

<b>Candidate Forename</b>		<b>Candidate Surname</b>	
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<b>Centre Number</b>						<b>Candidate Number</b>				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

**A216/01**

**TWENTY FIRST CENTURY SCIENCE  
ADDITIONAL SCIENCE A**

**UNIT 2: Modules B5 C5 P5  
(Foundation Tier)**

**WEDNESDAY 24 JUNE 2009: Morning**

**DURATION: 40 minutes**

**SUITABLE FOR VISUALLY IMPAIRED CANDIDATES**

**Candidates answer on the question paper**

**A calculator may be used for this paper**

**OCR SUPPLIED MATERIALS:**

**None**

**OTHER MATERIALS REQUIRED:**

**Pencil**

**Ruler (cm/mm)**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully and make sure that you know what you have to do before starting your answer.**
- **Answer ALL the questions.**
- **Write your answer to each question in the space provided, however additional paper may be used if necessary.**

## **INFORMATION FOR CANDIDATES**

- **The number of marks is given in brackets [ ] at the end of each question or part question.**
- **The total number of marks for this paper is 42.**
- **A list of physics equations is printed on pages 4 and 5.**
- **The periodic Table is printed on page 35.**

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# TWENTY FIRST CENTURY SCIENCE EQUATIONS

## USEFUL RELATIONSHIPS

### EXPLAINING MOTION

$$\text{speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{change of momentum} = \text{resultant force} \times \text{time for which it acts}$$

$$\text{work done by a force} = \text{force} \times \text{distance moved by the force}$$

$$\text{change in energy} = \text{work done}$$

$$\text{change in GPE} = \text{weight} \times \text{vertical height difference}$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times [\text{velocity}]^2$$

## ELECTRIC CIRCUITS

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$

$$\text{energy transferred} = \text{power} \times \text{time}$$

$$\text{power} = \text{potential difference} \times \text{current}$$

$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

## THE WAVE MODEL OF RADIATION

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

Answer ALL the questions.

1 Erupting volcanoes give out a mixture of gases.

(a) The information below shows some gases given out by a volcano.

(i) Draw straight lines to join the NAME of each gas to its FORMULA.

<u>NAME</u>	<u>FORMULA</u>
carbon dioxide	H <sub>2</sub> S
hydrogen sulfide	CO
carbon monoxide	SO <sub>2</sub>
sulfur dioxide	CO <sub>2</sub>

[2]

(ii) Only one of these gases is normally present in the atmosphere.  
Name the gas.

\_\_\_\_\_ [1]

**(b) Mary knows two important things about gases in the air.**

- **the size of the particle**
- **the type of particle.**

**Put a ring around the best term in each pair.**

**Gases in the air are made**

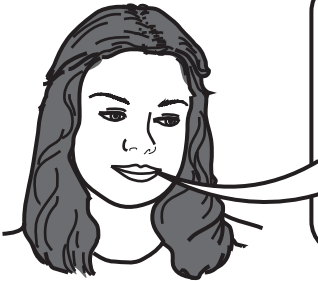
**of LARGE SMALL particles.**

**The particles are**

**MOLECULES GIANT STRUCTURES. [1]**

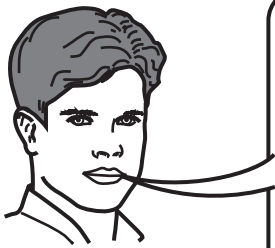
(c) Some of the gases from a volcano are sulfur compounds.

Mary asks her friends if sulfur is in living things.



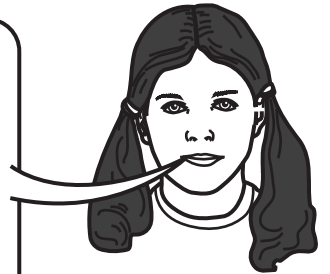
SU  
Living things don't contain sulfur.

JIM  
Living things contain small amounts of sulfur.



MIKE  
Living things contain large amounts of sulfur.

KATE  
Living things only contain sulfur if they have been poisoned.



Who gives the BEST answer?

answer \_\_\_\_\_ [1]

[Total: 5]



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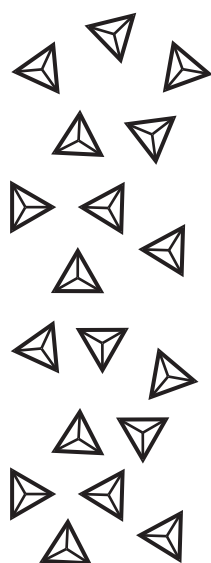
2 Volcanic lava can be runny or it can be stiff.

Volcanoes with stiff lava often explode dangerously.

Lava is made of silicon compounds.

The more links there are within a compound, the stiffer the lava.

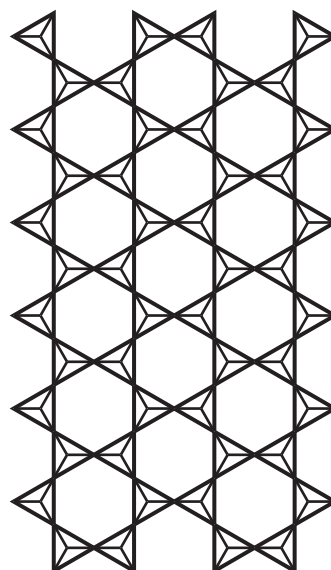
(a) Here are some of the particles of different silicon compounds in molten lava.



**A**



**B**

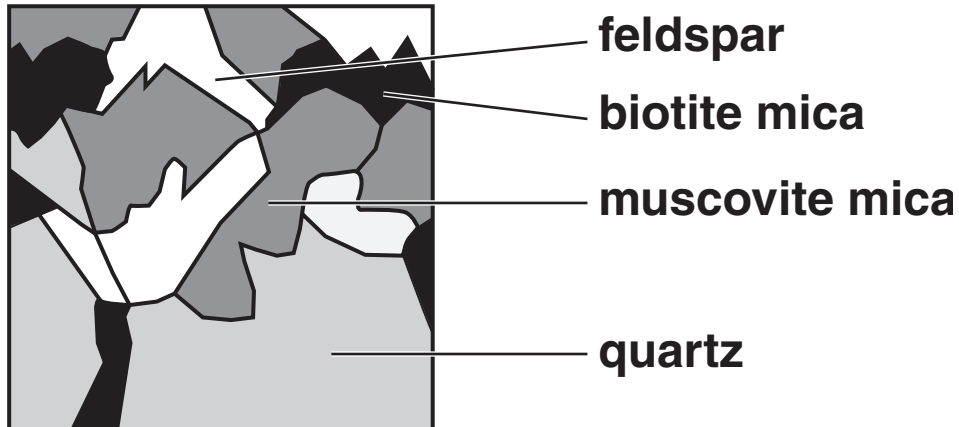


**C**

Which compound, A, B, or C, is most likely to be in runny lava?

answer \_\_\_\_\_ [1]

**(b) Molten rock sometimes cools to form granite.**



**(i) Granite contains crystals of different minerals.**

**Only one of these minerals is mainly made of silicon dioxide.**

**The other minerals are more complicated compounds of silicon.**

**Put a ring around the ONE mineral that is mainly made of silicon dioxide.**

**BIOTITE MICA**

**FELDSPAR**

**MUSCOVITE MICA**

**QUARTZ**

**[1]**

**(ii) Here are some statements about silicon dioxide.**

**Put a tick (✓) in the box next to each of the TWO correct statements.**

**It is soft.**

**It has a low boiling point.**

**It has a high melting point.**

**It does not dissolve in water.**

**It conducts electricity when solid.**

**[2]**

**[Total: 4]**

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- 3 Mark finds this table in a text book.  
It shows that different parts of the Earth's crust have different compositions.

	percentage in mantle	percentage in oceanic crust	percentage in continental crust
iron compounds	8	9	7
silicon compounds	45	49	60
calcium compounds	3	11	6
aluminium compounds	3	16	15
magnesium compounds	38	9	3

- (a) Use a word from this list to complete the sentence.

ALUMINIUM

CALCIUM

IRON

MAGNESIUM

SILICON

The continental crust has the highest percentage of \_\_\_\_\_ compounds. [1]

**(b) The compounds are not spread evenly, but often occur in deposits.**

**Some of these deposits contain magnesium carbonate.**

**Magnesium can be extracted from magnesium carbonate.**

**The first stage is to heat the magnesium carbonate to make magnesium oxide.**



**(i) Give the formula of one chemical in the equation which is a solid.**

**answer \_\_\_\_\_**

**Give the formula of one chemical in the equation which is a gas.**

**answer \_\_\_\_\_ [1]**

- (ii) The magnesium then needs to be extracted from the magnesium oxide.

Mark knows that carbon will take the oxygen away from many metal oxides.

Complete the sentence.

Choose a word from this list.

DISSOLVES

EVAPORATES

NEUTRALISES

REDUCES

When carbon takes oxygen away from a metal

oxide, it \_\_\_\_\_  
the metal oxide. [1]



**(c) Mark finds that the reaction does not work with carbon and magnesium oxide.**

**Put a tick (✓) in the box next to the most likely reason for this.**

**The magnesium is too reactive to be extracted this way.**

**The magnesium oxide has too high a melting point.**

**The magnesium oxide is too dense.**

**The magnesium oxide is too hot.**

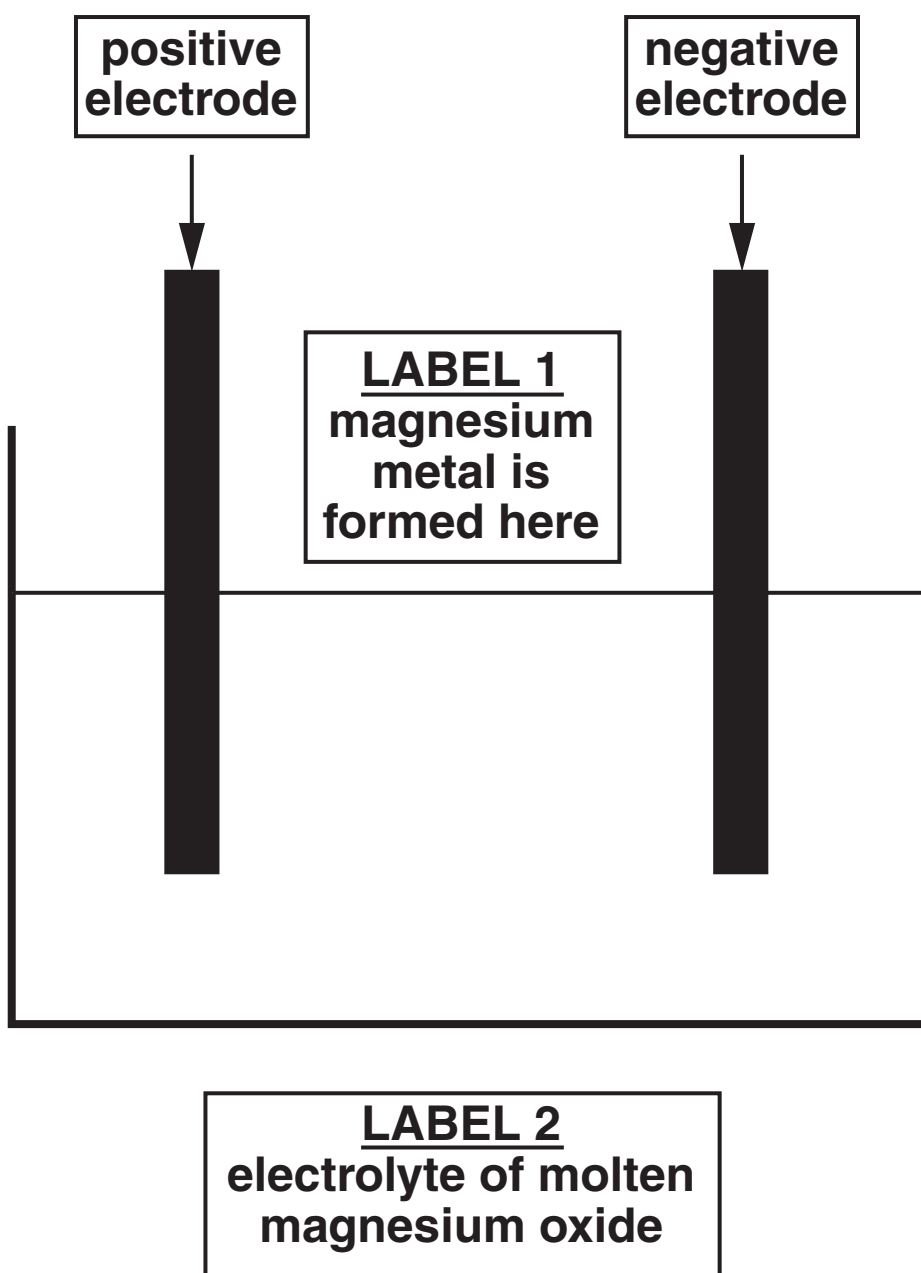
**[1]**

(d) He finds out that magnesium can be extracted by electrolysis.

One way might be to electrolyse molten magnesium oxide.

Complete labels 1 and 2 by drawing arrows to the correct parts of the diagram.

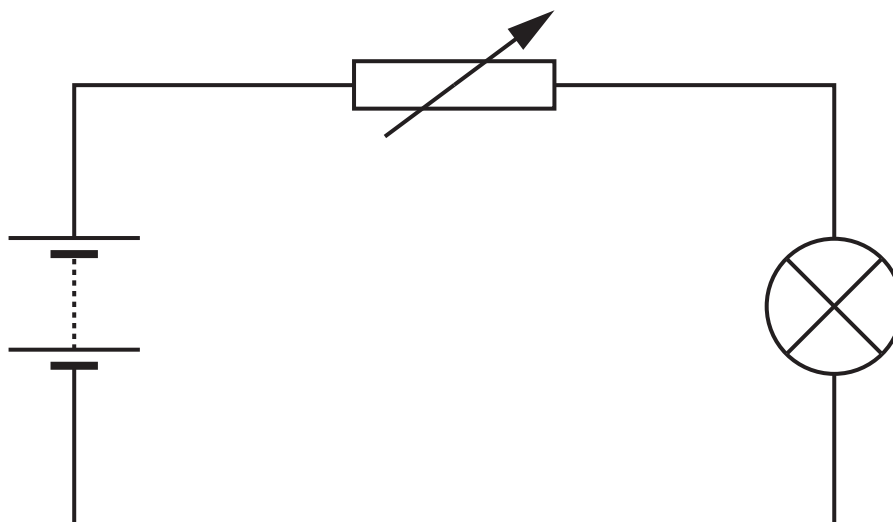
[2]



[Total: 6]

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4 Sylvia sets up this circuit.



(a) Sylvia decides to measure the potential difference ACROSS THE LAMP.

Draw on the circuit diagram to show how she connects a voltmeter.

Use the correct symbol.

[1]

(b) The voltmeter across the lamp reads 4 V. Sylvia asks her friends what this means.

**ALAN**

It tells you about the energy lost by charge on its way through the lamp.



**BESS**

It's the rate at which charge passes through the lamp.



**CARLO**

It tells you how much energy there is in the battery.



**DAVINA**

It's the amount of charge in the lamp.



Who has the **BEST** answer?

answer \_\_\_\_\_ [1]

**(c) (i) Sylvia adjusts the variable resistor.**

**These four sentences explain why the brightness of the lamp changes.**

**They are in the WRONG order.**

**A The lamp gets dimmer.**

**B The power of the lamp decreases.**

**C The current in the resistor decreases.**

**D The resistance of the circuit increases.**

**Put the sentences in the CORRECT order. The last one has been done for you.**

			<b>A</b>
--	--	--	----------

**[1]**

(ii) Complete the sentences for the variable resistor.

Choose words from this list.

DECREASES

INCREASES

STAYS THE SAME

Sylvia adjusts the variable resistor.

The current in the variable resistor decreases.

The voltage across the variable resistor

\_\_\_\_\_ .

The voltage across the battery

\_\_\_\_\_ [1]

[Total: 4]

**5 Brian has an electric toothbrush.**

**He connects it to the mains supply through a transformer.**

**(a) Complete the sentence about the transformer.**

**Choose words from the list.**

**COPPER**

**IRON**

**PLASTIC**

**WOOD**

**A transformer is two coils of wire wound on a core made of \_\_\_\_\_ . [1]**

**(b) The transformer is connected to the mains supply.**

**What is the voltage of the UK mains supply?**

**Put a ring around the correct answer.**

**13 V**

**50 V**

**230 V**

**[1]**



(c) How does the transformer work?

Put a **ring** around the correct word in each pair.

The transformer produces a lower

VOLTAGE CURRENT than the mains supply.

The current in one coil makes

A MAGNETIC AN ELECTRIC field through the

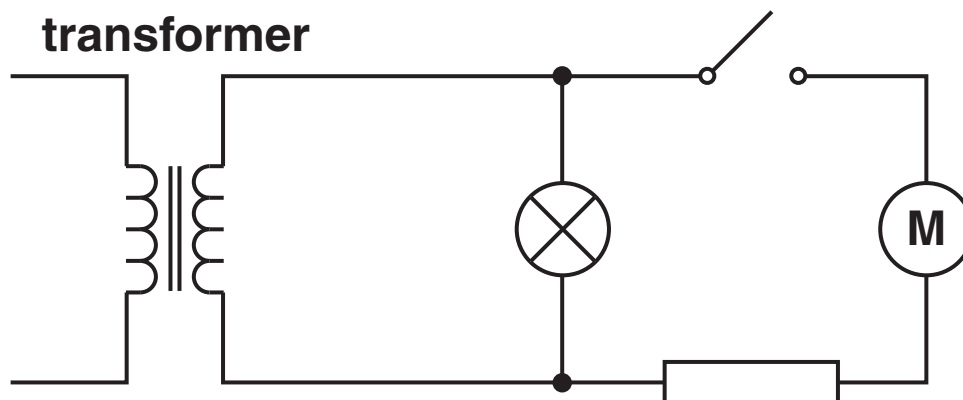
other coil. Changes in that field induce a

VOLTAGE CHARGE in the other coil.

This is because the mains supply provides

ALTERNATING DIRECT voltage. [2]

(d) Here is the circuit diagram for Brian's toothbrush.



The circuit includes a switch to turn on the motor in the toothbrush.

Put a **ring** around the switch. [1]

[Total: 5]

**6 Joe tests a circuit from his computer.**

**He needs to be careful. The chips in the circuit are easily damaged by static electricity.**

**(a) The sentences describe how Joe becomes charged as he walks across the floor towards his circuit.**

**They are in the WRONG order**

**A Joe sets off towards the circuit.**

**B This makes Joe electrically charged.**

**C His shoes rub against the floor as he walks.**

**D This transfers electrons from Joe to the floor.**

**Put the sentences in the correct order. The last one has been done for you.**

			<b>B</b>
--	--	--	----------

**[1]**

**(b) Electrons are transferred from Joe to the floor.**

**Use straight lines to join the START and END of the sentences.**

**START**

**END**

**Joe now has ...**

**... opposite charges.**

**The electrons have ...**

**... a positive charge.**

**Joe and the floor end up with ...**

**... a negative charge.**

**[2]**

**(c) Joe gets rid of any static electricity by touching a metal water pipe.**

**Which statement below explains this?**

**Put a tick (✓) in the box next to the correct answer.**

**Metals contain no electrons at all.**

**Metals and people always have different charge.**

**Metals have lots of electrons which are firmly held.**

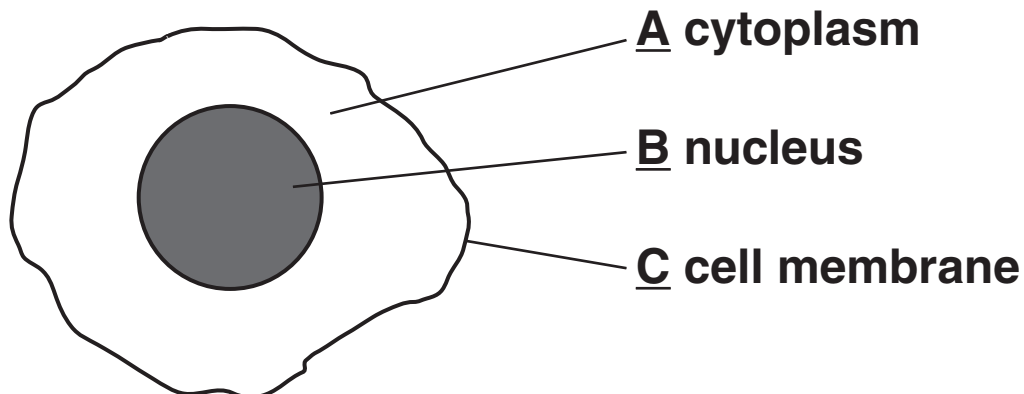
**Metals have lots of electrons which can move freely.**

**[1]**

**[Total: 4]**

**7 Cells contain the genetic code for making proteins.**

**Look at this diagram of a cell.**



**(a) (i) Which part of the cell, A, B, or C, contains the genetic code?**

**answer \_\_\_\_\_ [1]**

**(ii) In which part of the cell, A, B or C, are proteins made?**

**answer \_\_\_\_\_ [1]**

**(b) The genetic code is made of DNA.**

**Which of these statements is the best description of DNA?**

**Put a tick (✓) in the box next to the BEST description.**

**a ladder with rungs made from amino acids**

**two strands twisted into a double helix**

**a protein molecule that can copy itself**

**a bundle of tightly wrapped fibres**

**[1]**

**[Total: 3]**

- 8 (a) The cell cycle can be divided into CELL GROWTH and MITOSIS.

Here are some statements about the cell cycle.

- A The number of organelles increases.
- B DNA molecules split into two strands.
- C The cell divides and becomes two separate cells.
- D Copies of the chromosomes separate.
- E The newly formed DNA strands are copied.

Put the letters A, B, C, D and E into the correct column of the table to show where in the cell cycle the processes take place.

<u>CELL GROWTH</u>	<u>MITOSIS</u>

[3]

(b) MEIOSIS is another way that cells can divide.

Here are some statements about the results of mitosis and meiosis.

Put ONE tick (✓) in each row in the correct box.

<u>STATEMENT</u>	<u>TRUE FOR MITOSIS</u>	<u>TRUE FOR MEIOSIS</u>	<u>TRUE FOR BOTH</u>
number of chromosomes in daughter cells decreases			
daughter cells are identical to parent cell			
can produce gametes			
the number of cells increases			
daughter cells are identical to each other			

[4]

[Total: 7]

**9 Many plants can be grown from seeds or from cuttings.**

**(a) Why are cuttings preferred by some gardeners?**

**Put a tick (✓) in the box next to the BEST answer.**

**They can be grown in a greenhouse.**

**The features of the new plant are known.**

**They are more expensive than buying seeds.**

**There is more variety in the plants that grow.**

**[1]**



**(b) Which cells in a plant can develop into any other kind of plant cell?**

Put a **ring** around the correct answer.

**PHLOEM CELLS**

**ROOT HAIR CELLS**

**UNSPECIALISED CELLS**

**XYLEM CELLS**

**[1]**

**(c) When a cutting is taken, it can be dipped into a powder.**

**This helps it to develop roots.**

**(i) What does this powder contain?**

**Put a tick (✓) in the box next to the correct answer.**

**nutrients**

**hormones**

**enzymes**

**[1]**

**(ii) How is the cutting able to produce new leaves, roots and flowers?**

**Put a tick (✓) in the box next to the BEST answer.**

**All plant cells can change from one type to another.**

**There are always some unspecialised cells in the plant.**

**All the cells in a plant are identical.**

**Plant stems contain all the different types of plant cell.**

**[1]**

**[Total: 4]**

**END OF QUESTION PAPER**

# The Periodic Table of the Elements

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7	Li	9	Be	11	Na	12	Mg	13	Al	14	Si	15	P	16	S	17	Cl	18	Ar	19	F	20	Ne	21	Sc	22	Ti	23	V	24	Cr	25	Mn	26	Fe	27	Co	28	Ni	29	Cu	30	Zn	31	Ga	32	Ge	33	As	34	Se	35	Br	36	Kr	37	Rb	38	Sr	39	Y	40	Zr	41	Nb	42	Mo	43	Tc	44	Ru	45	Rh	46	Pd	47	Ag	48	Cd	49	In	50	Sn	51	Sb	52	Te	53	I	54	Xe	55	Cs	56	Ba	57	La*	58	Ce	59	Pr	60	Nd	61	Pm	62	Sm	63	Eu	64	Gd	65	Tb	66	Dy	67	Ho	68	Er	69	Tm	70	Yb	71	Lu	72	Hf	73	Ta	74	W	75	Re	76	Os	77	Ir	78	Pt	79	Au	80	Hg	81	Tl	82	Pb	83	Bi	84	Po	85	At	86	Rn	87	Fr	88	Ra	89	Ac*	90	Th	91	Pa	92	U	93	Np	94	Pu	95	Am	96	Cm	97	Bk	98	Cf	99	Es	100	Fm	101	Mendelevium	102	Nobelium	103	Livermorium	104	Tennessine	105	Oganesson	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000
																		Elements with atomic numbers 112-116 have been reported but not fully authenticated																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														

\* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.



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