

- M1.(a)** sodium loses (electron)
sharing / covalent / metallic = max 2 1
- chlorine gains (electron) 1
- 1 **or** an (electron) 1
- (b) (i) Have no overall electric charge 1
- (ii) Should iodine be added to salt? 1
- reason
any **one** from:
- cannot be done by experiment
accept difficult to get / not enough evidence
 - based on opinion / view
allow must be done by survey
 - ethical **or** economic issue. 1
- (c) (i) nitric (acid) 1
- (ii) an alkali 1
- (iii) indicator
accept any named acid base indicator 1
- (d) (i) Crystallisation 1
- (ii) fertiliser
allow to help crops grow 1

- (iii) any **one** from:
- pressure
allow concentration
 - temperature
ignore heat
 - catalyst.

1
[12]

M2.(a) natural gas

allow correct answer shown in box if answer line blank

1

(b) (i) 450

allow correct answer shown in box if answer line blank

1

(ii) iron

allow correct answer shown in box if answer line blank

1

(iii) The catalyst lowers the activation energy.

1

(c) (the gases are) cooled

1

ammonia condenses

allow ammonia liquefies

1

nitrogen and hydrogen are recycled

if no other mark awarded allow ammonia is separated for 1 mark

1

[7]

M3.	(a)	(i)	10	1
		(ii)	OH ⁻	1
	(b)	(i)	air	1
		(ii)	particles move faster	1
			particles collide more often	1
		(iii)	catalyst(s)	1
	(c)		liquid	1

[7]

- M4.** (a) increases 1
- (b) the reaction is reversible 1
- (c) A liquid 1
- (d) recycled / reused (owtte) 1
accept returned to pump / start
- [4]

- M5.** (a) pressure 1
- (b) nitrogen 1
- hydrogen 1
- (c) cooled 1
- [4]

- M6.** (a) (i) nitrogen + hydrogen → ammonia
accept full correct balanced equation 1
- (ii) reversible (reaction) (owtte)
do not allow just 'backwards' (unqualified) 1
- (iii) catalyst / speed up reaction
accept to lower activation energy 1
- (iv) boiling point 1
- (v) recycled (owtte) 1
- (b) (i) used to make explosives (owtte) used to make medicines (owtte) 1
- (ii) used to make fertilisers (owtte) 1
- (c) (i) sensible answers such as
provides workers (owtte)
good transport links
ignore reference to raw materials 1
- (ii) sensible idea 1
- linked reason
idea
linked reason
eg escape of chemicals /fumes /waste gases / pollution
harmful to health / environmental damage owtte
do not allow harmful / damage / smell (unqualified)

risk of explosion

because of high pressures / may endanger local people / dangerous

risk of fire

because of high temperatures / may endanger local people

noise

*any detrimental effect on quality of life **or** night and day*

lorries / traffic

danger / noise / pollution etc

unsightly

detrimental effect on quality of life / house prices / reduced tourism

uses a lot of land

loss of habitats

1

[10]

- M7.** (i) potassium hydroxide
accept correct formulae 1
- water 1
- (ii) fertiliser 1
- (iii) H⁺
*accept hydrogen but **not** H* 1
- [4]**

- M8.** (a) put on soil **or** for plants
*accept land **or** field **or** garden **or** crops **or** plants*
accept alternative answer to provide more food for increased population
- for growth
*accept to improve plant yield **or** help them grow*
*accept to replace **or** add nutrients (**not** nitrates) **or** minerals*
***or** to make plants grow better **or** for healthy plants*
*do **not** accept to make soil fertile **or** to feed plants* 2
- (b) (i) 2 1
- (ii) 80 1
- [4]**