CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2015 series

0653 COMBINED SCIENCE

0653/32 Paper 3 (Extended Theory), maximum raw mark 80

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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1 (a) (i) ← frictional force,→ driving force (*both required) ;*
↓ weight ; [2]

(ii) 30 000 (N) ;
no movement / acceleration vertically, so must be balanced / owtte ; [2]

(iii) pull of Earth / gravitational pull / gravity ; [1]

(b) (i) (30–90 s) constant speed ;
(90–120 s) (negative) acceleration / deceleration *(do not accept*: braking) ; [2]

(ii) distance travelled = area under graph ;
= (20 × 30 × ½) + [20 × (90–30)] ;
= 1500 m = 1.5 (km) ; [3]

[Total: 10]

2 (a) (i) to kill any existing microbes ; [1]

(ii) so that the enzymes in the bacteria are not denatured / optimum temperature for fermentation ; [1]

(b) (i) proteins ; [1]

(ii) by action of enzymes / protease / reference to digestion ; [1]

(iii) amino acids produced by bacterium **B** will help growth / protein synthesis of bacterium **A** ;
growth factors produced by bacterium **A** will speed up growth of bacterium **B** ;
faster yoghurt production / more profit ;
(if marking points 1 and 2 are not present then allow 1 mark for the idea that they each speed up the growth of the other) [max 2]

(c) (i) *(yoghurt **D**)*
contains less fat ; [1]

(ii) *(yoghurt **D**)*
contains more calcium ; [1]

[Total: 8]

3 (a) (i) fractional distillation ; [1]

(ii) physical because new substances are not made / involve only changes of state / owtte ; [1]

(b) (i) increasing boiling point from **A** to **D** ; [1]

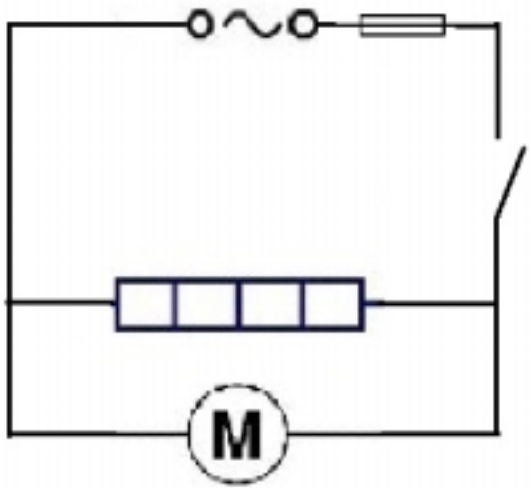
(ii) increasing size of molecules from **A** to **D** ;
increasing force between molecules from **A** to **D** ;
increasing energy required to separate molecules from **A** to **D** ; [max 2]

(c) 2C and 6H ;
correct single bonds between C and H atoms ; [2]

(d) produces alkenes / compounds with double bonds / unsaturated compounds ; [1]

[Total: 8]

4 (a) complete circuit with no open branches or short circuits ;
on-off switch and fuse in main circuit using correct symbols *(fuse either side of supply, order of fuse and switch either way round)* ;
heater and fan motor in parallel ;



[3]

(b) (i) **X** marked in the heater branch, either side of heater ; [1]

(ii) (as temperature rises, particle motion increases) and particles separate (expansion) ;
(expansion) greater in brass than in iron ; [2]

(iii) in the air coming into the heater / owtte ;
senses / switches off when air temperature in room is too high ; [2]

[Total: 8]

5 **(a)** **(i)** any value between 1 and 10 (micrometres) inclusive ; [1]

(ii) any answer of a million or more ;
any answer in hundreds ; [2]

(iii) male gamete is haploid and zygote is diploid / it has half the number of chromosomes ;
(assume 'it' refers to the male gamete) [1]

(b) amniotic fluid ;
protects against physical damage ; [2]

(c) **(i)** reference to reduced rate of flow of blood to (and from) placenta ; [1]

(ii) reduces growth rate ;
supply of nutrients / oxygen is reduced ;
(accept AVPs about lower rate of removal of waste products) [2]

[Total 9]

6 **(a)** **(i)** bubbles (gently) / owtte ; [1]

(ii) zinc is above hydrogen in the reactivity series ;
zinc is below calcium / above copper in the reactivity series ; [2]

(b) **(i)** (copper) <u>atoms</u> ; [1]

(ii) loss of copper ions ; [1]

(iii) zinc displaces copper ;
zinc has a greater tendency to form ions than copper ;
zinc is above copper in the reactivity series ; [max 2]

(c) (i)

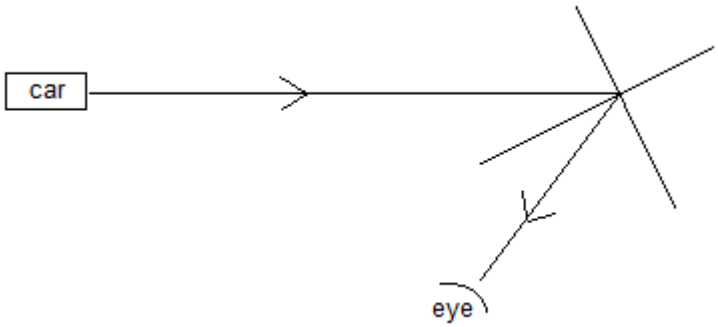
(zinc)
(iron)
tin ;
(copper)

[1]

(ii) tin displaces copper so is above copper in the reactivity series ;
tin does not displace iron so is below iron in the reactivity series ; [2]

[Total: 10]

7 (a) (normal to mirror as shown)



incident ray drawn so that angles of incidence and reflection are equal by inspection ;
incident and reflected rays carefully drawn, with arrows in the correct direction and meeting at one point on mirror ; [2]

(b) microwaves ; [1]

(c) (i) $v = f\lambda$; [1]

(ii) $f = \frac{v}{\lambda} = \frac{3 \times 10^8}{589 \times 10^{-9}}$;
$= 509 \times 10^{12}$ Hz ; [2]

(d) (i) $P = IV$ or $(I =) \frac{P}{V}$ or $\frac{36}{6}$;
$= 6$ (A) ; [2]

(ii) total current = 6 + 6 + 1 = 13 (A) / ecf ; [1]

[Total: 9]

8 (a) (i) the position of an organism in a food chain or food web ; [1]

(ii) energy lost at each stage (of food chain) ;
less energy for organisms further along chain ; [2]

(iii) badger correctly linked to all 3 organisms ;
arrows all present and in correct direction ; [2]

(b) breaking down removal of dead bodies / waste ;
recycling of nutrients ; [2]

(c) use an alternative source of food ;
move to a different habitat ; [2]

[Total 9]

9 (a) (i) non-metals are on right-hand side of Periodic Table ; [1]

(ii) number of outer shell electrons = group number ; [1]

(iii) small number of outer shell electrons in metals / owtte ; [1]

(b) (i) $H_2 + Cl_2 \rightarrow 2HCl$
1 mark for formulae ; balancing mark dependent on formulae ; [2]

(ii) 1 shared pair ;
no extra electrons ; [2]

(c) (i) green ; [1]

(ii) 7 to any less than 4 ; [1]

[Total: 9]