AQA GCSE CHEMISTRY (HIGHER) · 8462

CHEMISTRY



MARK SCHEME

4.8.2 IDENTIFICATION OF COMMON GASES (PACK 2)

SCORE	PERCENTAGE
/189	%

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Q1.

(a) 83 (cm^3)

allow 83.0 / 83.00

1

(b) mass of magnesium powder

1

temperature of hydrochloric acid

1

(c) $\frac{(46 + 47 + 49)}{3}$

*allow 47.3(333) (cm^3) for **1** mark*

1

= 47 (cm^3) (2 sf)

*an answer of 43 (cm^3) scores **1** mark*

1

*an answer of 47 (cm^3) scores **2** marks*

(d) all points plotted correctly (inc 0,0)

allow a tolerance of ±½ a square
*allow ecf from question **(c)***
ignore line
*allow **1** mark for four points plotted correctly*

2

(e) $\frac{80}{50}$

allow 80 ± 2

1

= 1.6 (cm^3/s)

allow 1.60 ± 0.04

1

*an answer of 1.6 (cm^3/s) scores **2** marks*

(f) rate is greatest at start

allow rate is faster at start

1

(then) rate decreases

allow (then) rate slows down

1

reaction stops

1

(g) there are more particle collisions each second

1

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there are more particles in the same volume

1

(h) (gas is) not carbon dioxide

ignore does not react with limewater

1

(i) hydrogen

allow H_2

1

pop sound

1

[17]

Q2.

(a) fermentation

1

(b) (i) turns cloudy / milky / white

ignore bubbles

1

because carbon dioxide is produced

allow CO_2 produced

1

(ii) filter paper

1

[4]

Q3.

(a) (i) fizz / effervescence / bubbles

allow calcium carbonate decreases in size or dissolves

1

because carbon dioxide produced / released

allow because gas produced / released

1

limewater turns cloudy / milky / white

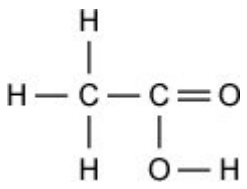
1

because (a precipitate of or solid) calcium carbonate forms

allow because of carbon dioxide if not already credited

1

(ii)



allow -OH

do not allow lower case 'h'

1

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(iii) acid

must be in this order
ignore any name of an acid

1

ester(s)

1

(b) white (precipitate) no change

no change no change

all four correct 2 marks
any two correct 1 mark

2

(c) (i) lilac

allow purple

1

red

1

must be in this order

(ii) colours are masked / changed by each flame colour

1

[12]

Q4.

(a) (i) copper is less reactive than hydrogen **or** copper is unreactive

1

(ii) Zinc and dilute hydrochloric acid

1

(b) (gas) syringe

1

(c) (i) 35

allow 3

1

because not close to others

accept it is <u>much</u> lower than the others
ignore references to trends or patterns
dependent on the first mark

1

(ii) (49 + 50 + 48) / 3

= 49

*correct answer with or without working gains **2** marks*

1

*allow ecf from anomaly identified in (i) for **2** marks:*

- *Exp 1 anomalous gives 43.3*

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- *Exp. 2 anomalous gives 44*
- *Exp. 4 anomalous gives 44.7*

*answer of 45.5 or 46 (anomaly not excluded) gains **1** mark*

*correct working **excluding anomaly** but with wrong answer gains **1** mark*

1

(iii) so that a mean can be calculated

*accept improves accuracy of the mean **or** so anomalies can be identified / discarded **or** to reduce effect of random errors*

ignore makes it a fair test

ignore reliability, validity, repeatability, reproducibility

1

(d) (i) idea of mixing with oxygen / air, letting air / oxygen in

accept converse

1

(ii) H_2O

do not accept incorrect additional products

1

balancing 2 … (1) … 2

allow fractions or multiples

dependent on first mark

1

[11]

Q5.

(a) time from when the heating is started until

1

the limewater turns cloudy / milky

1

(b) (i) the temperature was not high enough

accept the copper carbonate had not started to decompose / react

accept it takes time to heat up the copper carbonate

1

the bubbles of gas were air

accept no carbon dioxide produced

1

(ii) the copper carbonate was decomposing / reacting

accept the temperature was high enough to cause decomposition / a reaction

1

so carbon dioxide was produced

allow correct word / symbol equation

1

(iii) copper oxide was produced

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allow correct word / symbol equation

1

because the copper carbonate had <u>completely</u> decomposed / reacted

ignore all of the carbon dioxide had been given off

1

[8]

Q6.

(a) (i) so there are no impurities

accept no other chemicals / not contaminated

allow to get the correct result

1

(ii) high melting point

1

unreactive

1

(iii) yellow-orange

1

(b) (i) bubbles / fizz / effervescence

ignore any named gas

1

(ii) milky

1

(c) fast(er)

1

small(er) amount

1

[8]

Q7.

(a) (i) any **two** from:

- bubbles / effervescence / fizzing
  ignore hydrogen / gas produced
- lithium disappears / gets smaller
  allow dissolves
  *do **not** allow melts / burns*
- lithium moves on the surface of the water
  ignore floats
- (universal indicator) turns blue / purple

2

(ii) 2

left-hand side correct

1

2

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right-hand side correct

allow multiples for full credit

1

(iii) light / burn, which will give a (squeaky) pop / explosion

1

(iv) all have 1 electron in their outer shell / energy level

allow have the same number of electrons in their outer shell / energy level

1

(b) They react with oxygen

1

They have low melting points

1

(c) (i) electronic structure [2,8,8] is drawn

*incomplete inner shells scores a maximum of **1** mark*

1

charge is +

*allow $[2,8,8]^+$ for **1** mark*

1

(ii) because (in potassium) the outer shell electron is further away from the nucleus **or** because potassium atoms are larger than sodium atoms

*it should be clear that the candidate is referring to the outer shell electron: if this is not clear a maximum of **2** marks can be awarded*

1

therefore the outer shell electron is less strongly attracted to the nucleus **or** is more shielded from the attraction of the nucleus and so the outer shell electron in potassium is more easily lost

1

***3** marks can be scored for answering the question in terms of sodium*

1

[13]

Q8.

(a) (i) magnesium oxide

1

(ii) decomposition

1

(b) (i) bar chart

1

(ii) more

1

(iii) limewater

1

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turns cloudy / milky

accept forms a white precipitate

1

[6]

Q9.

(a) (i) yellow

1

(ii) lilac

1

(b) (bubble through) limewater

1

cloudy

allow white / milky

1

(c) (i) silver nitrate solution

1

(ii) white

1

[6]

Q10.

(a) (i) fermentation

1

(ii) cloudy

accept milky / white

1

there is carbon dioxide / CO_2

accept calcium carbonate forms

1

allow a (white) solid / precipitate forms

(b) (i) (the amount of ethanol used) increases (from 1970) to 1989

*if no year(s) or incorrect year(s) indicated then max **1***

correct year(s) only needs to be indicated once to gain full marks accept values in range 1987-1992

1

then it decreases from 1989 (to 2000)

1

(ii) any **one** from:

- Brazil had more oilfields
- cost of crude oil had decreased
- cost of ethanol / sugar (cane) had increased

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- demand for ethanol / sugar (cane) had increased
- availability of ethanol / sugar (cane) had decreased
  accept availability of land to grow sugar (cane) had decreased
- climate change affects growing sugar (cane)

1

[6]

Q11.

(a) limewater **or** calcium hydroxide solution

1

(reacts with carbon dioxide and) turns cloudy / milky

linked to first point

*if no other mark awarded 'puts out lighted splint' gains **1** mark*

1

(b) (i) any **two** from:

- same volume / amount of the acids
- concentration of the acids
- temperature
- same surface area / size / mass / amount of calcium carbonate
- same measuring equipment

2

(ii) any **three** from:

- (after about 4 minutes) the sulfuric acid stops reacting **or** nitric acid continues to react
  accept more CO_2 with nitric acid at any time after 4 minutes
- (initially) the reaction with sulfuric acid is faster
- (the reaction stops) because calcium sulfate is a solid
  allow sulfuric acid produces a solid
- (the reaction continues) because calcium nitrate is soluble / in solution / aqueous
  allow nitric acid produces an (aqueous) solution
- because the calcium sulfate prevents the sulfuric acid reacting with the calcium carbonate
- (the rate is faster) because sulfuric acid contains two hydrogens

3

[7]

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Q12.

(a) (i) carbon dioxide / CO_2

1

carbonate / CO_3^{2-}

answers must be in the order shown

marks are independent

1

(ii) ammonia / NH_3

1

litmus

answers must be in the order shown

marks are independent

1

(b) (i) solution is blue

accept blue precipitate only if sodium hydroxide added

allow blue liquid

allow copper sulfate / copper ions are blue

1

(ii) barium chloride / $BaCl_2$

allow barium nitrate / barium ions / Ba^{2+}

1

white

answers must be in the order shown

marks are independent

1

[7]

Q13.

(a) (i) react

allow neutralise

allow bubbles / fizzes

accept produces gas / CO_2F

ignore rises

1

(ii) stop <u>reacting</u> / <u>producing</u>

stops on its own is insufficient allow stop working / bubbling / fizzing

1

the (hydrochloric) acid / (calcium) carbonate is used up

accept because the (calcium) carbonate has neutralised the (hydrochloric) acid

OR

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have been used up (1)

the graph line becomes horizontal / levels out (1)

OR

stays the same / no change (1)
ignore reference to graph line

no further reaction (1)

1

(iii) bubble the gas through limewater / calcium hydroxide solution
allow (add) limewater
test must be correct to gain result mark

1

(the solution) goes cloudy
allow milky

1

(b) advantage > Quarrying limestone provides building materials, employment and new road links

1

disadvantage > Quarrying limestone releases dust, and lorries release carbon dioxide from burning diesel fuel

1

[7]

Q14.

(a) (i) milky

1

carbonate ions

1

(ii) red

1

(b) (i) smaller

1

(ii) The answer obtained is closer to the true value

1

[5]

Q15.

(a) (i) (bubble gas produced through) limewater
incorrect tests = zero

1

(limewater) goes cloudy / milky

1

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(ii) *ignore yes or no*

red flame indicates that calcium / lithium ions present
allow aluminium has no flame colour

or

Ca/Mg also produce a (white) precipitate with NaOH

1

the (white) precipitate formed in test 3 **or** by adding sodium hydroxide solution would dissolve (in excess) if aluminium ions were present

1

(iii) *ignore yes or no*

because a white precipitate is formed in test 4 **or** by adding silver nitrate

1

but chloride ions are in hydrochloric acid

1

(b) (i) mass spectrometry
allow MS

or

atomic absorption spectroscopy
allow AAS
spectrometry / spectroscopy alone is insufficient

1

(ii) can detect a small(er) amount of the substance
allow can detect small(er) changes
allow small(er) sample sizes
ignore references to precision / accuracy

1

[8]

Q16.

(a) stop them reacting
owtte

1

(b) (i) fizzing / bubbles / effervescence
owtte

1

(ii) (g)

1

(iii) limewater

1

(c) yellow

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1

(d) (i) barium chloride

1

(ii) white

1

(iii) eg don't see what is being bought

ignore references to cost

or

a comment about quality / purity
eg may be impure / contaminated

1

[8]

Q17.

(a) limewater / calcium hydroxide

1

(limewater) goes milky / cloudy

*do **not** allow this mark if lime water added to solution or powder*

or

gives white precipitate / solid

1

(b) eg flame colour of (Na) and flame colour of (K) interfere / mask / mix with each other

accept difficult to determine the colour

or

hard to distinguish

accept some indication that two distinct colours are not seen

1

(c) (i) barium chloride (solution) / $BaCl_2$

ignore mention of acidification but

*do **not** allow sulfuric acid.*

wrong reagent = no mark

1

white precipitate / white solid

allow white barium sulfate

or

barium sulfate precipitate

1

(ii) white precipitate / white solid

ignore goes milky

*do **not** accept any mention of precipitate dissolving*

1

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[6]

Q18.

(a) (i) get wrong coloured flame/result owtte

or

to get the correct result

allow contaminated

1

(ii) high melting point

1

unreactive

1

(iii) yellow-orange

1

(b) (i) bubbles / fizz / effervescence

ignore any named gas

1

(ii) milky

1

(c) fast(er)

1

small(er) amount

1

Q19.

(a) hydrogen

accept H_2
*do **not** accept H*

1

(b) litmus paper / Universal Indicator paper / pH paper

allow any suitable <u>named</u> indicator

1

bleached / turns white **or** loses its colour

*do **not** accept bleached cloth / leaves etc.*
allow second mark unless <u>incorrect</u> indicator given
allow starch iodide paper (1)
goes black / blue black (1)
allow potassium iodide solution (1) goes brown / orange / black precipitate (1)

1

(c) because they have a negative charge **or** opposite charges attract

accept (because) it is Cl^-
*accept chlorine, Cl **or** chlorine ions has a negative charge*

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*do **not** accept Cl^- on its own*
*do **not** accept Cl_2 o.e. has negative charge*

1

(d) kill bacteria / germs, etc. **or** sterilise / disinfect

accept destroys bacteria etc.
ignore clean / purify water (owtte)
*do **not** accept just gets rid of bacteria*

1

(e) hydroxide (ion)

accept OH^-

1

[6]

Q20.

(a) F

accept indium / In

1

(b) C

accept sodium / Na

1

(c) A

accept hydrogen / H / H_2

1

[3]

Q21.

(a) (i) H_2O_2 reactant correct

ignore any state symbols

1

$H_2O + O_2$ products correct

1

$2H_2O_2 \rightarrow 2H_2O + O_2$ balanced

accept correct multiple

1

(ii) glowing splint

1

relights

accept 'bursts into flame'
*do **not** accept a lighted splint burns brighter **or** faster*

1

(b) unchanged

*accept **not** used up **or** left (behind)*

1

(c) (i) gas syringe **or** measuring cylinder **either** with scale drawn **or** labelled

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1

the apparatus as drawn would work

1

(ii) correct plotting of points

one *mark to be deducted for each error*

2

best fit graph line drawn (single line drawn)

1

(iii) concentration of hydrogen peroxide decreases

accept less particles of hydrogen peroxide to collide

*do **not** accept hydrogen peroxide gets used up*

1

rate of reaction decreases

accept reaction gets slower

1

(iv) any two from:

- temperature
- pressure
- division of catalyst **or** manganese oxide

*do **not** accept any other factors*

2

[15]

Q22.

(a) (i) test: limewater

accept calcium hydroxide solution

1

result: 'goes' cloudy

*accept white **or** milky*

*do **not** accept misty **or** chalky test must be correct before result mark can be considered*

1

(ii) $2\ NaHCO_3 + H_2SO_4 \rightarrow$

$Na_2SO_4 + (2)\ H_2O + (2)\ CO_2$

1

correctly balanced

1

(b) (i) $H^+ + OH^-$

1

$\rightarrow H_2O$

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deduct **one** mark if incorrectly balanced

accept H_3O^+ instead of H^+ then $2H_2O$ needed for balance

1

(ii) pH increases

accept numerical indication

1

(c) addition of sulphuric acid

1

correct use of an indicator

accept idea of forming a neutral solution

1

crystallisation (of neutral solution)

accept description using evaporation

1

[10]

Q23.

(a) oxygen/O_2

for 1 mark

1

(b) water/H_2O

for 1 mark

1

(c) carbon dioxide/CO_2
(if symbols are used they must be correct)

for 1 mark

1

(d) gives out

for 1 mark

1

heat or energy (2 independent marks)

for 1 mark

1

[5]

Q24.

(a) (i) oxygen (not air)

(ii) oxides/monoxides/dioxides

for 1 mark each

Do not allow specific examples

2

(b) (i) water

(ii) sulphur

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(iii) carbon

for 1 mark each

3

(c) gives out/releases heat/energy

for 1 mark

1

(d) (i) carbon dioxide

(ii) carbon

for 1 mark each

(allow correct symbols/formulae)

2

[8]

Q25.

(a) nitrogen / N2

[Do not allow N or N^2] for 1 mark

(b) heat

for 1 mark

(c) carbon dioxide / CO_2

for 1 mark

[3]

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