
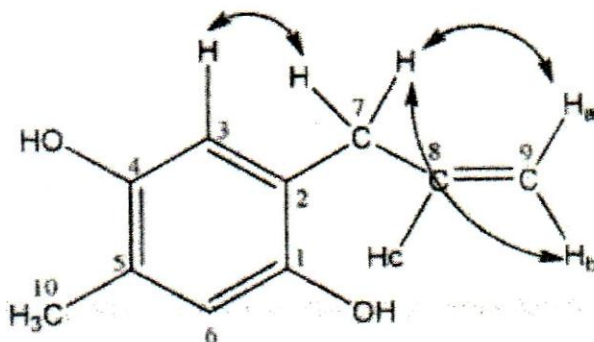
	TANTA UNIVERSITY FACULTY OF PHARMACY DEPARTMENT OF PHARMACOGNOSY				
	FINAL EXAM FOR THIRD YEAR PHARMACY STUDENTS				
COURSE TITLE:	PHARMACOGNOSY		COURSE CODE: 4125		
DATE	10/6/2021	TERM: SECOND	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS	

The exam consists of 100 (ONE HUNDRED) select the single best answer questions (1.5 × 100=150 marks) in 12 pages :

- **Structural elucidation and biosynthesis of natural products**
(Sentences No. 1-30, 45 marks, 45 minutes)
- **Phytotherapy** (Sentences No. 31-80, 75 marks, 55 minutes)
- **Chromatography** (Sentences No. 81-100, 30 marks, 20 minutes)
- **All questions must be answered in the specified ELECTRONIC ANSWER SHEET using a blue pen.**
- **Answers outside the electronic sheet will not be accepted.**
- **DO NOT use a corrector pen.**

Select a single best answer from the following 100 sentences and mark your choices in the provided electronic answer sheet :

A- (Q 1 – Q 9)



2-Allyl-1,4-dihydroxy-5-methylbenzene

2-Allyl-1,4-dihydroxy-5-methylbenzene is a new monoterpene isolated from essential oil of *Nigella sativa* suggested to be biosynthesized from a known monoterpene (dihydroxythymoquinone). The compound displayed the following NMR data:

- **¹H-NMR:** 2.01 (3H, s), 3.25 (2H, d, $J=3.5$ Hz), 4.98 (1H, d, $J=11.5$), 5.05 (1H, d, $J=15$ Hz), 5.95 (1H, ddt, $J=3.5, 11.5, 15$ Hz), 6.51 (1H, s), 6.52 (1H, s).
- **¹³C-NMR:** 16.0 (q), 35.0 (t), 115.0 (t), 117.0 (d), 118.0 (d), 123.0 (s), 125.0 (s), 138.0 (d), 148.0 (s), 149.0 (s)

1-The two protons at C-9 are:

- A- Chemically equivalent.
- B- Enantiomeric.
- C- Homomeric.
- D- Inequivalent being in cis/trans relationship with C-8 proton.

2-Proton at C-8 at resonates at:

- A- 5.05 ppm.
- B- 4.98 ppm.
- C- 5.95 ppm.
- D- 6.52 ppm.

3-The two protons at C-7 are:

- A- Enantiomeric.
- B- Homomeric.
- C- Diastereomeric.
- D- Phenolic.

4-Signals of protons at C-3 & C-6 are located downfield because of:

- A- Electronegativity of adjacent groups.
- B- Ring currents.
- C- Diamagnetic shielding.
- D- Being located at sp^2 carbon.

5-Hydroxyl protons of phenolic hydroxyl groups resonate at:

- A- 2.10 ppm.
- B- 3.25 ppm.
- C- Not provided.
- D- 5.05 ppm.

6- Coupling constant J_{H9b8c} is:

- A- 11.5 Hz.
- B- 15.0 Hz.
- C- 3.5 Hz.
- D- None of the above

7- C-4 resonates at:

- A- 117.0 ppm.
- B- 149.0 ppm.
- C- 138.0 ppm.
- D- 123.0 ppm.

8- Signals of C-1, C-2, C-4, C-5 are not observed if the following technique for carbon multiplicity is used:

- A- APT
- B- SFORD
- C- INEPT
- D- DEPT

9-The biosynthesis of this metabolite from dihydrothymoquinone can proceed by transformation of isopropyl group in the later compound into allyl group in the first by all the following reactions except:

- A- Hydride shift.
- B- Methyl group shift.
- C- Methyl group hydroxylation.
- D- Dehydration

B- Considering the bicyclic monoterpene Thujone from wormwood (Q 10- Q 14):**10- The methyl groups at C-8 & C-9 are:**

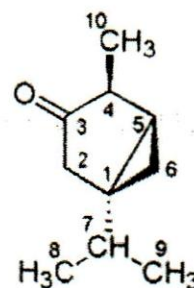
- A- Chemically equivalent.
- B- Chemically and magnetically equivalent.
- C- Diastereomeric.
- D- Proton multiplicity is triplet.

11-Protons at C-6 exhibit:

- A- Vicinal coupling only.
- B- Both geminal and vicinal coupling.
- C- Geminal coupling only.
- D- Long range allylic coupling.

12- Geminal coupling only is observed in case of:

- A- C-6 protons.
- B- C-10 protons.
- C- C-2 protons.
- D- Proton at C-7.



13- Multiplicity of C-10 methyl protons is:

- A- Singlet.
- B- Doublet due to vicinal coupling with C-4 protons.
- C- Triplet.
- D- Quartet.

14- C-3 carbon can resonate at:

- A- 45.4 ppm
- B- 41.7 ppm.
- C- 32.6 ppm.
- D- 218 ppm.

15-Regarding H/H homonuclear coupling:

- A- Scalar coupling is transmitted *via* spatial proximity.
- B- Dipolar coupling is transmitted *via* bond electrons.
- C- NOE experiment is used to detect dipolar coupling.
- D- Scalar coupling is not associated with signal splitting.

16- The long-range H/ H coupling is observed in all the following except:

- A- Aromatic compounds.
- B- Unsaturated hydrocarbons.
- C- Protons separated by 2 or 3 single bonds.
- D- Rigid bicyclic systems with protons stereochemically fixed in W or M arrangement.

17-Fragmentation by rearrangement in mass spectroscopy:

- A- Produces a radical and even electron ion.
- B- Results from two-bond cleavage.
- C- Results from one-bond cleavage.
- D- involves hydrogen transfer to uncharged species (group).

18-A high abundance fragment ion in mass spectrum of primary carboxylic acid with a γ hydrogen is located at m/e:

- A- 91
- B- 60
- C- 105
- D- 77

19- Fragmentation in mass spectroscopy is uncommon in the following case:

- A- β to a double bond.
- B- β or α to a heteroatom.
- C- β to an aromatic ring.
- D- β to a carbonyl group.

20- A mild ms ion generation technique, which uses nitrogen UV laser is:

- A- MALDI.
- B- ESI-MS.
- C- CI-MS.
- D- FAB-MS.

21- A quasi molecular ion observed in case of using ESI MS is:

- A- $(M + 29)^+$.
- B- $(M + 18)^+$.
- C- $(M + \text{cation})^+$ in the anion mode.
- D- $(M + \text{anion})^-$ in the anion mode.

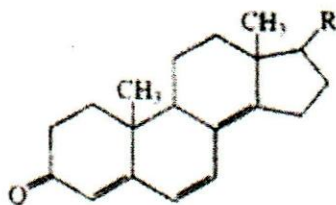
22- C-7 hydroxyl group in flavonoids can be detected from the following UV data:

- A- Large bathochromic shift after addition of aluminum chloride.
- B- Band II bathochromic shift after addition of sodium acetate.
- C- A large band I shift after addition of sodium methoxide.
- D- Decrease in bathochromic shift due to addition of AlCl_3 after addition of acid.

23- The following amino acid has 32% carbon in combustion analysis data:

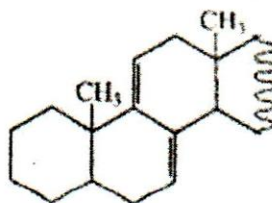
- A- Alanine $\text{C}_3\text{H}_7\text{NO}_2$
- B- Glycine $\text{C}_2\text{H}_5\text{NO}_2$
- C- Leucine $\text{C}_6\text{H}_{13}\text{NO}_2$
- D- Methionine $\text{C}_5\text{H}_{11}\text{NO}_2\text{S}$.

24- The calculated UV λ_{max} of the following steroid chromophore:



- A- 356 nm.
- B- 275 nm.
- C- 341 nm.
- D- 346 nm.

25- The calculated UV λ_{max} of the following chromophore is:



- A- 244 nm.
- B- 239 nm.
- C- 214 nm.
- D- 234 nm.

26- The base peak in mass spectrum of limonene at $m/e = 68$ can arise from:

- A- One bond cleavage of isopropenyl group from the molecular ion.
- B- Cleavage β to double bond.
- C- Retro Diels-Alder fragmentation.
- D- McLafferty rearrangement.



27- McLaferty rearrangement is encountered in all the following except:

- A- Ketones with an alkyl group having γ hydrogen.
- B- Carboxylic acids with at least propyl group.
- C- Ethyl esters
- D- Amines.

28- The biosynthesis of shikimic acid lacks the following reaction:

- A- Reaction of phosphoenol pyruvate with erythrose-4-phosphate.
- B- Intra molecular aldol condensation of DAHP to form 3-dehydroquinic acid.
- C- 1,2-*cis* elimination of water.
- D- 1,4-*trans* elimination of phosphoric acid.

29- Flavonoids are:

- A- Have mixed biosynthetic origin: acetate & shikimate.
- B- Totally formed from acetate
- C- Totally formed from shikimic acid.
- D- Precursors are different from stilbenes and Phenanthrenes.

30- Regarding terpenoid compounds:

- A- Isoprene units are biosynthesized only from mevalonic acid.
- B- Monoterpenes such as cinnamic aldehyde are formed from two isopentenyl pp units.
- C- Molecular rearrangements are not involved in biosynthesis of terpenoids.
- D- Steroids and triterpenes are formed from two farnesyl pyrophosphate molecules.

31- Advantage of herbal medicine may include:

- A- Initiating self-treatment
- B- Low side effect
- C- Treatment safety
- D- Safety with lower side effect.

-Treatment with herbal remedies with known ...(32)....effect such as echinacea can reduce the required dose of ...(33)... and improve wound healing.

- A- Immunomodulating
- B- Hypotensive
- C- Wound healing
- D- Antibiotics

34- Responses of infants and small children to herbal remedies are different from those of adults due to:

- A- Allergy
- B- Higher rates of excretion
- C- Low rate of excretion and metabolism
- D- Higher rates of metabolism

35-are preferably used with pediatric patients because they contain low doses of the active constituents.

- A- Tinctures
- B- Flavored liquid glycerites
- C- Combined preparations
- D- Infusion

36- Medicinal plants are capable of triggeringallergic reactions.

- A- Type I (immediate)
- B- Type IV (delayed)
- C- Type III
- D- Type I and Type IV

37- Which of the following is Not true for preparation of medicinal teas:

- A- Non-metallic container
- B- B-Tea pots with a lid
- C- Glass coffeepot
- D- Metallic receptacle

38- Caking of hygroscopic preparations such as instant teas is a problematic especially in case of:

- A- Chinese herbs
- B- Herbal tea mixture
- C- Chinese herbs and herbal tea mixture
- D- Volatile constituents

39- Infusion method is best used when the herbal tea is flower or leaves.

- A- True
- B- False

40- Vitamin K found in alfalfa can affect the anticoagulant effect of warfarin, resulting in decreased anticoagulant activity (antagonize).

- A- True
- B- False

41- Medicinal teas for gastrointestinal, liver, and biliàry complaints are ideally taken:

- A- Sweetened with sugar substitute
- B- Unsweetened
- C- Sweetened with honey
- D- Use only sweetener as is necessary

42- The following herb (s) may Not interfere with coagulation

- A- Garlic
- B- Ginger
- C- Aloe vera
- D- Ginkgo

43- Herbs with high tannin content can interfere with

- A- Neuroleptic drugs
- B- CNS acting drugs
- C- Vit. K
- D- Anticoagulants

44- Medicinal teas should generally be taken for:

- A- 4 weeks
- B- At least 3 months
- C- Several months
- D- From 4-6 Weeks

45- *Aloe vera* gel can impair absorption of many different drugs through its..... content.

- A- Anthraquinone
- B- Flavonoid
- C- Tannins
- D- Anthraquinone and mucilage.

-Select one interaction for each of the following herbs. For questions 46-48 choose from List I; and for 49-51 choose from List II. Record your answer in the specified electronic ANSWER SHEET.

46- Capsicum with (ACE inhibitors)

47- Ginkgo with (Aspirin, warfarin)

48- Ephedra with (MAOI)

List I
A- Bleeding
B- Increase BP
C- Increase cough
D- Decreased effect

List II
A- Reduce absorption
B- Increases bioavailability
C- Deplete potassium.
D- Hypotensive effect

49- Diuretic herbs

50- Grapefruit Juice with Calcium antagonists

51- Cathartic herbs

52- increases the ability of granulocytes and macrophages to ward off disease.

- A- Echinacea
- B- Ginko
- C- Licorice
- D- Elder flower

- For questions 53-55, choose from List III; Record your answer in the specified electronic ANSWER SHEET.

53- *Ginkgo biloba*

54- Garlic

55- Hawthorn leaf and flower

List III
A- Lymphatic edema
B- Treatment of heart failure
C- Antithrombotic
D- Enhancement of memory

- For questions 56-58, choose from List IV; Record your answer in the specified electronic ANSWER SHEET.

56- Rosemary leaf contraindication

57- Artichoke leaf

58- *Rauwolfia* contraindication

List IV
A- Depression
B- Bleeding
C- Heart failure
D- Antilipemic effect

59- Acute sinusitis could be treated by one of the following herbal remedies:

- A- Antibiotics
- B- Cold receptor stimulator
- C- Diaphoretics
- D- Immunomodulators

60- Horseradish root:

- A- Antitussive
- B- Expectorant
- C- Reduces secondary bacterial infection
- D- Antiphlogistics

61- may cause Aldosterone-like effect when larger quantities are consumed.

- A- Ivy leaf
- B- Licorice
- C- Primula root
- D- Sundew herb

62- The antiviral effect of purple Echinacea is due to:

- A- Chicoric acid
- B- Flavonoids
- C- Alkylamides
- D- Chicoric acid and alkylamides

- For questions 63-65, choose from List V; Record your answer in the specified electronic ANSWER SHEET.

63- Chamomile flower**64- Peppermint oil****65- Purple echinacea****List V**

- | |
|---|
| <ul style="list-style-type: none"> A- Febrifuge B- Avoided in multiple sclerosis C- Antiphlogistics D- Stimulate cold receptors |
|---|

66- Kavapyrones has one or more of the following effect(s)

- A- Dopaminergic
- B- Serotonergic
- C- Antioxidant
- D- Both dopaminergic and serotonergic effects

67- The following herb (s) has a positive effect in sleep disorders:

- A- Balm leaf
- B- Lavender flower oil
- C- Balm leaf and Lavender oil
- D- St. John's wort

68- Oral hypericum preparations have..... effect.

- A- Antidepressant
- B- Analgesic
- C- Sleep promoting
- D- Antitussive

69- Saint John's wort interact with some drugs due to:

- A- Inhibits cytochrome P₄₅₀ enzyme
- B- Induces cytochrome P₄₅₀ enzyme
- C- Inhibits P-glycoprotein drug transporter.
- D- Induces cytochrome P₄₅₀ and inhibits P-glycoprotein.

70- One of the following herb has positive effect on Non-age-related debility:

- A- Chamomile
- B- Balm leaf
- C- Ginseng
- D- Valerian root

- For questions 71-73, choose from List VI; Record your answer in the specified electronic ANSWER SHEET.

71- Stinging nettle

72- Cayenne fruit

73- Devil's claw root

List VI
A- Treatment of gout
B- Analgesic
C- Antidyscratic
D- Depletion of substance P

74- Devil's claw is used externally in case of osteoarthritis and arthrosis.

A- True

B- False

75- Willow bark; aspen leaf and bark modulate prostaglandin and leukotriene synthesis:

A- True

B- False

76- Beta-glucan from oats has.... effect:

A- Hypocholesterolemic

C- Liver protective

B- Liver protective

D- Bone protective

- For questions 77-79, choose from List VII; Record your answer in the specified electronic ANSWER SHEET.

77- Food (or part of a food) that provides health benefits:

78- Product (other than tobacco) contains one or more of dietary ingredients:

79- Contain lactic-acid-producing bacteria:

List VII
A- Functional foods
B- Nutraceuticals
C- Dietary supplement
D- Probiotics

80- Capsaicin, diallyl sulfide, and ajoene have one of the following effects:

A- Phytoestrogen

B- Positive effect on lipid profile

C- Anticancer

D- Anti-inflammatory

81- Which of the following gases is unsuitable for use as a GC carrier gas?

A- Nitrogen

B- Oxygen

C- Helium

D- Hydrogen

82- Silicone-based oils are used in GLC as

A- Mobile phases

B- Solvents

C- Stationary phases

D- Internal standards

83- The mechanism of separation behind GLC is

A- Ion-exchange

B- Size exclusion

C- Adsorption

D- Partitioning

84- Which of the following GC chromatograph parts operates at room temperature?

- A- Flow controller
- B- Column
- C- Detector
- D- Sample injection port

85- Volatile compounds can be separated effectively by GC columns operated at

- A- Room temperature
- B- Constant gas pressure
- C- Isothermal condition
- D- Programmed temperature gradient

86- is highly recommended for detection of organic volatile compounds (hydrocarbons).

- A- UV/Vis
- B- FID
- C- Refractive index
- D- FT-IR

87- Hydrocarbon fractions of low molecular weight have always retention times in GC chromatograms.

- A- Short
- B- Long
- C- Intermediate
- D- Very long

88- Fatty acids can be analyzed by GC after

- A- Mixing with standards
- B- Hydrogenation
- C- Esterification
- D- Spiking

89- Sampling in case of SPME coupled with GC is carried out by

- A- Derivatization
- B- Decreasing temperature
- C- Suction of vapors
- D- Adsorbent fibers

90- Kovat indices (KI-values) are calculated relative to..... of a series of n-alkanes.

- A- Retention times
- B- Gas pressure
- C- Peak area
- D- Retention volumes

91- Gradient elution is preferred in HPLC with compounds having polarities.

- A- Low
- B- High
- C- Variable
- D- Similar

92- With a mobile phase composition (e.g., 90% water: 10% acetonitrile), will eluted firstly in case reversed phase HPLC.

- A- Polar compounds
- B- Non-polar compounds
- C- Lipophilic compounds
- D- Long chain hydrocarbons

93- The symbol to indicates in a chromatogram.

- A- Retention time of unretained peak.
- B- Retention time of the 2nd peak
- C- Retention time of the last peak
- D- Retention volume of a certain peak

94- Enantiomers of atropine can be separated by chromatography.

- A- Size exclusion
- B- Gel permeation
- C- Chiral HPLC
- D- Cation exchange

95- An aqueous mixture consists of fucoidan (> 60 kDa sulphated polysaccharide) and NaCl can be ideally separated using chromatography.

- A- Gel permeation
- B- Gel filtration
- C- GC
- D- Paper

96- is suitable for separation of an aqueous mixture consists of fucoidan (high molecular weight sulphated polysaccharide) and NaCl.

- A- Cationic resin
- B- Polyacrylamide
- C- Sepharose
- D- Sephadex

97- can be used for holding fucoidan (high molecular weight sulphated polysaccharide) on its surface.

- A- Cationic exchangers
- B- Anionic exchangers
- C- CM-resins
- D- S-resins

98- Application of a mixture of glucose and glucuronic acid to anionic exchangers results in

- A- Retardation of glucose
- B- Passing down of both
- C- Retardation of both
- D- Retardation of glucuronic acid

99- Softening of hard water rich in Ca^{+2} requires application of

- A- DEAE-resins
- B- Cationic exchangers
- C- Anionic exchangers
- D- Q-resins

100- Resins regeneration is always performed at the of chromatographic protocols.

- A- End
- B- Beginning
- C- Middle
- D- Conditioning step

Best wishes