

FIRST® LEGO® League Challenge BIOGLOW™ Building Instructions

Mission 2: Exploding Seeds

This build is 64 pieces, and 34 building steps.

Welcome to text-based instructions from Bricks for the Blind. Before you start building, here are some terms we'll be using:

- In Front of/Front: towards you.
- Behind/Back: away from you.
- Up: towards the ceiling.
- Down: towards the floor.
- Stud: the bump on a LEGO brick. Example: A 2x1 brick has two studs on it.
- Vertically: going from front to behind.
- Horizontally: going from left to right.
- Upright: pointing up towards the ceiling.
- That one/ppp: previously placed piece.
- Plate: piece with studs.
- Tile: smooth piece without studs (unless otherwise specified)
- Symmetrically: a mirror image. Example: If you place a 2x1 brick with technic connector on the front wall at the right, connector to the front, and then place another such piece symmetrically on the back wall, at the right, the technic connector of the second piece should point to the back, since it will be placed symmetrically.
- Centered-vertically: even amount of space in front of and behind the piece
- Centered-horizontally: even amount of space left and right of the piece.
- Row: studs lined up horizontally (left to right/side to side).
- Column: studs lined up upright or vertically (top to bottom/back to front).
- Standing upright: the piece is perpendicular to the ground, like a wall.
- Lying flat: the piece is parallel to the ground, like a piece of toast which fell off the table.
- Anti-stud: the portion of a piece which accepts studs, like the bottom of a plate.
- Jumper plate: a 1x2 plate with a single stud on top, or a 1x3 plate with only two studs on top.

For builders with low vision, or a sighted building partner who may want to follow along with the printed visual instructions that come with each set. As low vision users may benefit from viewing the instructions on a personal device where they can zoom in on content and use assistive technologies to enhance the visuals.

A note on LEGO Technic™ part names. These parts are somewhat different from regular LEGO bricks. I'll include some definitions in case the builder or helper is not familiar with LEGO Technic™.

Axles - An axle is a connector which has an X shaped cross-section. Because their cross section is not round, anything connected to an axle using an axle-hole will rotate with that axle. Axles are longer than they are wide, and the length of an axle corresponds with how many bricks long it is. Aka a 3L axle is three bricks long. Axles come in a variety of lengths, with a 2L axle being the shortest available. They may be combined with pins, or have circular stops on them. A stop prevents the axle from sliding through an axle-hole at a specific point on the axle.

Pins - A pin is a connector which has a circular cross section and a flanged notch out of one or both ends. This flanged notch allows them to click into bricks with a pin-hole. Pins come with and without friction ridges, which are small bumps on the pin which prevent them from rotating freely. For standard pins, black is a high friction pin, and gray is a low friction pin. A standard length pin is two brick lengths long, with a stop in the middle. This prevents a brick from being pushed from one side of the pin to the other. A 1L pin is one brick long and still retains the stop, however it also includes a hollow stud at the other end. A 3L pin is three bricks long, and only contains a stop at one side, allowing two bricks to be pushed onto the other side of the pin. Pins may also have one side which is an axle.

Lifarms - A lifarm is a basic structural element, similar to a brick or a plate, but usually without any studs. It is a beam with rounded ends and with holes in it, with the same spacing as the studs on a LEGO brick. lifarms come in a variety of lengths, including a 1x1 lifarm which looks like a cylinder. Thick lifarms are as wide as a LEGO brick, and thin lifarms are half as wide as a LEGO brick, but not the same thickness as a LEGO plate! The holes in a lifarm arm may accept axles or pins. They also come in a variety of shapes, including tees, els and triangles.

Gears - A gear is a functional element. They are typically discs with teeth on the outside, there are also worm gears which look like a spiraling cylinder! Gears connected by axles transmit or even transform rotational motion!

Axle and Pin Connectors - These elements are typically smaller than lifarms, and are used to connect some combination of pins or axles. They might have pins or axles, as well as axle or pin-holes. They have a lot of different angle combinations! The simplest just connects two axles or pins together in a straight line.

Bushes/Bushings - LEGO Technic™ uses bushes largely as spacers, but they also can reduce friction between rotating parts, or can form useful elements such as handles. Bushes are typically light gray, generally cylindrical, and have an axle-hole running through the middle. They have a flange at the front and back to make them easier to pull on and off.

Sorting Instructions:

This LEGO set comes in the bag labeled 3 and some large pieces from bag 0. Sort the pieces into groups as described below. Note that where there are multiple colors of the same brick in a step, the colors will be split across two groups to make telling the difference easier for the builder! LEGO includes a few spare parts in case you lose something. Set these into their own group away from the rest, in case you need them later.

Mission 2: Exploding Seeds

Group A contains all of the black 2L pins from this bag. These pins have friction ridges.

Group B contains all of the blue 3L pins from this bag. These pins have friction ridges.

Bag 3 (4 groups of bricks)

Main Build

Group 1 contains the pieces for steps 1-8.

Group 2 contains the pieces for steps 9-17.

Group 3 contains the pieces for steps 18-27.

Group 4 contains the pieces for steps 28-35. Include two lime green 19L flexible hoses from bag 0.

Building Instructions:

Groups A, B and 1. You will use the pins from groups A and B throughout the build.

Mission 2: Exploding Seeds

Main Build.

1.1. Let's start by building a base! Find a light gray 5x7 hollow frame. This looks like two 7L lifarms connected by two 3L lifarms on the ends, forming an open rectangle. Place this horizontally in front of you.

1.2. Push a black 2L pin from group A, from the back, into the middle hole on the front lifarm of the previous piece. This will point inside of the hollow frame.

2.1. Push a black 2L pin from group A, from the front, into the left hole on the front liftarm of the hollow frame.

2.2. Push a blue 3L pin from group B, with the stop ring near the front, into the right hole on the front liftarm of the hollow frame. Push this as far back as it can so it extends 1L to the front and 1L into the middle of the hollow frame.

3. Push a dark gray 5L thick liftarm, horizontally with the holes facing the front and back, centered horizontally onto the front sides of the previous two pieces.

4.1. Push a black 2L pin from group A, from the back, into the left hole on the back liftarm of the hollow frame. Repeat symmetrically on the right side.

4.2. Push a dark gray 5L thick liftarm, horizontally with the holes facing the front and back, centered horizontally onto the back sides of the previous two pieces.

5.1.1. Next, we'll build an upright section. Set the base aside for now. Place a light gray 3x3 T-shaped liftarm, upright with the stem of the letter T pointing up and the holes facing left and right, in front of you.

5.1.2. Push a black 2L pin from group A, from the left, into the center hole on the bottom row of the previous piece.

5.2. Push a black 2L pin from group A, from the left, into the top hole of the T-shaped liftarm.

5.3. Push the holes on the right side of a light green 11L thick liftarm, upright with the holes facing left and right, onto the previous two pieces so the bottom is even with the bottom of the T-shaped liftarm.

5.4. Place the base vertically in front of you, with pins extending into the center of the hollow frame on the right. Push the bottom row of the upright assembly, from the left, onto these two pins.

6.1. Now we'll extend the upright assembly. Find a light green 7x3 bent liftarm. This is a 7L liftarm connected to a 3L liftarm at a 135 degree angle. The holes at each end are axle holes. Rotate this so it's vertical with the holes facing up and down, with the 7L liftarm at the front and the 3L liftarm pointing away from you and to the right.

6.2. Push a black 2L pin from group A, from the top, into the second and fourth holes from the front. Count the axle hole as the first hole. Place two more, from the top, into the second and third holes from the back, also counting the axle hole.

6.3. Rotate the 7x3 bent liftarm so the pins are on the right and the 7L liftarm is upright at the bottom. The 3L liftarm should angle up and away from you. Push the second pin from the bottom, from the left, into the top hole in the upright 11L liftarm on the base assembly. The bottom pin should also connect to the 11L liftarm.

7. Push a light green 7L thick liftarm onto the two free pins on the right side of the 7x3 bent liftarm so the back of the 7L liftarm is even with the back of the 3L portion of the bent liftarm. The front of this piece will slope down at the front.

8.1. Next, we'll build a part that looks like a plant stem. Set the base and stand aside for now. Find a lime green axle and pin connector #5. This piece has two 1L axle connectors which form an angle slightly greater than 90 degrees, and a perpendicular pin hole between them. Place this piece, with one axle connector facing right and the other facing to the back left, in front of you.

8.2. Push a red 2L axle, from the right, into the right axle connector of the previous piece so it extends 1L to the right.

Group 2.

9. Find a yellow axle and pin connector #3. This piece has two 1L axle connectors which form an angle almost 180 degrees, and a perpendicular pin hole between them. Push the left axle connector of this piece, with the pin hole on top and the right axle hole pointing slightly to the back, from the right onto the previous piece.

10. Keeping the previous piece on the right, rotate the stem assembly so the pin holes face the front and back. Push a blue 3L pin from group B, with the stop at the back, from the back into each of the two pin holes. Push these all the way in so they extend 1L to the front and back.

11.1. Push a red 2L axle, from the right, into the rightmost axle hole on the stem assembly so the right side extends 1L to the right.

11.2. Push the yellow axle and pin connector #3, with the pin hole facing front and back and the right axle hole pointing down and to the right, from the right onto the previous piece.

12.1. Push a red 1L pin with a stud on one side, with the stud at the front, from the front into the pin hole of the previous piece

12.2. Push a light gray 3L axle, from the right, into the axle hole on the right side of the assembly.

13.1.1. Next, we'll add a small flower and a leaf. Place a lime green 1x1 round plate with three leaves on one side, with the leaves on the right, in front of you.

13.1.2. Place a pink 1x1 round plate on the previous piece.

13.2. Push a green 3L bar, from the bottom, through the hollow anti-studs of the previous two pieces until the top is even with the top of the 1x1 round plate. The bar will extend about 2L below the piece with leaves.

13.3. Rotate this assembly so the bar is at the front, and so the leaves face to the right. Push the bar, from the back, through the red 1L pin with a stud that's in the rightmost pin hole of the assembly.

14. Place a lime green 1x1 round plate with three leaves on one side, with the leaves pointing up, on the stud of the pin we just put the bar through. The bar will pass through the hollow stud of this piece.

15.1. Find a yellow axle connector with an axle hole. This piece has a 1L axle connector on one side, and a perpendicular axle hole on the other. If you were to push axles through both holes they would form a T with the axle connector making the stem. Push the axle hole of this piece, with the axle connector at the front, onto the right side of the 3L axle that's on the right side of the stem. Push it all the way to the left.

15.2. Push the axle hole of another yellow axle connector with an axle hole, with the axle hole at the back, onto the axle to the right of the previous piece.

16. Now we'll add the stem to the stand and base. Place the stand and base in front of you so that the 7L lifarm on top of the stand is horizontal, and is higher on the right side than the left. Rotate the stem assembly so it's horizontal with the previous two pieces on the right. Push the right pin on the back side of the stem into the rightmost hole on the 7L lifarm on top of the stand. The left pin will attach to the fourth hole from the right on the 7L lifarm. This will cause the right side of the stem to be the tallest part of the assembly.

17. Find the axle hole near the left end of the stem that points upwards. Push the end of a green 6L bar with a stop, with the stop near the bottom, into this hole.

Group 3.

18.1. Push the rightmost hole of a lime green 7L thick liftarm, horizontally with the right side higher than the left, onto the rightmost pin on the front side of the stem. The fourth hole from the right will attach to the other pin.

18.2. Push a red 1L pin with a stud on one side, with the stud at the front, into the second hole from the right of the previous piece. Push another into the third hole from the left.

19. Place a purple butterfly on the left piece from the previous step.

20.1. Next, we'll add a couple more leaves. Place a lime green 1x2 round plate with three leaves on one side, with the leaves on the right, in front of you.

20.2. Push the bar of a lime green short bar with two small leaves on top, with the leaves on the top, from the top through the hollow stud of the previous piece.

20.3. Repeat steps 20.1-20.3.

20.4. Rotate one leaf assembly so the leaves point up and the bar is at the back. Push the bar into the hollow stud on the front side of the 7L liftarm in front of the stem. This is in the second hole from the right.

20.5. Rotate the other leaf assembly so the leaves point to the left and so the stem is at the front. Push the stem, from the back, through the rightmost hole of the 7x3 bent liftarm that's at the back of the stand.

21. Next, we'll make a seed. Set the stand aside for now. Stack two tan 1x1 round plates and place them in front of you.

22. Place the stack from the previous step onto a brown 2x2 dome bottom. This piece has an anti-stud at the bottom and looks kind of like a bowl. The two pieces will fit inside the bowl.

23. Place a brown 2x2 round brick with four points at the bottom on the previous piece.

24. Place a brown 2x2 round tile with a single stud on the previous piece.

25.1. Now we'll add a stem to the seed. Place a brown 5L L-shaped bar, horizontally with the short bar on the left and the long bar at the front, in front of you.

25.2. Push two red thick bushings, from the right, onto the long side of the bar. Push them all the way to the left.

25.3. Rotate the bar assembly so it's upright with the short bar on top, pointing to the left. Push the bottom of the bar into the hollow stud of the 2x2 round tile with a stud that's on top of the seed. Push it all the way down.

26.1. Push the hollow stud on a gold ring with a stud, with the ring on top and the stud facing the left, from the left, onto the short bar that's on top of the seed. Push it all the way to the right.

26.2. Push the hollow anti-stud of a tan 1x1 round plate with a hollow stud over the bar until it attaches to the stud on the ring.

27. Place the stand back in front of you, with the top of the stem on the right. Find the 6L bar that sticks up near the left side of the stem. Slide the ring on top of the seed onto the bar. Slide it as far to the right as it will go so the seed sits next to the stand.

Group 4.

28. Now we'll make a couple of flexible assemblies, one at a time. Set the stand aside for now. Stack two tan 1x1 round plates and place them in front of you.

29. Place the stack from the previous step onto a brown 2x2 dome bottom. This piece has an anti-stud at the bottom and looks kind of like a bowl. The two pieces will fit inside the bowl.

30. Place a brown 2x2 round brick with four points at the bottom on the previous piece.

31. Place a brown 2x2 round tile with a single stud on the previous piece.

32.1. Rotate the seed so it's horizontal with the stud on the right. Push a brown 2L bar with a stop ring in the middle, from the left, into the hollow anti-stud on the left side of the seed.

32.2. Push the hollow stud on a gold ring with a stud, with the ring hanging down and the stud on the left, from the left, onto the previous piece. Push it all the way to the right until it touches the 2x2 dome bottom.

33.1. Next, we'll add a long, flexible hose. Push the tube on one end of a lime green 19L flexible hose, horizontally, into the hollow stud on the right side of the seed.

33.2. Repeat steps 28-33.1.

34. Place the stand, with the top of the stem on the right, in front of you. Push the free end of one of the flexible tubes into the back axle connector that's on top of the stem. Repeat on the front side with the other flexible tube.

35. Next, we'll hook the rings on the seeds onto the bar that's sticking up from the stem. Bend the back flexible hose until you can hook the ring onto the bar. Repeat with the front seed. The two flexible tubes should make a circle over the stand.

Congratulations! Now this build is complete!

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