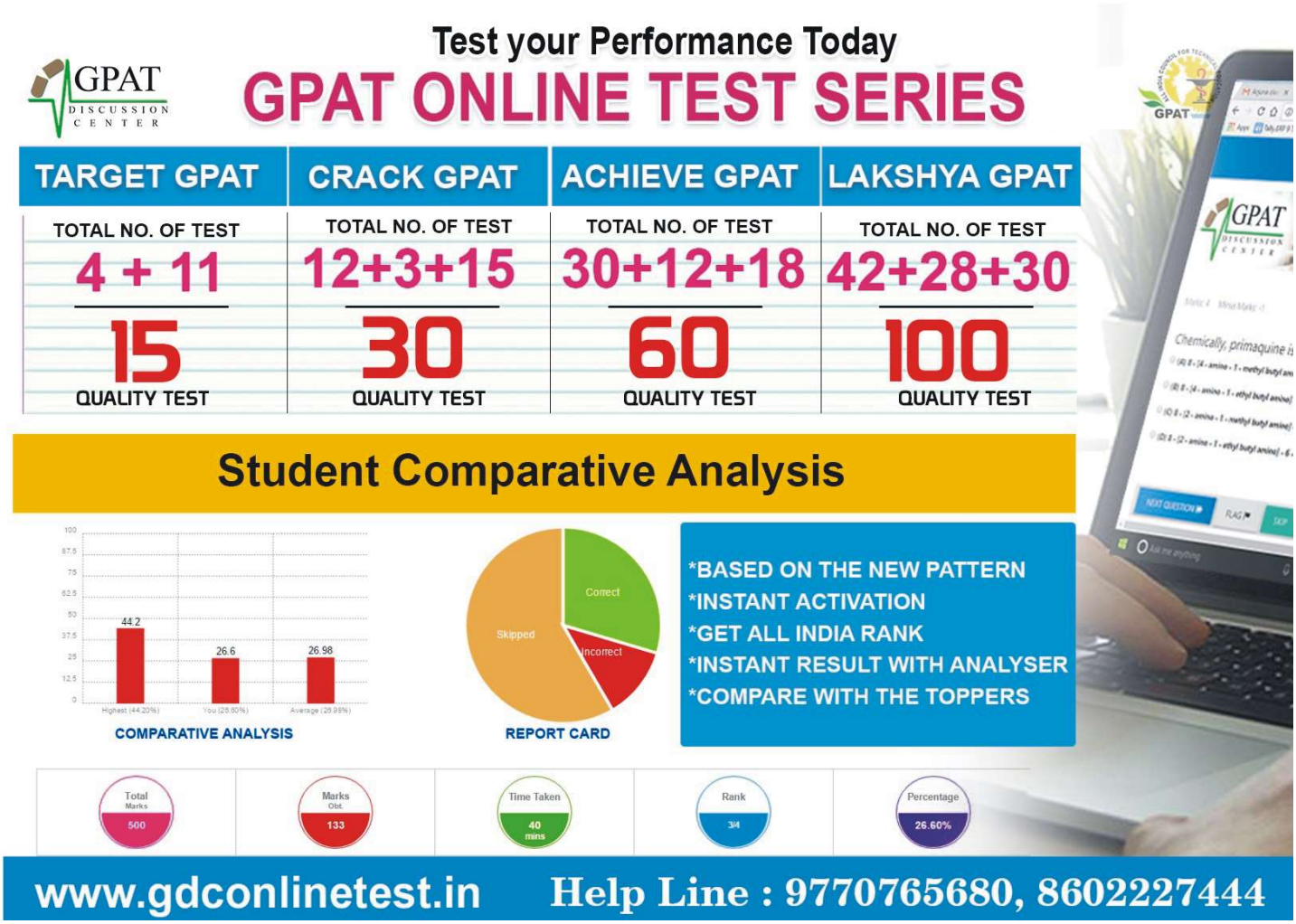

ANSWER KEY GATE 2009

1-b	2-b	3-c	4-b	5-c	6-b
7-b	8-d	9-c	10-d	11-c	12-b
13-d	14-a	15-b	16-b	17-a	18-a
19-b	20-c	21-c	22-b	23-d	24-d
25-b	26-b	27-c	28-a	29-a	30-d
31-b	32-b	33-a	34-c	35-d	36-c
37-a	38-c	39-b	40-a	41-c	42-a
43-a	44-a	45-a	46-c	47-d	48-a
49-c	50-a	51-a	52-d	53-c	54-d
55-a	56-b	57-d	58-a	59-b	60-c

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