

Question	Answer	Marks	Guidance
1(a)(i)	proton acceptor; M2 does not accept (protons) readily OR less able to accept protons (than strong bases);	2	A alternative words to 'acceptor' e.g. 'receiver' I references to pH A 'hydrogen ion' or 'H ⁺ ' for proton I accepts fewer/less protons
(a)(ii)	M1 same <u>concentration</u> of both bases; M2 measure their pH; M3 the higher pH is the stronger base;	3	A suitable method e.g. universal indicator or pH paper or pH meter I litmus or methyl orange or phenolphthalein I titration methods for M2 and M3 A suitable colours of both weak strong bases e.g. ethylamine is (greeny)blue, NaOH is darker blue/purple A alternative methods for M2 and M3 e.g. measure conductivity (M2) and high conductivity is the stronger base (M3) e.g. add aluminium / Al (M2) and stronger base gives faster rate of effervescence / more fizzing / more bubbling (M3)
(b)(i)	$3\text{CH}_2\text{NH}_2 + \text{H}_2\text{SO}_4 \rightarrow (\text{CH}_3\text{CH}_2\text{NH}_3)_2\text{SO}_4$ species; balancing; the salt is ethylammonium sulfate;	3	A multiples I state symbols A one mark for correct product A close spellings A diethylammonium sulfate

Question	Answer	Marks	Guidance
(b)(ii)	sodium hydroxide / calcium hydroxide / NaOH / Ca(OH) ₂ ;	1	any Group 1 or Group 2 hydroxide or oxide
(c)(i)	<p>Any two from:</p> <p>(particles move in) random motion;</p> <p>(particles) collide;</p> <p>(particles) move from a region of high concentration to low concentration;</p>	2	<p>A alternative phrases for collide</p> <p>A down a concentration gradient</p>
6(c)(ii)	<p>M2 it has a lower (relative) molecular mass (than HBr);</p> <p>M3 ethylamine diffuses faster (than HBr);</p>	3	<p>A ethylamine is less dense</p> <p>A ethylamine is a lighter molecule but</p> <p>I 'ethylamine is lighter'</p> <p>I ethylamine is a smaller molecule</p> <p>A ethylamine molecules or particles move faster</p> <p>A ECF for M2 and M3 if A is given e.g. HBr diffuses faster for M3 because it is a lighter molecule for M2</p> <p>A ECF for M2 if B is given e.g. they diffuse at same rate for M3 because molecules weigh the same for M2</p>

2 (a) (i) two atoms per molecule [1]

(ii) 7e in outer shell or level / same number of outer electrons / need to gain one electron [1]

(iii) different number of energy levels / different number of electrons [1]

(iv)

halogen	solid, liquid or gas at room temperature	colour
chlorine	gas	yellow / yellow green / green
bromine	liquid	<u>brown</u> / <u>red-brown</u> / <u>orange-brown</u> not: red / orange
iodine	solid	black / grey / silver-grey / purple / violet NOT : blue-black

NOTE: one mark for each vertical column

[2]

(b) correct formula, AsF₃ [1]

3nbps and 1bp around all 3 fluorine atoms [1]

3bps and 1nbp around arsenic atom [1]

(c) (increased) light increases / causes forward reaction / light causes

AgCl reacts with CuCl [1]

(increased) light increases the amount of silver (and so darkens glass) [1]

decrease in light reverses reaction / uses up silver / silver reacts (and so reduces darkness)[1]

[Total: 11]

- 3 (a) (i) photosynthesis or a photochemical reaction [1]
not an example, question requires a process
not devices which convert light into electricity
- (ii) cell [1]
accept battery
not generator
- (b) (i) correct formula [1]
cond following marks conditional on correct formula
 If covalent mark 1 only
 correct charges [1]
 6x and 2o around anion [1]
 do **NOT** penalise for incorrect coding
ignore electrons around potassium
- (ii) correct formula [1]
 If ionic mark 1 only
cond
 2 bp and 2 nbp around selenium [1]
 1 bp and 3 nbp around both chlorine atoms [1]
- (iii) the ionic compound
 higher melting point / boiling point / less volatile
 conducts when molten or aqueous, covalent compound does not
 is soluble in water, covalent is not / ionic insoluble in organic solvents, covalent soluble
 in organic solvents
 harder
 any **two** [2]
note there has to be comparison between the ionic compound and the covalent
 compound
not density
- (c) base [1]
not alkali
 accepts a proton [2]
 accepts hydrogen ion / H⁺ **only** [1]
 proton and H⁺ [2]

- 4 (a) 3 bp and 1nbp around phosphorus [1]
1 bp and 3nbp around each chlorine [1]



- (ii) acid solutions same concentration [1]
measure pH/pH paper/Universal indicator [1]
hydrochloric acid lower pH [1]

colours of Universal indicator can be given as red<orange<yellow
ignore precise pH values as long as HCl is lower than H_3PO_3

OR Acid solutions same concentration [1]
add magnesium or any named metal above Hydrogen in reactivity series but not above magnesium
calcium carbonate or any insoluble carbonate [1]
hydrochloric acid react faster/shorter time [1]

OR acid solutions same concentration [1]
measure electrical conductivity [1]
hydrochloric acid better conductor/bulb brighter [1]

OR acid solutions same concentration [1]
add sodium thiosulphate [1]
hydrochloric acid forms precipitate faster/less time [1]

- (iii) sodium hydroxide/sodium carbonate [1]
titration **cond** on correct reagent [1]
second mark scores for mention of titration /burette/pipette/indicator.
experimental detail not required

any named soluble calcium salt e.g. calcium chloride/nitrate/hydroxide [1]
precipitation/filter/decant/centrifuge

