



# Cambridge IGCSE™

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## CO-ORDINATED SCIENCES

0654/12

Paper 1 Multiple Choice (Core)

October/November 2023

45 minutes

You must answer on the multiple choice answer sheet.

\* 2 1  
6 8 1  
8 4 8  
5 6 \*

You will need: Multiple choice answer sheet  
Soft clean eraser  
Soft pencil (type B or HB is recommended)

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### INSTRUCTIONS

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

### INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

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This document has **16** pages. Any blank pages are indicated.

1 Which statement about the characteristics of living organisms is correct?

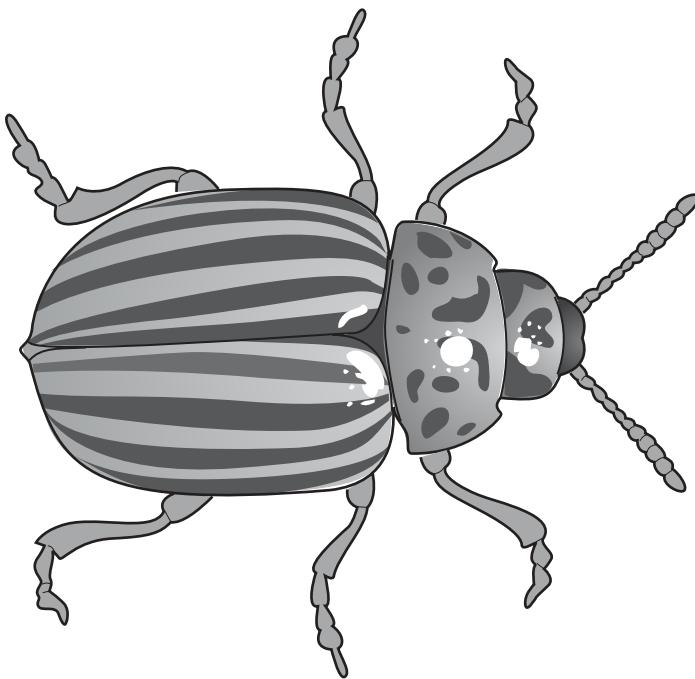
A Excretion is the removal of excess substances and toxic materials.

B Movement is the ability to detect and respond to environmental changes.

C Nutrition is the breaking down of molecules to release energy.

D Respiration is the manufacture of carbohydrates from raw materials.

2 The diagram shows a beetle.



The length of the diagram is 75 mm.

The actual length of the beetle is 5 mm.

What is the magnification?

A  $\times 5$       B  $\times 15$       C  $\times 80$       D  $\times 375$

3 A colourless liquid gives the test results shown.

test	colour obtained
Benedict's	blue
biuret	purple
iodine	blue / black

Which nutrients are in the colourless liquid?

A protein, reducing sugar and starch  
 B protein and reducing sugar only  
 C protein and starch only  
 D protein only

4 Which type of molecule are enzymes?

A carbohydrate  
 B fat  
 C protein  
 D starch

5 Which conditions cause the highest rate of transpiration in a plant?

	temperature	wind speed
A	high	high
B	high	low
C	low	high
D	low	low

6 Which row provides the greatest amount of the nutrient needed to move food through the alimentary canal?

	nutrient content / 100 g			
	calcium/mg	fibre/g	protein/g	sugar/g
A	36.0	5.1	9.0	24.8
B	35.0	2.8	3.3	20.0
C	46.0	10.9	9.0	0.8
D	8.5	0.0	28.0	0.0

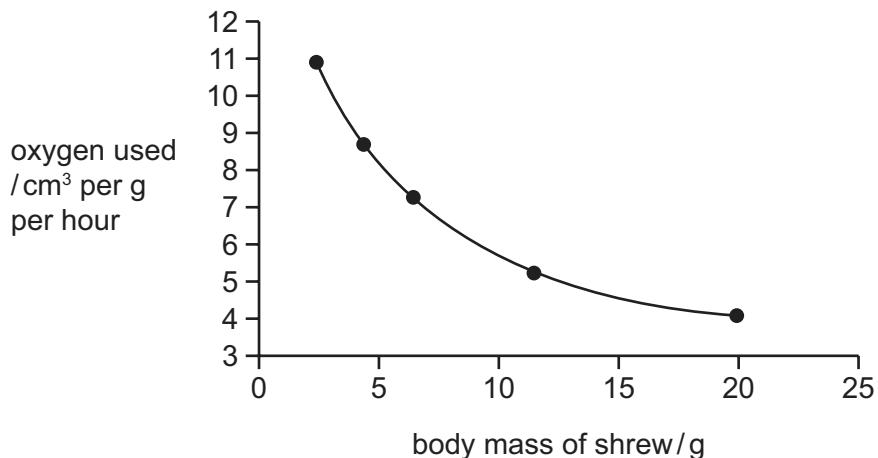
7 The rates of water uptake and loss are measured in four leaves. The results are shown in the table.

Which leaf is least likely to wilt?

	rate of water uptake /mm <sup>3</sup> per minute	rate of water loss /mm <sup>3</sup> per minute
A	8	15
B	9	11
C	12	13
D	15	10

8 Small mammals need more energy to maintain a constant body temperature.

The graph shows the rate of oxygen used by species of shrews with different body masses.

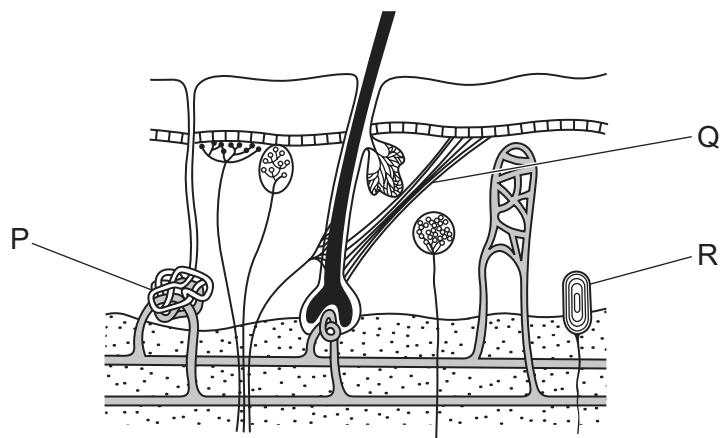


Which statements are correct?

- 1 Heavier shrews use oxygen more slowly than lighter shrews.
- 2 Heavier shrews respire faster than lighter shrews.
- 3 Heavier shrews lose heat more slowly than lighter shrews.

**A** 1, 2 and 3      **B** 1 and 2 only      **C** 1 and 3 only      **D** 2 and 3 only

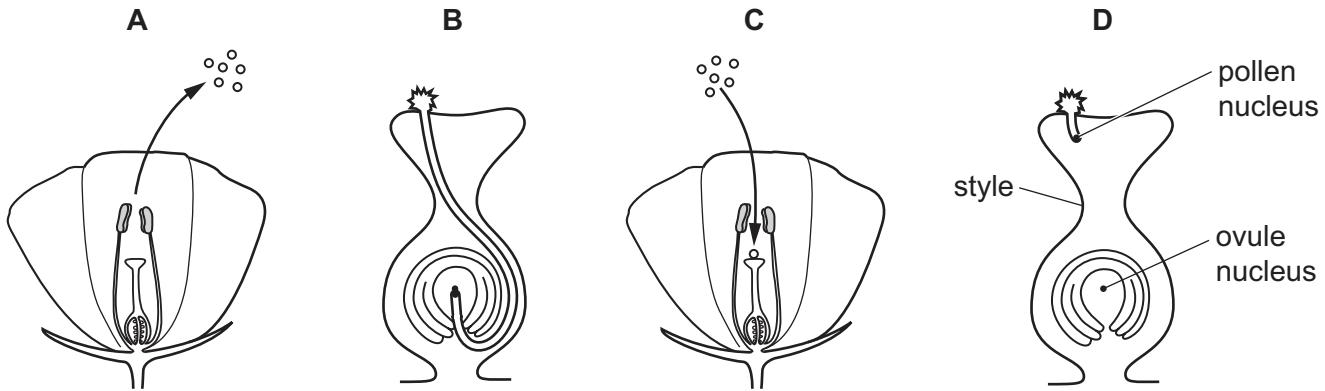
9 The diagram shows a section through the skin.



Which row contains the correct names of the structures labelled P, Q and R?

	P	Q	R
A	sweat gland	hair	blood vessel
B	receptor	hair	receptor
C	sweat gland	hair erector muscle	receptor
D	receptor	hair erector muscle	blood vessel

10 Which diagram shows fertilisation occurring in a flower?



11 Which term describes differences between individuals of the same species?

- A competition
- B generation
- C selection
- D variation

12 Which type of organism gets its energy from breaking down dead or waste organic matter?

A carnivore  
B consumer  
C decomposer  
D producer

13 The concentration of carbon dioxide in the atmosphere has increased during the last 200 years. What has contributed to this increase?

A burning large areas of forest  
B increasing use of pesticides  
C planting more crops  
D using fewer fossil fuels

14 A sample of water contains two useful substances, insoluble chalk and a soluble salt. Which two processes are used to individually separate the insoluble chalk from the soluble salt and from the water?

A distillation and chromatography  
B distillation and crystallisation  
C filtration and chromatography  
D filtration and crystallisation

15 Which statement about isotopes of the same element is correct?

A They have the same number of protons but different number of electrons.  
B They have the same number of protons but different number of neutrons.  
C They have the same number of neutrons but different number of electrons.  
D They have the same number of neutrons but different number of protons.

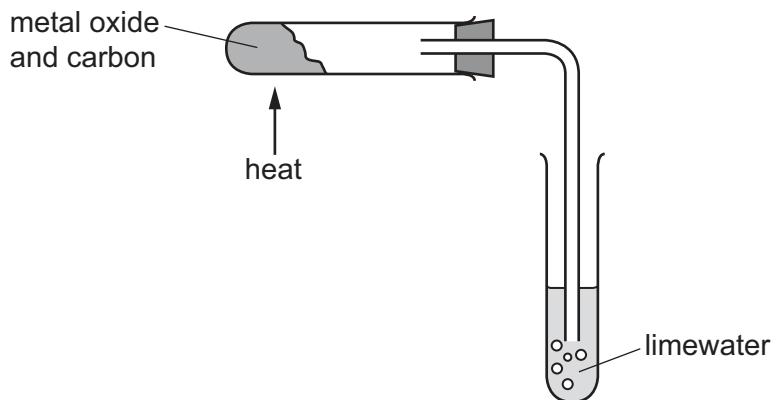
16 Which equation represents the reaction between aluminium and oxygen?

A  $2Al + 3O \rightarrow Al_2O_3$   
B  $Al_2 + 3O \rightarrow Al_2O_3$   
C  $2Al_2 + 3O_2 \rightarrow 2Al_2O_3$   
D  $4Al + 3O_2 \rightarrow 2Al_2O_3$

17 Which substance does **not** undergo electrolysis?

- A aqueous copper chloride
- B copper wire
- C dilute sulfuric acid
- D molten lead(II) bromide

18 To extract a metal from its ore, a metal oxide is mixed with carbon and heated as shown.

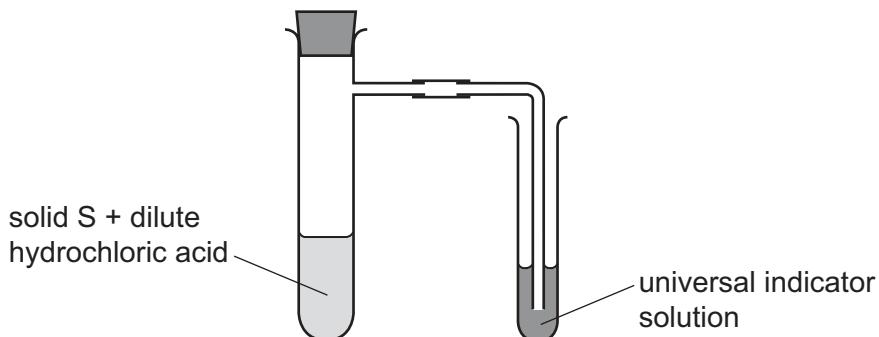


The limewater turns cloudy.

Which term describes what happens to the metal oxide?

- A combustion
- B neutralisation
- C oxidation
- D reduction

19 Solid S is added to dilute hydrochloric acid in the apparatus shown.



The universal indicator solution shows the pH decreases.

What is solid S?

- A zinc
- B zinc carbonate
- C zinc hydroxide
- D zinc oxide

20 Which substance is a basic oxide?

- A calcium oxide
- B carbon dioxide
- C nitrogen dioxide
- D sulfur dioxide

21 Which statements about the halogens are correct?

- 1 They are diatomic metals.
- 2 Their atoms have seven outer-shell electrons.
- 3 Going down the group, they change from solid to liquid to gas.
- 4 Going down the group, they become darker in colour.

- A 1 and 2
- B 1 and 3
- C 2 and 4
- D 3 and 4

22 Which statement explains why argon is used to fill lamps?

- A It is a gas.
- B It is colourless.
- C It is reactive.
- D It is unreactive.

23 Aluminium is a .....1..... resource. It is found in the ore bauxite where it is present in aluminium oxide.

Pure aluminium is extracted from aluminium oxide by .....2..... .

Which words complete gaps 1 and 2?

	1	2
A	finite	electrolysis
B	finite	heating with carbon
C	renewable	electrolysis
D	renewable	heating with carbon

24 Which gas is an air pollutant?

- A argon
- B carbon dioxide
- C nitrogen
- D sulfur dioxide

25 Which word equation describes the manufacture of lime from limestone?

- A calcium carbonate  $\rightarrow$  calcium hydroxide + carbon dioxide
- B calcium carbonate  $\rightarrow$  calcium oxide + carbon dioxide
- C calcium hydroxide  $\rightarrow$  calcium oxide + water
- D calcium oxide + carbon dioxide  $\rightarrow$  calcium carbonate

26 Which process is used to separate petroleum into useful products?

- A cracking
- B filtration
- C fractional distillation
- D thermal decomposition

27 Polymers are long chain molecules made from smaller molecules.

What are these smaller molecules called?

- A alkanes
- B atoms
- C components
- D monomers

28 Which row gives the units for mass  $m$  and gravitational field strength  $g$ ?

	mass $m$	gravitational field strength $g$
A	kg	N/kg
B	kg	kg/N
C	N	N/kg
D	N	kg/N

29 A solid, rectangular piece of wood measures  $8.0\text{m} \times 1.0\text{m} \times 0.10\text{m}$ . The block has a mass of 440 kg.

What is the density of the wood?

- A  $55\text{kg/m}^3$
- B  $352\text{kg/m}^3$
- C  $550\text{kg/m}^3$
- D  $3520\text{kg/m}^3$

30 The weight of a box exerts pressure on the ground.

Which pair of changes to the box **must** reduce the pressure?

- A decreasing the weight and decreasing the area of the base
- B decreasing the weight and increasing the area of the base
- C increasing the weight and decreasing the area of the base
- D increasing the weight and increasing the area of the base

31 A horizontal force acts on a block.

The block moves in the direction of the force.

Which two quantities affect the work done by the force on the block?

- A magnitude of force and distance moved
- B magnitude of force and mass of block
- C magnitude of force and volume of block
- D magnitude of force and weight of block

32 A gas is contained in a cylinder of constant volume.

The gas is cooled.

What happens to the speed of the molecules of the gas and to the pressure of the gas?

	speed of molecules	pressure of gas
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

33 Which statement about the relative thermal expansion of solids, liquids and gases is correct?

- A Solids expand least, gases expand most.
- B Solids expand least, liquids expand most.
- C Gases expand least, liquids expand most.
- D Gases expand least, solids expand most.

34 The amplitude of a sound wave increases, and the frequency of the wave decreases.

What is the effect on the loudness of the sound and on the pitch of the sound?

	loudness	pitch
A	greater	higher
B	greater	lower
C	less	higher
D	less	lower

35 A plastic rod is rubbed with a cloth. The rod becomes positively charged.

Which statement describes why this happens?

- A Electrons move from the cloth to the rod.
- B Electrons move from the rod to the cloth.
- C Protons move from the cloth to the rod.
- D Protons move from the rod to the cloth.

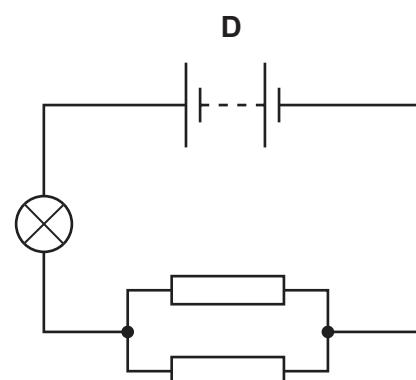
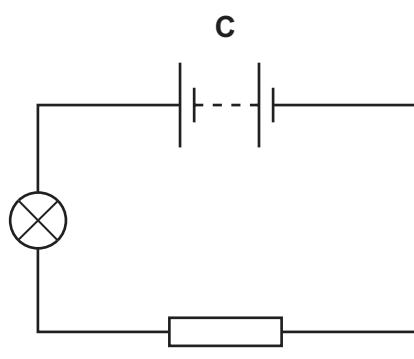
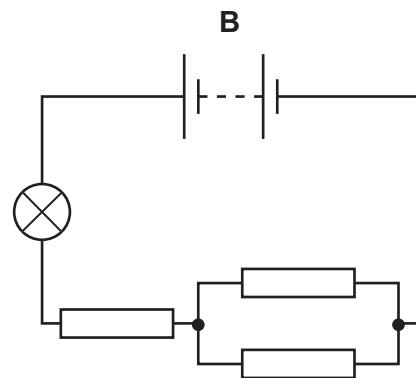
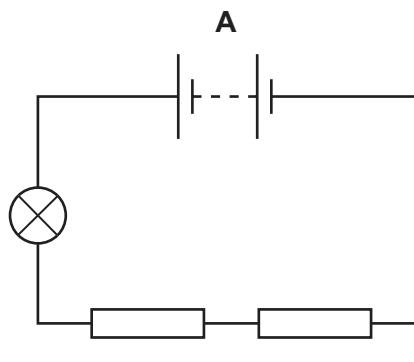
36 What is a current in a metal wire?

- A a flow of electrons
- B a flow of ions
- C a flow of neutrons
- D a flow of protons

37 A lamp is connected in four circuits in turn.

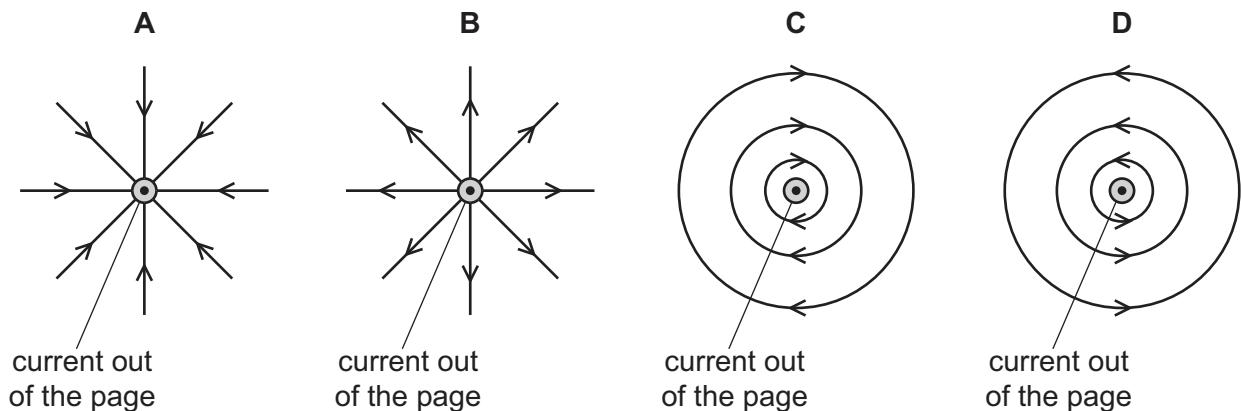
The batteries are identical and the resistors are identical.

In which circuit is the lamp the brightest?



38 The diagrams show a wire carrying a current out of the page.

Which diagram shows the pattern of magnetic field lines near the wire?



39 Which row describes the relative ionising effect and the relative penetrating ability of alpha and gamma radiation?

	relative ionising effect	relative penetrating ability
<b>A</b>	alpha is more ionising	alpha is more penetrating
<b>B</b>	alpha is more ionising	gamma is more penetrating
<b>C</b>	gamma is more ionising	alpha is more penetrating
<b>D</b>	gamma is more ionising	gamma is more penetrating

40 A radioactive isotope has a half-life of 4.0 days. A sample of the isotope emits radiation at a rate of 100 emissions per minute.

What was the rate of emission from the sample 8.0 days earlier?

- A** 25 emissions per minute
- B** 50 emissions per minute
- C** 200 emissions per minute
- D** 400 emissions per minute



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## The Periodic Table of Elements

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3	Li	4	Be	5	Li	6	Be	7	Li	8	Be	9	Li	10	Be	11	Li	12	Be	13	Li	14	Be	15	Li	16	Be	17	Li	18	Be	19	Li	20	Be	21	Li	22	Be	23	Li	24	Be	25	Li	26	Be	27	Li	28	Be	29	Li	30	Be	31	Li	32	Be	33	Li	34	Be	35	Li	36	Be	37	Li	38	Be	39	Li	40	Be	41	Li	42	Be	43	Li	44	Be	45	Li	46	Be	47	Li	48	Be	49	Li	50	Be	51	Li	52	Be	53	Li	54	Be	55	Li	56	Be	57	Li	58	Be	59	Li	60	Be	61	Li	62	Be	63	Li	64	Be	65	Li	66	Be	67	Li	68	Be	69	Li	70	Be	71	Li	72	Be	73	Li	74	Be	75	Li	76	Be	77	Li	78	Be	79	Li	80	Be	81	Li	82	Be	83	Li	84	Be	85	Li	86	Be	87	Li	88	Be	89	Li	90	Be	91	Li	92	Be	93	Li	94	Be	95	Li	96	Be	97	Li	98	Be	99	Li	100	Be	101	Li	102	Be	103	Li	104	Be	105	Li	106	Be	107	Li	108	Be	109	Li	110	Be	111	Li	112	Be	113	Li	114	Be	115	Li	116	Be	117	Li	118	Be	119	Li	120	Be	121	Li	122	Be	123	Li	124	Be	125	Li	126	Be	127	Li	128	Be	129	Li	130	Be	131	Li	132	Be	133	Li	134	Be	135	Li	136	Be	137	Li	138	Be	139	Li	140	Be	141	Li	142	Be	143	Li	144	Be	145	Li	146	Be	147	Li	148	Be	149	Li	150	Be	151	Li	152	Be	153	Li	154	Be	155	Li	156	Be	157	Li	158	Be	159	Li	160	Be	161	Li	162	Be	163	Li	164	Be	165	Li	166	Be	167	Li	168	Be	169	Li	170	Be	171	Li	172	Be	173	Li	174	Be	175	Li	176	Be	177	Li	178	Be	179	Li	180	Be	181	Li	182	Be	183	Li	184	Be	185	Li	186	Be	187	Li	188	Be	189	Li	190	Be	191	Li	192	Be	193	Li	194	Be	195	Li	196	Be	197	Li	198	Be	199	Li	200	Be	201	Li	202	Be	203	Li	204	Be	205	Li	206	Be	207	Li	208	Be	209	Li	210	Be	211	Li	212	Be	213	Li	214	Be	215	Li	216	Be	217	Li	218	Be	219	Li	220	Be	221	Li	222	Be	223	Li	224	Be	225	Li	226	Be	227	Li	228	Be	229	Li	230	Be	231	Li	232	Be	233	Li	234	Be	235	Li	236	Be	237	Li	238	Be	239	Li	240	Be	241	Li	242	Be	243	Li	244	Be	245	Li	246	Be	247	Li	248	Be	249	Li	250	Be	251	Li	252	Be	253	Li	254	Be	255	Li	256	Be	257	Li	258	Be	259	Li	260	Be	261	Li	262	Be	263	Li	264	Be	265	Li	266	Be	267	Li	268	Be	269	Li	270	Be	271	Li	272	Be	273	Li	274	Be	275	Li	276	Be	277	Li	278	Be	279	Li	280	Be	281	Li	282	Be	283	Li	284	Be	285	Li	286	Be	287	Li	288	Be	289	Li	290	Be	291	Li	292	Be	293	Li	294	Be	295	Li	296	Be	297	Li	298	Be	299	Li	300	Be	301	Li	302	Be	303	Li	304	Be	305	Li	306	Be	307	Li	308	Be	309	Li	310	Be	311	Li	312	Be	313	Li	314	Be	315	Li	316	Be	317	Li	318	Be	319	Li	320	Be	321	Li	322	Be	323	Li	324	Be	325	Li	326	Be	327	Li	328	Be	329	Li	330	Be	331	Li	332	Be	333	Li	334	Be	335	Li	336	Be	337	Li	338	Be	339	Li	340	Be	341	Li	342	Be	343	Li	344	Be	345	Li	346	Be	347	Li	348	Be	349	Li	350	Be	351	Li	352	Be	353	Li	354	Be	355	Li	356	Be	357	Li	358	Be	359	Li	360	Be	361	Li	362	Be	363	Li	364	Be	365	Li	366	Be	367	Li	368	Be	369	Li	370	Be	371	Li	372	Be	373	Li	374	Be	375	Li	376	Be	377	Li	378	Be	379	Li	380	Be	381	Li	382	Be	383	Li	384	Be	385	Li	386	Be	387	Li	388	Be	389	Li	390	Be	391	Li	392	Be	393	Li	394	Be	395	Li	396	Be	397	Li	398	Be	399	Li	400	Be	401	Li	402	Be	403	Li	404	Be	405	Li	406	Be	407	Li	408	Be	409	Li	410	Be	411	Li	412	Be	413	Li	414	Be	415	Li	416	Be	417	Li	418	Be	419	Li	420	Be	421	Li	422	Be	423	Li	424	Be	425	Li	426	Be	427	Li	428	Be	429	Li	430	Be	431	Li	432	Be	433	Li	434	Be	435	Li	436	Be	437	Li	438	Be	439	Li	440	Be	441	Li	442	Be	443	Li	444	Be	445	Li	446	Be	447	Li	448	Be	449	Li	450	Be	451	Li	452	Be	453	Li	454	Be	455	Li	456	Be	457	Li	458	Be	459	Li	460	Be	461	Li	462	Be	463	Li	464	Be	465	Li	466	Be	467	Li	468	Be	469	Li	470	Be	471	Li	472	Be	473	Li	474	Be	475	Li	476	Be	477	Li	478	Be	479	Li	480	Be	481	Li	482	Be	483	Li	484	Be	485	Li	486	Be	487	Li	488	Be	489	Li	490	Be	491	Li	492	Be	493	Li	494	Be	495	Li	496	Be	497	Li	498	Be	499	Li	500	Be	501	Li	502	Be	503	Li	504	Be	505	Li	506	Be	507	Li	508	Be	509	Li	510	Be	511	Li	512	Be	513	Li	514	Be	515	Li	516	Be	517	Li	518	Be	519	Li	520	Be	521	Li	522	Be	523	Li	524	Be	525	Li	526	Be	527	Li	528	Be	529	Li	530	Be	531	Li	532	Be	533	Li	534	Be	535	Li	536	Be	537	Li	538	Be	539	Li	540	Be	541	Li	542	Be	543	Li	544	Be	545	Li	546	Be	547	Li	548	Be	549	Li	550	Be	551	Li	552	Be	553	Li	554	Be	555	Li	556	Be	557	Li	558	Be	559	Li	560	Be	561	Li	562	Be	563	Li	564	Be	565	Li	566	Be	567	Li	568	Be	569	Li	570	Be	571	Li	572	Be	573	Li	574	Be	575	Li	576	Be	577	Li	578	Be	579	Li	580	Be	581	Li	582	Be	583	Li	584	Be	585	Li	586	Be	587	Li	588	Be	589	Li	590	Be	591	Li	592	Be	593	Li	594	Be	595	Li	596	Be	597	Li	598	Be	599	Li	600	Be	601	Li	602	Be	603	Li	604	Be	605	Li	606	Be	607	Li	608	Be	609	Li	610	Be	611	Li	612	Be	613	Li	614	Be	615	Li	616	Be	617	Li	618	Be	619	Li	620	Be	621	Li	622	Be	623	Li	624	Be	625	Li	626	Be	627	Li	628	Be	629	Li	630	Be	631	Li	632	Be	633	Li	634	Be	635	Li	636	Be	637	Li	638	Be	639	Li	640	Be	641	Li	642	Be	643	Li	644	Be	645	Li	646	Be	647	Li	648	Be	649	Li	650	Be	651	Li	652	Be	653	Li	654	Be	655	Li	656	Be	657	Li	658	Be	659	Li	660	Be	661	Li	662	Be	663	Li	664	Be	665	Li	666	Be	667	Li	668	Be	669	Li	670	Be	671	Li	672	Be	673	Li	674	Be	675	Li	676	Be	677	Li	678	Be	679	Li	680	Be	681	Li	682	Be	683	Li	684	Be	685	Li	686	Be	687	Li	688	Be	689	Li	690	Be	691	Li	692	Be	693	Li	694	Be	695	Li	696	Be	697	Li	698	Be	699	Li	700	Be	701	Li	702	Be	703	Li	704	Be	705	Li