Ivent Solutions Market Trend Update
November 2021

Planning for Chinese New Year (CNY) 2022

The Year of the Tiger is almost upon us once again… But why are we talking about it so far out from February 2022? Well… there are a lot of factors as we know, but CNY in February 2022 (yes 3 months out) has the potential to cause much more disruption to our already stretched supply chains. If you have not considered ordering out beyond standard leadtimes, then now is certainly the time to do so…

- Leadtimes are still increasing on many components
- Increased user demand on most tech products
- Raw material shortages
- Increasing pricing (lithium is a prime example)
- Factory closures due to electricity shortages in China
- Congested shipping lines compounded by Christmas rush
- New Zealand/Australia Christmas holiday shut-downs

CNY officially runs from 1st February to 6th February 2022, however factories are likely to close on Friday 28th January and re-open on Monday 14th February. Additional pressure after CNY will occur with the traditional labour shortages in China from staff not returning to the factories.

What is The Year of the Tiger???

The Tiger is known as the king of all beasts in China. The Tiger zodiac sign is a symbol of strength, exorcising evils, and braveness. Many Chinese kids wear hats or shoes with a Tiger image shown for good luck. The Tiger ranks third among the animals of the Chinese zodiac. The 12 zodiac animals are, in order: Rat, Ox, Tiger, Rabbit, Dragon, Snake, Horse, Goat, Monkey, Rooster, Dog, and Pig.

Each year is related to an animal sign according to a 12-year-cycle. The year of the Tiger in 2022 is actually based on the heavenly branch known as the "*Water Tiger*". The branch last occurred in 1962 and will not re-occur until the year 2082. Lucky numbers in 2022 will be 0, 1, 3, 4 and 5 and it is best to avoid the numbers 6, 7 and 8! Lucky colours are **grey, white, blue, purple, orange** and **black**… and it is best to avoid **gold, silver, brown** and **pink**! If you feel like travelling then the lucky directions are North, East and South, but it is a very good idea to avoid heading Southwest… this is most unlucky! These lucky and unlucky traditions are especially applicable to those whose birth zodiac is a Tiger, most recent years for the Tiger are **1938, 1950, 1962, 1974, 1986, 1998** and **2010**. If you were born in January or February it gets a little more complicated… You can work out your Chinese Zodiac here…

https://www.chinahighlights.com/travelguide/chinese-zodiac/chinese-zodiac-calculator.htm

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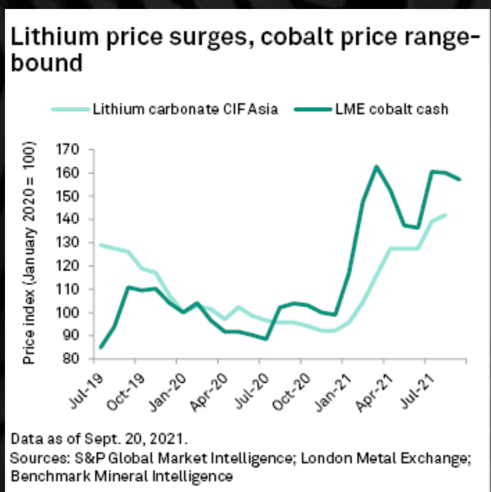
Lithium Pricing Skyrocketing

The graph below says it all really… Ivent's comprehensive supply base of battery cell and battery pack manufacturers have been sending official company "stamped" letters over the last few months in regard to price increases that will be applied in the coming months. Looking back only a year ago the key raw material of Lithium Carbonate was around the RMB 45,000/tonne mark (USD 7000/tonne), however the same time this year has the price at RMB 150,000/tonne mark (USD 23500/tonne).

Benchmark's EXW China (battery) grade of lithium carbonate rose by 26.5% to RMB 160,000/tonne (USD 24,800/tonne) in the final **two weeks** of September 2021 alone. This incredible increase surpasses the previous high of USD 24,750/tonne for battery-grade lithium carbonate assessed on 30 March 2018, and marks a new era for the lithium industry, Benchmark said.



Spot prices in China have climbed by **170%** so far this year which is predominantly driven by the global drive towards electric vehicles. Prices of spodumene, a key source of lithium which is mainly mined in Australia has also climbed **144%** this year to USD 990/tonne.

Reflecting back on the electric vehicle demand, it is clear to see that demand is outstripping supply and pushing up pricing exponentially. In China, the biggest market for electric vehicles, Lithium Carbonate output rose 19% year on year, to almost 20,000 tonnes per month. However, demand for Lithium cells used in EV's jumped 26.1% which has flipped the market into a deficit of nearly 10,000 tonnes per month. Global sales of EV's were up 150% in the months to July to just over 3 million units, compared to the same period in 2020. China alone took 1.3 million of the 3 million EV's so accounts for over 43% of global demand… scary numbers! EV sales globally are projected to rise to 5.8 million units year on year and this will only further pressurize the lithium cell market. Most analysts are referring to huge anxiety in the market about where the lithium supply is actually going to come from in the near future, to a point where EV production could be limited.

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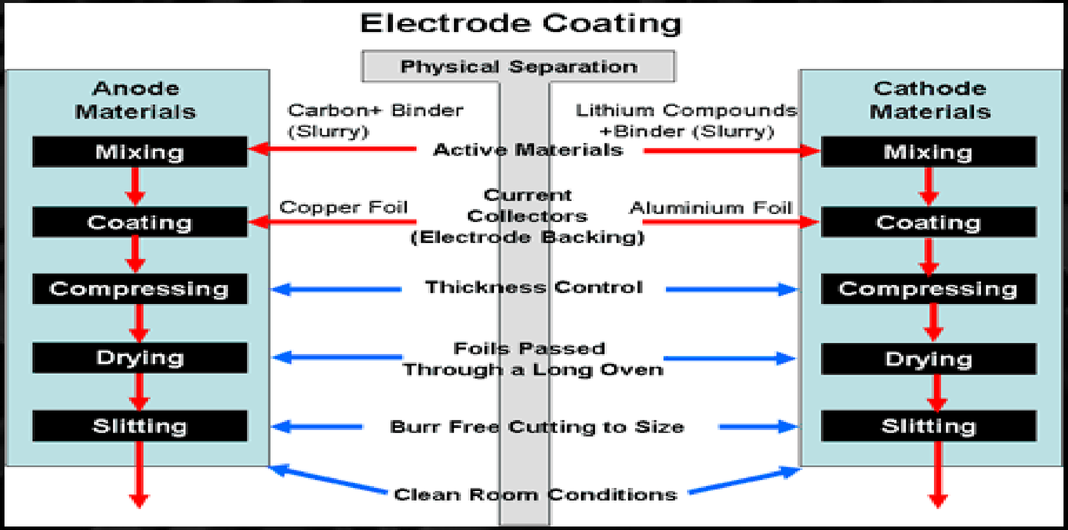
How Are Lithium Cells Actually Manufactured – A Case Study

Electrode Coating - The anodes and cathodes in Lithium cells are of similar form and are made by similar processes on similar or identical equipment. The active electrode materials are coated on both sides of metallic foils which act as the current collectors conducting the current in and out of the cell. The anode material is a form of Carbon and the cathode is a Lithium metal oxide. Both of these materials are delivered to the factory in the form of black powder and to the untrained eye they are almost indistinguishable from each other. Since contamination between the anode and cathode materials will ruin the battery, great care must be taken to prevent these materials from coming into contact with each other. For this reason the anodes and cathodes are usually processed in different rooms.

Particle size must be kept to a minimum in order to achieve the maximum effective surface area of the electrodes needed for high current cells. Particle shape is also important. Smooth spherical shapes with rounded edges are desirable since sharp edges or flaky surfaces are susceptible to higher electrical stress and decomposition of the anode passivating SEI layer, which can lead to very large heat generation and possible thermal runaway when the cells are in use. The metal electrode foils are delivered on large reels, typically about 500mm wide, with copper for the anode and aluminium for the cathode, and these reels are mounted directly on the coating machines where the foil is unreeled as it is fed into the machine through precision rollers. The coating process is shown in the diagram here ->



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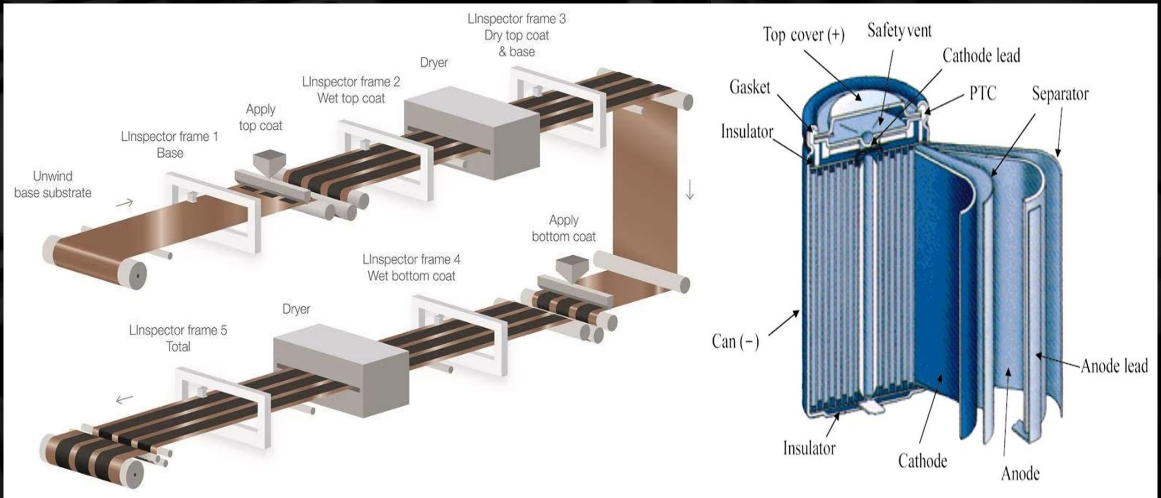
The first stage is to mix the electrode materials with a conductive binder to form a slurry which is spread on the surface of the foil as it passes into the machine. A knife edge is located just above the foil and the thickness of the electrode coating is controlled by adjusting the gap between the knife edge and the foil. Since it is not unusual for the gravimetric or volumetric energy storage capacity of the anode material to be different from that of the cathode material, the thickness of the coating layers must be set to allow the energy storage per unit area of the anode and cathode electrodes to be matched. From the coater, the coated foil is fed directly into a long drying oven to bake the electrode material onto the foil. As the coated foil exits the oven it is re-reeled. The coated foils are subsequently fed into slitting machines to cut the foil into narrower strips suitable for different sizes of electrodes. Later they are cut to length. Any burrs on the edges of the foil strips could give rise to internal short circuits in the cells so the slitting machine must be very precisely manufactured and maintained.

Cell Assembly - In the best factories cell assembly is usually carried out on highly automated equipment, however there are still many smaller manufacturers who use manual assembly methods. The first stage in the assembly process is to build the electrode sub-assembly in which the separator is sandwiched between the anode and the cathode. Two basic electrode structures are used depending on the type of cell casing to be used, a stacked structure for use in prismatic cells and a spiral wound structure for use in cylindrical cells. The assembly process for prismatic and cylindrical cells is illustrated in the following flow diagram.



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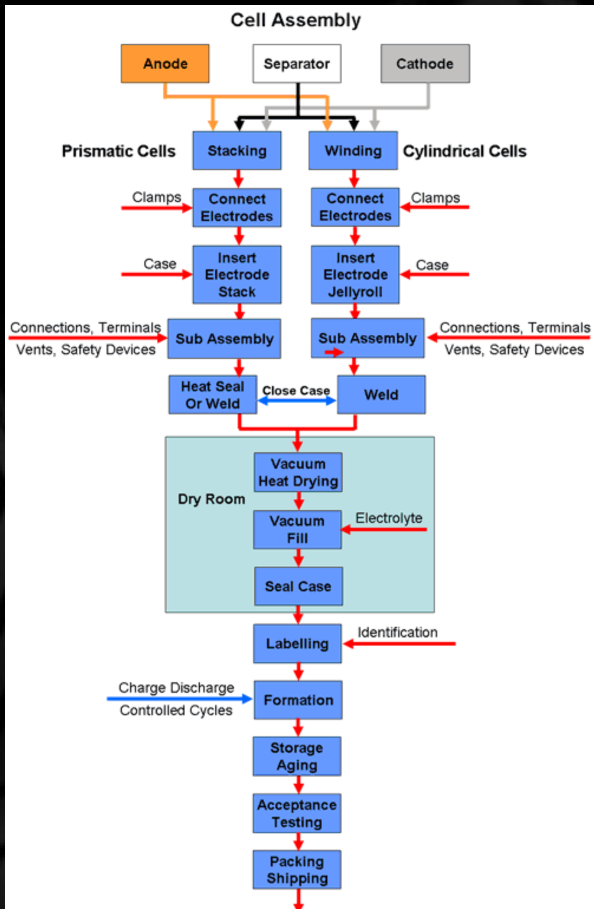


Prismatic Cells - Prismatic cells are often used for high-capacity battery applications to optimize the use of space. These designs use a stacked electrode structure in which the anode and cathode foils are cut into individual electrode plates which are stacked alternately and kept apart by the separator. The separator may be cut to the same size as the electrodes but more likely it is applied in a long strip wound in a zig zag fashion between alternate electrodes in the stack. While this case design makes optimum use of space when used in a battery pack, it has the disadvantage that it uses multiple electrode plates which need a clamping mechanism to connect all the anodes together and to the main terminal post and a similar mechanism for the cathodes. This all adds to the complexity and labour content of the cell and consequently to the costs. Some prismatic cells are also made by the simpler method of winding the electrodes on a flat mandrel. Stacked electrodes are also used for the production of pouch cells.

Cylindrical Cells - For cylindrical cells the anode and cathode foils are cut into two long strips which are wound on a cylindrical mandrel, together with the separator which keeps them apart, to form a jelly roll (Swiss roll in the UK). Cylindrical cells thus have only two electrode strips which simplifies the construction considerably. A single tab connects each electrode to its corresponding terminal, although high power cells may have multiple tabs welded along the edges of the electrode strip to carry the higher currents.

The next stage is to connect the electrode structure to the terminals together with any safety devices and to insert this sub-assembly into the can. The can is then sealed in a laser welding or heating process, depending on the case material, leaving an opening for injecting the electrolyte into the can. The following stage is to fill the cell with the electrolyte and seal it. This must be carried out in a "dry room" since the electrolyte reacts with water. Moisture will cause the electrolyte to decompose with

the emission of toxic gases. Lithium Hexafluoride ($LiPF_6$) for instance, one of the most commonly-used electrolyte materials, reacts with water forming toxic hydrofluoric acid (HF). Afterwards the cell is given an identification with a label or by printing a batch or serial number on the case.

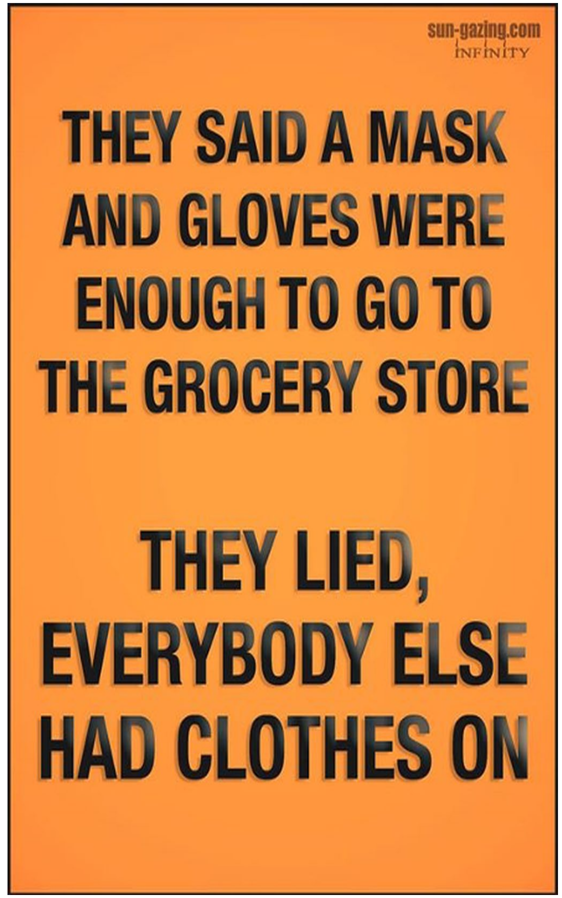
Formation - Once the cell assembly is complete the cell must be put through at least one precisely controlled charge / discharge cycle to activate the working materials, transforming them into their useable form. Instead of the normal constant current - constant voltage charging curve, the charging process begins with a low voltage which builds up gradually. This is called the Formation Process. For most Lithium chemistries this involves creating the SEI (solid electrolyte interface) on the anode. This is a passivating layer which is essential for moderating the charging process under normal use. During formation, data on the cell performance such as capacity and impedance, are gathered and recorded for quality analysis and traceability. The spread of the performance measurements also gives an indication of whether the process is under control. (**Beware of manufacturers** who use this process for sorting their cells into different performance groups for sale with alternative specifications).

Although not the prime purpose of formation, the process allows a significant percentage of early life cell failures due to manufacturing defects, the so called "*infant mortalities*", to occur in the manufacturer's plant rather than at the customers' premises.

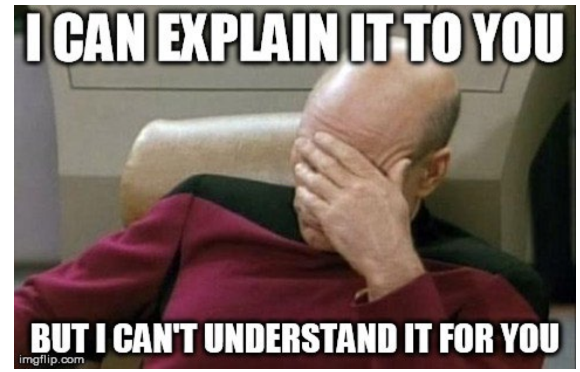
Process Control - Tight tolerances and strict process controls are essential throughout the manufacturing process. Contamination, physical damage and burrs on the electrodes are particularly dangerous since they can cause penetration of the separator giving rise to internal short circuits in the cell and there are no protection methods which can prevent or control this.

Support Services - Cleanliness is essential to prevent contamination and cells are normally manufactured in clean room conditions with controlled access to the assembly facilities often via air showers. Apart from the production test equipment, a battery manufacturer should be expected to have a materials laboratory equipped to carry out a full analysis of the materials used in the production of the cells as well as to carry out failure analysis.


EVERYTHING THE LIGHT TOUCHES IS NEW ZEALAND
WHAT ABOUT THE SHADOWY PLACE? NO SIMBA, THAT'S AUCKLAND, YOU MUST NEVER GO THERE


sun-gazing.com
INFINITY
THEY SAID A MASK AND GLOVES WERE ENOUGH TO GO TO THE GROCERY STORE
THEY LIED, EVERYBODY ELSE HAD CLOTHES ON


Me after washing my hands for 20 seconds 57 times in one day
boredpanda.com


I CAN EXPLAIN IT TO YOU
BUT I CAN'T UNDERSTAND IT FOR YOU
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AND BREATHE, NEW ZEALAND
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FEAR OF CORONA IS ON THE DECLINE
RELEASE THE MURDER HORNETS


SOCIAL DISTANCING
6 FT
KEEP TWO CAPYBARA LENGTHS BETWEEN YOU AND OTHERS.

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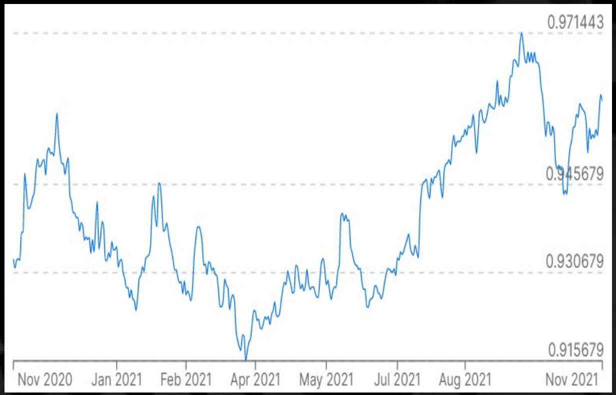
A forest of green arrows this month!

NZD versus AUD - AU$0.960 vs NZ$1.00



NZD versus USD - US$0.710 vs NZ$1.00

NZD versus EUR - EU$0.615 vs. NZ$1.00

Copper - USD9750 / tonne

Lead - USD2400 / tonne

Nickel - USD19500 / tonne

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This Month in Tech History…

November 8, 1923 – Jack Kilby is born in Jefferson City, Missouri. After several years of study at the University of Illinois and the University of Wisconsin, Kilby began work at Texas Instruments Inc., where he invented the integrated circuit in 1958. With that invention, he proved that resistors and capacitors could exist on the same piece of semiconductor material.

November 30, 1955 – IBM delivers the first two IBM 7090 mainframe computers. One of the first commercially produced fully-transistorized computers, the 7090 and the later 7094 were notable for being used by NASA to control the Mercury and Gemini space flights along with many other significant scientific and government applications in the 1960’s. Some 7090’s were even used through the 1970’s into the 1980’s.

November 18, 1970 – Microsoft Corp. co-founder and CEO Bill Gates gets his start in computer programming at the Lakeside School in Seattle. The school owned some early computers and Gates and his friends spent nearly all their time pushing the machines to their limits. Time on Lakeside and other machines in the Seattle area was costly, however, so the newly formed Lakeside Programmers Group offered Information Sciences, Inc. free programming services on its PDP-10 in return for free time on the computer. The group designed a payroll program for the company.

November 10, 1983 – Microsoft formally announces Windows, a graphical user interface for Microsoft DOS-based systems. Bill Gates promises that Windows will ship by April of 1984. However, in true Microsoft fashion, Windows 1.0 doesn’t actually ship until November 1985. While Windows 1 and Windows 2 saw limited usage, it wasn’t until Windows version 3 that Windows began to see widespread acceptance.

November 12, 1990 – Tim Berners-Lee submits a proposal for a hypertext project he calls “WorldWideWeb”. In this proposal he lays out his vision for what will, of course, become the modern web. In about three months, he will have a web browser ready. And in only another three months, the first web server will go online, marking the launch of the world wide web.

November 1, 2005 – A software error related to a system upgrade halted stock and bond trading on the Tokyo Stock Exchange. Problems came to light before the market's opening at 9 a.m. local time and delayed the start of trading until 1:30 p.m. The glitch was the most serious to hit the exchange since 1999, when floor trading was scrapped so that an all-electronic trading system could be installed.

November 5, 2006 – According to Internet services company Netcraft Ltd., on this day over 100 million Web sites existed on the Internet. The milestone capped an extraordinary year in which the Internet added 27.4 million sites, easily topping the previous full-year growth record of 17 million from 2005.

CHINA HOLIDAYS 2022

JANUARY

						01
02	03	04	05	06	07	08
09	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	**31**					

FEBRUARY

Chinese New Year

Lantern Festival

		01	**02**	**03**	**04**	**05**
06	07	08	09	10	11	12
13	14	**15**	16	17	18	19
20	21	22	23	24	25	26
27	28					

MARCH

		01	02	03	04	05
06	07	08	09	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

APRIL

Qingming Festival

					01	02
03	**04**	**05**	06	07	08	09
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	**30**

MAY

May Day

01	**02**	03	04	05	06	07
08	09	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

JUNE

Dragon Boat Festival

			01	02	**03**	**04**
05	06	07	08	09	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

JULY

					01	02
03	04	05	06	07	08	09
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

AUGUST

	01	02	03	04	05	06
07	08	09	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

SEPTEMBER

Mid-Autumn Festival

				01	02	03
04	05	06	07	08	09	**10**
11	**12**	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

OCTOBER

National Day (Golden Week)

						01
02	**03**	**04**	**05**	**06**	**07**	08
09	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

NOVEMBER

		01	02	03	04	05
06	07	08	09	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

DECEMBER

				01	02	03
04	05	06	07	08	09	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31