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**CO-ORDINATED SCIENCES**

**0654/32**

Paper 3 Theory (Core)

**October/November 2018**

MARK SCHEME

Maximum Mark: 120

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**Published**

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.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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This document consists of **16** printed pages.

**PUBLISHED****Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**GENERIC MARKING PRINCIPLE 5:**

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

**GENERIC MARKING PRINCIPLE 6:**

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
1(a)	nucleus labelled; cytoplasm labelled;	<b>2</b>
1(b)	presence of cell wall; presence of chloroplasts; presence of (permanent) vacuole;	<b>max 2</b>
1(c)	from higher concentration (outside the cell) to lower concentration (inside the cell); by (molecules) random movement;	<b>2</b>
1(d)	glucose / oxygen;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(a)	<b>J</b> too great a proportion of other gases / too little oxygen; <b>K</b> nitrogen and oxygen the wrong way round;	<b>2</b>
2(b)(i)	incomplete combustion of hydrocarbons / fuel;	<b>1</b>
2(b)(ii)	toxic;	<b>1</b>
2(b)(iii)	argon / Ar;	<b>1</b>
2(b)(iv)	it is inert / does not react in the body;	<b>1</b>
2(c)(i)	(label to either N <sub>2</sub> or O <sub>2</sub> ) only one type of atom;	<b>1</b>
2(c)(ii)	(label to H <sub>2</sub> O) water molecules contain two hydrogen atoms and one oxygen atom;	<b>1</b>
2(c)(ii)	cobalt chloride (paper); turns from blue to pink;	<b>2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
3(a)	X-rays – viewing bones / images of internal structures;	<b>1</b>
3(b)	(more likely to be affected by) ionising radiation; named effect of ionising radiation on body cells;	<b>2</b>
3(c)(i)	number of oscillations / vibration per second / per unit time;	<b>1</b>
3(c)(ii)	any value above 20 000 Hz; maximum value for human hearing is 20 000 Hz;	<b>2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
4(a)(i)	65 (b / p / m);	<b>1</b>
4(a)(ii)	10 (minutes);	<b>1</b>
4(a)(iii)	X anywhere on 35 minutes;	<b>1</b>
4(b)	heart (muscle) contracts / pumps, more / faster;	<b>1</b>
4(c)	aorta;	<b>1</b>
4(d)	red blood cells circled;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
5(a)(i)	Cu K;  29 19;	<b>2</b>
5(a)(ii)	(copper) ref. to the equality of numbers of protons and electrons;	<b>1</b>
5(a)(iii)	(total of the) protons plus neutrons (in the nucleus of an atom);	<b>1</b>
5(b)	potassium is too malleable / weak; potassium reacts with water;	<b>2</b>
5(c)(i)	copper carbonate → copper oxide + carbon dioxide;	<b>1</b>
5(c)(ii)	thermal decomposition;	<b>1</b>
5(c)(iii)	turns milky;	<b>1</b>
5(c)(iv)	coloured;	<b>1</b>



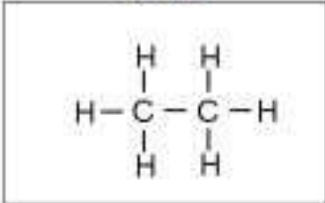
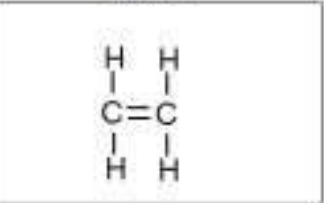
<b>Question</b>	<b>Answer</b>	<b>Marks</b>
6(a)	all symbols correct; lamps in parallel; switch in correct place; fuse in correct place;	<b>4</b>
6(b)	$R = V / I$ or $12 / 16$ ; $= 0.75$ ; $\Omega$ ;	<b>3</b>
6(c)	kinetic; gravitational (potential);	<b>2</b>
6(d)	upright; laterally inverted;	<b>2</b>
6(e)(i)	opposite charges <u>attract</u> ;	<b>1</b>
6(e)(ii)	like charges <u>repel</u> ;	<b>1</b>

Question	Answer	Marks									
7(a)(i)	homozygous; dominant;	<b>2</b>									
7(a)(ii)	dd;	<b>1</b>									
7(b)	<table border="1" data-bbox="848 379 1426 576"> <tr> <td></td> <td><b>D</b></td> <td><b>d</b></td> </tr> <tr> <td><b>D</b></td> <td><b>DD</b></td> <td><b>Dd</b></td> </tr> <tr> <td><b>d</b></td> <td><b>Dd</b></td> <td><b>dd</b></td> </tr> </table>		<b>D</b>	<b>d</b>	<b>D</b>	<b>DD</b>	<b>Dd</b>	<b>d</b>	<b>Dd</b>	<b>dd</b>	<b>1</b>
	<b>D</b>	<b>d</b>									
<b>D</b>	<b>DD</b>	<b>Dd</b>									
<b>d</b>	<b>Dd</b>	<b>dd</b>									
7(c)	(phenotype) affected by environment; named example;	<b>2</b>									
7(d)(i)	nuclei; sperm and egg;	<b>2</b>									
7(d)(ii)	male chromosomes are XY, female chromosomes are XX;	<b>1</b>									

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
8(a)(i)	making, lime / calcium oxide; neutralisation of, acidic industrial waste / acidic soil; used in blast furnace / for iron extraction; AVP;	<b>max 2</b>
8(a)(ii)	in atom number of protons = number of electrons; in calcium ion there are fewer electrons than protons;	<b>2</b>
8(b)(i)	calcium chloride;	<b>1</b>
8(b)(ii)	(pH decreases) the gas / CO <sub>2</sub> reacts with the water; turning it acidic; reference to non-metal oxide;	<b>max 2</b>
8(b)(iii)	increase acid concentration; increase (acid) temperature; use powdered calcium carbonate / increase surface area of calcium carbonate	<b>max 2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
9(a)(i)	600 (s);	<b>1</b>
9(a)(ii)	speed = distance / time; $11250 / 600 = 18.8$ (m / s)	<b>2</b>
9(b)	chemical;	<b>1</b>
9(c)(i)	coal, natural gas, peat;	<b>1</b>
9(c)(ii)	solar/wind/waves/HEP/geothermal/tides;	<b>1</b>
9(d)(i)	<b>Q</b> ;	<b>1</b>
9(d)(ii)	<b>R</b> ;	<b>1</b>
9(d)(iii)	opposite directions; <b>Q</b> greater than <b>S</b> ;	<b>2</b>

Question	Answer	Marks
10(a)	<b>A</b> hair; <b>B</b> sweat gland;	<b>2</b>
10(b)(i)	sweating; vasodilation / more blood goes to surface of the skin; goes red / gets hot; hair lies flat;	<b>max 3</b>
10(b)(ii)	maintenance of constant internal environment;	<b>1</b>
10(c)	ref to central nervous system (CNS); sensory → relay → motor; ref to effector / muscle / gland;	<b>3</b>

Question	Answer	Marks
11(a)(i)	methane / CH <sub>4</sub> ;	1
11(a)(ii)	water;	1
11(a)(iii)	exothermic;	1
11(b)(i)	the larger the molecules the higher the boiling point;	1
11(b)(ii)	<b>A B C</b> ; boiling point is below 20 °C / at 20 °C they will have boiled;	2
11(c)	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>ethane</p>  </div> <div style="text-align: center;"> <p>ethene</p>  </div> </div> <p>single C-C in ethane and double C=C in ethene; 6 × H and all correct in ethane; 4 × H and all correct in ethene;</p>	3
11(d)(i)	orange / brown / yellow;	1
11(d)(ii)	unsaturated / contain double (C to C) bonds;	1

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
12(a)(i)	conduction;	<b>1</b>
12(a)(ii)	convection current drawn;	<b>1</b>
12(a)(iii)	convection;	<b>1</b>
12(b)(i)	railway tracks / overhead power cables;	<b>1</b>
12(b)(ii)	thermostat / thermometer;	<b>1</b>
12(c)	surface most fall 1 or 2 correct; 3 correct;	<b>2</b>
12(d)	temperature at which a liquid changes into a gas;	<b>1</b>
12(e)	iron loses magnetism quicker than steel steel is magnetised more slowly than iron;	<b>1</b>
12(f)(i)	box to the left of radio waves;	<b>1</b>
12(f)(ii)	radio waves;	<b>1</b>

Question	Answer	Marks									
13(a)(i)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">digestion process</td> <td style="width: 50%; padding: 5px;">example of this process in the human body</td> </tr> <tr> <td style="padding: 5px;">chemical digestion</td> <td style="padding: 5px;">enzymes in the stomach breaking food down</td> </tr> <tr> <td style="padding: 5px;">mechanical digestion</td> <td style="padding: 5px;">food chewed / ground by teeth owtte</td> </tr> </table>	digestion process	example of this process in the human body	chemical digestion	enzymes in the stomach breaking food down	mechanical digestion	food chewed / ground by teeth owtte	<b>2</b>			
digestion process	example of this process in the human body										
chemical digestion	enzymes in the stomach breaking food down										
mechanical digestion	food chewed / ground by teeth owtte										
13(a)(ii)	(across wall of) small intestine; into the blood;	<b>2</b>									
13(b)(i)	<div style="text-align: center;"> <p><b>nutrient</b>                      <b>smaller units</b></p> <table style="margin: auto; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 5px; text-align: center;">fats and oils</td> <td style="width: 20px;"></td> <td style="border: 1px solid black; padding: 5px; text-align: center;">amino acids</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px; text-align: center;">proteins</td> <td style="width: 20px;"></td> <td style="border: 1px solid black; padding: 5px; text-align: center;">glucose</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px; text-align: center;">starch</td> <td style="width: 20px;"></td> <td style="border: 1px solid black; padding: 5px; text-align: center;">glycerol and fatty acids</td> </tr> </table> </div> <p style="margin-top: 20px;">1 or 2 correct; 3 correct;</p>	fats and oils		amino acids	proteins		glucose	starch		glycerol and fatty acids	<b>2</b>
fats and oils		amino acids									
proteins		glucose									
starch		glycerol and fatty acids									
13(b)(ii)	carbon, hydrogen and oxygen circled;	<b>1</b>									
13(c)	(diet contains) all required nutrients; in sufficient / correct proportions;	<b>2</b>									