

1. (a) rectally/by suppository, by inhalation, by injection (parenterally),
by applying to skin/topically; 2
*[2] for three, [1] for two. Award [1 max] if intravenous,
subcutaneous and intramuscular are given.*
- (b) an effect produced as well as the one intended/unwanted or undesired effect; 1
[3]
2. intramuscular/into muscles;
intravenous/into veins;
subcutaneous/into fat;
(Award [2] for three correct [1] for two or one correct);
- intravenous;
the drug is circulated/transported quickly via the blood stream
(to various parts of the body); 4
Accept parenteral (other than by mouth).
[4]
3. (a) hydrochloric acid/HCl; 1
- (b) $Mg(OH)_2 + 2HCl \rightarrow MgCl_2 + 2H_2O$;
 $NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$; 2
*Accept equations with H^+ instead of HCl / OH^- instead of
 $Mg(OH)_2$ and HCO_3^- instead of $NaHCO_3$.*
- (c) $Al(OH)_3$;
neutralize 0.03 mol of H^+ /contains three OH^- ions/OWTTE; 2
Do not award second mark if other than $Al(OH)_3$ chosen
[5]
4. (a) $Mg(OH)_2 + 2HCl \rightarrow MgCl_2 + 2H_2O$ / $Al(OH)_3 + 3HCl \rightarrow AlCl_3 + 3H_2O$;
*Award [1] for correct reactants and products and [1] for
balancing.* 2
- (b) $Al(OH)_3$ /aluminium hydroxide; 1
- (c) corrosive to body/tissue/strong base/alkali; 1
[4]
5. (a) bacteria;
interfere with cell wall formation;
prevent formation of cross-links (within wall);
size/shape of cell cannot be maintained;
water enters the cell/osmosis occurs;
cell bursts/disintegrates; 4 max
Award [1] each for any three of the last five points.
- (b) (overprescription) makes penicillins less effective; they destroy useful bacteria;
allow a resistant population to build up/OWTTE; 3
[7]

6. (a) $C_{16}H_{18}O_4N_2S$; 1
Accept elements in any order
- (b) prevents deactivation by stomach acid/more resistant to stomach acid;
prevents deactivation by the enzyme penicillinase (produced by bacteria)
/increases resistance/tolerance to penicillinase; 2
- (c) penicillin interferes with the cell wall formation;
cells can expand/burst/disintegrate/bacteria die; 2
- (d) makes penicillin less effective;
destroys useful/beneficial bacteria;
allows resistant population to build up; 2
Award [1] each for any two.
- [7]**
7. (a) bacteria are larger/viruses are smaller;
bacteria are cellular/viruses are non-cellular;
bacteria have/nucleus/cytoplasm/cell membrane/organelles/
opposite for viruses;
bacteria can feed/excrete/respire/grow outside cells/opposite for viruses;
Accept "bacteria are living whereas viruses are non-living".
viruses insert DNA/RNA into cells/rely on a host cell to reproduce;
bacteria multiply by cell division/binary fission/mitosis/meiosis;
Award [1] each for any four. 4 max
- (b) they alter the host cell's genetic material;
they prevent the virus from multiplying;
they alter the virus's binding site on the cell wall/they alter
the structure of the cell wall to prevent the virus entering;
they prevent viruses from leaving the cell; 2 max
Award [1] each for any two.
- [6]**
8. (a) bacteria multiply by cell division/binary fission/mitosis;
viruses insert DNA/RNA/genetic material into cells; 2
*For "bacteria multiply by themselves but viruses require a host
cell"/OWTTE award [1].*
- (b) block enzyme activity within host cell/block reverse transcriptase;
alter host cell's genetic material;
prevent virus from multiplying/replicating;
alter virus's binding site on cell wall/prevent virus binding with cell wall;
prevent virus from entering/leaving cell; 2
Award [1] each for any two.
- (c) HIV virus mutates rapidly;
HIV metabolism linked to that of host cell/HIV uses host cell;
Drugs harm host cell as well as HIV/difficult to target HIV without damaging
host cell; 2
- [6]**
9. (a) *mild analgesics*
they prevent/interfere with the production of substances/prostaglandins
that cause pain;
they intercept pain at its source;
strong analgesics
they bond to receptor sites in the brain;
pain signals within brain/spinal cord blocked; 4

	(b) (i)	CH ₃ CO/COCH ₃ ; <i>Do not accept ester group/CH₃COO.</i>	1
	(ii)	<i>acetaminophen (paracetamol)</i> amide; hydroxy(l)/phenol/alcohol; <i>ibuprofen</i> carboxylic acid; <i>Do not accept carboxyl.</i> <i>Ignore any formulas even if wrong.</i>	3
	(iii)	ibuprofen; asymmetric/chiral carbon atom/carbon atom joined to four different groups; <i>Award second mark even if ibuprofen not chosen.</i>	2
			[10]
10.	(a)	<i>mild analgesic</i> intercepts pain at the source/ <i>OWTTE</i> ; by interfering with the production of substances/(enzymes) that cause pain/prostaglandins/ <i>OWTTE</i> ; <i>strong analgesic</i> binds to pain receptors in the brain; preventing the transmission of nerve impulses;	4
	(b) (i)	<i>advantage</i> prevents inflammation/thins blood/effective against blood clots/prevents strokes/quick acting/prevents the recurrence of heart attacks/relieves symptoms of arthritis/rheumatism/reduces fever; <i>disadvantage</i> irritates the stomach lining/produces allergic reactions/Reye's syndrome/causes stomach bleeding/causes stomach ulcers;	2
	(ii)	increases the risk of stomach bleeding/haemorrhage/enhances depression of CNS;	1
	(iii)	may cause kidney/liver damage;	1
11.	(a) (i)	antipyretic/reducing fever;	1
	(ii)	anti-inflammatory/anti-clotting/prevention or treatment of heart attacks/strokes;	1
	(b) (i)	ether; alkene/carbon to carbon double bond; (tertiary) amine; <i>Award [1] each for any two.</i>	2
	(ii)	<i>main effect</i> pain relief; <i>side effect</i> constipation;	2
12.	(i)	14/14.03 (<i>ignore units</i>);	1
	(ii)	increasing amounts needed to produce same effect; increasing amounts cause damage/death;	2

[3]

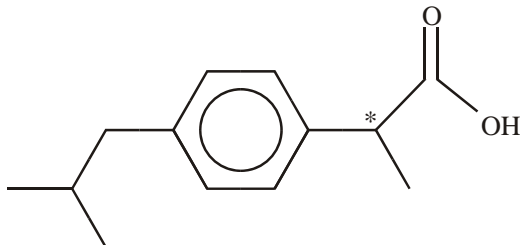
13. (a) oxidizing agent/accepts electrons;
orange to green; 2
- (b) gas-liquid/chromatography;
infra-red spectroscopy; 2
- (c) stomach bleeding; 1
14. potassium dichromate(VI) (*oxidation number and presence of acid not essential*);
orange to green;
redox (*accept reduction/oxidation*); 3
15. (a) (tertiary) amine; 1
- (b) amide; 1
- (c) basic;
N atoms can accept H^+ ions from water/forms OH^- ions in the solution; 2
- (d) anxiety;
irritability;
sleeplessness; 1
increase in urine output;
Award [1] for any two.
- increased blood pressure;
reduction in urine output; 1
Award [1] mark for any two.
- (f) sympathomimetic drug mimics the effect of adrenaline/stimulates the
sympathetic nervous system; 2
amphetamines/methamphetamines/speed/ecstasy;
16. (a) *both contain*
six-membered ring;
five-membered ring;
(tertiary) amine group;
N- has methyl group attached; 2 max
Award [1] each for any two.
- (b) *short-term effects*
increased heart rate/blood pressure/restriction of blood vessels;
acts as an anti-diuretic/reduction in urine output;
- long-term effects*
increased risk of heart disease/coronary thrombosis;
risk of becoming addicted/physically dependent;
high cost;
(increased risk of) (lung, mouth, throat) cancer;
(increased risk of) bronchitis/emphysema;
reduction in capacity of blood to carry oxygen;
withdrawal symptoms/weight gain (on quitting); 6 max
Award [1] each for any six, provided at least one short-term effect given.

17. (a) amphetamines/stimulants;
increased heart rate/increased blood pressure/increased breathing rate
/dilation of pupils/constriction of arteries/sweating/increased alertness
/decreased appetite; 2
- (b) (i) nicotine; 1
Accept nicotin.
- (ii) increased heart rate;
increased blood pressure;
reduced urine output;
increased concentration/stimulating effect; 2
Award [1] each for any two.
- (iii) increased risk of cancer;
increased risk of stroke/(coronary) thrombosis/heart disease;
ulcers;
emphysema/bronchitis/shortage of breath;
coughing/bad breath/yellowing of teeth or fingers;
effect on pregnancy; 2
Award [1] each for any two.

18. (a) optical;
chiral/asymmetric carbon atom/carbon joined to 4 different atoms;
circle on diagram (around CH joined to N); 3
- (b) alleviates morning sickness;
causes (limb) deformation in fetus; 2

[5]

19. (a)



1

- (b) a chiral auxiliary is itself an enantiomer;
it is bonded to the reacting molecule to create the stereochemical conditions
necessary to follow a certain pathway;
once the desired enantiomer is formed the auxiliary is removed;
different enantiomers may have different biological effects, some of which may
be harmful;
genetic defects/deformities/other suitable example; 5

[6]

20. (a) cause changes in visual and sound perception/hallucinations;
LSD may cause a permanent effect of “flashbacks”/effects of LSD
may be experienced a year or more after the last use of the drug/
psychological dependence; 2

OR

mescaline may cause nausea/trembling/liver damage/reduce appetite;

(b) both contain amines/aromatic (benzene) ring;

<i>mescaline</i>	<i>LSD</i>
primary amine	secondary and tertiary amine
ether groups	amide
one ring	alkene(s)
	indole ring
	four cyclic rings
	heterocyclic

2

Accept any one clear difference from the above list.

[4]

21. (a) (i) cisplatin and geometric/cis-trans isomerism;
Taxol[®] and optical isomerism;

2

Accept other correct examples.

(ii) atoms/groups arranged differently in space/*OWTTE*;
chiral/asymmetric carbon atom/carbon joined to 4 different
atoms/groups;

2

(b) chiral auxiliary attaches to starting molecule;
chosen reagents convert starting molecule into only one enantiomer;
chiral auxiliary removed to leave desired enantiomer;
chiral auxiliary is itself optically active/possess a chiral atom;

2

Award [1] each for any two.

[6]

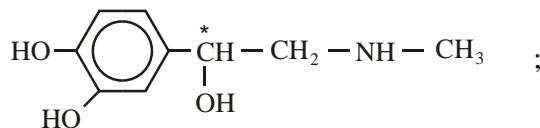
22. one enantiomer has beneficial/desired effect;
the other enantiomer no effect/harmful effect/waste of material/more clinical trials necessary;
thalidomide;
one thalidomide enantiomer relieves symptoms of morning sickness while the other isomer
can cause birth defects;

Accept alternatives, e.g.

ibuprofen;
one enantiomer much more effective;
taxol;
one enantiomer much more effective;

23. (a) asymmetric/chiral carbon atom/4 different groups around carbon atom/

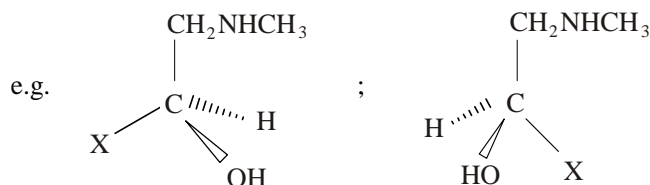
1



[4]

(b) one correct 3-D structure;
second structure clearly shown as correct isomer;

2



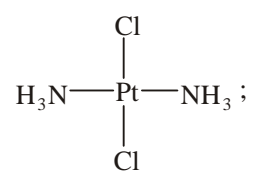
Accept diagrams that make it clear they are mirror images even though not perfect 3-D representations but must have the chiral carbon at the centre of the molecule.

(c) (i) covalent and coordinate/dative (covalent);
square planar;
90°;

3

(ii)

1



[7]