Part I. 60 Points (30 Questions; 2 Points Each)
Select the BEST answer for each of the following.

1. The drug illustrated below:

   ![Drug Structure]

   I  Has antiemetic activity.
   II Is active as a H₁ antagonist.
   III Causes sedation.

   a  I only
   b  III only
   c  I and II only
   d  II and III only
   e  I, II, and III

   Answer ________

2. The drug illustrated below is:

   ![Drug Structure]

   I  Is an enzyme inhibitor.
   II Can be administered iv.
   III Binds bile acids and prevents their reabsorption.

   a  I only
   b  III only
   c  I and II only
   d  II and III only
   e  I, II, and III

   Answer ________

3. The drug illustrated below is:

   ![Drug Structure]

   I  Used to treat angina.
   II Used to treat arrhythmias.
   III Known to increase serum triglycerides.

   a  I only
   b  III only
   c  I and II only
   d  II and III only
   e  I, II, and III

   Answer ________
4. The drug illustrated below:

<table>
<thead>
<tr>
<th></th>
<th>I. Is an α&lt;sub&gt;2&lt;/sub&gt;-agonist (centrally-acting).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>II. Physically displaces norepinephrine from storage granules.</td>
</tr>
<tr>
<td></td>
<td>III. Blocks the refilling of norepinephrine in storage granules.</td>
</tr>
</tbody>
</table>

a. I only  
b. III only  
c. I and II only  
d. II and III only  
e. I, II, and III

Answer ______

5. The drug illustrated below:

<table>
<thead>
<tr>
<th></th>
<th>I. Is a thiazide diuretic.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>II. Is used iv to reduce blood pressure.</td>
</tr>
<tr>
<td></td>
<td>III. Is used orally to treat insulin-induced hypoglycemia.</td>
</tr>
</tbody>
</table>

a. I only  
b. III only  
c. I and II only  
d. II and III only  
e. I, II, and III

Answer ______

6. The drug illustrated below is:

<table>
<thead>
<tr>
<th></th>
<th>I. Is used as an antihypertensive agent.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>II. Is associated with lower serum LDL.</td>
</tr>
<tr>
<td></td>
<td>III. Is associated with orthostatic hypotension as a side effect.</td>
</tr>
</tbody>
</table>

a. I only  
b. III only  
c. I and II only  
d. II and III only  
e. I, II, and III

Answer ______

7. The drug illustrated below:

<table>
<thead>
<tr>
<th></th>
<th>I. Is a prodrug.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>II. Increases Lipoprotein Lipase activity in endothelial cells.</td>
</tr>
<tr>
<td></td>
<td>III. A Class IB antiarrhythmic agent.</td>
</tr>
</tbody>
</table>

a. I only  
b. III only  
c. I and II only  
d. II and III only  
e. I, II, and III

Answer ______
8. The drug illustrated below:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Acts as a receptor antagonist.</td>
</tr>
<tr>
<td>II</td>
<td>Can produce a non-productive dry cough.</td>
</tr>
<tr>
<td>III</td>
<td>Is an angiotensin-converting enzyme inhibitor.</td>
</tr>
</tbody>
</table>

| a | I only |
| b | III only |
| c | I and II only |
| d | II and III only |
| e | I, II, and III |

Answer __________

9. The drug illustrated below:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Can cause hyperkalemia.</td>
</tr>
<tr>
<td>II</td>
<td>Can cause hypomagnesemia.</td>
</tr>
<tr>
<td>III</td>
<td>Can cause hyperuricemia.</td>
</tr>
</tbody>
</table>

| a | I only |
| b | III only |
| c | I and II only |
| d | II and III only |
| e | I, II, and III |

Answer __________

10. The drug illustrated below:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Is administered parenterally.</td>
</tr>
<tr>
<td>II</td>
<td>Is used to treat ventricular arrhythmias.</td>
</tr>
<tr>
<td>III</td>
<td>Is a Class IB antiarrhythmic agent.</td>
</tr>
</tbody>
</table>

| a | I only |
| b | III only |
| c | I and II only |
| d | II and III only |
| e | I, II, and III |

Answer __________

11. The drug illustrated below is:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Able to effectively block $\alpha_1$-receptors.</td>
</tr>
<tr>
<td>II</td>
<td>An H$_1$-antagonist.</td>
</tr>
<tr>
<td>III</td>
<td>Used to prevent motion sickness.</td>
</tr>
</tbody>
</table>

| a | I only |
| b | III only |
| c | I and II only |
| d | II and III only |
| e | I, II, and III |

Answer __________
12. The drug illustrated below:

- **I** Is approximately 50% eliminated in the bile.
- **II** Is a cascading prodrug.
- **III** Is an antagonist at angiotensin II receptors.

   a. I only
   b. III only
   c. I and II only
   d. II and III only
   e. I, II, and III

   **Answer**

13. The drug illustrated below:

- **I** Is available in an iv formulation.
- **II** Is a potent vasodilator.
- **III** Is a calcium channel blocker.

   a. I only
   b. III only
   c. I and II only
   d. II and III only
   e. I, II, and III

   **Answer**

14. The drug illustrated below:

- **I** Is used to treat allergic conjunctivitis.
- **II** Increases mucosal secretion in the stomach.
- **III** Is a Class III antiarrhythmic agent.

   a. I only
   b. III only
   c. I and II only
   d. II and III only
   e. I, II, and III

   **Answer**

15. The drug illustrated below:

- **I** Is a D₂-Agonist.
- **II** Is metabolized to α-methylnorepinephrine.
- **III** Has been used as an antihypertensive agent.

   a. I only
   b. III only
   c. I and II only
   d. II and III only
   e. I, II, and III

   **Answer**
16. The drug illustrated below:

<p>| | |</p>
<table>
<thead>
<tr>
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<th></th>
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</thead>
</table>
| ![Drug Image](image) | **I** Provides symptomatic relief in males with benign prostatic hyperplasia.  
**II** Is an α₁-antagonist  
**III.** Has a short duration of action (< 2 hours). |

a) I only  
b) III only  
c) I and II only  
d) II and III only  
e) I, II, and III  
**Answer** ______

17. The drug illustrated below is:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| ![Drug Image](image) | **I** Is a thiazide diuretic  
**II** Is used in the treatment of hypertension.  
**III** Is an angiotensin II receptor antagonist. |

a) I only  
b) III only  
c) I and II only  
d) II and III only  
e) I, II, and III  
**Answer** ______

18. The drug illustrated below:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| ![Drug Image](image) | **I** Is used to treat Erectile Dysfunction.  
**II** Inhibits the enzyme HMG-CoA reductase.  
**III** Lowers serum cholesterol. |

a) I only  
b) III only  
c) I and II only  
d) II and III only  
e) I, II, and III  
**Answer** ______

19. The drug illustrated below:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| ![Drug Image](image) | **I** Has a metabolite that is active and possesses a longer duration of action.  
**II** Is used to treat Conn’s Syndrome.  
**III** Is an aldosterone receptor antagonist. |

a) I only  
b) III only  
c) I and II only  
d) II and III only  
e) I, II, and III  
**Answer** ______
20. The drug illustrated below is:

![Chemical Structure](image)

I  Used to treat pulmonary edema.
II  The most potent loop diuretic.
III  Used to treat congestive heart failure.

a  I only
b  III only
c  I and II only
d  II and III only
e  I, II, and III

**Answer**

21. The drug illustrated below is:

![Chemical Structure](image)

I  Used to treat acute congestive heart failure.
II  A phosphodiesterase type 3 inhibitor.
III  Administered orally to prevent congestive heart failure.

a  I only
b  III only
c  I and II only
d  II and III only
e  I, II, and III

**Answer**

22. The drug illustrated below is:

![Chemical Structure](image)

I  Is an hepatic enzyme inhibitor.
II  Is a Class IB antiarrhythmic agent.
III  Is a hepatic enzyme inducer.

a  I only
b  III only
c  I and II only
d  II and III only
e  I, II, and III

**Answer**

23. The drug illustrated below is:

![Chemical Structure](image)

I  Used to treat glaucoma.
II  A carbonic anhydrase inhibitor.
III  A thiazide diuretic.

a  I only
b  III only
c  I and II only
d  II and III only
e  I, II, and III

**Answer**
24. The drug illustrated below:

`schematic_question_24.png`

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Is activated to an electrophile at low pH.</td>
</tr>
<tr>
<td>II</td>
<td>Acts irreversibly.</td>
</tr>
<tr>
<td>III</td>
<td>Is an angiotensin II receptor antagonist.</td>
</tr>
</tbody>
</table>

a I only  
b III only  
c I and II only  
d II and III only  
e I, II, and III  

**Answer** __________

25. The drug illustrated below:

`schematic_question_25.png`

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Does not cause rebound hypertension upon sudden withdrawal.</td>
</tr>
<tr>
<td>II</td>
<td>Is available as a transdermal patch.</td>
</tr>
<tr>
<td>III</td>
<td>Is an α₂-agonist (Centrally-Acting).</td>
</tr>
</tbody>
</table>

a I only  
b III only  
c I and II only  
d II and III only  
e I, II, and III  

**Answer** __________

26. The drug illustrated below:

`schematic_question_26.png`

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Is administered orally.</td>
</tr>
<tr>
<td>II</td>
<td>Is a Class III antiarrhythmic agent.</td>
</tr>
<tr>
<td>III</td>
<td>Is used as a prophylactic agent.</td>
</tr>
</tbody>
</table>

a I only  
b III only  
c I and II only  
d II and III only  
e I, II, and III  

**Answer** __________

27. The drug illustrated below:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Is an aldosterone antagonist.</td>
</tr>
<tr>
<td>II</td>
<td>Is cationic at physiological pH.</td>
</tr>
<tr>
<td>III</td>
<td>Is a bile acid metabolite of cholesterol.</td>
</tr>
</tbody>
</table>

a I only  
b III only  
c I and II only  
d II and III only  
e I, II, and III  

**Answer** __________
28. The drug illustrated below:

| I | Is used to treat hypertension. |
|   | II  Can be administered iv as an antiarrhythmic agent. |
|   | III  Is a calcium channel antagonist. |

   a  I only
   b  III only
   c  I and II only
   d  II and III only
   e  I, II, and III

   Answer

29. The drug illustrated below:

| I  is used to treat acute asthma attacks. |
| II  is administered intravenously. |
| III  is used as a prophylactic. |

   a  I only
   b  III only
   c  I and II only
   d  II and III only
   e  I, II, and III

   Answer

30. The drug illustrated below:

| I  Blocks the degradation of cGMP. |
| II  Is a phosphodiesterase inhibitor-type 5. |
| III  Is used to treat pulmonary hypertension. |

   a  I only
   b  III only
   c  I and II only
   d  II and III only
   e  I, II, and III

   Answer
Part II (12 points)

1. Indicate BRIEFLY and SPECIFICALLY the difference, if any, in the MECHANISM OF ACTION between the following two drugs. When requested, provide the generic name of the drug.

\[
\text{Generic Name: } \text{[Generic Name]} \]

2. Indicate BRIEFLY and SPECIFICALLY the difference, if any, in the MECHANISM OF ACTION between the following two drugs. When requested, provide the generic name of the drug.

\[
\text{Generic Name: } \text{[Generic Name]} \]

3. Indicate BRIEFLY and SPECIFICALLY the difference, if any, in the MECHANISM OF ACTION between the following two drugs. When requested, provide the generic name of the drug.

\[
\text{Generic Name: } \text{[Generic Name]} \]

4. Indicate BRIEFLY and SPECIFICALLY the difference, if any, in the MECHANISM OF ACTION between the following two drugs. When requested, provide the generic name of the drug.

\[
\text{Generic Name: } \text{[Generic Name]} \]
Part III (12 Points)

1. Indicate BRIEFLY and SPECIFICALLY the difference, if any, in the principal MEDICINAL USE between the following two drugs. When requested, provide the generic name of the drug.

Generic Name:________________________

2. Indicate BRIEFLY and SPECIFICALLY the difference, if any, in the principal MEDICINAL USE between the following two drugs. When requested, provide the generic name of the drug.

Generic Name:________________________

3. Indicate BRIEFLY and SPECIFICALLY the difference, if any, in the principal MEDICINAL USE between the following two drugs. When requested, provide the generic name of the drug.

Generic Name:________________________

4. Indicate BRIEFLY and SPECIFICALLY the difference, if any, in the principal MEDICINAL USE between the following two drugs. When requested, provide the generic name of the drug.

Generic Name:________________________
Part IV. (16 Points)  Complete the structures of the FOUR following compounds

Draw the correct chemical structure, including stereochemistry wherever indicated. Partial credit will be given but you will lose points for incorrect chemical symbols, hydrogens missing from heteroatoms, hydrogens missing from carbons labeled C, and for having too many bonds to an atom (see below for examples).

Examples:

Incorrect:

- Fluorobenzene
- Piperidine

Correct:

1.  2\text{H}-1,2,3-Benzothiadiazine-6-sulfonamide, 3,4-dihydro-3-\{(4-ethoxyphenyl)methyl\}-7-(trifluoromethyl)-, 1,1-dioxide

2.  1-Piperidinebutanol, α-\{4-(2-phenyl-1-oxopropyloxy)phenyl\}-4-(hydroxydiphenylmethyl)-,
3. 3-((1H-Tetrazol-1-yl)methyl)-1-(4-bromophenyl)-5-(4-methylpiperazin-1-yl)-1H-indole, monohydochloride

4. N-[1-[(S)-3-Hydroxy-2-methyl-1-oxopropyl]-L-prolyl]-L-alanine

THERE ARE TWELVE PAGES IN THIS EXAM!