UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2011 question paper

for the guidance of teachers

0654 CO-ORDINATED SCIENCES

0654/32 Paper 3 (Extended 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.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

UNIVERSITY of CAMBRIDGE
International Examinations

1 (a) (i) hair / fur; [1]

(ii) large ears / large eyes / long neck (so eyes high above ground) / long legs / strong legs ; [1]

(b) more oxygen can be absorbed from the air / idea of compensating for less oxygen being available ;
more oxygen supplied to, cells / muscles, / more oxygen carried by blood (cells) ;
for respiration ; [max 2]

(c) increases as animals breed / plenty of food available ;
reference to limiting factors / reaches carrying capacity / reaches capacity of environment ;
not enough, grass to eat / food / resources ;
many eaten by, foxes / pumas ;
plateau because birth rate equals death rate ; [max 3]

(d) choose guanacos with desirable features ;
allow to breed together ;
repeat with selected offspring ;
for many generations ; [4]

[Total: 11]

2 **(a)** reference to lithium's high reactivity ; [1]

(b) **(i)** lithium atom has, 3 protons and 3 electrons / equal numbers of protons and electrons ;
lithium ion has, 3 protons and 2 electrons / one more proton than electron ;
(accept comparison of numbers of positive and negative charges) [2]

(ii) it is an ionic compound / has a giant structure ;
strong bonds between ions / oppositely charged ions attract (strongly) ;
very large number of bonds have to be broken ;
much energy needed to break bonds ; [max 2]

(c) lithium carbonate + hydrochloric acid ⟶ lithium chloride + carbon dioxide + water
LHS ; RHS ;
(1 mark for correct balanced symbol equation) [2]

(d) **(i)** so that ions can move / liquid will conduct electricity ; [1]

(ii) each ion gains one electron / from 2 to 2.1 ; [1]

(e) avoid unexpected / uncontrolled effects (of impurities) ;
avoid harming the user ;
ensure correct dosage / owtte ; [max 1]

[Total: 10]

3 **(a)** (work done =) force × distance / weight × distance ;
= 700 × 55 = 38 500 J ; [2]

(b) relationship between pressure, force and area ;
pointed end has small area and large pressure ;
disc has large area and small pressure ; [max 2]

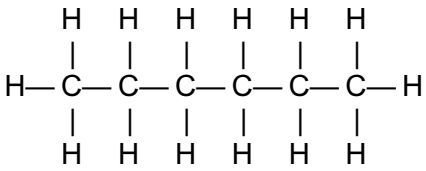
(c) less friction therefore go faster / less energy, lost / used ; [1]

[Total: 5]

4 (a) (i) *reference to:*
timescale / time to renew ;
action of heat / pressure ;
action of microorganisms / reference to decay ; [max 2]

(ii) oxygen ; [1]

(b) (i)



/ isomer formula correctly drawn ;
[1]

(ii) *similarities*
not very reactive or specific example / all burn / insoluble in water ;
differences
boiling points / melting points / flammability / viscosity ; [2]

(c) (i) reference to nitrogen in the air (intake) ;
nitrogen unreactive / (most) passes through engine (unchanged) ;
extra detail of reasons why nitrogen is unreactive ; [max 2]

(ii) speeds up the reactions taking place ;
provides surface on which reactions occur ; [max 1]

(iii) carbon monoxide is, removed / oxidised ;
carbon monoxide converted to carbon dioxide (which is non-poisonous) ;
(unburnt) hydrocarbons are oxidised / removed ;
hydrocarbons are converted into carbon dioxide and water (which are non-poisonous) ; [max 3]

[Total: 12]

5 **(a)** krypton ; [1]

(b) **(i)** lead / concrete ; [1]

(ii) causes ionisation inside cells ;
kills cells ;
damages DNA / causes mutation ;
causes cancer ;
radiation sickness ;
radiation burns ; [max 2]

(c) **(i)** same number of protons ;
different number of neutrons ; [2]

(ii) 3 half-lives ;
300 years ; [2]

[Total: 8]

6 **(a)** tendon ; [1]

(b) triceps / **B**, contracts ;
biceps / **C**, relaxes ;
tendon / **A**, transmits force from triceps to bone / pulls the bone ; [3]

(c) muscles can only pull / muscles cannot push ;
one muscle to pull in each direction / contraction of one muscle lengthens the other ; [2]

(d) **(i)** steady / linear / proportional, increase / gradient increases, owtte ;
from 0.62 to 1.1 (g/cm^3) / by 0.48 (g/cm^3) ; [2]

(ii) these foods contain calcium needed for bones ;
reference to avoiding risk of osteoporosis later ; [2]

(e) **(i)** (bone is) harder / stronger / less elastic / less smooth ; [1]

(ii) on the surface of the bones at the joint ;
reduces friction / allows bones to move smoothly over each other / absorbs shocks ;
[2]

[Total: 13]

7 **(a)** clockwise moment has to equal anticlockwise moment / $F_1d_1 = F_2d_2$, owtte ;
to stop crane tipping over when lifting weight ; [2]

(b) (moment =) force × distance / weight × distance ;
(= 5000 × 30) = 150 000 Nm ;
(150 000 / 25 000) = 6 m ; [3]

(c) **(i)** $v - u = at$ **or** $(t =) \frac{v-u}{a}$;
t = 40 / 10 = 4 s ; [2]

(ii) suitable scales and axes labelled with quantities and units ;
straight line ;
from 0 m / s at t = 0 to 40 m / s at t = 4 ; [3]

(iii) (KE =) ½ mv^2 ;
= 0.5 × 2 × 40 × 40 = 1600 J ; [2]

(iv) 1600 (J) ;
energy is conserved ; [2]

[Total:14]

8 (a) (i) petals / nectary ; [1]

(ii) anther / stamen ; [1]

(b)

feature	*insect-pollinated flower*	*wind-pollinated flower*
shape of stigma	rounded / flat / smooth	feathery ;
position of stigma	inside flower / inside petals	dangling / outside flower / outside petals ;

[2]

(c) pollen tube grows ;
(tube grows) through style ;
male gamete / male nucleus / pollen nucleus, travels down pollen tube ;
fuses with female gamete / female nucleus / egg cell ;
in ovule ; [max 4]

(d) sugars / glucose produced by photosynthesis in leaves ;
transported to flowers in phloem ;
as sucrose ;
mineral ions / named ions in xylem ; [max 2]

[Total: 10]

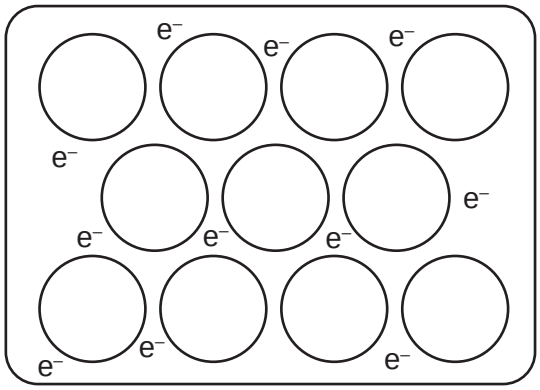
9 (a) (i) (acid) temperature / concentration ;
temperature / concentration affects the rate ;
idea of isolating the effect of changing the metal / development of explanation in terms of particles ;
(if *volume* of hydrochloric acid – max. of 2 marks) [3]

(ii) ignites / pops ;
hydrogen is given off ; [2]

(b) (i) **D** is more reactive than **B** as shown in the acid reaction ;
D is the negative electrode in the cell ; [2]

(ii) **C** ;
A is more reactive than **C** (since it is the negative electrode in the cell) ;
(since both) **A** and **C** are less reactive than **B** and **D** ; [max 2]

(c) A typical diagram might be:–



all atoms same size in a reasonably regular arrangement and reasonable indication of delocalised ('sea of') electrons ;
the idea of electrical conduction via the electrons ; [2]

[Total: 11]

10 (a) (i) straight lines ;
approx angles of incidence and reflection (correct by eye) ; [2]

(ii) (signal travels) faster / less interference / can carry more messages at once / less attenuation / resistance to the effects of moisture ; [1]

(b) (current =) voltage / resistance ;
= 250 / 20 000 = 0.0125 A ;
spasm ; [3]

[Total: 6]