

**MARK SCHEME for the May/June 2010 question paper**  
**for the guidance of teachers**

**0654 CO-ORDINATED SCIENCES**

**0654/22**

Paper 22 (Core Theory), maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

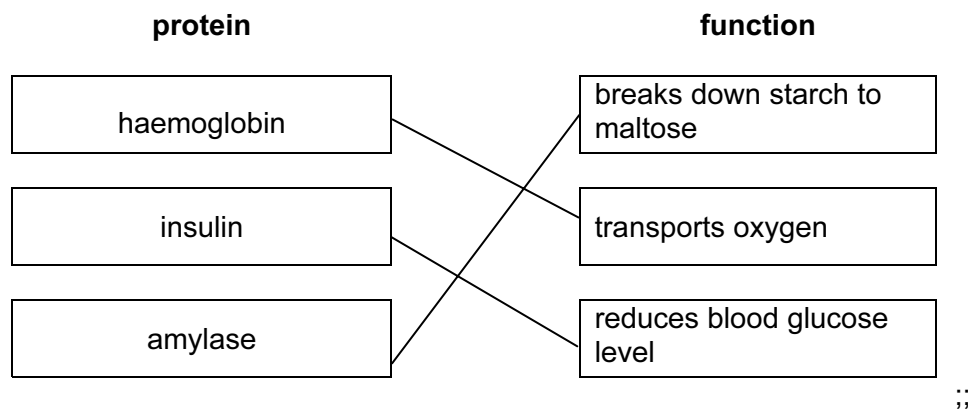
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- 1 (a) kinetic ; [1]
- (b) uranium, plutonium ; [1]
- (c) (i) cannot be replaced/used up more quickly than they are formed ; [1]
- (ii) solar/sunlight/tides/hydroelectric power/waves/wind/geothermal ; [1]
- (iii) no atmospheric pollution/no polluting gases ;  
no carbon dioxide emissions/greenhouse gases/global warming ;  
no sulfur dioxide emissions/acid rain ;  
less fossil fuels being burned ;  
less solid waste produced ;  
more energy released per kg ; [max 1]
- (d) to reduce heat/energy/power losses ;  
high voltage means low current ;  
lower  $I^2R$  means less energy lost ; [max 2]
- (e) (i) split/divide/break ; [1]
- (ii) negatively charged particle/electron ; [1]
- [Total: 9]**

2 (a)



- (b) carbon, hydrogen, oxygen, nitrogen (one mark for any two correct) ;; [2]
- (c) sample **A** (only) ;  
purple with biuret test/positive result with biuret test ; [2]
- (d) liver ; [1]

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- (e) nitrogen fixed / converted to a compound ;  
 by, lightning / bacteria / Haber process ;  
 ref. to nitrate / ammonium / ammonia ;  
 (ignore nitrite)  
 (nitrate / ammonium) taken up through plant roots (must mention roots) ;  
 (ignore osmosis)  
 used to make, amino acids / proteins (in plant) ;

[max 3]

**[Total: 10]**

- 3 (a) (i) hydrogen /  $H_2$  ; [1]

- (ii) A – sodium chloride / common salt /  $NaCl$  ;  
 B – chlorine /  $Cl_2$  ;  
 D – sodium hydroxide /  $NaOH$  ; [2]

- (iii) conducts (electricity) / good conductor ;  
 does not react with the electrolyte / unreactive ; [2]

- (iv) (damp) litmus / indicator paper ;  
 is bleached ; [2]  
 or  
 pass through bromide / iodide solution ;  
 displaces other halogen / colour change stated ;

- (b) (i) (sucrose is the carbohydrate)  
 because it contains only C, H and O / sucralose contains chlorine / another  
 element in addition to C, H, O ;  
 reference to energy released from sucrose; [1]

- (ii) 42 ; [1]

- (iii) can use less which offsets extra cost ;  
 (for equivalent sweetening) fewer kilojoules (consumed) ;  
 stated health benefit – control of body weight / diabetes / tooth decay ; [max 2]

**[Total: 11]**

- 4 (a) (i) A and C ;  
 overall resultant force / unbalanced forces ; [2]

- (ii) arrows in direction of resultant force ; [1]

- (iii) gravity (weight) ; [1]

- (iv) the Earth ; [1]

- (b) (density) = mass / volume ;  
 =  $720 / 80 = 9 \text{ (g/cm}^3\text{)}$  ; [2]

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- (c) component to show conduction (lamp ammeter);  
 component to provide PD (battery/cell/power pack);  
 correct circuit (including symbols); [3]

[Total: 10]

- 5 (a) (i) the greater the light intensity, the faster the rate of photosynthesis ;  
 but at high light intensities no effect on rate ; [2]

- (ii) energy ;  
 to make carbon dioxide combine with water ; [2]

- (b) (i) **P** (upper) epidermis ;  
**Q** air space ;  
**R** stoma ; [3]

- (ii) leaf **B** (no mark)  
 most photosynthesis takes place in palisade cells (compared with other cells)  
 larger / greater area of / greater volume of, palisade cells allows more  
 photosynthesis ; [1]

- (iii) reduces water loss ;  
 this leaf is exposed to (more) heat from Sun ; not light which would increase  
 evaporation rate ; [max 2]

- (iv) diffusion ;  
 down concentration gradient ;  
 through, stomata/**R** ;  
 through, air spaces/**Q** ; [max 3]

- (c) environment ;  
 leaves are from the same tree ;  
 so have the same genes ; [max 2]

[Total: 15]

- 6 (a) 7 ;  
 5 ; [2]

- (b) (i) test-tube / reaction mixture becomes warm / temperature rises ;  
 because reaction gives off heat ; [2]

- (ii) decrease (acid) temperature ;  
 decrease acid concentration / strength ;  
 lower magnesium surface area / less magnesium ; [max 2]

- (iii) →magnesium chloride + hydrogen ;; [2]

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(c) (i) (mark words separately)  
*metallic*  
reference to typical properties e.g. good conductor / malleable / ductile /  
sonorous/lustrous/high melting point/high boiling point/forms positive ions ;  
*element*  
contains only one type of atom/found in Periodic Table/other correct ; [2]

(ii) beryllium / calcium / strontium / barium ; [1]

(iii)  $26 - 12 = 14$  neutrons ; [1]

**[Total: 12]**

7 (a) (i) A to B ; [1]

(ii) 50 ; [1]

(iii) (momentum =) mass  $\times$  velocity ;  
 $= 600 \times 50 = 30000$  (kg m/s) ; [2]

(iv) (acceleration =) gradient (or use numbers) ;  
 $= 50/8 = 6.25$  (m/s<sup>2</sup>) ; [2]

(b) (i) (turning effect =) force  $\times$  distance ;  
 $= 0.3 \times 300 = 90$  (Nm) ; [2]

(ii) increase force ;  
increase distance / longer spanner ; [2]

(c) red and green – both needed for mark ; [1]

**[Total: 11]**

8 (a) (stimulus) sound ;  
(receptor) ear ;  
(effector) muscle ; [3]

(b) (i)  $2 \div 330$  ;  
0.006 (s) ; [2]

(ii) ring around results for heat 5 ; [1]

(iii) lane 8 (no mark)  
takes longer for sound (of gun) to reach lane 8 ; [1]

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- (c) (i) breaking down/releasing energy from, glucose/carbohydrate/other ;  
without oxygen ; [2]
- (ii) lactic acid ; [1]
- (iii) combined with oxygen ;  
in liver ;  
ref. to breathing faster ;  
ref. to oxygen debt ; [max 2]

**[Total: 12]**

9 (a) (a) cools ; [1]

(b) no (elemental) oxygen gas present ;  
oxygen is part of a compound/the water (vapour) ;  
compounds have different properties from the elements in them ;  
water puts the flame out ; [max 2]

(c) (i) (strong) heat/ must be fired (in kiln) ; [1]

(ii) carbon dioxide is an acidic oxide / causes (rain)water to be acidic / lowers the  
pH of rain ;  
acids react with limestone ;  
limestone contains (calcium) carbonate (which reacts with acids) ; [3]

(d) (i) forms limescale on the element/dishes/inside surfaces ;  
reduces efficiency of the (heating) element/may cause element to overheat/  
malfunction ;  
use more detergent ; [max 1]

(ii) calcium/magnesium ; [1]

(iii) helps to clean objects/improves washing efficiency/kills bacteria ; [1]

**[Total: 10]**