

M1.(a) reversible

allow equilibrium

1

(b) The colour changed from blue to pink

1

(c) 8.3 (°C)

1

(d) endothermic

allow dehydration

ignore reversible

1

[4]

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) reversible 1

(b) (from blue) to pink
do not accept
incorrect initial colour 1

(c) sensible answers such as:

- stop water reaching papers
accept stop entry of moisture / wet / dampness / condensation
- water (vapour) in air
ignore references to toxicity of cobalt chloride

1

[3]

M4.	(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]

M5.	(a)	22	1
	(b)	(i) exothermic	1
		(ii) C	1
		gives out most heat energy <i>accept has largest temperature change / increase</i> <i>allow has highest (final) temperature or hottest</i>	1
	(c)	(i) increases	1
		(ii) blue <i>ignore pale / dark etc</i>	1
		(iii) reversible (reaction) <i>allow goes both ways or two / either way</i>	1
		(iv) <u>anhydrous</u> copper sulfate	1

[8]

M6.	(a)	gases	1
		white	1
		solid	1
		ammonium chloride	1
	(b)	reversible	
		<i>allow phonetic spelling</i>	
		<i>allow goes both / two / either way(s)</i>	1

[5]

- M7.** (a) increases 1
- (b) the reaction is reversible 1
- (c) A liquid 1
- (d) recycled / reused (owtte)
accept returned to pump / start 1
- [4]

- M8.** (a) white to blue
accept colourless to blue 1
- (b) reversible 1
- [2]

- M9.** (a) water
accept H₂O or 5H₂O
 2 must be below halfway 1
- (b) the cold water / ice / cubes (owtte)
accept 'cooled down' or references to cold 1
- (c) reversible reaction 1
- (d) (i) 0.87g 1
- (ii) the student made errors in weighing during
 the experiments 1
- the student did not heat the copper sulfate for long enough in one of the experiments 1
- (e) white 1
- blue
allow 1 mark for blue to white 1

[8]

- M10.**
- (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]