

**MARK SCHEME for the October/November 2011 question paper
for the guidance of teachers**

0654 CO-ORDINATED SCIENCES

0654/22

Paper 2 (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.

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

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1 (a)

insect	1		2		3		4		name
	a	b	a	b	a	b	a	b	
A	✓			✓					<i>Musca</i>
B		✓				✓			<i>Formica</i> ;
C		✓			✓				<i>Termes</i> ;
D	✓		✓				✓		<i>Graphosoma</i> ;
E	✓		✓					✓	<i>Coccinella</i> ;

one mark per correct row

(if no ticks, or if all ticks are wrong, allow one mark for getting all four names correct) [4]

(b) idea of universal understanding/to identify its genus and species ; [1]

(c) (i) protease/trypsin/pepsin OR lipase ; [1]

(ii) amino acids OR fatty acids and glycerol ; [1]

(d) (i) white (blood) cells ; [1]

(ii) they can kill other organisms ;
 cause disruption to food chains ;
 they could harm human health ;
 pests can become resistant to the pesticides ; [max 1]

(e) (i) vibrations ;
 ref. to air particles/compressions and rarefactions ; [2]

(ii) (midge buzz) higher pitch ;
 because higher frequency ; [2]

[Total: 13]

2 (a) (i) arrows correctly drawn and labelled ; [1]

(ii) equal and opposite ; [1]

(iii) constant speed ; [1]

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- (b) (i) cause cancer/kills cells/radiation burns/radiation sickness ;
mutation/change DNA ;
- (ii) (granite) rocks/radon ;
- (c) electromagnetic wave ;
use ; [2]
- (d) (i) to stop snacks spoiling/oxidising ;
stops microbes respiring ;
nitrogen is unreactive ; [max 2]
- (ii) pressure inside packet is greater than airplane pressure ; [1]

[Total: 11]

- 3 (a) (i) 4 ; [1]
- (ii) silicon ;
(does have same outer electrons) because in same group ; [2]
- (iii) neon ; [1]
- (b) (i) formed as fossil fuel ;
decomposition of organic matter ;
from digestive systems of ruminants ;
ref. volcanism ; [max 2]
- (ii) B ;
exothermic means heat given off ;
much heat per second means rate is high ; [max 2]
- (c) (i) detergent/soap ; [1]
- (ii) suitable example of water pollution ; [1]

[Total: 10]

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- 4 (a) traps layer of air ;
ref. good insulator ;
- (b) (i) (weight =) 10 800 (N) ; [1]
- (ii) (work =) force × distance ;
= 10 800 × 100 = 1 080 000 (J) ; [2]
- (iii) (kinetic energy =) $\frac{1}{2} mv^2$;
= $\frac{1}{2} \times 1080 \times 0.2 \times 0.2 = 21.6$ (J) ; [2]
- (iv) (average speed =) distance/time ;
= 1000/4000 = 0.25 (m/s) ; [2]
- (c) does not deplete fossil fuel reserves/carbon neutral/kerosene is a hydrocarbon fuel ; [1]

[Total: 10]

- 5 (a) sexual and asexual ; (both needed) [1]
- (b) (i) (large) petals/large flowers/nectar guides/landing platform ; [1]
- (ii) male gamete fuses with female gamete ;
zygote produced ;
(allow 'sex cell' or 'nucleus' instead of 'gamete') [2]
- (iii) ovary ; [1]
- (iv) seeds ; [1]
- (c) (i) increase growth of plants ;
(plants need nitrates) to produce proteins ;
proteins needed to produce new cells ; [max 2]
- (ii) Q has nitrogen-fixing bacteria in its roots ;
provide plants with, nitrogen-containing compounds/ammonium ions ; [2]

[Total: 10]

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- 6 (a) (i) 89 ;
- (ii) melt the component metals together ;
- (iii) strong/hard/low malleability ;
 coins must not easily be damaged/must be easily recognised over long periods/owtte ;
OR
 (chemically) unreactive ;
 coins must not easily corrode ;
OR
 malleable ;
 can be shaped (for coin manufacture) ; [max 2]
- (b) (i) tin oxide + carbon → tin + carbon monoxide ; [1]
- (ii) carbon ;
 joins with oxygen ; [2]
- (c) (i) negative electrode ;
 liquid which conducts a current/contains mobile ions ; [2]
- (ii) (atom) loses electrons ; [1]
- (iii) 15 ; [1]
- (d) (i) sol/colloid ; [1]
- (ii) (sols are) not transparent so light does not reach skin/(sol) reflects light ;
 (allow sunscreen absorbs light/acts as a light filter) [1]
- [Total: 13]**
- 7 (a) from blood ; (ignore 'ref to bleeding')
 from red blood cells ;
 from haemoglobin ;
 by diffusion ; [max 2]
- (b) (i) keeping warm ;
 making new cells ;
 transmitting nerve impulses ; [max 2]
- (ii) homeostasis ; [1]
- (iii) water lost in sweat ;
 ref. to need to maintain water content of body ; [max 2]

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- (c) ref. to coronary artery ;
 supplies heart muscle with, blood/oxygen ;
 blockage (in blood vessel) ;
 cause of blockage (e.g. plaque, cholesterol, blood clot) ;
 heart, muscle/cells, die/cannot contract, because of lack of oxygen ;

[max 3]

[Total: 10]

- 8 (a) (i) arrows go down ; [1]
 (ii) convection ; [1]
 (iii) cold air becomes more dense and sinks ; [1]
- (b) (i) (density =) mass / volume ;
 = 7.4 / 8;
 = 0.925(g / cm³) ; [3]
 (ii) solid – regular arrangement and all particles touching ; [2]
 liquid – irregular arrangement and most particles touching ;
- (c) (i) (resistance =) voltage / current ;
 = 250 / 0.05 = 5000 (Ω) ; [2]
 (ii) $R_T = R_1 + R_2$;
 = 5000 + 5000 = 10 000 (Ω) ; [2]

[Total: 12]

- 9 (a) (i) A ; [2]
 C ;
- (b) (i) photosynthesis ; [2]
 respiration ;
- (ii) glucose / carbohydrate / sugar / starch ; [1]
- (iii) algae produce oxygen which coral uses / coral produces carbon dioxide which algae uses ; [1]

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- (c) (i) increased use of fossil fuel/example which implies this ;
carbon dioxide produced when fuel burns ;
- (ii) carbon dioxide dissolves in/reacts with (sea) water ;
makes water more acidic/less alkaline ;
non-metal oxides are acidic ; [max 2]
- (iii) accept any reasonable science based idea:
e.g. calcium carbonate may react with more acidic water / lower pH makes
it more difficult for coral to extract ions from sea / coral (polyps)/algae do not
survive in more acidic water ; [max 1]

[Total: 11]