OPTION D REVIEW QUESTIONS **Name** _____

1. (a) Many drugs are taken orally. State **three** other ways in which drugs may be taken by a patient.

(b) State what is meant by the term *side effect*.

2. List the **three** different ways in which drugs can be **injected** into the body. Predict, giving a reason, which of the three methods will result in the drug having the most rapid effect.

3. Antacids can be taken for indigestion caused by excess acidity.

(a) Identify the substance responsible for the low pH value of the liquid in the human stomach.

(b) Two active ingredients in antacids are $Mg(OH)_2$ and $NaHCO_3$. Write an equation to show how each ingredient can relieve indigestion.

(c) Three antacid preparations contain 0.01 mol of one of the following – $Mg(OH)_2$, $Al(OH)_3$ and $NaHCO_3$. Identify the most effective antacid. Give a reason for your choice, with reference to the formula of the antacid.

4. Magnesium hydroxide and aluminium hydroxide can act as antacids.

(a) Write an equation for the reaction of hydrochloric acid with one of the above antacids.

(b) Identify which antacid neutralizes the greater amount of hydrochloric acid if 0.1 mol of each antacid is used to neutralize the hydrochloric acid present in the stomach.

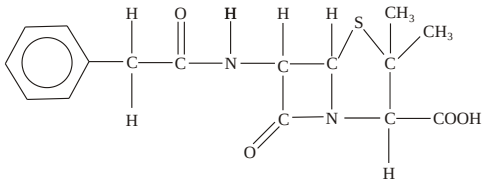
(c) Give **one** reason why sodium hydroxide is not used instead of these antacids.

5. Penicillins are molecules that can kill harmful micro-organisms. Their general structure is shown in Table 21 of the Data Booklet.

(a) State the type of micro-organism killed by penicillins and explain how they do this.

(b) Explain the effect of overprescription of penicillins.

6. Penicillin G was the first antibiotic used to fight infections. The structure of this antibiotic is as follows:



(a) Determine the molecular formula of penicillin G.

(b) State **two** reasons for modifying the side chain in penicillin G

(c) Describe the mode of action of penicillin in preventing the growth of bacteria.

(d) Discuss **two** effects of over prescription of penicillin to humans.

7. (a) Describe the differences between bacteria and viruses, by referring to their structures and the way they

multiply.

(b) Outline **two** ways in which antiviral drugs work.

8. (a) Describe the differences in the ways that bacteria and viruses multiply.

(b) Outline **two** ways in which antiviral drugs work.

(c) Explain why effective treatment of AIDS with antiviral drugs is difficult.

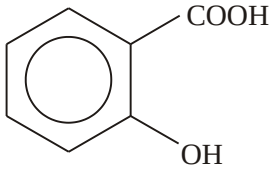
9. Refer to Table 21 of the Data Booklet when answering this question about analgesics.

(a) Describe the different ways in which mild and strong analgesics prevent pain.

mild analgesics: .....

strong analgesics: .....

(b) Some mild analgesics are derivatives of salicylic acid. The structure of salicylic acid is



(i) Salicylic acid can be converted to aspirin. Give the formula of the group that replaces one hydrogen atom in a molecule of salicylic acid in this conversion.

(ii) State the names of **two** functional groups present in acetaminophen (paracetamol) and **one** functional group present in ibuprofen.

acetaminophen (paracetamol) .....

ibuprofen .....

(iii) Identify, giving a reason for your choice, which of the analgesics in (b) (ii) exists as optical isomers.

10. Analgesics can be classified as mild or strong.

(a) State and explain how each type of analgesic prevents pain.

mild analgesic

strong analgesic

(b) Aspirin is a common mild analgesic.

(i) Outline **one** advantage and **one** disadvantage of using aspirin.

advantage

disadvantage

(ii) State **one** synergistic effect of using aspirin and ethanol together.

(iii) Acetaminophen (paracetamol) is often used as a substitute for aspirin. State **one** disadvantage of using acetaminophen.

11. (a) Aspirin and acetaminophen (paracetamol) are classified as mild analgesics.

(i) State **one** advantage of aspirin, other than reducing pain, which is common to acetaminophen (paracetamol).

(ii) State **one** advantage of aspirin which is **not** common to acetaminophen (paracetamol).

(b) Morphine, codeine and heroin are classified as strong analgesics.

(i) Name **two** functional groups common to morphine, codeine and heroin.

(ii) A hospital patient has been prescribed morphine after surgery. State the main effect and a major side effect of this drug.

12. Morphine is a naturally occurring analgesic that can be converted into codeine.

(i) Calculate the difference in relative formula mass between morphine and codeine.

(ii) Explain what is meant by developing tolerance towards codeine and state why this is dangerous.

13. Acidified potassium dichromate(VI) is commonly used in roadside tests for ethanol in the breath of persons operating motor vehicles. It reacts with the ethanol present to form ethanoic acid.

(a) State the function of potassium dichromate(VI) and give the colour change that takes place in this reaction.

(b) Identify **two** other methods for the detection of ethanol in a person's breath or blood that are considered to be more accurate.

(c) State **one** harmful effect of aspirin that is more likely to occur if it is taken with ethanol.

14. The breathalyser can be used to detect ethanol in breath. Explain how this can be done, by reference to the substance used, the colour change and the type of reaction occurring.

15. Nicotine and caffeine are two common stimulants.

(a) Apart from the methyl groups, state the name of **one** functional group, which is present in **both** nicotine and caffeine.

(b) State the name of **one** functional group, which is present in caffeine, but absent in nicotine.

(c) Suggest, with a reason, whether an aqueous solution of nicotine would be acidic, basic or neutral.

(d) State **two** effects of consuming caffeine in large amounts.

(e) State **two** short-term physical effects of nicotine consumption.

(f) Explain the term *sympathomimetic* drug and state **one** example other than nicotine.

16. Caffeine and nicotine are two stimulants whose structures are shown in Table 21 of the Data Booklet.

(a) Describe **two** similarities in their structures, not including the presence of double bonds, methyl groups and nitrogen atoms.

(b) Discuss the problems associated with nicotine consumption, distinguishing between short-term and long-term effects.

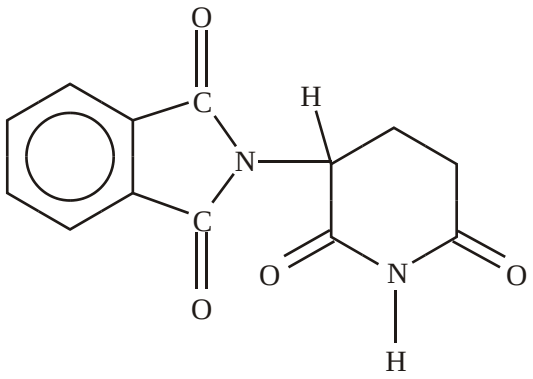
17. (a) State the name of the class of drugs with effects similar to that of adrenaline. Outline **one** effect of these drugs on humans.

(b) (i) Identify the stimulant responsible for addiction to smoking tobacco.

(ii) Describe **two** short-term effects of smoking tobacco.

(iii) Describe **two** long-term effects of smoking tobacco, other than addiction.

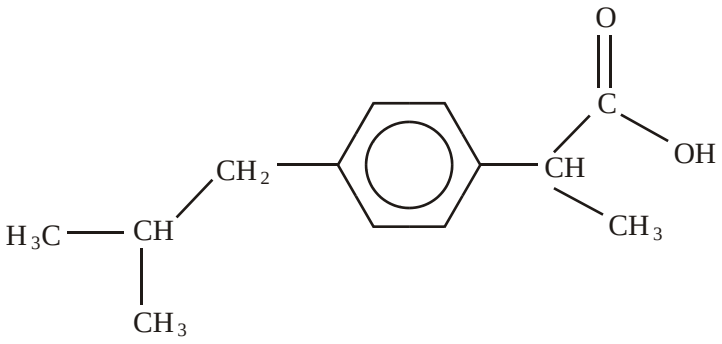
18. Some drug molecules such as Thalidomide exist as stereoisomers. Thalidomide has the structure shown below.



(a) State the type of steroisomerism shown by Thalidomide. Describe the feature responsible for this type of isomerism and identify it by means of a circle on the diagram.

(b) State **one** effect of **each** of these stereoisomers on pregnant women.

19. Ibuprofen is an analgesic with the following structure:



(a) Identify the chiral carbon atom(s) in the structure of ibuprofen using an asterisk (*).

(b) Describe how chiral auxiliaries can be used to synthesize only the desired enantiomeric form of a drug from a non-chiral starting compound. Explain why it is important to use only the desired enantiomeric form of a drug and state an example of what can happen if a racemic mixture is used.

20. (a) Lysergic acid diethylamide (also known as LSD or "acid") and mescaline are both mind-altering drugs. State **one** effect caused by both substances and **one** effect caused by LSD or mescaline only. (*Specify the substance which causes the effect*.)

(b) Outline the structural similarities and differences between LSD and mescaline.
(Structures are given in Table 21 of the Data Booklet.)

21. (a) (i) State the names of **two** anti-cancer drugs which have different types of stereoisomerism. Identify the type of stereoisomerism present in each drug.

(ii) Describe the structural feature of each drug responsible for the type of stereoisomerism.

(b) Discuss the function of a chiral auxiliary in the preparation of one of the drugs.

22. The manufacture of some drugs results in the formation of a racemic mixture. Explain why it is often preferable to use a method which does not form a racemic mixture, giving **one** example of such a drug and its effects.

23. The structures of adrenaline and cisplatin are shown in Table 21 of the Data Booklet. Both compounds exist as stereoisomers.

(a) Describe the structural feature of the adrenaline molecule responsible for this type of isomerism.

(b) Draw diagrams to show the structures of these two stereoisomers, showing clearly the relationship between them. Use the symbol **X** to represent the benzene ring with its attached OH groups.

(c) (i) Identify the **two** types of bonding in the cisplatin molecule and predict the name of its shape and the Cl–Pt–Cl bond angle.

(ii) Draw the structure of the stereoisomer of cisplatin.