1. (a) amide;  
   Do not accept carbonyl/ketone.  
   
   (b) (tertiary) amine;  
   
2. (i) (sympathomimetic drug) mimics the effect of adrenaline / stimulates the sympathetic nervous system;  
   
   (ii) amphetamine / methamphetamine / speed / ecstasy / cocaine;  
   
3. ethanol can interact with / enhance the effect of other drugs;  
   with aspirin increased bleeding of the stomach lining/peptic ulcers or other suitable example and their effect, such as sedatives, tranquilisers;  
   
4. (a) \[\text{Al(OH)}_3 + 3\text{HCl} \rightarrow \text{AlCl}_3 + 3\text{H}_2\text{O} / \text{Mg(OH)}_2 + 2\text{HCl} \rightarrow \text{MgCl}_2 + 2\text{H}_2\text{O};\]  
   Accept ionic equations.  
   
   (b) less effective and (magnesium hydroxide) 2/0.2 mol OH\(^-\) ions available as compared to (aluminium hydroxide) 3/0.3 mol OH\(^-\) ions for neutralization / neutralizes 2H\(^+\)/0.2 mol acid as compared to 3H\(^+\)/0.3 mol acid;  
   Do not accept aluminium hydroxide can neutralize more acid.  
   
   (c) strong base / corrosive / harmful to the body;  
   
   (d) Alginates:  
   provide a neutralizing layer on top of the stomach contents / to prevent acid rising up the esophagus / prevents acid reflux/heartburn;  
   Dimethicone:  
   as an anti-foaming agent / to prevent flatulence/gas/bloating;  
   
   [2]
5. viruses do not have cell/cellular structure; 
viruses do not have nucleus; 
viruses do not have cell wall; 
viruses do not have cytoplasm; 2 max
Accept opposite statements for bacteria.

6. (a) benzene/aromatic ring; 
amine/amino; 2
(b) secondary/tertiary amine; 
Do not accept amine. 
amide; 
Do not accept carbonyl / ketone. 
alkene/C=C double bonds; 
indole ring; 2 max

7. (a) (fluoxetine) amino group and reagent HCl/hydrochloric acid/acid/H⁺; 
(aspirin) carboxylic acid group and NaOH/sodium hydroxide/base/OH⁻; 2
Allow [I] for the two correct functional groups.
(b) increases aqueous/water solubility; 
facilitates distribution in the body; 2

8. (i) administered by injection; 1
(ii) (temporarily) bond to receptor sites in the brain/CNS; 
prevent the transmission of pain impulses; 2
(iii) ester; 1
9. (a) if concentration is too high it will have harmful side effects / determination of the lethal dose (to 50 % of the population) / OWTTE; if concentration is too low it has little or no beneficial effect / determination of the effective dose / dose which has a noticeable effect (on 50 % of the population) / OWTTE; therapeutic window is the range between these doses / range over which a drug can be safely administered / ratio of LD_{50}:ED_{50}; for minor ailments a larger window is desirable, for serious conditions a smaller window may be acceptable / OWTTE; (therapeutic window) depends on the drug/age/sex/weight; a small therapeutic window means that an overdose is a high risk / OWTTE; 4 max

(b) placebo contains none of the compound being tested as a drug; placebo can “fool” the body into healing itself / OWTTE; placebo is used as a control to measure the effectiveness of a drug / OWTTE; half/some of trial group given placebo and half/some given drug; patients and administrators should not know who gets a placebo and who gets a drug / double blind trial; 3 max

(c) LD_{50} / ED_{50}; risk:benefit ratio; side-effects; tolerance; 1 max [8]

10. (i) synthesis of large numbers of compounds using a variety of starting materials; automated process reacts a small number of compounds with a variety of reagents; (to produce) a large number of products; mix-and-split technique; small amounts of compounds are attached to resin/beads; library of many different but related compounds; compounds are tested for biological activity/effectiveness as possible drugs; parallel synthesis can produce smaller, more focused libraries; 3 max

(ii) purification of the product is relatively easy / product can be isolated by washing and filtration; 1 [4]

11. (a) prostaglandins are involved in the transmission of pain impulses (to the brain) / OWTTE; 1
(b) morphine (temporarily) bonds to/inhibits receptor sites in the brain (without depressing central nervous system) / OWTTE; 1

(c) causes blood disorders; causes damage to kidney; causes damage to liver; causes damage to brain; 2 max

(d) preventing (recurrence of) heart attacks/strokes / reduces blood clotting / thins the blood / anti-inflammatory; 1

(e) (i) phenol / alcohol / hydroxyl; 1

(ii) ester; 1

12. (a) penicillins interfere with the enzymes that bacteria need to make cell walls / interfere with formation of bacterial cell wall / OWTTE; the increased osmotic pressure causes the bacterium to die / the bacterial cells absorb too much water and burst / OWTTE; 2

(b) resistant to penicillinase enzyme / more resistant to bacteria breaking it down / effective against bacteria which are resistant (to penicillin G); resistance to breakdown by stomach acid (so can be taken orally) / OWTTE; 2

(c) bacteria which cause TB are extremely resistant to penicillins so a mixture of different antibacterials is used / OWTTE; 1

13. (a) diazepam/Valium®, nitrazepam/Mogadon®, alcohol/ethanol; Accept other correct depressants. 3

(b) sedation/relaxation/soothing/reduction of anxiety/reduces heart rate / dilates blood vessels / OWTTE; Accept sleepiness. 1