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WELSH JOINT EDUCATION COMMITTEE
CYD-BWYLLGOR ADDYSG CYMRU

General Certificate of Secondary Education

Tystysgrif Gyffredinol Addysg Uwchradd

MARKING SCHEMES

JANUARY 2007

SCIENCE

WJEC
CBAC

INTRODUCTION

The marking schemes which follow were those used by the WJEC for the January 2007 examination in GCSE Science. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

The WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

BI January 2007

Foundation and Higher Tier

Questions		Answers/Explanatory Notes	Marks Available
F	H		
1.		(a) 10 and 40 (1) (b) 0 (1) (c) They have 'antifreeze' in their blood (1)	**[3]**
2.		(a) (i) No ladybirds/predators/were eating orange trees (1) (ii) Ladybirds/predators ate them (1) (b) Plenty of food/no predators (1) (c) lack of food/lack of space/predation disease/competition for food (1)	**[4]**
3.		(a) Very hot/very dry/very cold at night/lack of food/only food is thorny desert plant (Any 2)/reverse of features on diagram. (not: no food/no water) (b) Dry dung/sweats very little (1) (c) Stores food/provides water/allows camel to go for long time without food and water (1) (d) (i) Web of tissue between toes (ii) Nostrils can be closed	(1) **[5]**
4.		(a) Correct plotting on grid (2) Line drawn with ruler (1) (b) (i) 150 cms (1) (allow: 150-154, ecf) (ii) 172 cms (1) (allow: 170-174, ecf) (c) 32 (1) (d) (i)&(ii) Ref to genes or inheritance/different ages/gender/diet or amount they eat (Any 2 different categories) (2)	**[8]**

Questions		Answers/Explanatory Notes	Marks Available
F	H		
5.		(a) Receptor (1) impulses (1) (b) Light/sound/pressure/temperature (heat)/chemicals (Any two) (2) (c) (i) Fast (1) Protective (1) (ii) Withdrawal reflex or example (1) (description of moving hand away not just touching flame)	**[7]**
6.		(a) A. hair (1) B. erector muscle (1) C. sweat gland (1) D. (blood) capillary (1) (b) (i) Part A flattens (1) Part D increases in size (1)/gets wider/dilates (ii) Part A no/less air trapped/no/less heat retained/more heat lost (1) Part B more blood to skin/allows more heat loss (1)	**[8]**
7.	**1.**	(a) (i) R R and r r	**[1]**
		(ii) gametes | R | R r | Rr | Rr r | Rr | Rr Gametes correct Genotypes correct using gametes given by candidate.	**[1]** **[1]**
		(b) (i) gametes | R | r R | RR | Rr r | Rr | rr Gametes correct Genotypes correct using gametes given by candidate.	**[1]** **[1]**
		(ii) 3:1/75%:25% (not: 75:25 or fraction)	**[1]**
		(iii) Mendel's results are approximately = 3:1. ratios the same (not: results the same/unequal results agree with nine)	**[1]**
		(iv) results are more reliable (not: fair test/ref. accuracy)	**[1]**

Questions		Answers/Explanatory Notes			Marks Available
F	H				
		(c)	Any one of the following: The existence of genes/DNA was not known or understood Mendel worked in a small laboratory with few people to carry on his work after his death There was little interest in the results of Mendel's experiments at the time (not: it wasn't believed/ref. religion)		**[1]** **[9]**
8.	**2.**	(a)	(i)	Gene that makes the weed resistant to herbicide	**[1]**
			(ii)	because it now has the gene for herbicide resistance from the weed (not: have inherited gene from weed)	**[1]**
		(b)	Any two from: Can spray the soya without harming it probably uses less herbicide greater yield of crop ref. to finance (not: doesn't damage environment unequal)		**[2]**
		(c)	(i)	(GM) winter rape and (GM) beet (both needed for mark)	**[1]**
			(ii)	reduces the numbers of butterflies and/or bees (not: reduces wildlife)	**[1]** **[6]**
	3.	(a)	(i)	*Panthera leo* or Panthera leo or <u>Panthera leo</u>	**[1]**
			(ii)	they both feed their young on milk (must use info in table)	**[1]**
			(iii)	the species/they are different species	**[1]**
		(b)	Either - local names differ from place to place (even within the same country) Or - scientific names are the same in all countries or eq		**[1]** **[4]**

Questions		Answers/Explanatory Notes			Marks Available
F	H				
	4.	(a)	any correct reference to exercise/sport		**[1]**
		(b)	(i)		**[1]**
		(c)	(i)	all plots correct 1 mark (± ½ square)	**[1]**
				joining plots with a ruler (no tolerance)	**[1]**
			(ii)	Any one from: age/gender	**[1]**
		(d)		Any one from: smoking/excessive alcohol/fat rich diet (not: diet unequal/unbalanced diet)	**[1]**
					[6]
	5.	(a)	(i)	sensory (1)	
			(ii)	motor (1)	
		(b)	electrical/nervous impulse (1)		
		(c)	synapse (1)		
		(d)	receptor (1) co-ordinator (1) effector (1)		
		(e)	description of any suitable example, e.g. taking hand away from hot object (not: knee jerk)		
	6.	(a)	(i)	70 (1)	
			(ii)	80 (1)	
			(iii)	100% survival in range of pH with no aluminium or converse (1)	
		(b)	Any four from list given in specifications: Oxygen, temperature, food, predation, disease, space, light, other minerals, type of fish (Any 4) A.V.P. e.g. pollutant quantity qualified. (not: amount of decay in lake/amount of fishing pollution unequal)		

Questions		Answers/Explanatory Notes	Marks Available
F	H		
	7.	(a) Rats/rodents/mice (1)	
		(b) (i) mutation (1)	
		(ii) gene/DNA/alleles (1)	
		(c) Adaptation/mutation (1) Helped survival /an advantage (1) passed on (1) through genes (1) Natural selection/survival of the fittest (to breed) (1) leads to evolution of new type (1) (Any five points)	Any 5
		(d) Shows a change in a species (1) taking place in over very short time (1) Illustrates natural selection/survival of fittest (to breed) (1)	2/3
			[10]

C1

Foundation only

Q	Mark	Answer	Accept	Neutral answer	Do not accept
1. (i) I	1	iron	Fe		1535
II	1	phosphorus	P		44
(ii)	1	(metals' m.p.'s) are higher	converse answer		metals melt faster / metals are high
(iii)	1	density *(Assume answer refers to 'metals' unless reference to non-metals made)*			

Q	Mark	Answer	Accept	Neutral answer	Do not accept
2. (a) (i)	1	prevent acid spray from escaping / prevent spray escaping / prevent acid escaping		lets gas out	
(ii) I	1	398(g)			
II	1	4(g)			
III	1	6(min)			
(iii)	1	mass continuously recorded / 'graph' and 'experiment' can be watched at the same time / experiment doesn't have to be watched			more accurate / more reliable
(iv) I	1	increases / gets faster / speeds up		time gets shorter	gets fast / more reactive / gets shorter /
II	1	decreases / gets slower / slows down		time gets longer	gets longer
(b)	1	(potassium) would be **too** reactive / violent reaction / risk of explosion / too dangerous		dangerous / very reactive	

Q	Mark	Answer	Accept	Neutral answer	Do not accept
3. (a) (i) I	1	PVC			
II	1	5			
(ii) I	1	sterilises water / kills germs		makes water safe to drink / healthy	
II	1	poisonous / toxic		harmful / dangerous	
(b) (i)	1	prevents tooth decay			
(ii)	1	chlorine is needed to make the water safe to drink / fluoridation is mass medication / tooth decay can be prevented by other means / fluoridation isn't necessary to make water safe to drink			

Q	Mark	Answer	Accept	Neutral answer	Do not accept
4. (i)	1	to use up **all** the acid / to cancel out **all** the acid/ to neutralise **all** the acid	acid **completely** used up etc.		
(ii) I	1	filtering	filter / filtration		
II	1	evaporating	evaporation		
(iii)	2	copper carbonate + dil. sulphuric acid (1) copper sulphate + water + carbon dioxide (1) *discrete marks*	correct formulae		
(iv)	1	sodium sulphate	Na_2SO_4		$NaSO_4$

Q	Mark	Answer	Accept	Neutral answer	Do not accept
5. (i) I	1	1 – 100 nm *units needed*			
II	1	silver / titanium dioxide			
(ii)	1	(different) properties		size	
(iii)	1	anti-bacterial	kills bacteria		
(iv)	1	self-cleaning windows		water repellant	windows

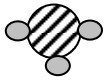
Q	Mark	Answer	Accept	Neutral answer	Do not accept
6. (a) (i)	2	hydrogen (1) and carbon (1)	H and C		
(ii) I	1	**G**			
II	1	**A**			
(b)	1	acid-rain			
	1	damages trees/crops/plants / harms or kills fish / corrodes metals… or named metal / damages/erodes buildings….or named rock / decreases pH of / increases acidity in rivers/lakes (*mark as two separate marking points*)	increases acidity in rivers / lakes		

Chemistry 1 Common Questions

Q	Mark	Answer	Accept	Neutral answer	Do not accept
7/1 (a) (i)	1	Cs	$^{133}_{55}Cs$		CS , cS
(ii)	1	boron / B	$^{11}_{5}B$		
(iii)	1	chlorine / Cl	$^{35}_{17}C1$		
(iv)	1	beryllium / Be	$^{9}_{4}Be$		
(b)	1	2 X's in first shell 8 X's in second shell 6 X's in outer shell	2,8,6 if diagram ignored		
(c) (i)	1	left gaps (for unknown elements)			
(ii)	1	(their) properties	reactivity		

Q	Mark	Answer	Accept	Neutral answer	Do not accept
8/2 (i) I	1	sodium oxide			oxide
II	1	sodium chloride			chloride
III	1	sodium hydroxide			hydroxide
(ii)	1	4:1(or blank):2			
(iii)	2	yellow flame (1) sodium (ions) present (*first point has to be correct for second mark to be obtained*)	orange		reference to 'chloride' (ions)
(iv)	2	risk (1) action (1) e.g.: amount/mass of sodium - small amount/mass used amount of water - use excess/a lot violent / speed of / rate of reaction - stand well back / safety screen / goggles / safety glasses handling sodium - use tweezers (*first point has to be correct for second mark to be obtained*)		wear gloves	

Chemistry 1 Higher only

Q	*Mark*	*Answer*	*Accept*	*Neutral answer*	*Do not accept*
3. (a) (i)	2	**A** (1) contains only one type of atom (1)			
(ii)	1	CH_4	H_4C		
(iii)	1	 hydrogen atoms must be touching nitrogen atom			
(b)	2	atoms re-arranged (1) new substance formed (1)	bonds broken **new** bonds formed		

Q	Mark	Answer	Accept	Neutral answer	Do not accept
4. (i)	1	they didn't know **how** the continents moved			
(ii)	3	shapes of continents (1) fossils (evidence) (1) rocks (evidence) (1) (*name of type of evidence rather than any description of it*)			plants/animals

Q	Mark	Answer	Accept	Neutral answer	Do not accept
5. (i) I	1	1659 to 2006	1659 to today 1659 to ' any year between 2000 and 2006'		
II	1	temperatures recorded (between these dates) *accept converse answer*			
(ii)	1	1920			
(iii)	1	glaciers/ice caps melt	sea levels rise / (coastal) flooding		
		climate changes	accept description of severe weather e.g., downpours, heat waves, drought, heavy snow, gales etc.		

Q	Mark	Answer	Accept	Neutral answer	Do not accept
6. (a) (i) I	2	NaCl ; Br_2 (1) 1:2:1Br_2:2NaCl (1) reactant and products must be correct before balancing mark can be awarded			
II	1	displacement	displacing / displace		
(ii)	1	a more reactive halogen displaces a less reactive one (from a solution of one of its compounds)			
(b) (i) I	2	436 + 243 (1) = 679 (1)			
II	2	2 × 432 (1) = 864 (1)			
(ii)	1	(overall) energy change is negative / (overall) energy change is 679-864 / (overall) energy change is –185 / energy **needed** to break bonds < energy **released** when bonds are formed			

Q	Mark	Answer	Accept	Neutral answer	Do not accept
7. (i)	1	0-100 nm	less than 100 nm		
(ii)	1	(different) properties / new properties	reactivity		
(iii)	1	enters the body / absorbed through the skin	might affect cells		
(iv)	1	e.g., socks, wound dressings, hospital linen, sanitary towels, incontinent pants, nappies, grout filler, hand soaps, refrigerators, washing machines, aeroplane air-conditioning, disinfectant spray, antiseptic		hospitals/cleaning products	

Q	Mark	Answer	Accept	Neutral answer	Do not accept
8. (i)	4	Scales (1) **all** 5 points plotted correctly (2) any 4 points plotted correctly (1) smooth curve through reliable points (1)			
(ii)	1	20 (cm^3)			
(iii)	1	repeat reaction 3 (and re-calculate average) / repeat all three reactions (for 20 cm^3 acid and re-calculate average) / do not use 122 number in calculation to find average			
(iv)	2	greater (surface) area (1) greater chance of collision (1)	collisions more likely / collisions more likely / more collisions per second/ more collisions in unit time		more collisions

Question F H		**Answers/ Explanatory notes**	**Marks Available**
1.	(i)	Sun (1) Galaxy (1)	2
	(ii)	moon (1) artificial satellite (1)	2
			[4]
2.	(i)	A chemical (1)	
	(ii)	B heat (1)	
	(iii)	C kinetic / movement (1)	3
			[3]
3.	(i)	same as (1)	
	(ii)	less than (1)	2
			[2]
4. (a)		$\text{Efficiency} = \frac{50}{1000} \times 100 (1 \text{ subs}) = 5\% (1)$	2
(b)		Light: 250 J (1) Wasted 750 J (1)	2
			[4]
5. **1.** (a)	(i)	hydroelectric **or** wind (1)	
	(ii)	no (fuel) cost [accept: no cost for waves] (1)	
	(iii)	unreliable source (1)	3
			[7]
6.	(i)	A (1)	
	(ii)	E (1)	2
			[2]

Question F H			Answers/ Explanatory notes	Marks Available
7.	(a)	(i)	£1050 (1) £350 (1)	2
	(b)		£950 – £350 = £600 (ans) e.c.f.	1
	(c)		Payback time $= \frac{1050}{350} = 3$ years (ans) e.c.f.	1
				[4]
8.	(a)		230 V (1)…50 Hz (1) …2kW / 2000 W (1) … 2000 (1)	4
	(b)	(i)	No. of kWh = 2 × 21 = 42 (1) [**not** 42000]	
		(ii)	Cost = 42 × 8(1) = 336 p [336 000 e.c.f.]	2
				[6]
9.	(a)		cans the same distance from the heater	1
	(b)		28 – 22 = 6°C	1
	(c)	(i)	radiation (1)	
		(ii)	absorbed (1)	2
				[4]
10. 1.	(a)	(i)	7610 – 6500 = 1110 (1)	
		(ii)	8525 – 7610 = 915 (1)	2
	(b)		Savings $= (1110 - 915)(1) \times 43$ $= 195 \times 43(1)$ = £83.85 correct subtraction (1) × 43 (1)	2
	(c)		Different times of year (1) Different types of weather (1) [or equiv statements] [accept: uses less gas / less energy use]	2
				[6]

Question F H		Answers/ Explanatory notes	Marks Available
11. 2. (a)	(i)	because of water content (1)	
	(ii)	heat generated (1)	2
(b)		cell damage/ changes in brain function/ cancer (any 2 × 1)	2
(c)		damage more likely in younger users / children will be exposed to it for longer than adults / reference to "softer" skulls/ easier penetration/ children still developing	1
(d)		Set up [or replicate] research with larger groups and discreet age ranges / more research with children	1
			[6]
12. (a)		gravity	1
(b)	(i)	any of: Mercury, Venus, Mars (1)	
	(ii)	any **two** of: Jupiter, Saturn, Uranus, Neptune (1)	2
(c)	(i)	any value between Mars and Jupiter (1)	
	(ii)	any value between Mars and Jupiter (1)	
	(iii)	any value between Mars and Jupiter (1) [ignore units]	3
			[6]
TOTAL FOUNDATION TIER			**[50]**
3. (a)	(i)	any value between Mars and Jupiter (1)	
	(ii)	any value between Mars and Jupiter (1)	
	(iii)	any value between Mars and Jupiter (1) [ignore units]	3
(b)	(i)	Inner planets rocky / outer gaseous (1)	
	(ii)	Sun's radiation melted ice✓ pushed gases out ✓ Solid planets left near Sun ✓ (Any 2×1)	3
(c)		$F_{out} > F_{in}$ (imbalance) **or** gas/fuel/H used up (1) expands to become a Red Giant (1) F_{in} then > F_{out} **and** contracts → (white dwarf)(1) [N.B. 1 mark for reference to forces]	3
			[9]

Question F H		Answers/ Explanatory notes	Marks Available
4. (a)		$\frac{22(1)}{12(1)} = 1{\cdot}83\,°\text{C/min}$ $\left[\frac{35}{12} = 1 \text{ mark}\right]$	2
(b)	(i)	air is a poor conductor (1) [accept: particles far apart]	
	(ii)	convectional heat rises / hot air rises (1)	2
(c)		to prevent heat loss to the surroundings / keep in the heat	1
(d)		blackened surfaces are the best absorbers of radiation [accept: shiny surfaces reflect heat]	1
			[6]
5. (a)		100 – 5 = 95 J/s [ignore unit]	1
(b)	(i)	Number of units = Power (kW) × time (h) (1) ÷1000 (1) 5×7 (1) $= \frac{20}{1000(1)} \times 5 \times 7(1) = 0{\cdot}7 \text{ kWh}$ Cost $= 0{\cdot}7 \times 8(1) = 5{\cdot}6\,\text{p}$	3_{max}
	(ii)	**5** × as much power [or repeat calculation]	1
(c)		Difference in cost = £2.69 – 45 p (1) Savings = 28 – 5·6 = 22·4 p (1) Time to pay extra cost $= \frac{224}{22{\cdot}4} = 10 \text{ weeks}$ (1)	3
			[8]

Question F H	Answers/ Explanatory notes	Marks Available
6. (a)	Ease of location / same place above equator [accept: always there!]	1
(b) (i)	$c = f\lambda$ (or in words) (1) $3\times10^8 = 5\times10^9\,\lambda$ (1) (subst/manip) $\lambda = \frac{3\times10^8}{5\times10^9} = 0\cdot06\,\text{m}$ (1)	3
(ii)	$v = \frac{s}{t}$ (equation) (1) [or in words] $3\times10^8 = \frac{2\times3\cdot6\times10^7}{t}$ (subst) (1) $t = \frac{2\times3\cdot6\times10^7}{3\times10^8}$ (1) $= 0\cdot24\,\text{s}$ [manip or ans]	3
		[7]
7. (a)	Gives out greenhouse gases / CO_2 ✓ producing global warming ✓ Increase in SO_x – acid rain / damage ✓ Heat released directly warms the earth ✓ } (any 3 × 1)	3
(b) (i)	Efficiency $= \frac{\text{Useful output}}{\text{Total input}}\times100\%$ (1) $82 = \frac{\text{Useful output}}{400}\times100$ (subs) (1) Useful output $= \frac{82\times400}{100}$ (1) $= 328\,\text{MJ/s}$ [MW] manip. or ans.	3
(ii)	No. of MJ/s transferred to grid = 328 – 210 = 118 MJ/s	1
(iii)	To make effective use of the piped heat / minimise losses [accept: make heat available to a lot of people]	1
		[8]
TOTAL	**HIGHER PAPER**	**50**

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