

NOVEMBER 2001

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK : 110

SYLLABUS/COMPONENT : 0654/3

**CO-ORDINATED SCIENCES
(EXTENDED)**

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- 1 (a) (i) C + E because they have the same number of outer electrons; [1]
- (ii) A as it has a, full outer shell / stable electronic structure; [1]
- (iii) D as it has seven outer electrons / needs one more to complete outer shell; [1]
- (b) (i) $N_2 + 3H_2 \rightarrow 2NH_3$; [2]
- (ii) hydrogen / nitrogen;
not all reactants react / reversible reaction;
- or*
- oxides of carbon;
produced by earlier processing;
- or*
- named noble gas;
present in air and does not react; [2]
- (c) (i) HNO_3 ; [1]
- (ii) oxygen; [1]
- (d) (i) neutralisation; [1]
- (ii) HPO_4^{2-} ;
overall charge must be zero; [2]
- 2 (a) (i) nucleus / chromosomes; [1]
- (ii) ionising radiation / named ionising radiation / radioactivity / cigarette smoking; [1]
- (iii) this is where, gametes / sperm, are formed;
mutation in one cell is not enough to affect the man;
offspring may contain mutation in all cells; [max 2]
- (b) (i) in nucleus;
that passes along pollen tube;
through style; [max 2]
- (ii) Aa;
red; [2]
- (iii) parents Aa Aa;
gametes A and a A and a;
offspring AA Aa Aa aa; [3]
- 3 (a) rotation could produce electricity or electricity could produce rotation;
rotation to electricity is generator;
electricity to rotation is motor;
detail; [4]
- (b) (i) needs to be alternating current / magnetic field not changing; [1]
- (ii) current changes / voltage changes / magnetic field changes; [1]

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- 4 (a) (i) fractional distillation; [1]
- (ii) *expect correct terminology*
gasoline less dense;
less viscous;
lower boiling point;
more flammable [max 2]
- (b) add to bromine (water);
becomes colourless ;
shows alkenes are present; [3]
- (c) working;
32g; [2]
- (d) removed from environment more quickly as it is biodegradable;
less CO emissions so less health hazard to, humans / animals;
as CO, reduces capacity of blood to carry oxygen / combines with Hb;
less sulphur dioxide produced / less acid rain;
ref. to specific environmental problem caused by, sulphur dioxide / acid rain; [max 4]
- 5 (a) idea that there are 1000 mg in one gram;
100 times; [2]
- (b) carbohydrate;
animals do not store carbohydrate / only plants contain starch / ref. to cellulose cell walls; [2]
- (c) (i) fats;
proteins; [2]
- (ii) respiration;
glucose, combined with oxygen / oxidised; *not 'burnt'*
to produce water and carbon dioxide; [max 2]
- (d) lipase;
in small intestine / duodenum / ileum;
breaks down fats to fatty acids and glycerol;
bile (salts) emulsify fats; [max 3]
- (e) (i) more cabbage can grow (in a particular area) than chickens;
energy lost between trophic levels;
so less biomass possible at higher trophic levels; [max 2]
- (ii) animals used for purposes other than food;
animal foods provide nutrients not obtainable from plant foods /
animal foods richer in some nutrients than plant foods;
named examples;; (e.g. calcium from milk, iron from meat)
people cannot eat grass (but some animals can);
animal foods can be eaten in winter when plant foods not available;
climate / terrain, may be unsuitable for growing plants; [max 2]

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- 6 (a)** mouse travels $5 \times 8 = 40$ m;
cat travels $0.5 \times 8 \times 10 = 40$ m; [2]
- (b)** work = force x distance;
 $20 \times 2 = 40$ J;
jump is 100% efficient / no air resistance; [3]
- (c) (i)** clockwise force x distance = anticlockwise force x distance;
working;
50cm; [3]
- (ii)** moment / turning force, of cat decreases; *not 'momentum', not 'force'*
beam tips down on mouse's side; [2]
- 7 (a) (i)** covalent; [1]
- (ii)** 6 electrons on each O and 4 on C; *must be able to tell which are which*
correctly shared pairs; [2]
- (b)** reaction, slows / stops, at high temperature;
enzyme, less efficient / does not work, at high temperature;
denatured; *not 'killed'* [max 2]
- (c) (i)** equal volumes of the wines; *not 'amount'*
addition of alkali to each in a controlled manner;
until mixture is neutral;
ref. to accurate method of detecting neutrality (*not UI*);
the wine requiring the greater volume of alkali is the more acidic; [max 4]
- (ii)** 0.04×150 ;
6g; [2]
- (d)** redox / oxidation;
oxygen has been gained by ethanol; [2]
- 8 (a) (i)** number / amount, of waves / oscillations, per, second / unit time; [1]
- (ii)** wavelength = velocity \div frequency;
working;
0.03 m; *allow e.c.f. if megahertz incorrectly dealt with* [3]
- (iii)** time = distance \div speed;
 3.3×10^{-5} s; *allow other correct units, e.g. .03 ms* [2]
- (b)** digital is series of pulses / off and on;
analogue continuous range of values; [2]
- (c)** light totally internally reflected (stated);
diagram showing this
explanation in terms of critical angle; [max 2]

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- 9 (a)** A cornea / conjunctiva;
 B optic nerve; *allow 'optical nerve', not 'optic fibre'*
 C iris; [3]
- (b)** two straight lines leaving top of flame;
 refracting inwards at the cornea / lens; *not if going through the iris*
 focus on retina; [3]
- (c)** lens is made thinner;
 ciliary muscles relax;
 increasing tension on suspensory ligament; *not ligaments 'contract'* [3]
- (d)** no cones / only rods, in this part of the retina;
 cones used for colour vision / rods only see in black and white; [2]
- 10 (a) (i)** P;
 all current passes through; [2]
- (ii)** Q;
 greater resistance in this part of branched circuit; [2]
- (b) (i)** 1.5 V;
 3.0 V; [2]
- (ii)** resistance = voltage ÷ current;
 15 ohms; *allow e.c.f. from (i)* [2]
- (iii)** formula or working;
 10 ohms; *allow e.c.f. from (i) and (ii)* [2]