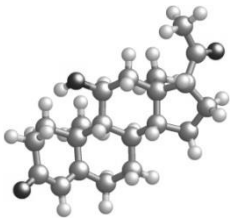


Chem!stry

Name: …… **( )**

Class: ……

Date: …… **/** …… **/** ……

Medicinal Chemistry – End of Unit Test

Name: ……

Register Number: ……

Class: 4 ……

Total out of 35:

Instructions for Candidates:

- Answer **ALL** of the questions on this test paper.
- The duration of this test is **70 MINUTES**.
- The correct answer to each multiple choice question is worth **ONE** mark.
- Read each question carefully and choose the **BEST** single answer from the four options **A**, **B**, **C** and **D**.
- Write your answer **CLEARLY** in the table below.
- Use a pen with only **BLACK** or **DARK BLUE** ink to write your answers.
- Calculators may be used during the test.

1.	**2.**	**3.**	**4.**	**5.**
6.	**7.**	**8.**	**9.**	**10.**
11.	**12.**	**13.**	**14.**	**15.**
16.	**17.**	**18.**	**19.**	**20.**
21.	**22.**	**23.**	**24.**	**25.**
26.	**27.**	**28.**	**29.**	**30.**
31.	**32.**	**33.**	**34.**	**35.**

1. The names that *alchemists* used for their chemicals hundreds of years ago are not the same as the ones that we use today. For example, silver nitrate ($AgNO_3$) used to be called *lunar caustic*, silver chloride (AgCl) was *horn silver*, sulfuric acid (H_2SO_4) was *oil of vitriol*, potassium sulfate (K_2SO_4) was *salt of lemery*, potassium hydroxide (KOH) was *caustic potash*, mercury(I) chloride (Hg_2Cl_2) was *horn quicksilver*, iron(III) chloride ($FeCl_3$) was *oil of Mars*, and ammonium hydroxide solution (NH_4OH) was *spirit of hartshorn*.

Which one of the following old chemical recipes is most likely to be correct?

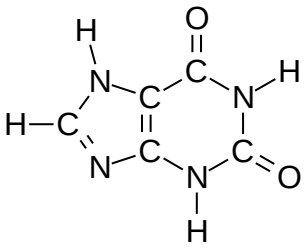
A Mix lunar caustic with horn silver to make oil of vitriol.

B Mix oil of Mars with spirit of hartshorn to make horn silver.

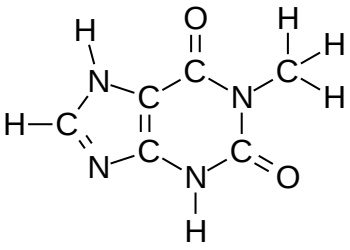
C Mix oil of vitriol with caustic potash to make salt of lemery.

D Mix horn quicksilver with caustic potash to make lunar caustic.

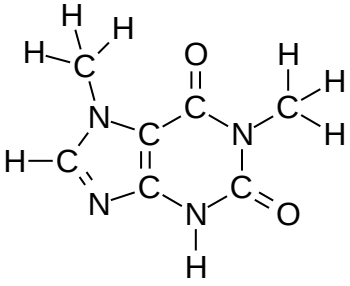
2. Caffeine, a chemical stimulant, is also known as 1,3,7−trimethylxanthine. What is the molecular structure of xanthine?



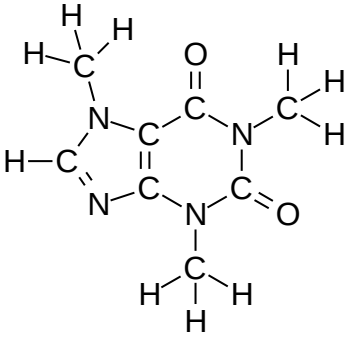
A



B



C



D

3. The structural formula of which drug is shown in *Figure 1*?

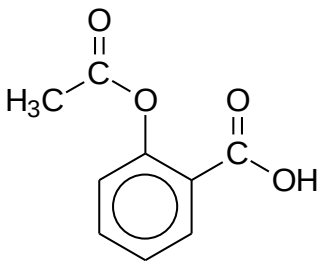


Figure 1.

A Aspirin.

B TCP.

C Paracetamol.

D Ibuprofen.

4. Which of the following is a *disadvantage* of administering a drug to a patient in the form of a tablet?

A Two drugs may be combined within the same tablet.

B No specialist equipment is required.

C It is easy to administer the correct dosage.

D The active drug may be destroyed by the acidic conditions of the stomach.

5. Derivatives of the chemical *curare* are used as muscle relaxants in conjunction with anaesthetics during surgery. What was the original use of curare?

A Used as a drug to treat leukaemia.

B Used as an arrow poison by tribes in South America.

C Used as a pesticide to protect food crops from insects.

D Used as a red pigment to dye fabrics.

6. In medieval Europe, a witch would apply a hallucinogenic drug to her body from a broomstick that had been dipped into a cauldron of plant material. What was the hallucinogenic drug, and from which plant was it extracted?

A Digitalin extracted from *Digitalis purpurea.*

B Atropine extracted from *Atropa belladonna.*

C Taxol extracted from *Taxus brevifolia.*

D Morphine extracted from *Papaver somniferum.*

7. *Figure 2* shows the structure of phenylpenicillin. The shaded four membered ring is essential for penicillin to function as an antibiotic.

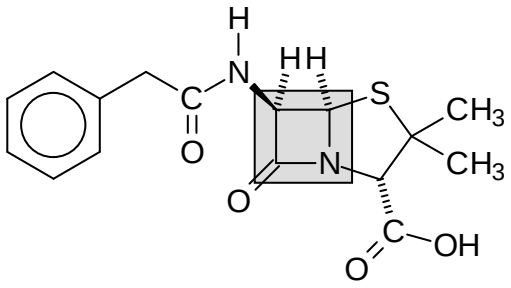


Figure 2.

What name is given to this four membered ring?

A Lactone ring.

B α–Amide ring.

C Cycloamide ring.

D β–lactam ring.

8. Some anticancer and antiviral drugs share the same mode of action. What is this mode of action?

A Inhibition of microtubule formation.

B Inhibition of ATP biosynthesis within mitochondria.

C Inhibition of DNA and RNA biosynthesis.

D Inhibition of passive transport across the cell membrane.

9. For what reason are drugs metabolised by enzymes in the liver?

A To make the drug more water soluble.

B To make the drug less toxic.

C To make the drug more lipid soluble.

D To increase the drug's biological activity.

10. Which of the following methods of administering a drug to a patient allows the drug to have the *fastest* action?

A Subcutaneous injection.

B Intravenous injection.

C Intramuscular injection.

D Tablet taken orally.

11. *Figure 3* shows the structural formula of a nitrogen mustard which is used as an anticancer drug.

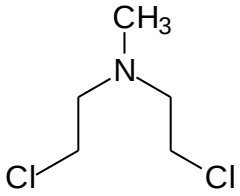


Figure 3.

How was the anticancer activity of the nitrogen mustards discovered?

A It was discovered that mustard gas used during the 1st World War caused a reduction in human white blood cell counts.

B It was initially designed as an antiviral drug but was found to also inhibit cell division.

C The drug was found to occur naturally in certain plant extracts.

D The drug was the first to be successfully designed on a super computer.

12. Who tested and developed *penicillin* as an antibiotic after its discovery in 1928?

A Harold Raistrick.

B Howard Florey.

C Alexander Fleming.

D Joseph Lister.

13. Which class of drug does *aspirin* belong to?

A Non–steroidal anti–inflammatory.

B Sedative.

C Antibiotic.

D Diuretic.

14. For what reason do the Olympic Committee ban the use of pain–killers amongst athletes?

A Because pain–killers stimulate the central nervous system.

B Some pain–killers have anabolic effects on the body.

C Pain–killers can mask the presence of anabolic steroids.

D To prevent athletes from training while injured.

15. The drug AZT is currently used to treat AIDS. What disease was AZT originally designed to treat?

A Bacterial infection of the eye.

B Cancer.

C Rheumatoid arthritis.

D Coronary heart disease.

16. *Figure 4* shows the structural formula of acyclovir. Which *functional group* has been highlighted in the molecule?

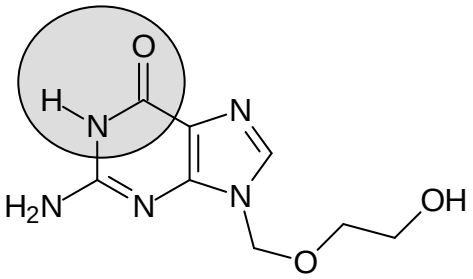


Figure 4.

A Amide.

B Carboxylic acid.

C Ketone.

D Ester.

17. In America in 2003, 102 000 men were diagnosed as having lung cancer. Of these patients, 93 000 died. With what *success* can lung cancer be treated?

A 8.8%

B 91.2%

C 55.5%

D 23.1%

18. How do the anticancer drugs *taxol*, *vinblastine* and *vincristine* exert their therapeutic effect?

A By preventing replication of DNA.

B By interfering with microtubule formation during mitosis.

C By inhibiting ATP biosynthesis within mitochondria.

D By inhibiting passive transport across the cell membrane.

19. Which of the following compounds is highly *carcinogenic*?

A Tetraethyl lead – $Pb(CH_3CH_2)_4$.

B Ethanol – CH_3CH_2OH.

C Benzene – C_6H_6.

D Ethanoic acid – CH_3COOH .

20. What is special about the *retroviruses*?

A None of the retroviruses cause fatal diseases.

B They have an enzyme which can transcribe proteins into DNA.

C They are the only class of virus which can reproduce outside of a host.

D They have an enzyme which can transcribe RNA into DNA.

21. By which mechanism is a benzene ring most likely to react with another chemical species?

A Electrophilic addition.

B Electrophilic substitution.

C Nucleophilic addition.

D Nucleophilic substitution.

22. What is meant by the term *placebo effect*?

A A placebo is a preparation which is pharmacologically inert but which may have a therapeutic effect based solely on the power of suggestion.

B A placebo is a preparation which is pharmacologically inert but which may have a toxic effect based solely on the power of suggestion.

C A placebo is a preparation which is pharmacologically active but which may have a toxic effect based solely on the power of suggestion.

D A placebo is a preparation which is pharmacologically inert but which may have a therapeutic effect based solely on the way the preparation is administered.

23. The drug carboplatin is used to treat cancer. A doctor takes a vial which contains 6.0 g of the drug dissolved in 20.0 cm^3 of water and injects 10.0 cm^3 of this solution into a 1490 cm^3 bag of saline. If the patient must be infused with 2.0 g of carboplatin every hour, what should the flow rate from the saline bag be per minute?

A 8.3 cm^3 / min.

B 11.1 cm^3 / min.

C 16.7 cm^3 / min.

D 33.4 cm^3 / min.

24. Due to mass vaccination by the World Health Organisation, there have been no reported cases of which viral disease since 1978?

A Rubella.

B Meningitis.

C Smallpox.

D Acquired immunodeficiency virus.

25. How is the hormone *insulin* administered to a patient?

A Intravenous injection.

B Subcutaneous injection.

C Intramuscular injection.

D Intradermal injection.

26. *Figure 5* shows a cell undergoing mitosis.

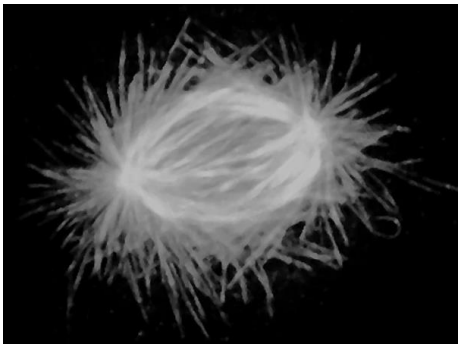


Figure 5.

After seeing photographs similar to the one in *Figure 8*, Professor Barnett Rosenberg was encouraged to carry out research which ultimately led to the discovery of which drug?

A AZT.

B Acyclovir.

C Vinblastine.

D Cisplatin.

27. A patient presents themselves to you with a large tumour located in their lungs that has spread through their body by metastasis. What treatment would you recommend to the patient?

A Surgery.

B Surgery and radiotherapy.

C Chemotherapy.

D Surgery and chemotherapy.

28. How do the group of anticancer drugs known as the nitrogen mustards inhibit cell division?

A They inhibit microtubule formation during mitosis.

B They covalently bond to bases on the same strand of DNA.

C They covalently bond to bases on different strands of DNA.

D The over stimulate microtubule formation during mitosis.

29. Why are injections given into veins rather than arteries?

A Arteries have a recognisable pulse; veins do not have a recognisable pulse.

B Arteries do not contain valves; veins contain valves.

C Arteries carry oxygenated blood; veins carry deoxygenated blood.

D Arteries carry blood under high pressure; veins carry blood under low pressure.

30. Butan-1-ol is heated with acidified potassium dichromate(VI) using distillation apparatus. What is formed as a result of this reaction?

A Butanal is the only organic reaction product.

B Butanone is the only organic reaction product.

C Butanone and butanoic acid are the only organic reaction products.

D Butanal and butanoic acid are the only organic reaction products.

31. The structural formula of propanoic acid is shown in *Figure 6*.

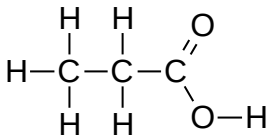


Figure 6.

Propanoic acid can be reduced in the laboratory using sodium tetrahydridoborate(III) (formula – $NaBH_4$). What product(s) *could* be formed when propanoic acid is reduced?

A. Only propanone.

B. Both propanone and propan-2-ol.

C. Only propanal.

D. Both propanal and propan-1-ol.

32. Which of the following 0.1 mol dm^{-3} aqueous solutions is *most likely* to have a pH value of 6?

A. Phenol.

B. Ethanoic acid.

C. Ethanol.

D. Ethyl ethanoate.

33. Which of the following is a unique chemical test for an *aldehyde*?

	Test Reagent:	**Observation:**
A.	Sodium hydrogencarbonate.	Effervescence.
B.	2,4-dinitrophenylhydrazine.	Orange precipitate.
C.	Fehling's Solution.	Blue solution yields a brick red precipitate.
D.	Bromine water.	Orange to colourless colour change.

34. The structure of benzene is shown in *Figure 7*.

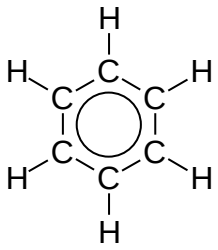


Figure 7.

What does the circle in the centre of the hexagon represent?

A. Delocalised π-bonding electrons in sp^3 hybridised orbitals.

B. Delocalised σ-bonding electrons in sp^3 hybridised orbitals.

C. Delocalised π-bonding electrons in sp^2 hybridised orbitals.

D. Delocalised σ-bonding electrons in sp^2 hybridised orbitals.

35. What is meant by the term *drug tolerance*?

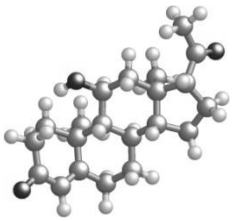
A The drug will no longer be able to exert therapeutic effect.

B The dosage of the drug needs to be increased to achieve the same therapeutic effect.

C The drug exerts a toxic effect in addition to the therapeutic effect.

D The drug causes many undesirable side-effects which can be moderated with lower dosage.

+ + + **End of Paper** + + +



Chem!stry

Name: …… **( )**

Class: ……

Date: …… **/** …… **/** ……

Medicinal Chemistry – End of Unit Test

Name: **Mark Scheme**

Register Number: **XX**

Class: **4 XX**

Total out of 35:
35

Instructions for Candidates:

- Answer **ALL** of the questions on this test paper.
- The duration of this test is **70 MINUTES**.
- The correct answer to each multiple choice question is worth **ONE** mark.
- Read each question carefully and choose the **BEST** single answer from the four options **A**, **B**, **C** and **D**.
- Write your answer **CLEARLY** in the table below.
- Use a pen with only **BLACK** or **DARK BLUE** ink to write your answers.
- Calculators may be used during the test.

1. C	**2. A**	**3. A**	**4. D**	**5. B**
6. B	**7. D**	**8. C**	**9. A**	**10. B**
11. A	**12. B**	**13. A**	**14. D**	**15. B**
16. A	**17. A**	**18. B**	**19. C**	**20. D**
21. B	**22. A**	**23. C**	**24. C**	**25. B**
26. D	**27. D**	**28. C**	**29. D**	**30. A**
31. D	**32. A**	**33. C**	**34. C**	**35. B**