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

accept has largest temperature change / increase

*allow has highest (final) temperature **or** hottest*

1

(c) (i) increases

1

(ii) blue

ignore pale / dark etc

1

(iii) reversible (reaction)

*allow goes both ways **or** two / either way*

1

(iv) <u>anhydrous</u> copper sulfate

1

[8]

M6. (a) gases

1

white

1

solid

1

ammonium chloride

1

(b) reversible

allow phonetic spelling

allow goes both / two / either way(s)

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 H_2O **or** $5H_2O$*

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]