

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

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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 ;
= $(20 \times 30 \times \frac{1}{2}) + [20 \times (90-30)]$;
= 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]

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

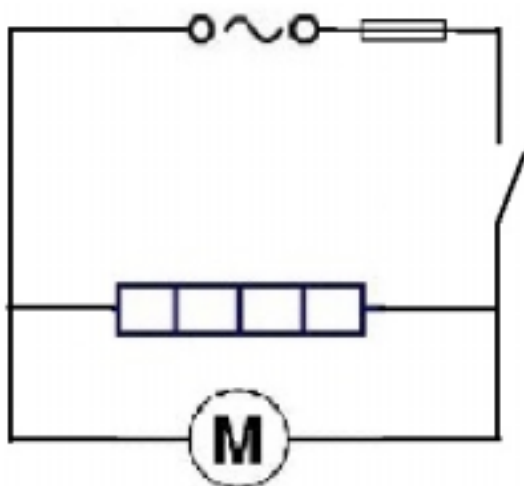
(ii) increasing size of molecules from **A** to **D** ;
 increasing force between molecules from **A** to **D** ;
 increasing energy required to separate molecules from **A** to **D** ; [max 2]

(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]

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- 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) atoms ; [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)

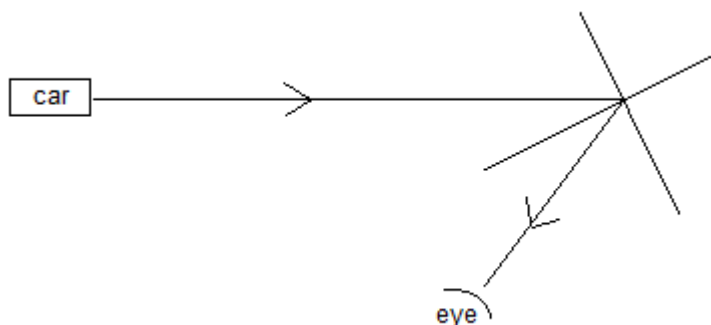
[1]

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

[2]

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(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]