CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2013 series

0654 CO-ORDINATED SCIENCES

0654/22 Paper 2 (Core Theory), maximum raw mark 120

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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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CAMBRIDGE
International Examinations

1 (a) (i) electrodes made to contact the contents ;
positive reading on ammeter / if there's a current then shows conduction ; [2]

(ii) **Q** conductor and **S** insulator ;
iron is a metal ;
sulfur is a non-metal ; [3]

(iii) chlorine ;
copper ; [2]

(iv) electrolysis ; [1]

(v) reference to use of damp indicator paper / solution of indicator ;
decolourised ; [2]

(b) (i) loses electron ;
each atom loses one electron / now protons – electrons = 1 ; [max 1]

(ii) sodium and chloride ions have opposite (electrical) charge ;
reference to force of attraction (between opposite charges) ; [2]

[Total: 13]

2 (a) (i) slows down ; [1]

(ii) frequencies ; [1]

(iii) frequencies ; [1]

(iv) amplitudes ; [1]

(b) sound waves travel by <u>vibration</u> of medium / particles ;
as the air is sucked out there is less of a medium / particles to convey the sound wave ;
no air / vacuum / medium means sound waves cannot pass through ; [max 2]

(c) reflection ;
total internal ;
when angle is greater than critical angle ; [max 2]

[Total: 8]

3 (a) (i) label to xylem ;
label to phloem ; [2]

(ii) *xylem:*
transports water ;
transports, mineral ions / named ion ;
provides support ;

phloem:
transports nutrients ;
made in leaves / by photosynthesis ;
e.g. sucrose / sugar ; [max 4]

(b) (i) more root hairs ;
shorter root hairs ; [2]

(ii) increase in number in both types is, the same / 0.44 more root hairs per unit area ;
decrease in length is much greater in plant **B**s ; [2]

(iii) (roots have) reduced surface area ;
less able to take up water / mineral ions ;
(reduced water) causes reduced photosynthesis ;
less glucose made ;
glucose used for energy / respiration ;
for growth / building up large molecules building cell walls ;
less nitrate (uptake) reduces protein synthesis ;
less phosphate (uptake) reduces cell membrane synthesis ;
less magnesium (uptake) reduces chlorophyll synthesis ;
less potassium
(uptake) reduces protein synthesis ; [max 3]

(c) nitrate used to make, amino acids / proteins / chlorophyll production ;
proteins needed to make new cells ; [2]

[Total: 15]

4 (a) (i) increased ;
because mixture has become more alkaline ; [2]

(ii) colour change (blue) to red ;
effervescence stops / (gas) bubbles stop being produced ; [2]

(b) (i) colour change of cobalt chloride paper shows water ;
and cloudy limewater shows carbon dioxide ; [2]

(ii) no more gas bubbles through limewater ; [1]

(iii) sodium carbonate has lower mass ;
matter in the form of carbon dioxide and water has been removed ; [2]

(iv) *sodium hydrogencarbonate* → sodium carbonate + carbon dioxide + water ; [1]

[Total: 10]

5 (a) (i) series ; [1]

(ii) ammeter with correct symbol in series ;
voltmeter with correct symbol in parallel ; [2]

(iii) $R_T = R_1 + R_2$;
= 15 Ω ; [2]

(iv) I = V/R ;
9/15 = 0.6 A ; [2]

(b) density = mass/volume ;
= 9000/3000 = 3.0 (g / cm^3) ; [2]

(c) heat transferred from body to sweat / heat absorbed by sweat from athlete's body / heat energy in body reduced by sweating ;
kinetic energy of water molecules increases / water molecules move faster ;
faster moving / more energetic (water) molecules escape / leave the surface / water molecules turn to gas / vapour ;
break bonds / break forces of attraction between molecules ;
(KE) / energy of (remaining) water molecules (in sweat) decreases ; [max 3]

[Total: 12]

6 (a) **A** penis ;
B sperm duct ;
C urethra ; [3]

(b) reference to X and Y chromosomes ;
male XY and female XX ;
sperm can be X or Y ;
eggs all X ; [max 3]

(c) (i) human immunodeficiency virus ; [1]

(ii) not have sexual intercourse / wear a condom ;
(allow other methods e.g. not sharing needles / must not donate blood) [1]

[Total: 8]

7 (a) (i) liquid **AND** solid ; (both required) [1]

(ii) iodine atom has more electron shells than bromine ;
iodine atom contains more protons, neutrons (and electrons) than bromine ; [2]

(iii) mixture becomes brown ;
because iodine is produced / because iodine is displaced / because chlorine ;
is more reactive than iodine ; [max 2]

(b) to kill harmful bacteria / microorganisms ;
to make water safe for humans ; [2]

(c) flask contains a mixture / chlorine and helium atoms have not bonded ;
because helium is noble gas / inert ; [2]

[Total: 9]

8 (a) (i) driving force forwards and friction forces backwards ; [1]

(ii) air resistance / tyres on road / brakes ; [1]

(iii) equal and opposite ; [1]

(iv) constant speed ; [1]

(v) gravity / weight ; [1]

(b) (i) speed = distance/time ;
= 400/25 = 16 m/s ; [2]

(ii) kinetic ; [1]

(iii) gravitational / potential ; [1]

(c) pressure increases ;
particles move faster therefore **more frequent** collisions with tyre walls ; [2]

9 (a) (i) has an effect whenever present ; [1]

(ii) white ; [1]

(iii) (parents' genotypes) **Ff** and **Ff** ;
gametes **F** and **f** from both parents, ;
offspring genotypes **FF**, **Ff**, **Ff** and **ff** ; [3]

(iv) 3:1 ; [1]

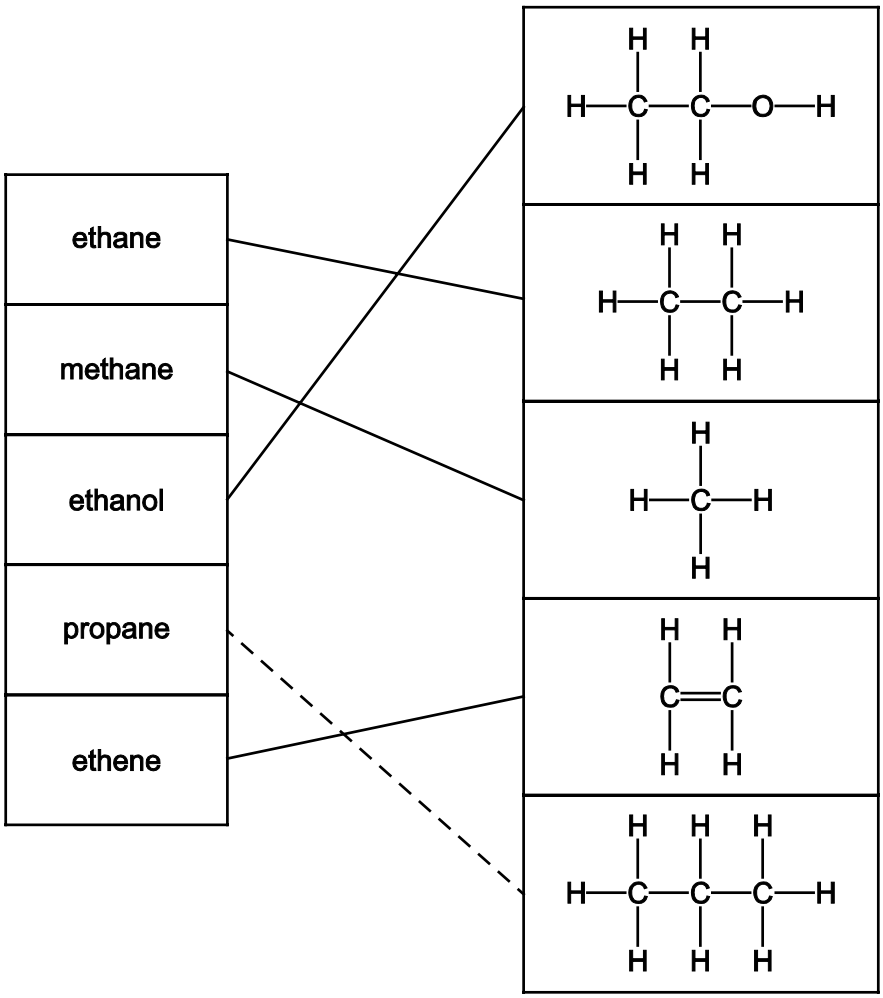
(b) (i) oxygen combined with **glucose** ;
chemical energy in **glucose** transferred to (heat) energy ;
exothermic reaction ; [max 2]

(ii) fur traps air ;
fur / air, acts as an insulator ;
reduces heat loss by, convection / radiation ; [max 2]

(iii) ears / paws / nose, colder than other parts of body ;
black pigment produced in colder areas ;
enzyme is active in these areas ; [max 2]

[Total: 12]

10 (a) (i)



(4 correct = 3 marks, 2/3 correct = 2 marks, 1 correct = 1 mark) ;;; [3]

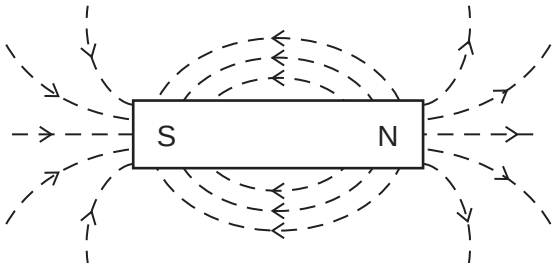
(ii) fuel ;
solvent ;
in drinks ; *(allow other correct)* [max 2]

(b) (i) CF_2Cl_2 ;
(allow elements in any order) [1]

(ii) covalent ;
non-metallic atoms bonded ; [2]

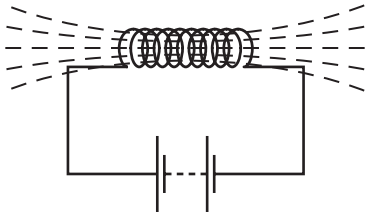
[Total: 8]

11 (a) (i)



shape ;
arrow direction ; [2]

(ii)



[1]

(iii) advantage – can be turned on and off / can have variable strength / can be stronger ; [1]

(b) (i) magnetic ;
current ;
stronger ; [3]

(ii) reverse current ;
reverse magnetic field ; [2]

12 (a) (i) producer ; [1]

(ii) carbohydrate / glucose / sugar / sucrose ; [1]

(iii) energy (flow / transfer) ; [1]

(b) carbon dioxide ;
methane ; [2]

[Total: 5]