CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT

GCSE

Science

Session: 2000 June
Type: Mark scheme
Code: 1794

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Oxford Cambridge and RSA Examinations

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RECOGNISING ACHIEVEMENT

GENERAL CERTIFICATE OF SECONDARY EDUCATION
(former Midland Examining Group syllabus) GCSE 1794

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

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MARK SCHEME FOR COMPONENTS
TAKEN IN JUNE 2000

INVESTOR IN PEOPLE

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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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

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Markscheme 1794/1
June 2000

Science: Double Award Syllabus A (Co-ordinated)

Question	Expected Answers	Mks	Additional Guidance
1	A = reptile B = mammal C = bird D = fish E = amphibian	(4)	all correct = 4 marks 4 correct = 3 3 correct = 2 2 correct = 1
2 a	(cell) membrane; cytoplasm; nucleus;	1 1 1	
b i	cytoplasm; (cell) membrane; controls (the reactions) inside the cell/contains DNA;	1 1 1	**Owtte** reject brain / nerve centre
ii	respiration;	1	
c	to absorb water / to take up water / to anchor root in soil / to absorb minerals / nutrients / named nutrient;	1	ALLOW correct reference to absorption IGNORE Surface area reference
d	24 ÷ 6 ; 4;	1 1	
e	Root (hairs) pulled off / destroyed / left in soil when pulled up; plant cannot absorb enough water / less water; ref. to turgidity / flaccidity of cells; root (hairs) regrow; plant takes up water (and recovers);	3 (13)	**ANY three points**
3 a	oesophagus; stomach; pancreas; small intestine;	1 1 1 1	
b i	**A** on small intestine;	1	Some part of letter inside
ii	**D** on stomach;	1	Organ
iii.	**E** on anus;	1	
c	Muscles; Behind food contract/in front of food relax; Peristalsis;	1 1 (9)	**ANY two points** **ACCEPT** *'muscles squeeze/push food along'* = 1 **ACCEPT** 'muscles squeeze food along by peristalsis' = 2 IGNORE reference to types of muscles

Question	Expected Answers	Mks	Additional Guidance
4 a i	(green) plants;	1	
ii	caterpillar / grasshopper / greenfly;	1	
iii	bird / spider / beetle;	1	
b	food web;	1	
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;	2 (6)	**ANY two points.** **ACCEPT** additional valid explanations
5 a i	20; 50;	1 1	**ACCEPT 19-20**
ii	bar correctly drawn;	1	
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	3 (6)	**ANY three points** numbers increase for both diseases = 2 marks
6 a	preserved / mineralised remains of an animal / remains of an animal turned to rock / imprint of animal in the rock;	1	Remains of animal = 0
b	coal / limestone / sandstone / chalk / marble / shale / mudstone / (any) sedimentary rock;	1	
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;	1	
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;	2	This is a low-demand question. The candidates will express these ideas in a variety of ways. **ACCEPT** any two points about fossils formation for 1 mark each Reject heating
e i	lobe-finned fishes;	1	
ii	A and B (need both);	1 (7)	

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)**	

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Question	Expected Answers	Mks	Additional Guidance
9 a	stomach acid;	1	
	tears;	1	
b i	(platelets)		**ANY three points**
	forms clots / scab / mesh / barrier;		
	stops microbes / bacteria entering;		Accept phagocytosis
	(white blood cells)		Reject germs
	engulf / eat / surround microbes / bacteria;	3	Ignore fight / kill bacteria
	produce antibodies/antitoxins;		
ii	plasma, transports / carries (dissolved food substances / urea / carbon dioxide / enzymes antibodies / cells / blood cells / hormones / proteins / heat);	1	Blood part and job for 1 mark
	red blood cells / haemoglobin, carries oxygen / carbon dioxide;	1	
		(7)	
10 a i	carbon dioxide;	1	Ignore energy
	oxygen;	1	Accept carbon dioxide and oxygen
ii	photosynthesis;	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)	

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Question	Expected Answers	Mks	Additional Guidance
11 a	pain killer / stops pain/numbs pain;	1	**Owtte** IGNORE specific examples, eg headaches. ignore references to 'aches'
b	Barbiturate;	1	
c	feel cannot live without it / need it to work normally / body becomes dependent upon it / addictive / craving;	1	Reject stimulates mind
	withdrawal symptoms / specific example of symptoms / euphoric effects if taken;	1	
		(4)	
12 a i	before = 15 after = 33	1	
	change = 18;	1	ecf
ii	Multiply 2 factors (1) 20 x 18 x 4.2 (1) 1512 (J) (1)	3	ecf Correct answer with no working = 3 Correct equation only = 1
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;	4	ACCEPT bell jar/lid Comparative statement needed Explanation must match feature
		(9)	
		Total 90	

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Markscheme 1794/2
June 2000

Science: Double Award Syllabus A (Co-ordinated)

Question	Expected Answers	Mks	Additional Guidance
1 a	Oesophagus/(i); Pancreas/(ii); large intestine/(iii);	1 1 1	Lines must end on structure Accept word written on diagram Each correctly labelled
b	Muscles; Behind food contract / in front of food relax; Peristalsis;	2	**ANY two points** **ACCEPT** *'muscles squeeze/push food along'* = 1 **ACCEPT** 'muscles squeeze food along by peristalsis' = 2 Ignore reference to types of muscle.
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;	1 1 **(7)**	
2 a	Pain killer / stops pain / numbs pain;	1	**Owtte** Ignore specific examples e.g. headaches Ignore references to aches
b	Barbiturate;	1	
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;	2 **(4)**	Reject stimulates mind
3 a i	(platelets) forms clots / scabs / mesh / plug / barrier; stops microbes / bacteria entering; (white blood cells) engulf / eat / surround microbes / bacteria; produce antibodies / antitoxins;	3	**ANY three points** Accept phagocytosis Ignore fight/kill bacteria Reject reference to germs
ii	plasma, transports / carries (dissolved food substances / urea / carbon dioxide / hormones / enzymes / antibodies / cells / proteins / heat); red blood cells / haemoglobin, carries oxygen / carbon dioxide;	1 1	Blood part and job for 1 mark
b	Acid destroys microbes; Acid produced/found in stomach;		

Question	Expected Answers	Mks	Additional Guidance
4 a	18 °C temperature; 20 x 18 x 4.2; ecf for temperature rise 1512 (J); ecf for temperature rise	1 1 1	Correct answer = 3 marks Correct equation = 1 mark
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;	4 (7)	Feature with correct explanation Accept bell jar/lid Comparative statement needed
5 a	to absorb water/to take up water/ to anchor root in soil/ to absorb minerals/nutrients/ named nutrient;	1	Allow correct reference to absorption Ignore reference to surface area
b	24/6 = 4	1	
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);	3	**ANY three points**
d	correctly labelled guard cell; if labelling	1	Lines must end on structure. Allow line only
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;	1 1	
f	guard cells take in water/become turgid; due to uneven thickness of cell walls; guard cells change their shape;	1 1 (10)	Reject wrong shape

Question	Expected Answers	Mks	Additional Guidance
6 a	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;	2	Any two points Reject nerve / nerve cell Reject *' the skin is more sensitive in some areas than others'*
b	receptor / or named receptor / nerve ending;	1	Reject messages / signals
	transduces / changes energy;	1	Reject electricity
	into nerve impulses / electrical energy or impulses;	1	
c	receptor;	1	
	synapse;	1	
	effector;	1	
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;	2	**ACCEPT any 2** structural comments without explanations = 1 Ignore synapse reference Ignore Axons
		(10)	
7 a i	B B BB	1 1	Parent gametes = 1
	b b Bb Bb bb		ticks in vertical line on RHS.
ii	bb x bb	1	**ACCEPT** bb
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;	1	**Any one point** Ignore radiation Accept increased temperature
		(4)	

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 x 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; egestion/faeces;	2 (9)	Ignore CO_2 Allow oxidation

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Question	Expected Answers	Mks	Additional Guidance
9 a	$6CO_2 + 6H_2O$ ----------> $C_6H_{12}O_6 + 6O_2$	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)	

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Question	Expected Answers	Mks	Additional Guidance
10 a i	It / predator / animal that kills and eats another animal / prey;	1	
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;	2	**ACCEPT** any 2 features with correct explanations. **ACCEPT** any 2 unexplained features for 1 (max)
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;	3	ANY three points Accept otters less fertile/ less reproduction/ fewer young;
c	mink compete for same homes/ holes/habitat (in river bank); mink compete for (same) food;	1 1	**ALLOW** mink kill or drive out/aggressive to otter = 1 Accept mink pass disease to otters
		(8)	
11 a i	all correct = 2 marks; 6 or 7 correct = 1 mark;	2	
ii	smooth curve;	1	
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;	1 1	
b	as the amount of sweat increases (cooling), more water is leaving the body, water level of (blood) drops therefore less urine = 2; 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.	5	**LOR** marking Accept converse argument
		(10)	

Question	Expected Answers	Mks	Additional Guidance
12 a i	capable of dividing to form lots of cells/plants; all (genetic) information available for complete development of complete plant (in one cell);	1 1	
ii	to obtain disease free plants/ no contamination;	1	
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;	1 1 1	Reject controls growth on its own
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;	4	**ANY four points** Reject cheaper
		(10)	
13 a	greater rate of respiration with increasing activity; carbon dioxide is a (waste) product of respiration;	1 1	
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;	3	**ANY three points**
		(5)	
		Total = 105	

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RECOGNISING ACHIEVEMENT

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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 / green;	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

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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) iron – cars / bridges / drain covers / radiators etc; It is strong / cheap; copper - 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; magnesium – 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; àred-brown solid / coating on zinc / zinc changes colour / zinc is copper coated/copper colour appears ;	1 1 **(12)**	**REJECT** any mention of bubbles or unqualified equations

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Question	Expected Answers	Mks	Additional Guidance
5 a i	3.5%;	1	Unit required
ii	There is too much CO;	1	
b	toxic / poisonous / complexes with blood (owtte) / prevents oxygen uptake / colourless / odourless / kills;	1	REJECT *'dangerous', unbreathable', 'chokes', 'suffocates'*
c	(carbon dioxide route to answer) name: greenhouse effect(owtte); (1) causing: traps heat; (1) result: earth warms up/global warming; ((1) effect: more hurricanes (owtte) / warmer / drier / colder/change in rain patterns/ more winds/floods; (1) (Smog route to answer) smog/fog; (1) water droplets(suspended) in the air; (1) reduces sunlight/temperature changes/blocks light/reduces visibility;(1)	3 (6)	**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 a	melts (very easily) / low melting point; catches fire (easily); (too) flexible / bends easily;	 2	**ANY** two points No others allowed
b	easy to make PVC coloured (ora); difficult for PVC to catch fire (ora);	1 1	**Mark first two answers only** **ACCEPT** *'PVC does not catch fire'* No others allowed
c	does not bend easily / can be coloured;	1	
d	Washing up bowls / food wrapping / cling film / buckets / bags / children's toys / washing up gloves;	1 (6)	**ACCEPT** any sensible answer
7 a i	Electrons;	1	
	Neutrons and protons;	1	
ii	Nucleus / nuclei;	1	**REJECT** *'core"*
b i	1;	1	
ii	2 / II;	1	
c	H or He;	1	**REJECT** names
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 (into ethanol);	 3 (9)	**ANY** three points *'wear aprons /coats' / 'protect the bench' / 'keep metal under oil' / 'don't breathe in fumes' / 'stand far away'* are all **NEUTRAL**

Question	Expected Answers	Mks	Additional Guidance
8 a i	B;	1	
ii	A;	1	
iii	D;	1	
b	$2H_2O_2 \longrightarrow 2H_2O + O_2$	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);	à1	**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 more mass in the first 2 mins"* = 2 *'the slope is steeper at the start '* = 2 *'it is steep in the first 2 mins '* = 1 *'It is steep at first'* = 1 *'Greater/bigger drop at start'* = 2 *'Big drop at start'* = 1
c	line starts at 190g and is below the first one;	1	
	giving same mass loss/ finishes at 186g;	1	
		(8)	
10 a	sodium chloride/ salt;	1	**REJECT** sodium chlorine
	sulphur dioxide/ sulphur (IV) oxide;	1	**REJECT** sulphur oxide
b	giant structures have high (mpts);	1	*"molecular structures have lower melting points than giant structures"* = 2 marks
	molecular structures have low (mpts) / melt easily;	1	
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 20 + 8 = 28 or 28
	= 56;	1	**IGNORE** units
f	Both are in the same group(owtte) / they have the same outer electrons;	3	Look for comparison somewhere in the answer
	Strontium has 2 outer electrons / strontium is in Group 2;		
	Strontium loses 2 electrons / forms an ion Sr^{2+} ;		**REJECT** 'electrons shared'
		(12)	

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

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RECOGNISING ACHIEVEMENT

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Markscheme 1794/4
June 2000

Science : Double Award Syllabus A (Co-ordinated)

Question	Expected Answers	Mks	Additional Guidance
1 a i	Electrons;	1	
	Neutrons and protons;	1	
ii	Nucleus / nuclei;	1	**REJECT** 'core'
b i	1;	1	
ii	2/ II;	1	
c	H or He;	1	**REJECT** names
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	**ANY** three points 'wear aprons / coats' / 'protect the bench' / 'keep metal under oil' / 'don't breathe in fumes' / 'stand far away' are all **NEUTRAL**
e	NaOH;	1	Allow 1 mark for an incorrect balanced e.g. $2Na + H_2O$ -------> $Na_2O + H_2$
	$2Na + 2H_2O$ --------> $2NaOH + H_2$	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	**ANY four points** **ACCEPT** two correct electron arrangements as an alternative to the second point.
		(15)	
2 a	giant structures have high (mpts); molecular structures have low (mpts) / melt easily;	1 1	*"molecular structures have lower melting points than giant structures"* gains 2 marks
b	2.8.8; 2.8;	1 1	Accept 2 8 8 or 2-8-8 Accept correct diags
c	40 + 16; =56;	1 1	**AWARD** 1 mark for 20+8= 28 28+1 **IGNORE** units
d	Both in the same group (owtte) / they have the same outer electrons; Strontium has two outer electrons/strontium is in Group 2;	1	Look for comparison somewhere in the answer
	Strontium loses two electrons / forms an ion Sr^{2+} ;	1	Reject 'electrons shared'
		(9)	

Question	Expected Answers	Mks	Additional Guidance
3 a i	B;	1	
ii	A;	1	
iii	D;	1	
b	$2H_2O_2 \longrightarrow 2H_2O + O_2$	1	**ACCEPT** multiples
		(4)	
4 a	**D C A B** **D** somewhere before **C**; **C** somewhere before **A** ; **A** somewhere before **B** ;	 1 1 1	
b	Melting/liquefying; Crystallisation / solidifying / freezing;	1 1	**ACCEPT** either order 'heat' = 0 'cooling / cools' = 0
c	High temperature / hot; High pressure / a lot of pressure / extreme pressure/intense pressure;	1 1	not heat **ACCEPT** 'higher' If values quoted on their own: min = 100 atm, min = 1000°C
d	no yes ; yes no ;	2	four correct = 2 marks 2 or 3 correct = 1 mark
e	Crystallising of magma; Where either crystallises (intrusive inside the earth, extrusive at surface or close to surface of earth);	1 1	**REJECT** *'cooling'* Ignore crystal size
		(11)	

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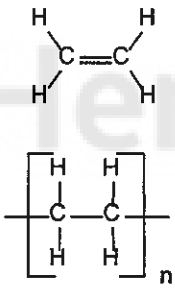
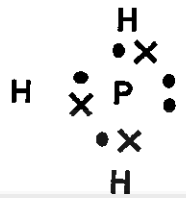
Question	Expected Answers	Mks	Additional Guidance
5 a	a gas / carbon dioxide is given off/escapes/lost (as the reaction takes place);	1	'hydrogen given off' = 0 'marble chips dissolve' = 0 'gas/CO_2 formed' = 0
b i	Correct plotting of points;;	2	error + or - one square -1 for each mistake, minimum 0
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 more mass in the first 2 mins" = 2* *'the slope is steeper at the start ' = 2* *'It is steep in the first two minutes' = 1* *'It is steep at first' = 1* *'greater/bigger drop at start' = 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 1	
d	Reaction slower/takes longer; particles further apart; fewer (effective) collisions;	1 1 1	
		(11)	
6 a i	**B A D E C**		
	A somewhere before **D**; **D** somewhere before **E**; **E** somewhere before **C**;	1 1 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
7 a	Alkalines;	1	
b	In plentiful / excess air;	1	2 marks for products
	Carbon dioxide;	1	2 marks for a distinction
	in limited air;	1	in the amount of air
	carbon monoxide / carbon / soot;	1	Any reference to incorrect product e.g. hydrogen, ethene loses 1 mark
c i	Cracking / thermal decomposition;	1	**ACCEPT** *'decomposition'* **REJECT** *'Endothermic / Exothermic'*
ii	$4C_2H_4$;	1	
	H_2 ;	1	
iii	Red / brown / red-brown / orange / yellow;	1	**REJECT** 'clear' / discoloured
	Colourless;	1	**ACCEPT** 'decolourised' / paler
d i		1	
		2	Indication of long molecule = 1, single bond between carbon atoms = 1
ii	Does not tear / waterproof / airtight / no trees cut down / easy to produce a film / transparent / does not rot;	1	Does not rot cannot be credited twice
	Does not rot away / uses up oil supplies;	1	
		(15)	
8 a	earthquakes at plate boundaries;	1	
	most;	1	
b	Any line through two or more points starting and finishing on a drawn plate boundary;	1	
c	Plates moving past each other/rubbing together/friction between plates;	1	
d	Any **two** relevant points;;	2	REJECT answers relating to materials or buildings
		(6)	

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	**IGNORE** shape 3 covalent bonds = 1 marks two non-bonded electrons = 1 mark
		(6)	
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 larger surface area;	1	
iii	64 / 56; Mass of copper = 1.1(4) (tonnes);	1 1	
		(5)	

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Question	Expected Answers	Mks	Additional Guidance
11 a	Fluorine, F;	1	**BOTH** required Correct symbol
b i	Solid;	1	
ii	236 –320 (°C) ;	1	(Actual value = 302 °C)
	Differences 94 to 121 to 150+ ;	1	**ACCEPT** any supporting explanation
iii	Very dark grey/black;	1	
iv	Sodium astatide;	1	
	NaAt;	1	Symbol must be correct
c i	(line 1) (x) (x) (✓) (line 2 (x) ✓ ✓ (line 3) x x (x)	3	Four correct = 3; Three correct = 2, Two correct = 1
ii	Displacement;	1	
iii	$2KI + Br_2 \text{------} > I_2 + 2KBr$	2	Products = 1
d	<u>Sodium hydroxide</u> - Making soap, degreasing , cleansing drains, paint stripping, oven cleaner, absorbing acid gases, making paper; <u>Sodium hydrogencarbonate</u> - Raising agent, indigestion tablets, baking powder, toothpaste, fire extinguishers; <u>Sodium carbonate</u> - Washing soda, making glass, neutralising acids, softening water, soap powder;	2 **(15)**	**ANY** two points
		Total = 105	

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RECOGNISING ACHIEVEMENT

Archives & Heritage

Markscheme 1794/5
June 2000

Science : Double Award Syllabus A (Co-ordinated)

Question	Expected Answers	Mks	Additional Guidance
1 a	cell;	1	
	Moon;	1	
b i	Continuous straight line from bird to eye through periscope;	1	
	suitable reflection(s) at mirror;	1	
	arrow(s) on ray(s);	1	
ii	Right way up;	1	
	same size;	1	
	virtual;	1	
c	Transverse waves are up and down/crests and troughs / at right angles to the direction;	1	Reject description of diagram
	Longitudinal waves travel along the wave / rarefactions and compressions / backwards and forwards / vibrates in same direction as wave;	1	
		(10)	
2 a i	C arrow along field line in correct direction;	1	
	D arrow along field line in correct direction;	1	
ii	both like poles;	1	
	labelled N;	1	
b i	idea of electromagnet/iron magnetised by current;	1	Emphasis on electromagnet REJECT *'current through iron'*
	attracts iron bar;	1	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	**ALLOW** *'soft iron'*
		(11)	

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

Question	Expected Answers	Mks	Additional Guidance
5 a	travels as a wave;	1	
	several cm lead;	1	
b i	Increases;	1	
ii	decreases;	1	
iii	**ANY** two points from:	2	
	Idea of fair test;		
	Correct variation on γ count with thickness;		
	Logical effect;		
iv	alpha stopped by glass/short ranged;	1	
v	safety;	1	**REJECT** ref. to *'damaging liquid'*.
	elaboration – e.g. does not affect body tissue;	1	Safety may be implied.
		(9)	
6 a	Hubble telescope;	1	
	Mir Space Station;	1	
	Moon;	1	
b	**Any** two from:		
	less distance to travel/orbit path shorter;	2	Beware repetition if vague e.g. smaller orbit
	larger speed;		
	lower orbit/less distance from Earth;		
	more gravity;		
c	Gravity;	1	Accept centripetal
d	speed = distance ÷ time;	1	
	90 000 ÷ 0.3;	1	
	300 000;	1	
		(9)	
7 a	radiation;	1	
	convection;	1	
b	(cooling by) evaporation;	1	
	Any **TWO** of :		
	energy to evaporate comes from body;	2	
	molecules/particles carry energy/heat;		**NOT** just *'carry sweat away'*
	conduction takes energy/heat to body surface;		Give **CREDIT** *for 'energy needed to evaporate'* or ref to latent heat
	the high energy particles escape;		
	leaving body at a lower temperature;		
c	**ANY** two approaches from:	4	**ALLOW** IR
	<u>reduces</u> <u>radiation</u>;		
	shiny surfaces radiate less/reflects;		
	<u>reduces</u> <u>convection</u>;		For each point there must be a <u>reduces</u> process followed by a <u>because</u> reason
	warm air kept near skin/prevents wind/air movement;		
	<u>reduces</u> <u>evaporation</u>;		
	sensible process;		
	<u>reduces</u> <u>conduction</u>;		
	ref to trapped air/correct ref to plastic material;		
		(9)	

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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	Look for moment. Use of Principle of moments. Answer.
		(10)	
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	

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RECOGNISING ACHIEVEMENT

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Markscheme 1794/6
June 2000

Question	Expected Answers	Mks	Additional Guidance
2 a	**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;	1	**REJECT** *'more force'* **REJECT** *'not strong enough'*
b	equation implied; substitution (1500 ÷ 3000); answer (0.5); unit (m/s^2);	1 1 1 1	**ALLOW** N/Kg
c i	4 / 5 points plotted correctly;	1	Within ½ small square
ii	straight line through origin;	1	Look for at least two points above and below line
iii	line across (between 64-66mm) and down; correct answer from candidate's graph;	1 1	
d	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	Look for moment. Use of Principle of moments. Answer.
		(12)	
3 a	electrons; idea of backwards and forwards;	1 1	**ACCEPT** *'vibrate / oscillate'*
b	higher current; less heating / less resistance/melts thin wire / prevents fire;	1 1	**ACCEPT** *'higher power'* **REJECT** *'more electricity', 'faster current', 'stronger current'* Ref. to 'It' implies thicker wire
c i	0.1, 0.2, 0.7, 0.5	2	All correct = 2 2 or 3 correct = 1
ii	fan heater ;	1	**ECF** (from energy column)
iii	2.5; 15131(.0);	1 1	**ECF** **ECF**
		(9)	

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;	1	
	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;	2	 **NOT** just *'carry sweat away'* Give **CREDIT** *for 'energy needed to evaporate'* or ref. to latent heat
c	**ANY** two approaches from: reduces radiation; shiny surfaces radiate less / reflects; reduces convection; warm air kept near skin / prevents wind / air movement; reduces evaporation; sensible process; reduces conduction; ref. to trapped air / correct ref. to plastic material;	4 **(9)**	**ALLOW** IR For each point there must be a reduces process followed by a because 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** *'shorter wavelength'* 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	**ALLOW** *'higher frequency'*
		(10)	

Question	Expected Answers	Mks	Additional Guidance
6 a i	idea of electromagnet / iron magnetised by current; attracts iron bar;	1 1	emphasis on electromagnet **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)	

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Question	Expected Answers	Mks	Additional Guidance
7 a	motor spins faster;	1	
	red lamp brighter;	1	
	green lamp off;	1	
b i	line across and down;	1	
	5 - 6 (mA);	1	
ii	equation implied;	1	R = V/I or V = I R
	substitution (1.6 ÷ 0.005) (**ecf** from graph);	1	**OR** 1.6 ÷ 5
	answer (320) (**ecf** from graph);	1	**OR** 0.32
	unit (ohms);	1	**OR** KΩ
iii	starts very high / infinite;	1	
	decreases;	1	
iv	voltage across red LED = voltage across green LED;	1	
	current through red LED is 25 mA from graph;	1	**ORA**
	no current through green LED **OR** current through motor = current through red LED;	1	
		(14)	
8 a i	charge must flow through rod;	1	**ALLOW** *'current'*
	electrons move down;	1	
ii	left hand side of the ball;	1	
b i	ions;	1	
	+ to dome, - to ball (**BOTH** required);	1	
ii	equation implied (energy/charge);	1	**OR** consistent conversions
	substitution (90 ÷ 0.001);	1	
	answer (90 000);	1	
		(8)	

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

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