CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0654 CO-ORDINATED SCIENCES

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

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CAMBRIDGE
International Examinations

1 **(a)** mass 100 (kg) and weight less than 100 (N) ; [1]

(b) need resultant upwards force to accelerate the rocket ; [1]

(c) kinetic ;
gravitational ;
chemical ;
thermal / light / sound ; [4]

(d) sound cannot travel through space / a vacuum ; [1]

(e) **(i)** turns atoms into ions ;
by removal of electrons ; [2]

(ii) destroys / damages cells / DNA ;
causes cancer / mutations / radiation burns ; [2]

(iii)

gamma radiation	*X-rays*		*visible light*		*microwaves*	radiowaves

;; [2]

[Total: 13]

2 **(a)** **W** = ovary ;
X = vagina ; [2]

(b) **Y** for zygote / embryo to become implanted / for nourishment of the embryo ;
Z to (contract to) push the baby out at birth / to contain / hold fetus ; [2]

(c) joining together of egg <u>and</u> sperm ;
happens in fallopian tube ;
male gamete = sperm ;
female gamete = egg ;
forming a zygote ; [max 3]

(d) fewer sexual partners / using a condom ; [1]

(e) **(i)** blood / body fluid contact / through the placenta ; [1]

(ii) reduced probability ; [1]

(iii) infection through milk / breastfeeding ; [1]

[Total: 11]

3 **(a)** **(i)** H and He ; [1]

(ii) neon ; [1]

(iii) period 4 (or 5 or 6) ; [1]

(b) **(i)** protons and neutrons ;
3 protons ;
4 neutrons ; [3]

(ii) reference to increased number of electron shells / orbits / rings ; [1]

[Total: 7]

4 **(a)** (physical) breakdown / description of breakdown ;
of (large insoluble) food molecules ;
into smaller / soluble products ; [max 2]

(b) amylase ; [1]

(c) **(i)** at the start / in first minute / in first few seconds ; [1]

(ii) maltose / sugar ; [1]

(iii) line sketched so that it is of the same general shape (not levelling off above zero) ;
and above the 35 °C line ; [2]

(d) produces small / soluble molecules that pass into the bloodstream ;
starch too large to diffuse across into the bloodstream ; [max 1]

[Total: 8]

5 **(a)** Al_2O_3
Fe_2O_3
$NaCl$;;
(three correct 2 marks, one or two correct 1 mark) [2]

(b) **(i)** lead oxide + carbon → lead + carbon dioxide ; [1]

(ii) test for electrical conductivity ;
lead will be a good conductor ;
OR
test for malleability ;
lead will be malleable ; [max 2]

(iii) lead oxide ;
oxygen has been removed from it ;
OR
lead ;
Pb^{2+} ions gain electrons ; [max 2]

(c) (i) negative electrode ; [1]

(ii) lead / Pb^{2+} (no mark)
atoms are electrically neutral / have equal protons and electrons ;
positive ion has more protons than electrons (so must gain electrons to form atom) ;
so positive (ionic) charge has to be neutralised by gain of (negative) electrons ; [max 2]

[Total: 10]

6 (a) (i) 0.3 (Hz) ; [1]

(ii) vibrations in different directions ;
longitudinal vibrations move in same direction as wave / energy moves ;
transverse vibrations move at right angles to direction that wave / energy moves ; [2]

(iii) sound / ultrasound waves ; [1]

(b) (i) (volume =) 7500 (cm^3) ; [1]

(ii) (density =) $\frac{\text{mass}}{\text{volume}}$;
$= \frac{1875}{7500} = 0.25$;
g / cm^3 ; [3]

(c) (i) infra-red ; [1]

(ii) thermal energy needed / used to cause evaporation ;
some molecules have more energy / move faster than others ;
faster moving molecules escape from surface ;
escape from forces between molecules / pull of other molecules ;
water molecules turn to water vapour / leave as water vapour ; [max 3]

[Total: 12]

7 (a) **M**
E
C
E ;;;
(four correct 3 marks, three correct 2 marks, one or two correct 1 mark) [3]

(b) (i) (assume answers refer to **P** if the word *it* is used)
P is more flammable / volatile / burns more easily / ORA ;
P burns with cleaner flame / owtte ;
R is too viscous / does not flow easily / not easily moved around through pipes / owtte ;
other correct ; [max 2]

(ii) carbon dioxide / CO_2 ;
water (vapour) / H_2O ; [2]

(iii) ice ;
low temperature of the air causes the water formed to freeze ; [2]

(c) (i) the larger / heavier / more C atoms in the molecules the higher the boiling point of the alkanes ; [1]

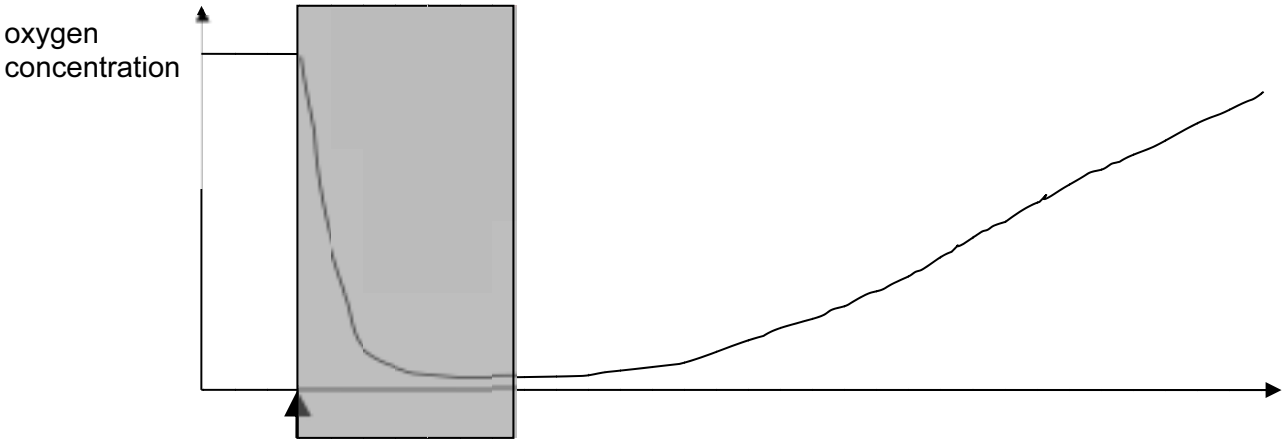
(ii) 100 ± 2 °C ; [1]

(iii) **A** and **B** ;
they have boiling points below 20 °C ; [2]

[Total: 13]

8 (a) deforestation ;
carbon dioxide ;
temperature ;
soil ; [4]

(b) (i) an X anywhere in the shaded zone ;



[1]

(ii) decreases, then increases ;
reference to rapid decrease / slower increase ; [2]

(iii) (fall) respiration of bacteria / decomposers ;
(rise) photosynthesising plants / oxygen in air dissolving ; [2]

(iv) prevents respiration ; [1]

[Total: 10]

9 **(a)** (R =) $\frac{V}{I}$;

$\frac{220}{50}$ = 4.4 (Ω) ; [2]

(b) **(i)** identifies increased magnetic field ;
by increasing number of turns/increasing current ; [2]

(ii) e.g. used to separate ferrous metals in scrap yard ;
can be switched on and off / strength can be increased or decreased ; [2]

(iii) voltmeter connected (correct symbol) ;
in parallel ; [2]

[Total: 8]

10 **(a)** geotropism ;
(main) stem / shoot grows upwards / against gravity ;
(main) root grows downwards / with gravity ; [3]

(b) **(i)** grow downwards so) can absorb water ;
can absorb mineral ions ;
better anchorage in soil ; [max 2]

(ii) (grow upwards so) can reach light ;
for photosynthesis ; [2]

(c) stem will grow to the side / towards the light ;
roots no response / away from light ;
phototropism ;
[max 2]

(d) *any two from:*
nutrition ;
excretion ;
respiration ;
reproduction ;
growth ;
movement ; [max 2]

[Total: 11]

11 (a) hydrogen ;
copper chloride ;
potassium chloride, and water ; [3]

(b) (i) limewater ;
goes cloudy / milky ; [2]

(ii) increase acid concentration ;
increase (acid) temperature ;
grind up the (same mass of) calcium carbonate ; [max 2]

(c) (i) soil is too acidic (for the intended crop) ;
calcium carbonate reacts with / neutralises acid (in soil) ;
so promotes healthy crop development / owtte ; [max 2]

(ii) (calcium carbonate) is strongly heated ; [1]

[Total: 10]

12 (a) (i) **QR** ; [1]

(ii) **P** or **S** ; [1]

(iii) the higher the speed the greater the KE ; [1]

(b) speed $= \frac{\text{distance}}{\text{time}}$;
distance $= 28 \times 28 = 784$ (m) ; [2]

(c) (i) $\mathbf{L_1}$ and $\mathbf{L_3}$; [1]

(ii) $\mathbf{L_1}$ and $\mathbf{L_2}$; [1]

[Total: 7]