

Question	Answer	Marks	AO Element	Notes	Guidance
1(a)	(volumetric) pipette	1			
1(b)	to show when the acid has been neutralised	1			
1(c)	red / pink (1) (to) blue (1)	2			
2(a)	measuring cylinder	1			
2(b)	measure the volume of gas given off / measure volume of carbon dioxide produced OR measure time taken (1) (measure volume) over a given time(s) OR (measure time) to produce given volume(s) of gas (1)	2			
3(a)	hydrogen / H ₂	1			
3(b)	gas syringe <u>connected to a flask</u> OR this described in words (1) closed apparatus / workable apparatus OR this described in words (1) timer or stopwatch OR this described in words (1)	3			

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4	B - The components to be separated must be soluble in the solvent.	1			
5	A	1			
6	(volumetric) pipette	1			
7(a)	burette	1			
7(b)	any two from: <ul style="list-style-type: none"> • starts off at high / alkaline pH / pH above 7; • pH decreases / gets more acidic / less alkaline / becomes neutral; • ends up at acidic pH / pH below 7; 	2			
8(a)	condenser	1			

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8(b)	any characteristic of a mixture, e.g. can be separated by physical means / has variable composition / properties are the average of those of the components	1			
8(c)	geraniol floats on top of the water	1			
9	add a (dilute) acid	1			
	filter	1			
	copper does not react or dissolve / zinc reacts or dissolves or forms a salt	1			

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10	diffusion (through a membrane); nitrogen diffuses faster; because it has the smaller M_r ; or (turn into) liquid; (fractional) distillation; different boiling points; or burn a named substance to make non-gaseous product; oxygen reacts / nitrogen does not react; name of product of combustion;	3			
11	add sodium hydroxide solution	1			
	filter	1			
	zinc hydroxide (is amphoteric it) will react or will dissolve / magnesium hydroxide does not react or does not dissolve	1			
12	chromatography	1			

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	use a locating agent / the two acids move at different rates / alanine travels faster / alanine higher up paper / travels further	1			
13	grind grape skins / blend skins / crush skins	1			
	(grape skins) in water / in solvent / in named solvent	1			
	filter (off the solid / grape skins)	1			
14	(left box) flask / Erlenmeyer	1			
	(right box) (gas) syringe	1			
15	grind flowers / grind them / crush / blend / use a mortar and pestle	1			

Question	Answer	Marks	AO Element	Notes	Guidance
	extract with solvent / add solvent / add water	1			
	filter (the solution through glass wool)	1			
16	A and C	1			both needed for the mark
17(a)	(C), B, E, D, A	2			one pair reversed = 1 mark
17(b)	boiling point	1			
18	filter funnel and filter paper	1			
	either funnel or filter paper labelled	1			

Question	Answer	Marks	AO Element	Notes	Guidance
19(a)	chromatography	1			
19(b)	spot near the bottom and above the solvent level	1			
19(c)	to keep atmosphere in jar saturated (with solvent vapour)	1		allow: to reduce / prevent (solvent) evaporation	
19(d)	A <u>and</u> C	1			
20	any suitable solvent other than water e.g. ethanol	1		allow: ethanoic acid / aqueous ammonia ignore: hydrochloric / sulfuric / nitric acids / strong alkalis / aqueous solutions of salts	
21	filter funnel with filter paper + container to collect filtrate	1			
	correct labels for two of: (filter) funnel, filter paper, baker or flask	1		ignore: incorrect labels ignore: filtrate / water / sand	

Question	Answer	Marks	AO Element	Notes	Guidance
22(a)	to break up the cells / to extract the pigment / to separate the pigment from the petals / idea of getting the colour out of the petals, e.g. otherwise the colour won't come out	1			
	idea that solvent dissolves the pigment / idea of making a solution	1		ignore: find out how pure the rose petals are / reference to separating colours	
22(b)	pigment might be absorbed onto filter paper / pigment sticks to filter paper	1			
23	evaporate some of the solvent	1		allow: evaporate / heat allow: add more rhubarb	
24	mortar	1		allow: mortar and pestle	
25	volumetric pipette	1			

Question	Answer	Marks	AO Element	Notes	Guidance
26(a)	it would dissolve / it would mix with the solvent / solvent would wash it off / so that the spot / Y didn't dissolve in the solvent / Z would dissolve in the solvent	1			
26(b)	any two from: dip paper into the solvent put lid on jar let solvent run up paper / let solvent separate spots take paper out before solvent reaches the top / record solvent front	2		ignore: wait for spots to appear / spots start to spread (unqualified) ignore: reference to R_f values / locating agents	
27(a)	simple distillation fractional distillation or diffusion fractional distillation filtration or evaporation chromatography	5			

Question	Answer	Marks	AO Element	Notes	Guidance
27(b)	<p>M1 dissolving M2 filtration M3 evaporation or heat (to crystallisation point) M4 crystallisation or allow leave to cool or M3 crystallisation M4 filtration</p> <p>OR: adding to H₂SO₄ method M1 add excess mixture to acid (or until no more dissolves) M2 filtration or M1 add excess acid to mixture M2 with heat</p> <p>M3 evaporation or heat (to crystallisation point) M4 crystallisation or allow leave to cool or M3 crystallisation M4 filtration</p>	4		Stop marking if heated to dryness	
28	foodstuffs or drugs	1			
29(a)	square / rectangular sheet of paper in chromatography tank;	1		note: the sheet should not touch the sides of the beaker	

Question	Answer	Marks	AO Element	Notes	Guidance
	solvent at bottom of tank with paper dipping into it;	1		note: solvent does not have to be labelled / paper can just touch the surface But there should be no gap between the solvent and the paper	
	watchglass over the tank (this can just be shown as a line);	1			
29(b)	place spot of ink / dye on the paper;	1		note: answer must imply a spot or drop (not just ink put on paper)	
	above the solvent level;	1			
	let the solvent run up the paper / solvent moves the dyes up the paper / some idea that solvent is needed for the movement of the spots;	1			
29(c)	any suitable solvent e.g. ethanol / butanol / ester / alcohol;	1			
30	The volume is lower than expected;	1			

- Mark Scheme

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Question	Answer	Marks	AO Element	Notes	Guidance
31(a)	W, X and Y ;	1			
31(b)	4 / four ;	1			
32(a)	burette;	1			
32(b)	sodium hydroxide;	1			
32(c)	indicator in flask / reference to indicator;	1			
	run liquid from burette (until indicator changes colour);	1			

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Question	Answer	Marks	AO Element	Notes	Guidance
33	Any five from: <ul style="list-style-type: none"> • condenser • connected to flask • mixture in flask • idea of heating the solution / boil the solution • water has lower boiling point than sodium sulfate / sodium sulfate is solid and water is liquid (at rtp) • on heating water boils more easily / forms vapour more easily / water boils first / water will evaporate (not sodium sulfate) • steam / water vapour goes to top of the flask and into condenser • water vapour gets into condenser • sodium sulfate does not turn to gas • sodium sulfate remains in flask / sodium sulfate is left • water vapour / steam goes to liquid in condenser • water collected in receiver 	5			
34	filtration / filtered;	1			

Question	Answer	Marks	AO Element	Notes	Guidance
35	Any four from: <ul style="list-style-type: none"> • filter funnel ; • filter paper in filter funnel ; • container below funnel to collect filtrate ; • river water poured into filter funnel ; • insoluble material / residue / solid on filter paper + labelled OR as written statement ; • filtrate / solution collected in container OR as written statement ; 	4			not: filter paper lying flat across top of funnel
36	temperature above 100 °C	1			
	presence of inorganic catalyst	1			
37(a)	capillary tube / very narrow tube;	1			
37(b)	ink would undergo chromatography / ink would run up the paper / ink masks the results / ink would smear / ink mixes with spot ORA for pencil / lead;	1			

- Mark Scheme

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Question	Answer	Marks	AO Element	Notes	Guidance
37(c)	B;	1			
37(d)	A;	1			
37(e)	C;	1			
38	A = flask	1			
	B = measuring cylinder	1			
39	boiling or turning to steam	1			
	then condensing / condensation	1			
40	D - 25 °C and 45 seconds	1			
					[Total: 107]