



GCSE

Science

Session: 2000 June
Type: Mark scheme
Code: 1794

GENERAL CERTIFICATE OF SECONDARY EDUCATION
(former Midland Examining Group syllabus)

GCSE 1794

SCIENCE: DOUBLE AWARD
(SYLLABUS A)
(CO-ORDINATED)

MARK SCHEME FOR COMPONENTS
TAKEN IN JUNE 2000



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1794

The number of candidates awarded each grade was as follows:

	A*A*	AA	BB	CC	DD	EE	FF	GG
Percentage in Grade	7.6	10.4	12.9	29.0	20.9	10.8	5.3	1.9
Cumulative Percentage in Grade	7.6	18.0	30.9	59.9	80.7	91.5	96.8	98.8

These statistics are correct at the time of going to publication.

The total entry for the examination was 39259

Component Threshold Marks

Component	Max Mark	A	B	C	D	E	F	G
1 Paper 1	90			61	52	43	34	25
2 Paper 2	105	67	57	48	31			
3 Paper 3	90			66	56	47	38	29
4 Paper 4	105	81	70	59	39			
5 Paper 5	90			51	41	32	23	14
6 Paper 6	105	65	55	45	28			
7 Coursework	63	51	45	39	33	27	21	15

Foundation Tier

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	400				257	217	178	139	100
Percentage in Grade					28.2	28.7	21.7	14.1	6.5
Cumulative Percentage in Grade					28.2	56.9	78.6	92.7	99.2

The total entry for the examination was 22105

Higher Tier

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	400	309	275	241	207	146	115		
Percentage in Grade		16.1	22.0	27.5	23.5	10.3	0.4		
Cumulative Percentage in Grade		16.1	38.1	65.6	89.1	99.4	99.8		

The total entry for the examination was 17152



RECOGNISING ACHIEVEMENT

UCLES

Markscheme 1794/1
June 2000

Question	Expected Answers	Mks	Additional Guidance
4	<p>a i (green) plants;</p> <p>ii caterpillar / grasshopper / greenfly;</p> <p>iii bird / spider / beetle;</p> <p>b food web;</p> <p>c (decrease) more eaten by spiders; less grasshoppers for spiders to eat; (increase) more green plants to eat; less eaten by grasshoppers; (population remains the same) more food; more eaten by spiders;</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>(6)</p>	<p>ANY two points.</p> <p>ACCEPT additional valid explanations</p>
5	<p>a i 20; 50;</p> <p>ii bar correctly drawn;</p> <p>b (more cigarettes), more deaths from lung cancer; (more cigarettes), more deaths from bronchitis; increase greater with lung cancer than bronchitis; At 1-14 more die from bronchitis;aw</p>	<p>1</p> <p>1</p> <p>1</p> <p>3</p> <p>(6)</p>	<p>ACCEPT 19-20</p> <p>ANY three points numbers increase for both diseases = 2 marks</p>
6	<p>a preserved / mineralised remains of an animal / remains of an animal turned to rock / imprint of animal in the rock;</p> <p>b coal / limestone / sandstone / chalk / marble / shale / mudstone / (any) sedimentary rock;</p> <p>c evidence for evolution / to see how species (AW) have changed over time / to see if Charles Darwin got it right / evidence for early life / what was living years ago /to study extinct animals / plants / to date rocks;</p> <p>d dead body got covered by (sand) / bones left (after decay / rots); bones (and sand) turn to rock / due to pressure / squashed; rock was uncovered;</p> <p>e i lobe-finned fishes; ii A and B (need both);</p>	<p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>(7)</p>	<p>Remains of animal = 0</p> <p>This is a low-demand question. The candidates will express these ideas in a variety of ways.</p> <p>ACCEPT any two points about fossils formation for 1 mark each Reject heating</p>

Question	Expected Answers	Mks	Additional Guidance
7 a	4 or 5 bars correct = 2 2 or 3 bars correct = 1	2	
b i	body mass, height, length of index finger;	1	ANY 2 for 1 mark
ii	blood group, sex (gender);	1	BOTH needed
c	(controlled by genes) any one of: blood group, natural eye colour and sex (gender);	1	
	(controlled by genes and modified) body mass and skin colour;	1	
	(caused by the environment) scar;	1	
		(7)	
8 a i	pressure / contact / touch points of hairpin / hairpin;	1	ACCEPT pain
ii	Susan calling out (1 or 2 points);	1	ACCEPT '1 or 2'
b	finger tips;	1	
c	there are more touch / pressure receptors / sense cells / nerve endings in some parts than others / density of receptors is greater than other parts; sensors different distances from surface; thickness of skin varies; the sense cells in some parts share neurones and so is not possible to distinguish between two or one points; sense receptors may inhibit the functioning of neighbouring receptors in some parts; some parts might have a bigger brain area devoted to them compared to other parts;	2	REJECT 'nerves', 'nerve cells' REJECT 'the skin is more sensitive in some areas than others'
d	receptor/dendron; synapse; effector;	1 1 1	
		(8)	

Question	Expected Answers	Mks	Additional Guidance
9 a	stomach acid; tears;	1 1	
b i	(platelets) forms clots / scab / mesh / barrier; stops microbes / bacteria entering; (white blood cells) engulf / eat / surround microbes / bacteria; produce antibodies/antitoxins;	3	ANY three points Accept phagocytosis Reject germs Ignore fight / kill bacteria
ii	plasma, transports / carries (dissolved food substances / urea / carbon dioxide / enzymes antibodies / cells / blood cells / hormones / proteins / heat); red blood cells / haemoglobin, carries oxygen / carbon dioxide;	1 1	Blood part and job for 1 mark
		(7)	
10 a i	carbon dioxide; oxygen;	1 1	Ignore energy Accept carbon dioxide and oxygen
	ii <u>photosynthesis</u> ;	1	
b i	light (energy) / sun;	1	Accept solar energy
	ii chlorophyll;	1	
c i	respiration;	1	IGNORE aerobic / anaerobic ALLOW glycolysis / fermentation/oxidation
ii	starch; for storage / used in respiration / for energy (release); cellulose; for support / for cell wall; protein / amino acids for growth / enzymes / repair; sucrose; for transport / for sweet fruits / nectar; fat / lipids; for cell membrane / storage / cuticle / energy release; chlorophyll; for photosynthesis / absorbs light / aw; vitamins; for enzyme reactions;	4	mark in pairs. 1 mark for the substance and 1 mark for the use. Reject fructose / carbohydrates, polysaccharides Use only = 0 Name alone = 1 mark
		(10)	

Question	Expected Answers	Mks	Additional Guidance
11 a	<p>pain killer / stops pain/numbs pain;</p> <p>b Barbiturate;</p> <p>c feel cannot live without it / need it to work normally / body becomes dependent upon it / addictive / craving; withdrawal symptoms / specific example of symptoms / euphoric effects if taken;</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>(4)</p>	<p>Owtte IGNORE specific examples, eg headaches. ignore references to 'aches'</p> <p>Reject stimulates mind</p>
12 a i	<p>before = 15 after = 33 change = 18;</p> <p>ii Multiply 2 factors (1) 20 x 18 x 4.2 (1) 1512 (J) (1)</p> <p>b Stirrer; more even heating / owtte; air enclosed; heat cannot escape; oxygen (rather than air to burn biscuit); more complete / effective / better burning; crumbled biscuit; increased surface area; copper(coil); better heat conductor; coil; larger surface area;</p>	<p>1</p> <p>1</p> <p>3</p> <p>4</p> <p>(9)</p>	<p>ecf</p> <p>ecf Correct answer with no working = 3 Correct equation only = 1</p> <p>ACCEPT bell jar/lid Comparative statement needed</p> <p>Explanation must match feature</p>
		Total 90	



RECOGNISING ACHIEVEMENT

UCLES

Markscheme 1794/2
June 2000

Science: Double Award Syllabus A (Co-ordinated)

Question	Expected Answers	Mks	Additional Guidance
1	<p>a Oesophagus/(i); Pancreas/(ii); large intestine/(iii);</p> <p>b Muscles; Behind food contract / in front of food relax; Peristalsis;</p> <p>c Bile emulsifies fats / breaks large drops of fats into small droplets / aw to increase surface area of fats (for enzymes to work on); Bile is alkaline / neutralises acid / to give the optimum pH for enzymes / raises pH;</p>	<p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>(7)</p>	<p>Lines must end on structure</p> <p>Accept word written on diagram</p> <p>Each correctly labelled</p> <p>ANY two points</p> <p>ACCEPT 'muscles squeeze/push food along' = 1</p> <p>ACCEPT 'muscles squeeze food along by peristalsis' = 2</p> <p>Ignore reference to types of muscle.</p>
2	<p>a Pain killer / stops pain / numbs pain;</p> <p>b Barbiturate;</p> <p>c Feel cannot live without it / need it to work normally / body becomes dependent / addictive / craving; Withdrawal symptoms / specific examples of symptoms / euphoric effects if taken;</p>	<p>1</p> <p>1</p> <p>2</p> <p>(4)</p>	<p>Owtte</p> <p>Ignore specific examples e.g. headaches</p> <p>Ignore references to aches</p> <p>Reject stimulates mind</p>
3	<p>a i (platelets) forms clots / scabs / mesh / plug / barrier; stops microbes / bacteria entering;</p> <p>(white blood cells) engulf / eat / surround microbes / bacteria; produce antibodies / antitoxins;</p> <p>ii plasma, transports / carries (dissolved food substances / urea / carbon dioxide / hormones / enzymes / antibodies / cells / proteins / heat); red blood cells / haemoglobin, carries oxygen / carbon dioxide;</p> <p>b Acid destroys microbes; Acid produced/found in stomach;</p>	<p>3</p> <p>1</p> <p>1</p>	<p>ANY three points</p> <p>Accept phagocytosis</p> <p>Ignore fight/kill bacteria</p> <p>Reject reference to germs</p> <p>Blood part and job for 1 mark</p>

Question	Expected Answers	Mks	Additional Guidance
4	<p>a 18 °C temperature; 20 x 18 x 4.2; ecf for temperature rise 1512 (J); ecf for temperature rise</p> <p>b stirrer; more even heating/owtte; air enclosed; heat cannot escape; oxygen (rather than air to burn biscuit); more complete/effective/better burning; crumbled biscuit; increased surface area; copper (coil); better heat conductor; coil; larger surface area;</p>	<p>1 1 1</p> <p>4</p> <p>(7)</p>	<p>Correct answer = 3 marks Correct equation = 1 mark</p> <p>Feature with correct explanation</p> <p>Accept bell jar/lid Comparative statement needed</p>
5	<p>a to absorb water/to take up water/ to anchor root in soil/ to absorb minerals/nutrients/ named nutrient;</p> <p>b $24/6 = 4$</p> <p>c root (hairs) pulled off/destroyed/ left in soil when pulled up; plant cannot absorb enough/less water; ref. to turgidity/flaccidity of cells; root (hairs) regrow; plant takes up water (and recovers);</p> <p>d correctly labelled guard cell; if labelling</p> <p>e wilted plant did not lose water (vapour)/did not transpire/ recovered plant lost water (vapour); recovered plant stomata were open/ wilted plant stomata closed;</p> <p>f guard cells take in water/become turgid; due to uneven thickness of cell walls; guard cells change their shape;</p>	<p>1</p> <p>1</p> <p>3</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>(10)</p>	<p>Allow correct reference to absorption Ignore reference to surface area</p> <p>ANY three points</p> <p>Lines must end on structure. Allow line only</p> <p>Reject wrong shape</p>

Question	Expected Answers	Mks	Additional Guidance
6 a	<p>there are more touch / pressure receptors / sense cells (in some parts than others) / nerve endings / density of receptors is greater than other parts; sensors different distances from surface; thickness of skin varies; the sense cells in some parts share neurones and so is not possible to distinguish between two or one points; sense receptors may inhibit the functioning of neighbouring receptors in some parts; some parts might have a bigger brain area devoted to them compared to other parts;</p> <p>b receptor / or named receptor / nerve ending; transduces / changes energy; into nerve impulses / electrical energy or impulses;</p> <p>c receptor; synapse; effector;</p> <p>d Long, to cover distance; Thin, take up little space / diffusion of ions; fatty / myelin sheath, insulation; fatty sheath, speeds up transmission of impulses; many endings, to increase surface area / sensitivity / more connections / dendrites / dendrons;</p>	<p>2</p> <p>1 1 1</p> <p>1 1 1</p> <p>2</p> <p>(10)</p>	<p>Any two points</p> <p>Reject nerve / nerve cell</p> <p>Reject 'the skin is more sensitive in some areas than others'</p> <p>Reject messages / signals</p> <p>Reject electricity</p> <p>ACCEPT any 2 structural comments without explanations = 1</p> <p>Ignore synapse reference</p> <p>Ignore Axons</p>
7 a i	<p>B B</p> <p>BB</p> <p>b b</p> <p>Bb Bb</p> <p>bb</p> <p>ii bb x bb</p> <p>b X ray / uv / nuclear / ionising radiation / analine / ninhydrin / phenol/dioxin / pcb's / radioactive substances / mustard gas / tar (from cigarettes) / benzene (from petrol) / strong magnetic field;</p>	<p>1 1</p> <p>1</p> <p>1</p> <p>(4)</p>	<p>Parent gametes = 1</p> <p>ticks in vertical line on RHS.</p> <p>ACCEPT bb</p> <p>Any one point</p> <p>Ignore radiation</p> <p>Accept increased temperature</p>

Question	Expected Answers	Mks	Additional Guidance
8 a	(decrease) more eaten by spiders; less grasshoppers for spiders to eat; (increase) more green plants to eat; less eaten by grasshoppers; (population remains the same) more food; more eaten by spiders;	2	Any two points Accept additional valid explanations.
b i	a step / level / stage / position / place in a food chain or web; feeding level; level in pyramid of numbers / biomass / energy;	1	Any one point
ii	Bird;	1	
c i	$20 / 1000 \times 100;$ $= 2\%;$	1 1	2 = two marks
ii	(named) Carbohydrates / (named) proteins / (named) fats / ATP/DNA/RNA;	1	Accept any organic containing carbon that is passed along the food chain
iii	Respiration; as heat energy / light / sound; movement / muscular contraction; excretion / carbon dioxide / urine / urea / sweating; inedible parts; death/decay;	2	Ignore CO ₂ Allow oxidation
	egestion/faeces;	(9)	

Question	Expected Answers	Mks	Additional Guidance
9 a	$6\text{CO}_2 + 6\text{H}_2\text{O} \text{ -----} > \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$	2	Symbols = 1 mark Balancing = 1 mark
b i	respiration;	1	Ignore anaerobic / aerobic Allow glycolysis / fermentation / oxidation
ii	starch; for storage / used in respiration / for energy (release); cellulose; for support / for cell wall; protein/amino acids; for growth / repair / enzymes; sucrose; for transport / nectar; fats / lipids; for cell membrane / storage / cuticle / energy release; chlorophyll; for photosynthesis/absorbs light/aw; vitamins; for enzyme reactions;	4	Mark in pairs. 1 mark for the substance and 1 mark for the use. Reject fructose / carbohydrates / polysaccharides Use only = 0 Name only = 1
c	Temperature / availability of water / acid rain / (named) minerals in soil;	1	Reject humidity Reject heat
d i	A;	1	
ii	E; No increase in rate unless carbon dioxide concentration is increased / levels constant unless carbon dioxide concentration increases;	1 1	
e	Red/blue – high rate / photosynthesis occurs; Green – low rate / no photosynthesis; Green light reflected / not absorbed; Red or blue light absorbed;	3	ANY three points
		(14)	

Question	Expected Answers	Mks	Additional Guidance
10 a i	<p>It / predator / animal that kills and eats another animal / prey;</p> <p>ii streamlined body, for speed through water; large / sharp claws, to holding / catch fish; sharp teeth, to tear / catch at fish; eyes at front of head, for binocular / good vision / good judgement of distance of prey; big / webbed feet, for swimming; tail qualified, for swimming / steering; fur qualified, for movement qualified;</p> <p>b Pesticides are poisonous substances; Pesticides kill otter food/pesticides taken in by fish/plants; Passed through chain/web; Concentration of pesticides increases as passes through food chain/web/concentration builds up in otter body;</p> <p>c mink compete for same homes/ holes/habitat (in river bank); mink compete for (same) food;</p>	<p>1</p> <p>2</p> <p>3</p> <p>1</p> <p>1</p> <p>(8)</p>	<p>ACCEPT any 2 features with correct explanations.</p> <p>ACCEPT any 2 unexplained features for 1 (max)</p> <p>ANY three points Accept otters less fertile/ less reproduction/ fewer young;</p> <p>ALLOW mink kill or drive out/aggressive to otter = 1</p> <p>Accept mink pass disease to otters</p>
11 a i	<p>all correct = 2 marks; 6 or 7 correct = 1 mark;</p> <p>ii smooth curve;</p> <p>iii volume of sweat increases and volume of urine decreases; volume of urine decreases at a steady rate, volume of sweat at a changing rate;</p> <p>b as the amount of sweat increases (cooling), more water is leaving the body, water level of (blood) drops therefore less urine = 2;</p> <p>Correct ref. to brain senses that water level in blood lower, more ADH produced, ADH causes kidney to remove more water from urine and reabsorbed into the blood, therefore less and more concentrated urine is formed.</p>	<p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>5</p> <p>(10)</p>	<p>LOR marking</p> <p>Accept converse argument</p>

Question	Expected Answers	Mks	Additional Guidance
12 a	<p>i capable of dividing to form lots of cells/plants; all (genetic) information available for complete development of complete plant (in one cell);</p> <p>ii to obtain disease free plants/ no contamination;</p> <p>iii sucrose – source of energy/respiration/for manufacture of cellulose; amino acids – for protein production/enzymes; auxins – promote/stimulate/encourage (root) growth/ development/elongation of cells;</p> <p>b fast; little space needed/done on a large scale; disease free; good qualities maintained; genetically identical/clone; offers more control over production; high yields/many plants from one cell; no competition;</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>4</p> <p>(10)</p>	<p>Reject controls growth on its own</p> <p>ANY four points</p> <p>Reject cheaper</p>
13 a	<p>greater rate of respiration with increasing activity; carbon dioxide is a (waste) product of respiration;</p> <p>b Increasing carbon dioxide concentration lowers pH; Lower pH/Increasing carbon dioxide concentration in blood detected/stimulated; by medulla/ brain; increased rate of nerve impulses; to intercostal muscles/ diaphragm;</p>	<p>1</p> <p>1</p> <p>3</p> <p>(5)</p>	<p>ANY three points</p>
		<p>Total = 105</p>	



RECOGNISING ACHIEVEMENT

UCLES

Markscheme 1794/3
June 2000

Science : Double Award Syllabus A (Co-ordinated)

Question	Expected Answers	Mks	Additional Guidance
1 a	Thermometer; Condenser; salty water; pure water;	1 1 1 1	ACCEPT recognisable spellings
b	add / mix / put in / put together / place / the Universal Indicator with the water; turns / goes / be / <u>green</u> ;	1 1 (6)	
2	aircraft fuel; propane gas; road tar;	1 1 1 (3)	DEDUCT 1 mark for every item in excess of three
3	Tick - - tick - tick	1 1 1 (3)	DEDUCT 1 mark for every tick in excess of three

Question	Expected Answers	Mks	Additional Guidance
4 a i	copper;	1	
	ii Magnesium;	1	
	iii Magnesium Iron Copper	1	must have all three in correct order
b i	copper;	1	
	ii copper sulphate;	1	
c	Carry out the reaction (owtte) / use a thermometer; Detect a temperature increase;	1 1	'temp change' = 0 REJECT any mention of heating
d i	copper and iron;	1	must have both
	ii (no mark for name of metal) <u>iron</u> – cars / bridges / drain covers / radiators etc; It is strong / cheap; <u>copper</u> - water pipes / water tanks / wire / coins; it does not react with water / it can be shaped / it is a good conductor / it does not corrode; <u>magnesium</u> – alloy wheels / flares / fuse in thermit; it has a low density / burns easily;	1 1	ALLOW any uses for steel ALLOW reference to uses as catalysts(1) because they are transition metals ALLOW uses of copper alloys. REJECT 'copper does not rust'
e	blue colour fades; red-brown solid / coating on zinc / zinc changes colour / zinc is copper coated/copper colour appears ;	1 1	REJECT any mention of bubbles or unqualified equations
		(12)	

Question	Expected Answers	Mks	Additional Guidance
5	a i	1	Unit required
	ii	1	
	b	1	REJECT 'dangerous', 'unbreathable', 'chokes', 'suffocates'
	c	3	ANY three points REJECT refs to 'acid rain'/'ozone' Rising sea level/causes pollution = neutral 'Smoke' = neutral ACCEPT refs to 'solid particles in the air'
		(6)	
6	a	2	ANY two points No others allowed
	b	1	Mark first two answers only ACCEPT 'PVC does not catch fire' No others allowed
		1	
	c	1	
d	1	ACCEPT any sensible answer	
		(6)	
7	a i	1	REJECT 'core'
		1	
	ii	1	
	b i	1	REJECT names ANY three points 'wear aprons /coats' / 'protect the bench' / 'keep metal under oil' / 'don't breathe in fumes' / 'stand far away' are all NEUTRAL
	ii	1	
	c	1	
	d	3	
		3	
	(9)		

Question	Expected Answers	Mks	Additional Guidance		
8	a	i	B;	1	
		ii	A;	1	
		iii	D;	1	
	b		$2\text{H}_2\text{O}_2 \longrightarrow 2\text{H}_2\text{O} + \text{O}_2$	1	ACCEPT multiples
				(4)	
9	a		a gas / carbon dioxide is given off / escapes / lost (as the reaction takes place);	1	'Hydrogen given off' = 0 'Marble chips dissolve' = 0 'Gas/CO ₂ formed = 0
	b	i	correct plotting of points;	2	error + or - one square -1 for each mistake, minimum 0
		ii	correct curve (ecf from plot);	1	ACCEPT a reasonable attempt a comparison of the slope scores = 2
		iii	2 grams lost between 0 and 2 minutes;	1	"it loses <u>more</u> mass in the first 2 mins" = 2
			1 gram lost between 2 and 4 minutes (therefore faster between 0 and 2 mins.);	1	'the slope is <u>steeper</u> at the start' = 2 'it is steep in the first 2 mins' = 1 'It is steep at first' = 1
	c		line starts at 190g and is below the first one; giving same mass loss/ finishes at 186g;	1	'Greater/ <u>bigger</u> drop at start' = 2 'Big drop at start' = 1
				1	
				(8)	
10	a		sodium chloride/ salt;	1	REJECT sodium chloride
			sulphur dioxide/ sulphur (IV) oxide;	1	REJECT sulphur oxide
	b		giant structures have high (mpts); molecular structures have low (mpts) / melt easily;	1	"molecular structures have <u>lower</u> melting points than giant structures"
				1	= 2 marks
	c		bonds;	1	
	d		2.8.8;	1	ACCEPT 2 8 8 or 2-8-8
			2.8;	1	ACCEPT correct diags
	e		40 + 16;	1	AWARD 1 mark for
			= 56;	1	20 + 8 = 28 or 28
	f		Both are in the same group(owtte) / they have the same outer electrons; Strontium has 2 outer electrons / strontium is in Group 2; Strontium loses 2 electrons / forms an ion Sr ²⁺ ;	3	IGNORE units Look for comparison somewhere in the answer
				(12)	REJECT 'electrons shared'

Question	Expected Answers	Mks	Additional Guidance
11 a	<p>D C A B</p> <p>D somewhere before C ; C somewhere before A ; A somewhere before B ;</p> <p>b Melting / liquefying; Crystallisation / solidifying / freezing;</p> <p>c high temperature / hot; high pressure / lot of pressure / extreme pressure / intense pressure;</p> <p>d no yes yes no</p>	<p>1 1 1</p> <p>1 1</p> <p>1 1</p> <p>2</p> <p>(9)</p>	<p>ACCEPT either order 'heat' = 0 'cooling'/'cools' = 0</p> <p>not heat. ACCEPT 'higher' If values are quoted on their own: min = 100 atm Min = 1000 °C</p> <p>four correct = 2 marks 2 or 3 correct = 1 mark</p>
12 a	<p>reversible;</p> <p>b i air;</p> <p>ii crude oil;</p> <p>c i B A D E C</p> <p>A somewhere before D; D somewhere before E; E somewhere before C;</p> <p>c ii eutrophication;</p>	<p>1</p> <p>1</p> <p>1</p> <p>1 1 1</p> <p>1</p> <p>(7)</p>	
13 a	<p>nitrogen;</p> <p>b oxygen;</p> <p>c carbon dioxide;</p> <p>d carbon dioxide;</p> <p>e argon:</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>(5)</p>	<p>ACCEPT symbols / formulae throughout.</p>
		<p>Total = 90</p>	



RECOGNISING ACHIEVEMENT

UCLES

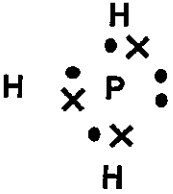
Markscheme 1794/4
June 2000

Science : Double Award Syllabus A (Co-ordinated)

Question	Expected Answers	Mks	Additional Guidance
1 a i	Electrons;	1	REJECT 'core' REJECT names ANY three points 'wear aprons / coats' / 'protect the bench' / 'keep metal under oil' / 'don't breathe in fumes' / 'stand far away' are all NEUTRAL Allow 1 mark for an incorrect balanced e.g. $2\text{Na} + \text{H}_2\text{O} \text{-----} > \text{Na}_2\text{O} + \text{H}_2$ ANY four points ACCEPT two correct electron arrangements as an alternative to the second point.
	Neutrons and protons;	1	
ii	Nucleus / nuclei;	1	
b i	1;	1	
ii	2/ II;	1	
c	<u>H</u> or <u>He</u> ;	1	
d	use a small amount (of Li/Na/K); do not touch / use tongs / wear gloves; wear safety spectacles; use a safety screen / fume cupboard / venting; dispose of final solution carefully; keep top on jars of metals; use a large water surface / large container; bucket of sand in room / fire extinguisher; put any bits back (under oil) or (or into ethanol);	3	
e	NaOH;	1	
	$2\text{Na} + 2\text{H}_2\text{O} \text{-----} > 2\text{NaOH} + \text{H}_2$	1	
f	Reactivity increases down group or converse; atoms larger down group / outer electron further away; on reaction atoms each lose one electron; electrons more easily lost down group; force of attraction between nucleus and outer electron reduced;	4 (15)	
2 a	giant structures have high (mpts); molecular structures have low (mpts) / melt easily;	1 1	<i>"molecular structures have lower melting points than giant structures"</i> gains 2 marks Accept 2 8 8 or 2-8-8 Accept correct diags AWARD 1 mark for $20 + 8 = 28$ $28 + 1$ IGNORE units Look for comparison somewhere in the answer Reject 'electrons shared'
b	2.8.8; 2.8;	1 1	
c	40 + 16; = 56;	1 1	
d	Both in the same group (owtte) / they have the same outer electrons; Strontium has two outer electrons/strontium is in Group 2; Strontium loses two electrons / forms an ion Sr^{2+} ;	1 1 1 (9)	

Question	Expected Answers	Mks	Additional Guidance
3 a i ii iii b	B; A; D; $2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$	1 1 1 1 (4)	ACCEPT multiples
4 a b c d e	D C A B D somewhere before C; C somewhere before A ; A somewhere before B ; Melting/liquefying; Crystallisation / solidifying / freezing; High temperature / hot; High pressure / a lot of pressure / extreme pressure/intense pressure; no yes ; yes no ; Crystallising of magma; Where either crystallises (intrusive inside the earth, extrusive at surface or close to surface of earth);	1 1 1 1 1 1 2 1 1 (11)	ACCEPT either order 'heat' = 0 'cooling / cools' = 0 not heat ACCEPT 'higher' If values quoted on their own: min = 100 atm, min = 1000°C four correct = 2 marks 2 or 3 correct = 1 mark REJECT 'cooling' ignore crystal size

Question	Expected Answers	Mks	Additional Guidance
5 a	a gas / carbon dioxide is given off/escapes/lost (as the reaction takes place);	1	'hydrogen given off' = 0 'marble chips dissolve' = 0 'gas/CO ₂ formed' = 0
b i	Correct plotting of points;;	2	error + or - one square -1 for each mistake, minimum 0
ii	Correct curve (ecf from plot);	1	ACCEPT a reasonable attempt
iii	2 grams lost between 0 and 2 minutes;	1	a comparison of the slope scores = 2
	1 gram lost between 2 and 4 minutes (therefore faster between 0 and 2 mins.);	1	"it loses <u>more mass in the first 2 mins</u> " = 2 'the slope is <u>steeper at the start</u> ' = 2 'It is steep in the first two minutes' = 1 'It is steep at first' = 1 ' <u>greater/bigger drop at start</u> ' = 2 'big drop at start' = 1
c	line starts at 190g and is below the first one; giving same mass loss/ finishes at 186g;	1	
d	Reaction slower/takes longer; <u>particles</u> further apart; fewer (effective) collisions;	1 1 1	
		(11)	
6 a i	B A D E C		
	A somewhere before D ;	1	
	D somewhere before E ;	1	
	E somewhere before C ;	1	
ii	Eutrophication;	1	
b i	nitrogen N ₂ ammonia NH ₃ hydrogen H ₂	2	Three correct labels = 2 marks Two correct labels = 1
ii	Iron/Fe/iron oxide;	1	
iii	Nitric acid;	1	Nitrate acid = 0
		(8)	

Question	Expected Answers	Mks	Additional Guidance
9 a	8.8 (g) hydrogen; no. of moles P = $91.2/31 = 2.94$ no. of moles of H = 8.8; Formula PH_3 ;	1 1 1	Answer only = 1
b	34;	1	
c		2 (6)	IGNORE shape 3 covalent bonds = 1 marks two non-bonded electrons = 1 mark
10 a	Copper toxic / metals expensive / save ores / pollutant /can be sold;	1	Dangerous = 0
b i	Filtration / decanting;	1	Accept displacement reaction
ii	They have <u>larger</u> surface area;	1	
iii	64 / 56; Mass of copper = 1.1(4) (tonnes);	1 1	
		(5)	

Question	Expected Answers	Mks	Additional Guidance
11 a	Fluorine, F;	1	BOTH required
b i	Solid;	1	Correct symbol
ii	236 –320 (°C) ;	1	(Actual value = 302 °C)
iii	Differences 94 to 121 to 150+ ;	1	ACCEPT any supporting explanation
iv	Very dark grey/black;	1	
v	Sodium astatide;	1	
vi	NaAt;	1	Symbol must be correct
c i	(line 1) (x) (x) (✓)		
ii	(line 2) (x) ✓ ✓	3	Four correct = 3;
iii	(line 3) x x (x)		Three correct = 2,
iv	Displacement;	1	Two correct = 1
v	$2\text{KI} + \text{Br}_2 \rightarrow \text{I}_2 + 2\text{KBr}$	2	Products = 1
d	<u>Sodium hydroxide</u> -		ANY two points
i	Making soap, degreasing , cleansing drains, paint stripping, oven cleaner, absorbing acid gases, making paper;	2	
ii	<u>Sodium hydrogencarbonate</u> -		
iii	Raising agent, indigestion tablets, baking powder, toothpaste, fire extinguishers;		
iv	<u>Sodium carbonate</u> -		
v	Washing soda, making glass, neutralising acids, softening water, soap powder;		
		(15)	
		Total	
		= 105	



RECOGNISING ACHIEVEMENT

UCLES

Markscheme 1794/5
June 2000

Science : Double Award Syllabus A (Co-ordinated)

Question	Expected Answers	Mks	Additional Guidance
1 a	cell; Moon;	1 1	Reject description of diagram
b i	Continuous straight line from bird to eye through periscope; suitable reflection(s) at mirror; arrow(s) on ray(s);	1 1 1	
ii	Right way up; same size; virtual;	1 1 1	
c	Transverse waves are up <u>and</u> down/crests <u>and</u> troughs / at right angles to the direction; Longitudinal waves travel along the wave / rarefactions <u>and</u> compressions / backwards and forwards / vibrates in same direction as wave;	1 1 (10)	
2 a i	C arrow along field line in correct direction; D arrow along field line in correct direction;	1 1	
ii	both like poles; labelled N;	1 1	
b i	idea of electromagnet/iron magnetised by current; attracts <u>iron bar</u> ;	1 1	Emphasis on <u>electromagnet</u> REJECT 'current through iron' Reject iron becomes magnetic Reject attract hammer
ii	ANY two points from: circuit breaks / current stops; iron demagnetised / electromagnet stops working; spring pulls back;	2	
c i	EITHER point: iron permanently attracted; no control by current;	1	
ii	ANY two points from: more coils; bigger battery / voltage / current / more cells; bigger core; weaker spring;	2 (11)	ALLOW 'soft iron'

Question	Expected Answers	Mks	Additional Guidance
3 a	ANY four from: gamma-rays; X-rays; infra-red; microwaves; radio;	4	ACCEPT infra-red eg label $\angle i = \angle r$, otherwise by eye
b	infra-red/ultra -violet; ultra -violet; gamma -rays/X-rays; infra-red;	1 1 1 1	
c i	Light;	1	
c ii	Any THREE from: internal reflection (stated or shown); $\angle i = \angle r$ or quality of diagram; angle > critical angle OR 42 °; total internal reflection;	3 (12)	
4 a	Energy;	1	ALLOW green and yellow/green REJECT 'break', 'blows up' 'explodes' 'blows' ACCEPT 'higher power' REJECT 'more electricity', 'faster current', 'stronger current' Ref to "it" implies thicker wire.
b i	Earth;	1	
b ii	Earth;	1	
b iii	trip/break <u>circuit</u> (breaker)/ <u>fuse</u> blows;	1	
c	higher current; less heating /less resistance/melts thin wire/prevents fire;	1 1	
d i	0.1, 0.2, 0.7, 0.5	2	
d ii	fan heater;	1	
d iii	2.5; 15131(.0);	1 1	
		(11)	

Question	Expected Answers	Mks	Additional Guidance
8 a	ANY one point from: more leverage; force further away from pivot; more force on spring; idea of force needed at E less than force at M;	1	REJECT 'more force' REJECT 'not strong enough'
b i	62, 70, 85, 94, 107	2	All correct = 2 3 or 4 correct = 1
ii	4/5 points plotted correctly; à	1	Within ½ small square
iii	straight line through origin;	1	Look for at least two points above and below line
iv	line across (between 64-66mm) and down; correct answer from candidate's graph;	1 1	
c	80 x 90 OR 12 x F; 80x90 = 12 x F OR F = 7200÷12 OR F = 80 x 90÷12; 600;	1 1 1 (10)	Look for moment. Use of Principle of moments. Answer.
9 a	switch; variable resistor; diode;	1 1 1	
b i	Any resistive component from list;	1	
ii	reduce value/lower value/remove resistor/increases current;	1	ACCEPT 2 marks for combined (i) and (ii) answer involving other components
c	ANY three points from: Current in motor; Current in red lamp/passes through X; No current in green lamp because Y is a one way device/Y wrong way round;	3	If only green lamp referred to then no current and reference to diode -- scores 2
d	red lamp off AND green lamp on;	1 (9)	
		Total = 90	



RECOGNISING ACHIEVEMENT

UCLES

Markscheme 1794/6
June 2000

Question	Expected Answers	Mks	Additional Guidance
2 a	<p>ANY one point: more leverage; force further away from pivot; more force on spring; idea of force needed at E less than force at M;</p>	1	<p>REJECT 'more force' REJECT 'not strong enough'</p>
b	<p>equation implied; substitution ($1500 \div 3000$); answer (0.5); unit (m/s^2);</p>	1 1 1 1	<p>ALLOW N/Kg</p>
c i	<p>4 / 5 points plotted correctly;</p>	1	<p>Within $\frac{1}{2}$ small square</p>
ii	<p>straight line through origin;</p>	1	<p>Look for at least two points above and below line</p>
iii	<p>line across (between 64-66mm) and down; correct answer from candidate's graph;</p>	1 1	
d	<p>80 x 90 OR 12 x F; $80 \times 90 = 12 \times F$ OR $F = 7200 \div 12$ OR $F = 80 \times 90 \div 12$; 600;</p>	1 1 1 (12)	<p>Look for moment. Use of Principle of moments. Answer.</p>
3 a	<p>electrons; idea of backwards and forwards;</p>	1 1	<p>ACCEPT 'vibrate / oscillate'</p>
b	<p>higher current; less heating / less resistance/melts thin wire / prevents fire;</p>	1 1	<p>ACCEPT 'higher power' REJECT 'more electricity', 'faster current', 'stronger current'</p>
c i	<p>0.1, 0.2, 0.7, 0.5</p>	2	<p>Ref. to 'It' implies thicker wire All correct = 2 2 or 3 correct = 1</p>
ii	<p>fan heater ;</p>	1	<p>ECF (from energy column)</p>
iii	<p>2.5; 15131(.0);</p>	1 1 (9)	<p>ECF ECF</p>

Science: Double Award Syllabus A (Co-ordinated)

Question	Expected Answers	Mks	Additional Guidance
1 a	radiation; all others need a medium / molecules / particles OR only radiation can travel through a vacuum;	1 1	ORA. ALLOW 'in space'
b	(cooling by) evaporation; Any TWO of : energy to evaporate comes from body; molecules / particles carry energy / heat; conduction takes energy / heat to body surface; the high energy particles escape; leaving body at a lower temperature;	1 2	NOT just 'carry sweat away' Give CREDIT for 'energy needed to evaporate' or ref. to latent heat
c	ANY two approaches from: <u>reduces radiation</u> ; shiny surfaces radiate less / reflects; <u>reduces convection</u> ; warm air kept near skin / prevents wind / air movement; <u>reduces evaporation</u> ; sensible process; <u>reduces conduction</u> ; ref. to trapped air / correct ref. to plastic material;	4 (9)	ALLOW IR For each point there must be a <u>reduces</u> process followed by a <u>because</u> reason

Question	Expected Answers	Mks	Additional Guidance
4 a	Any THREE from: internal reflection (stated or shown); $\angle i = \angle r$ or quality of diagram; angle > critical angle OR 42° ; total internal reflection;	3	e.g. label $\angle i = \angle r$, otherwise by eye
b i	light in / illuminate object; reflected light / image / signal from body out;	1 1	
ii	so that image is not 'jumbled up';	1	
iii	ANY one point from : no need for / smaller incisions; shorter / less complicated operations / avoids operations;	1 (7)	
5 a	ANY one answer from: use a more powerful transmitter; focus / direct signal more accurately; amplify signal en route / on reception; use a larger dish;	1	ACCEPT ' <i>shorter wavelength</i> ' if qualified
b i	T at origin of waves;	1	
ii	R where reflected beams cross;	1	
iii	correct beam on LHS of diagram; correct beam on RHS of diagram;	1 1	
iv	focus implied; consistent wavelength (3 waves); correct curvature, centred on R;	1 1 1	
c	shorter wavelength; less diffraction;	1 1 (10)	ALLOW ' <i>higher frequency</i> '

Question	Expected Answers	Mks	Additional Guidance
6 a i	idea of electromagnet / iron magnetised by current; attracts iron bar;	1 1	emphasis on <u>electromagnet</u> REJECT 'current through iron' Reject iron becomes magnetic Reject attract hammer
	ii ANY two points from: circuit breaks / current stops; iron demagnetised / electromagnet stops working; spring pulls back;	2	
b i	EITHER point: iron permanently attracted; no control by current;	1	
	ii ANY two points from: more coils; bigger battery / voltage / current / more cells; bigger core; weaker spring;	2	ALLOW 'soft iron'
c i	Forces in opposite directions;	1	
	ANY two points from: force down on AB OR force up on CD; current in a field so gets a force; field of wire acts against field of magnet; force is perpendicular to current / field;	2	ACCEPT use of FLHR
	ii spins other way; current/forces reverse;	1 1	ALLOW 'poles on coil reverse'
	iii idea of contacts reverse / current reverses' when coil passes vertical / every half turn; so forces reverse OR show opposite vertical forces;	1 1	
		(14)	

Question	Expected Answers	Mks	Additional Guidance	
7	a motor spins faster; red lamp brighter; green lamp off;	1		
		1		
		1		
	b i	line across and down; 5 - 6 (mA);		1
		equation implied;		1
	ii	substitution ($1.6 \div 0.005$) (ecf from graph);		1
		answer (320) (ecf from graph);		1
		unit (ohms);		1
	iii	starts very high / infinite; decreases;		1
				1
	iv	voltage across red LED = voltage across green LED;		1
		current through red LED is 25 mA from graph;		1
		no current through green LED OR current through motor = current through red LED;		1
				(14)
8	a i	charge must flow through rod;	1	
		electrons move down;	1	
	ii	left hand side of the ball;	1	
	b i	ions; + to dome, - to ball (BOTH required);	1	
			1	
	ii	equation implied (energy/charge);	1	
		substitution ($90 \div 0.001$);	1	
		answer (90 000);	1	
	(8)			

Question	Expected Answers	Mks	Additional Guidance
9 a i	<p>ANY two points from: Idea of fair test; Correct variation on γ count with thickness; Logical effect;</p> <p>ii alpha stopped by glass / short ranged;</p> <p>iii safety; elaboration – e.g. does not affect body tissue;</p> <p>b i time taken for count rate or activity to halve to halve/ number of nuclei decaying to halve;</p> <p>ii correct activity after 5, 10 years; correct activity after 15, 20 years; smooth curve through points;</p> <p>iii line across, not going down more than 5 squares</p> <p>iv activity reduces too quickly / half life too short;</p> <p>not enough counts / particles to check bottles / requires calibration / changed frequently;</p>	<p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>(12)</p>	<p>REJECT ref. to '<i>damaging liquid</i>'. Safety may be implied.</p> <p>or atoms / particles</p> <p>At least four points</p> <p>Do not worry about the label</p>
10 a	<p>equation implied (distance / speed); substitution (600 / 300 000); answer = 0.002;</p> <p>b i infra-red has longer wavelength / short frequency;</p> <p>ii visible does not get through dust / too much dust;</p> <p>c <u>gravity</u> pulls them together;</p> <p>d i dimmer / lower temperature;</p> <p>ii (nuclear) fusion / hydrogen converting into helium;</p> <p>e it is much more massive than Jupiter;</p> <p>f it is much further from the star than the Earth from the Sun (<i>owtte</i>);</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>(10)</p>	<p>Quoting the distance is sufficient</p>
		<p>Total = 105</p>	