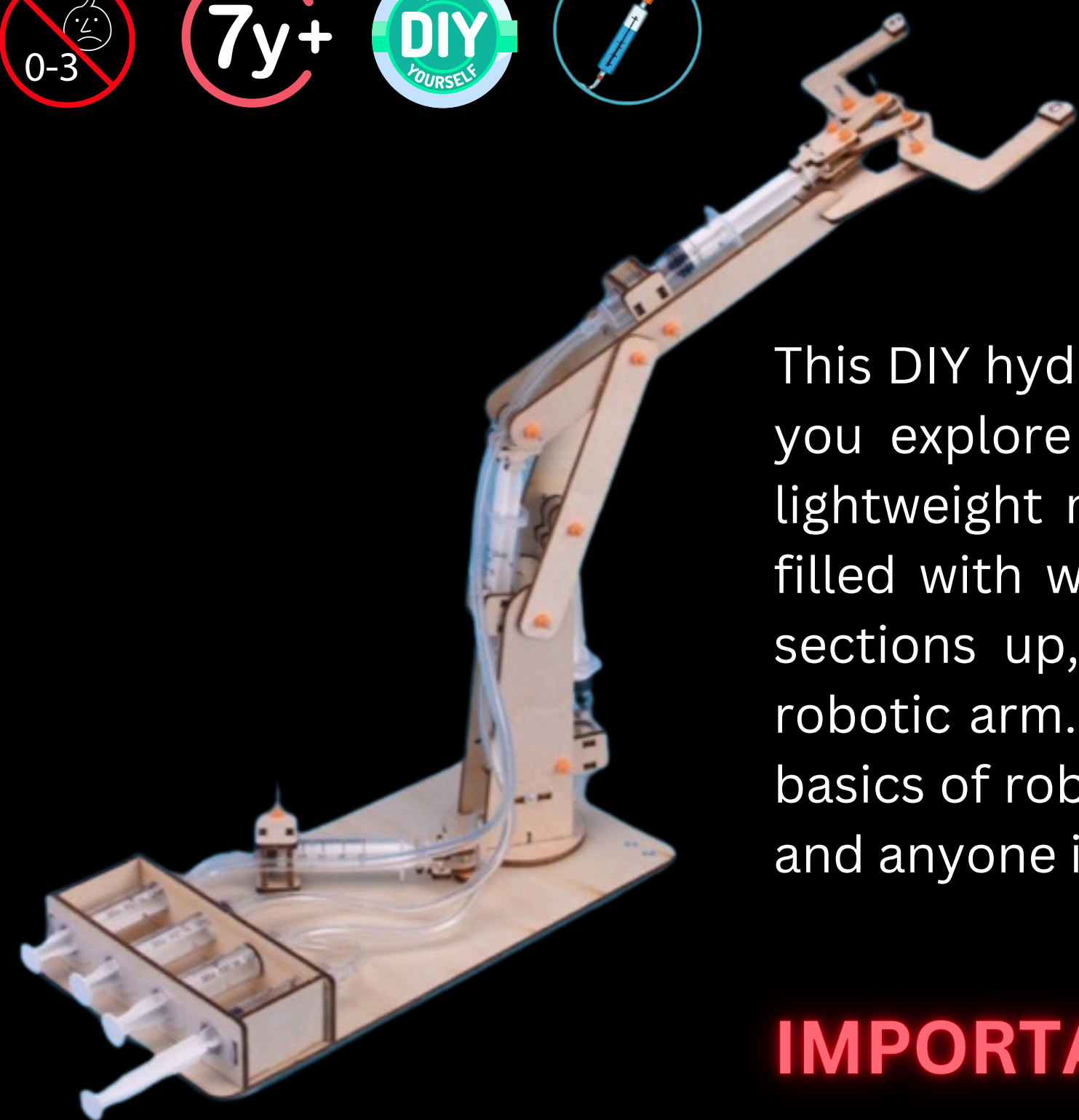


DIY MECHANICAL ARM

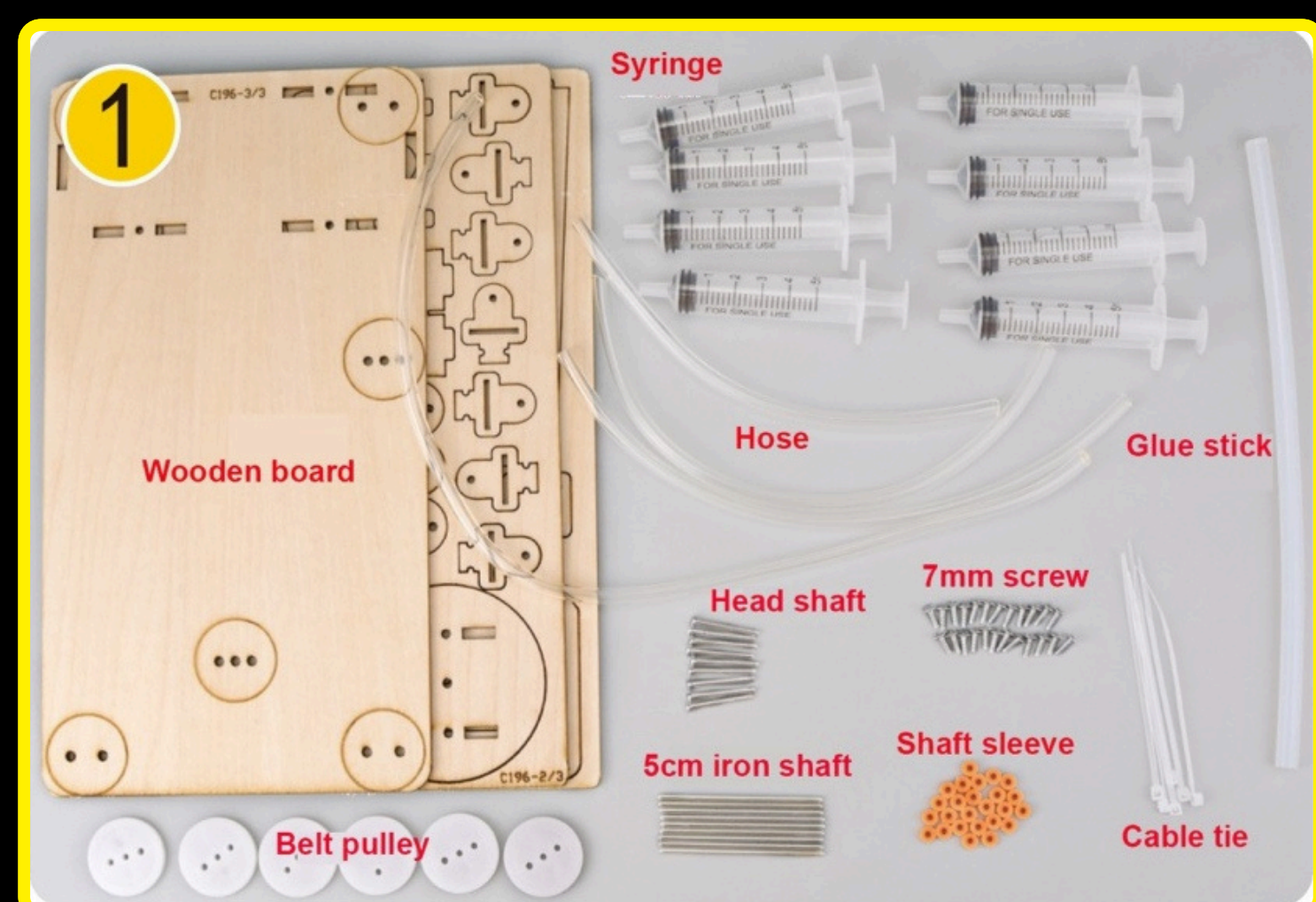
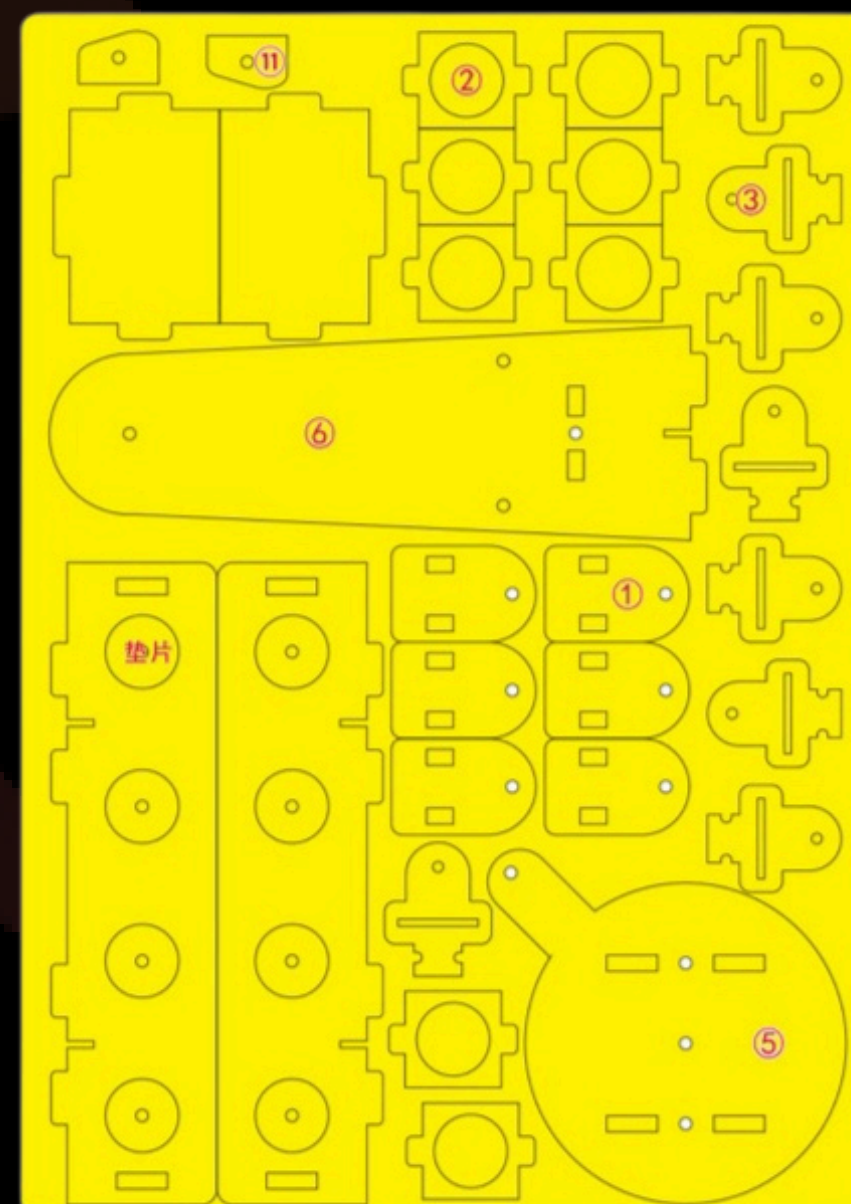
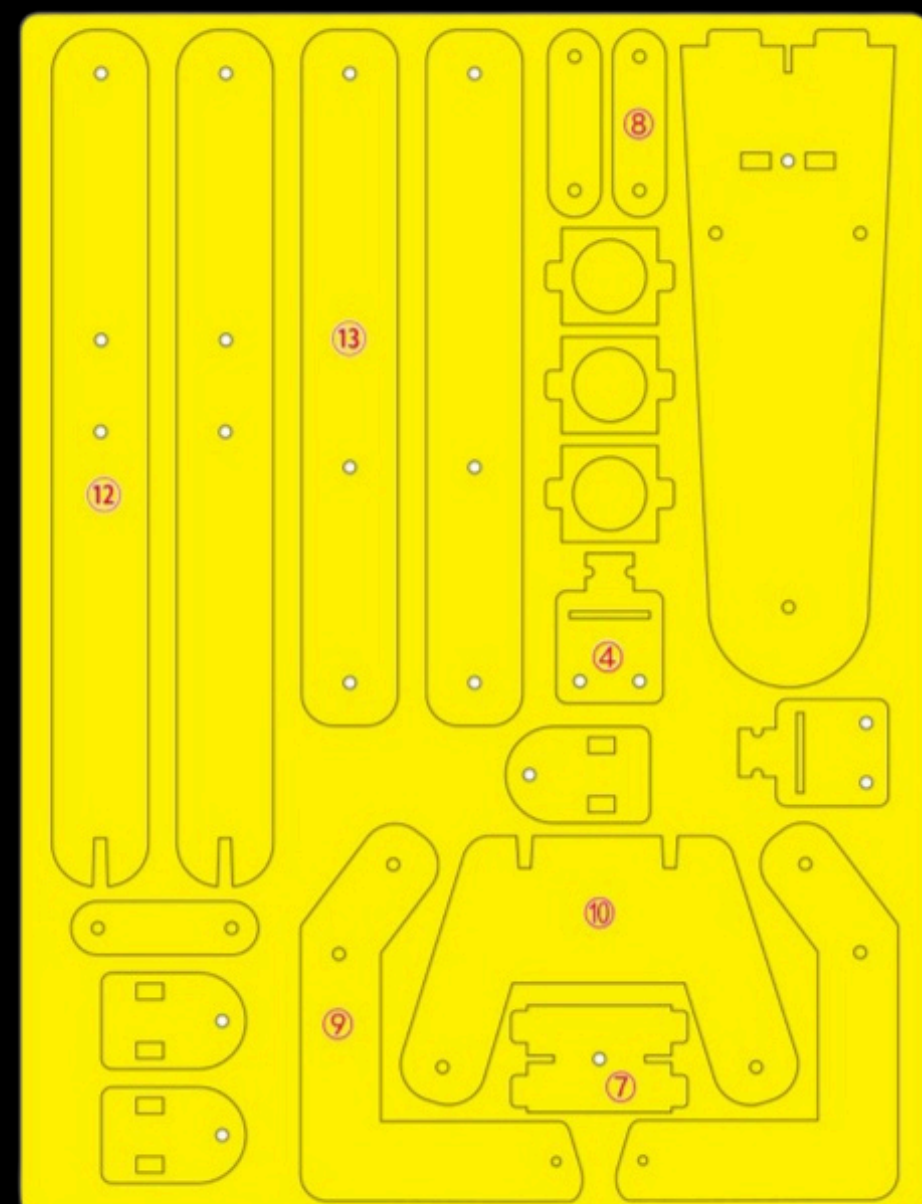


This DIY hydraulic mechanical arm is a hands-on educational kit that lets you explore the principles of hydraulics and engineering. Made from lightweight materials, it features moveable joints powered by syringes filled with water. By controlling the syringes, you can move the arm's sections up, down, and side to side, mimicking the motion of a real robotic arm. It's perfect for learning about physics, mechanics, and the basics of robotics in a fun, interactive way. Ideal for students, hobbyists, and anyone interested in science and technology.

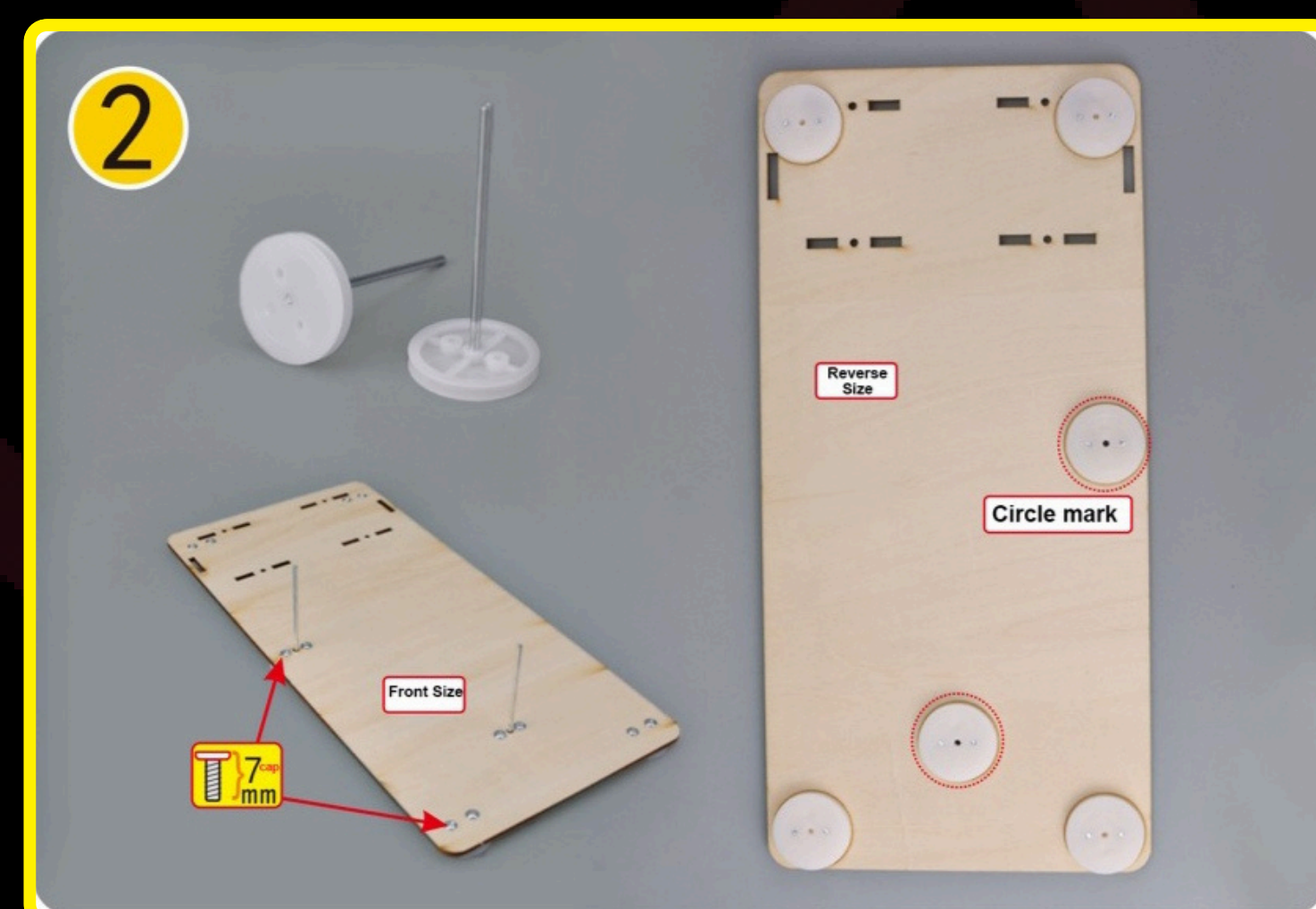
IMPORTANT! KEEP SAFE



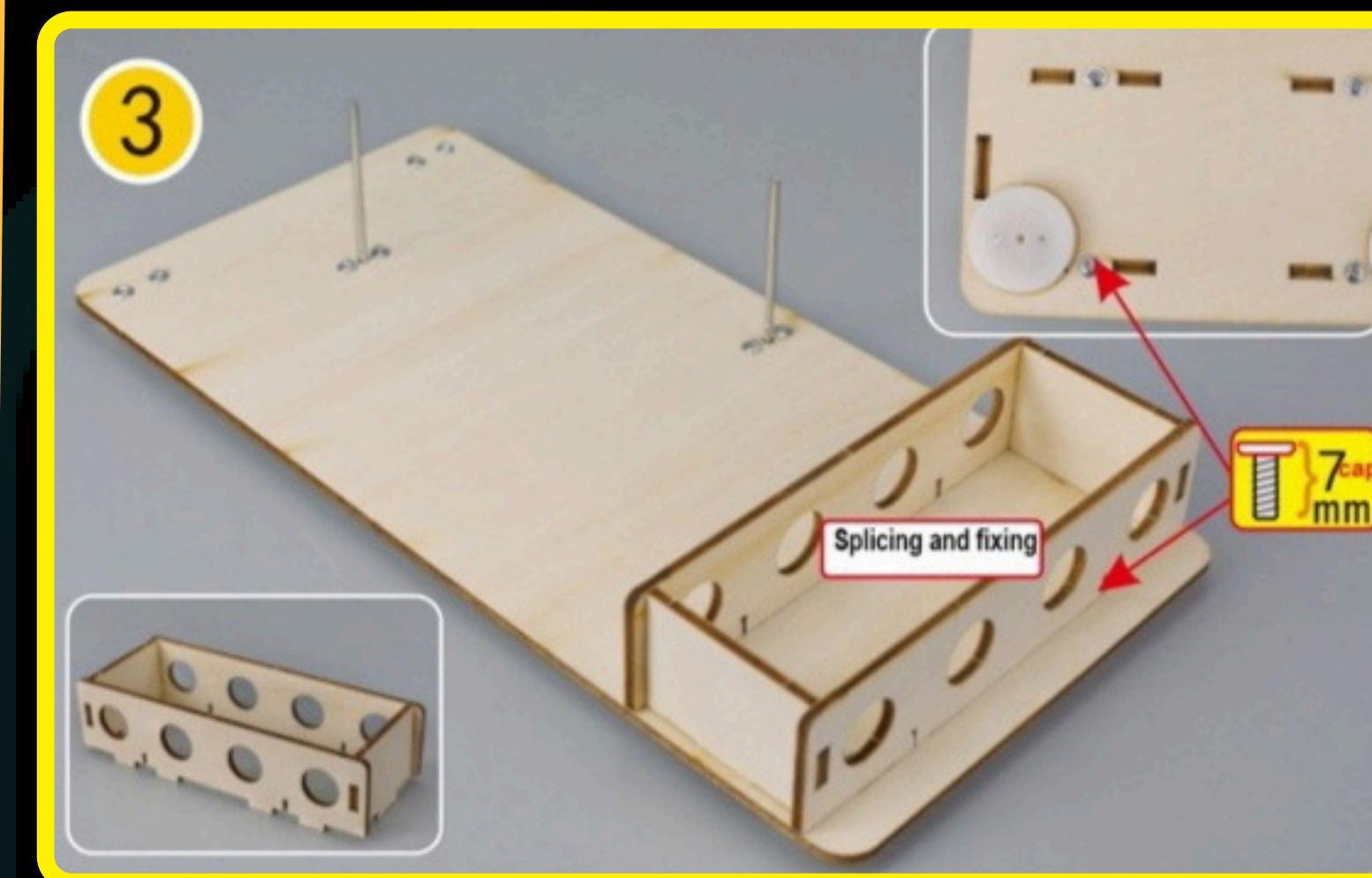
- Choking Hazard - This toy is not suitable for children under 3 years old. It contains small parts that could be a choking hazard.
- Handling Fire - Lighters or matches are hot and can be dangerous. Always ask a grown-up to help you.
- Be careful when opening the pack! Small bits can go missing quickly. Losing these bits might stop your model from working.
- Don't build this alone! It's not safe to do it by yourself. Ask a grown-up like your mum, dad, or teacher to help.
- Read the instructions carefully. This will help you make your model. If you don't understand something, ask for help. It's okay to ask - it's part of learning!



1. Carefully lay out all parts and components as shown in the provided diagrams. Use the yellow template to distinguish the wooden pieces. Ensure the labels on the parts match those in the instructions.



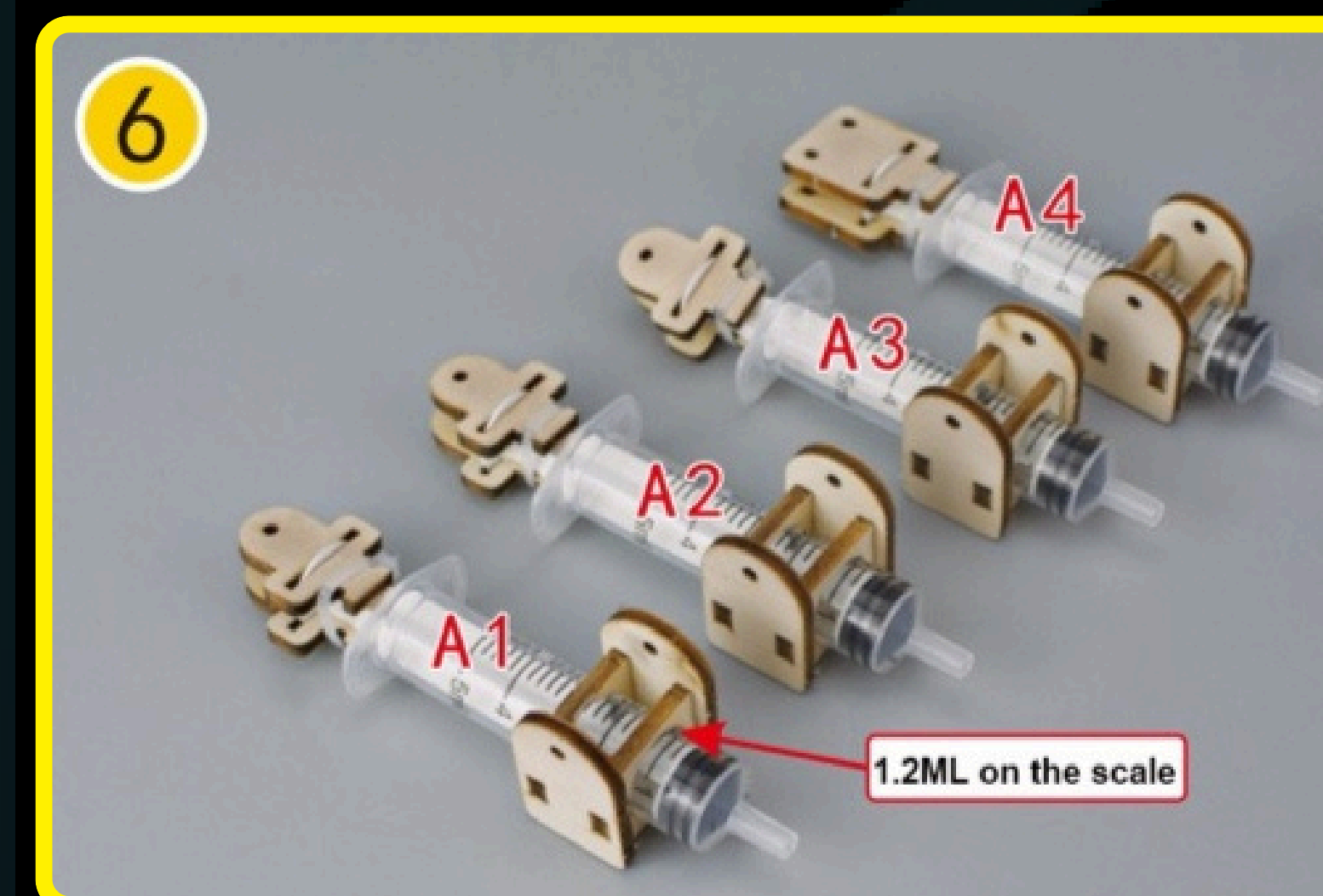
1. Insert two 5 cm iron shafts on to two belt pulleys. Align them with the designated holes on the wooden board. Ensure the pulleys are positioned close to the wooden board and then tighten the screws to secure them.



3. Locate the rectangular wooden piece with a cut-out slot that forms the fixing seat for the syringes.

Position this piece vertically on the main wooden base (flat rectangular board) and align the cut-out slot with the designated hole.

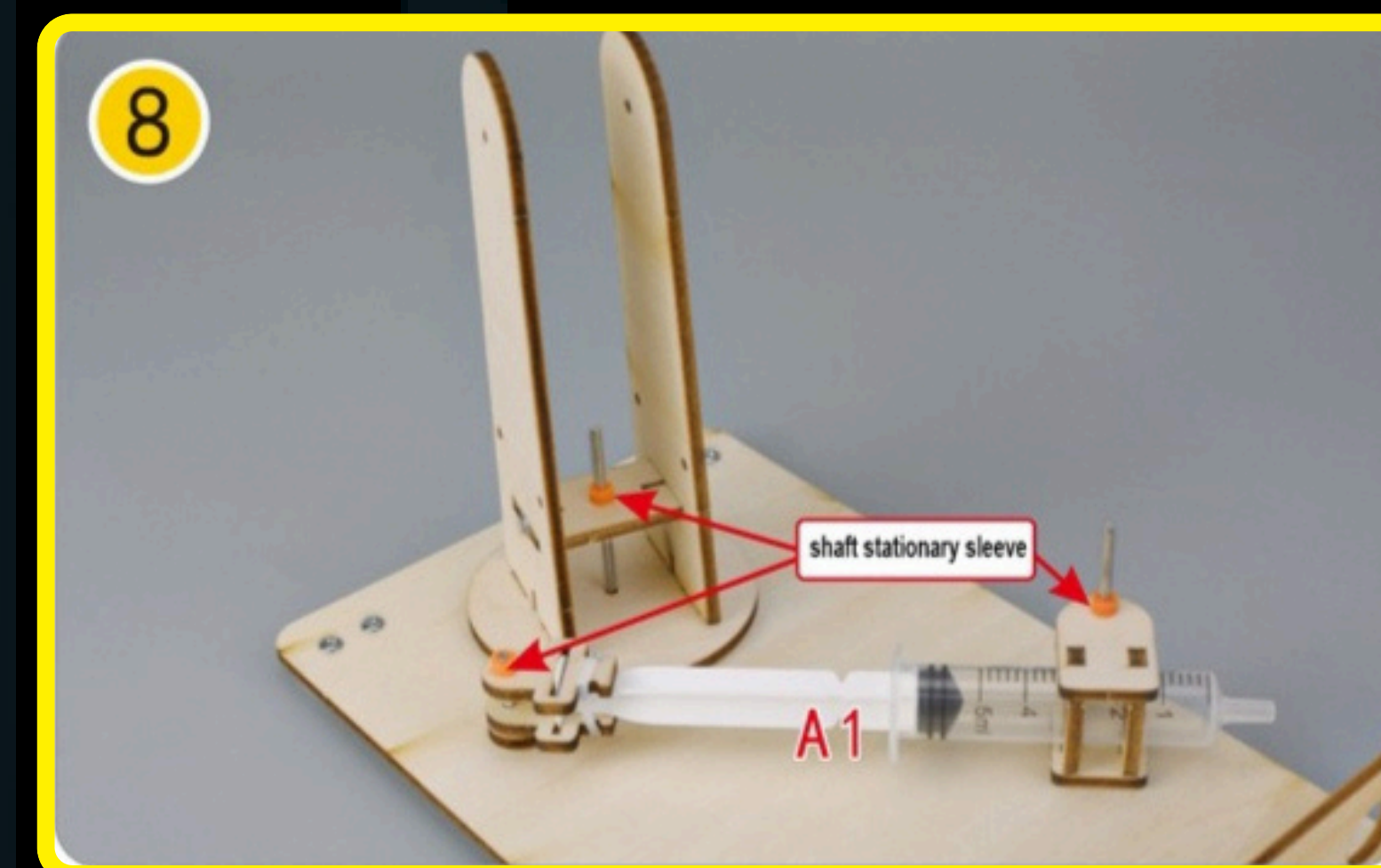
Secure it in place using screws and nuts, ensuring that the rectangular fixing seat is firmly attached and does not wobble.



6. Use the four rings you prepared in step 4 and insert them onto the four syringes you prepared in step 5.

The bottom side of the ring should go up to the 1.2 ml reading on the syringe scale as depicted and the rings can be reinforced with hot melted glue (Provided) for durability.

Note : The completed units are named A1, A2, A3, & A4 for easy reference in installation.



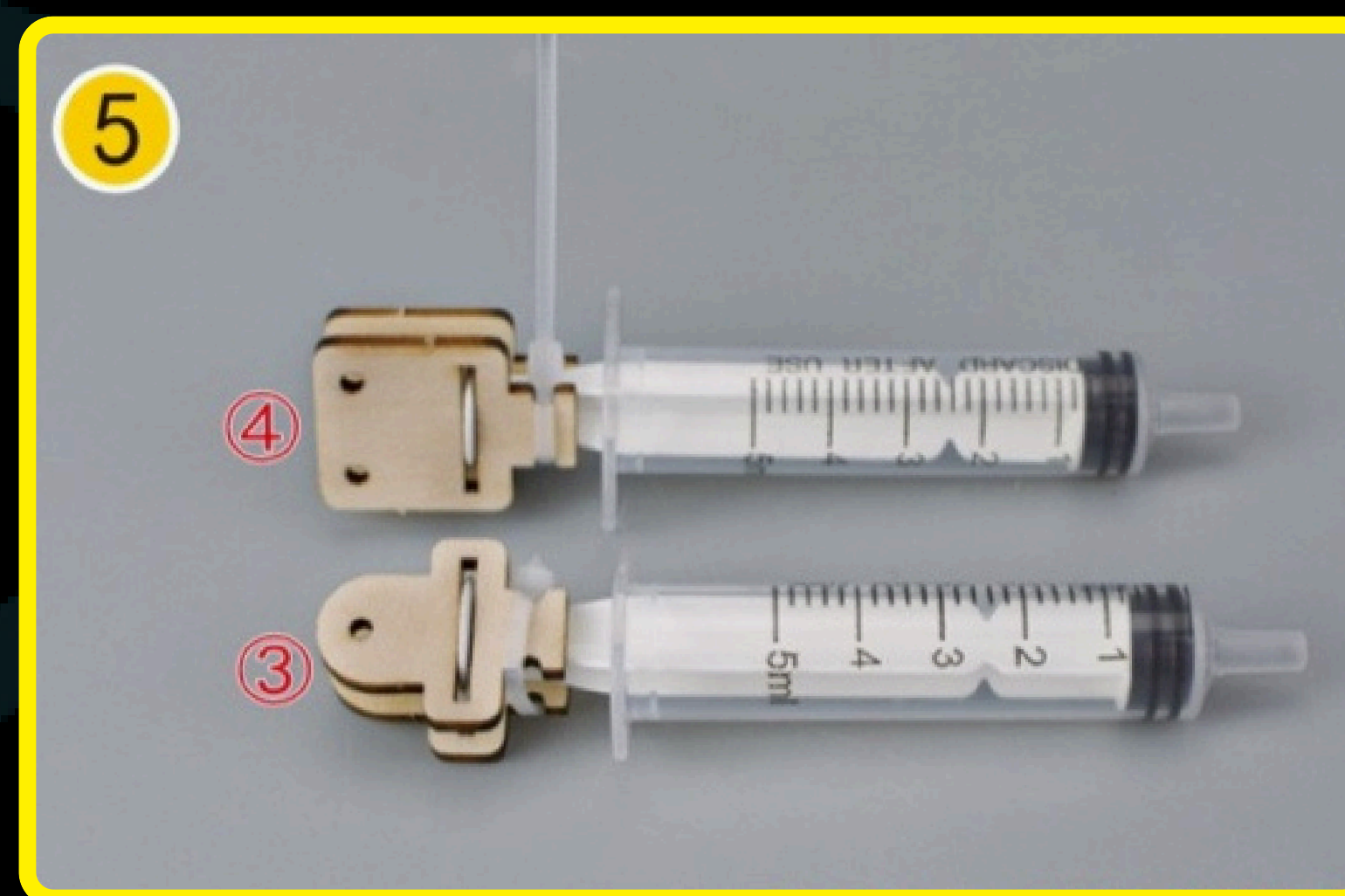
8. Install the rotary arm rod onto the unit you prepared in step 3 (The base) by inserting it through the iron shaft.

Then install the A1 syringe as shown using the head shaft on the rotary arm rod and the remaining iron shaft on the base.

Next, secure all three shafts using shaft sleeves.

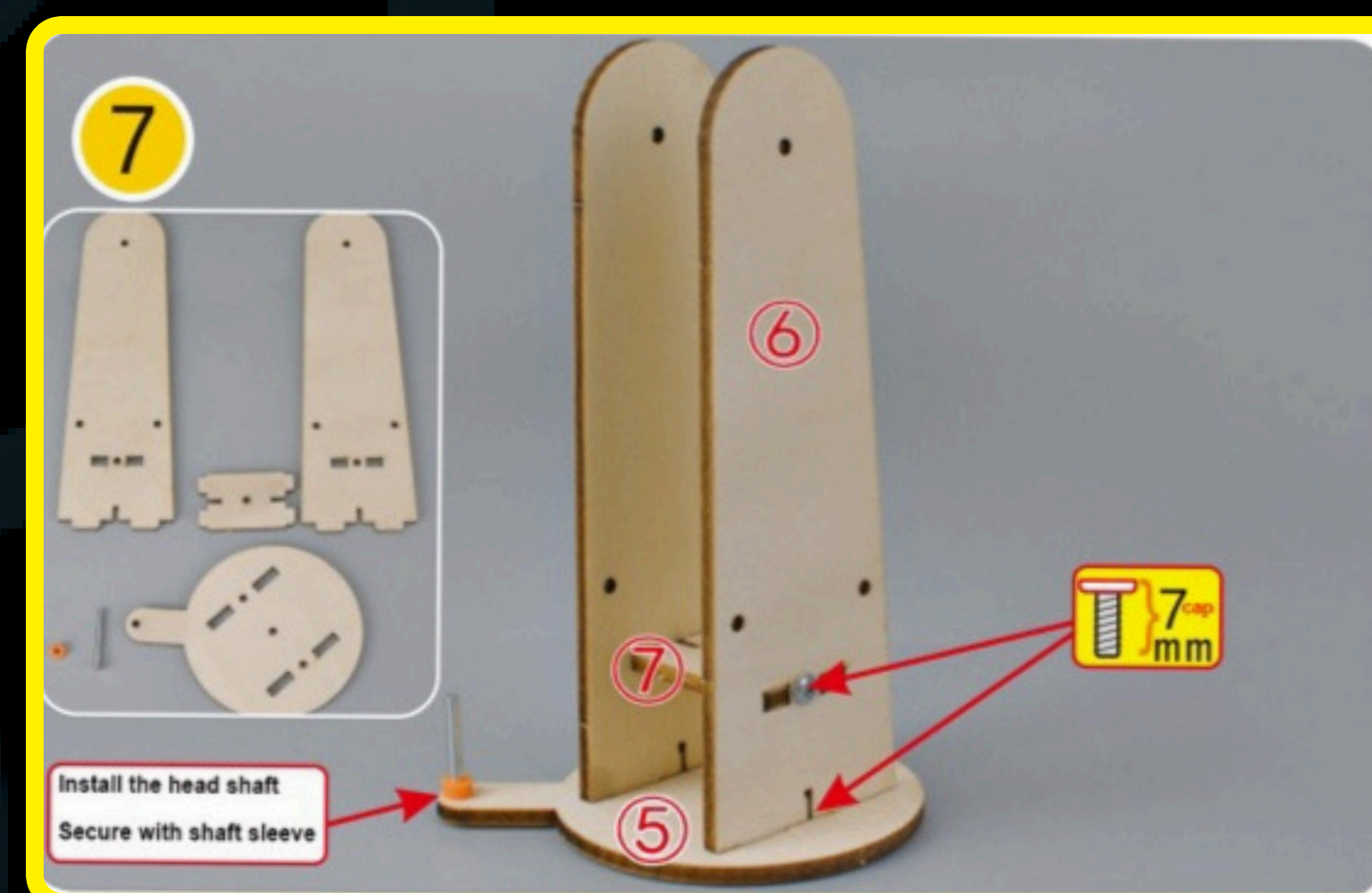


4. Now assemble O4 rings using parts numbered (01) and (02) in the diagram that would hold the syringes.



5. Use wooden parts numbered (03) & (04) as shown above to fix the four attachments on the plungers of the syringe.

Then attach them firmly to the plunger using cable ties. (trim the surplus after tightening)



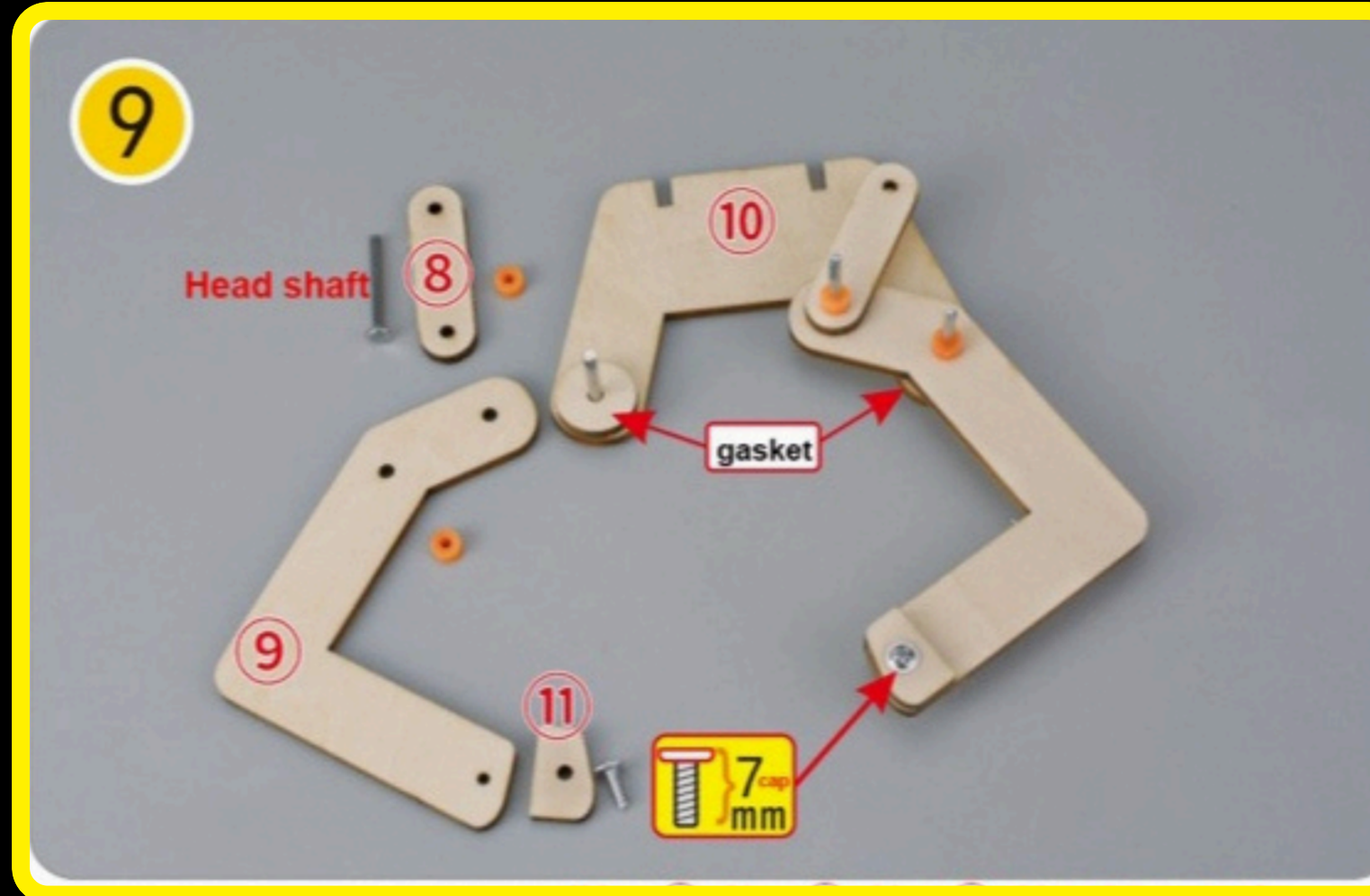
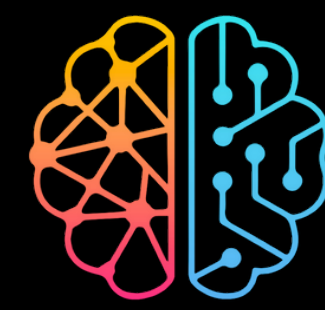
7. Use wooden parts numbered (05), (06) & (07) to assemble the rotary arm rod and use 7mm screws as illustrated to attach them firmly to each part.

Then install a head shaft onto the rotary arm rod and seal it with a shaft sleeve.

"I have no special talent. I am only passionately curious."

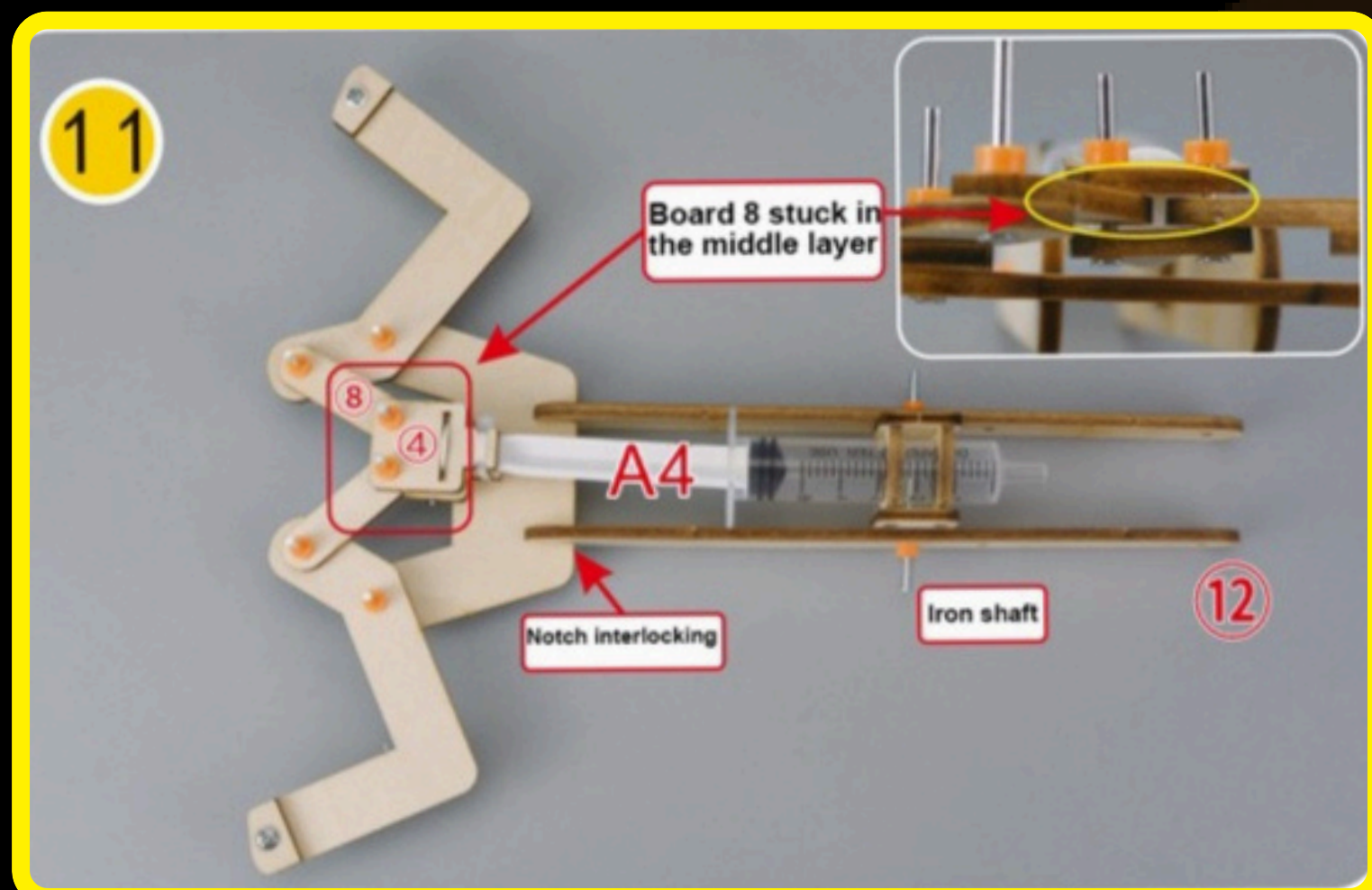
Albert Einstein





9. Use pieces (08), (09), (10) & (11) and prepare the gripper using head shafts and shaft sleeves.

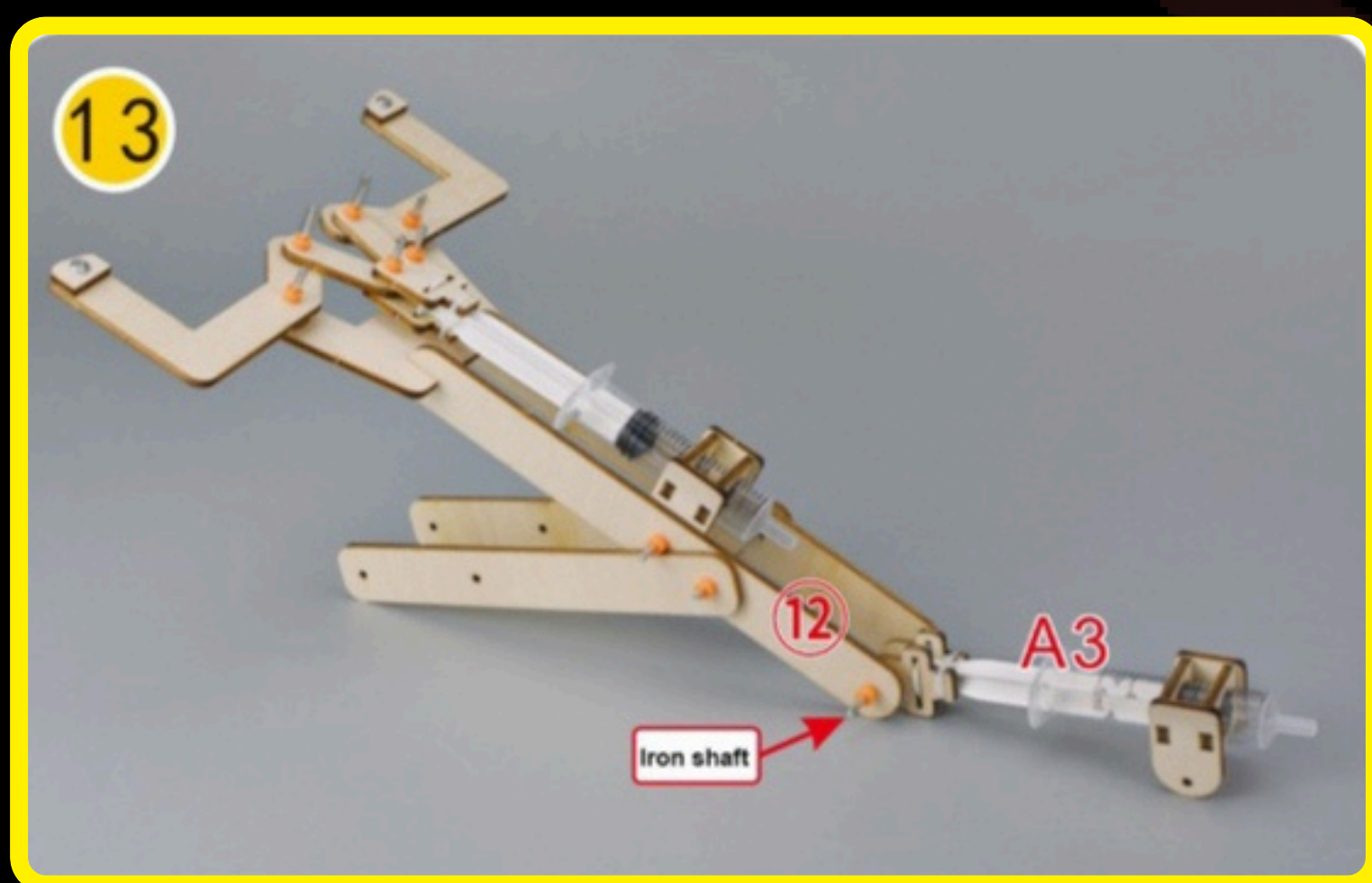
Use 7mm screws to attach each (11) onto each (09)



11. Clamp the (12) wooden pieces on to the A4 syringe through inserting a 5cm iron shaft through them and the syringe and secure them with shaft sleeves on both sides.

Then use a head shaft to connect the (08) piece of the gripper and (04) piece of the syringe plunger. Seal the shafts with sleeves as well.

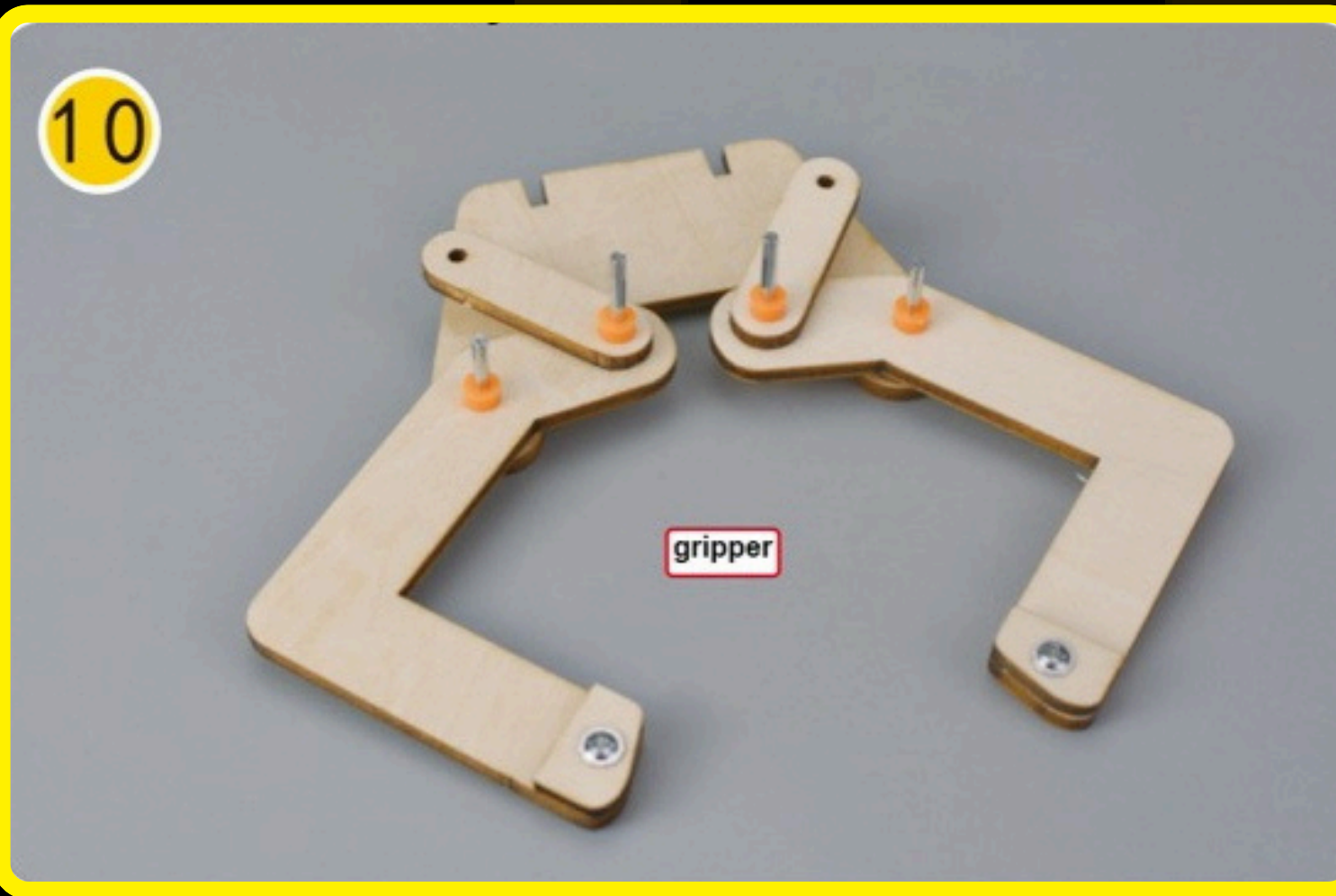
Note : The (08)s should go in between the (04)s attached to the plunger and each notch of (12) should interlock with (10).



13. Connect the A3 syringe to the remaining end of (12)s using a 5 cm iron shaft and seal both sides with shaft sleeves.

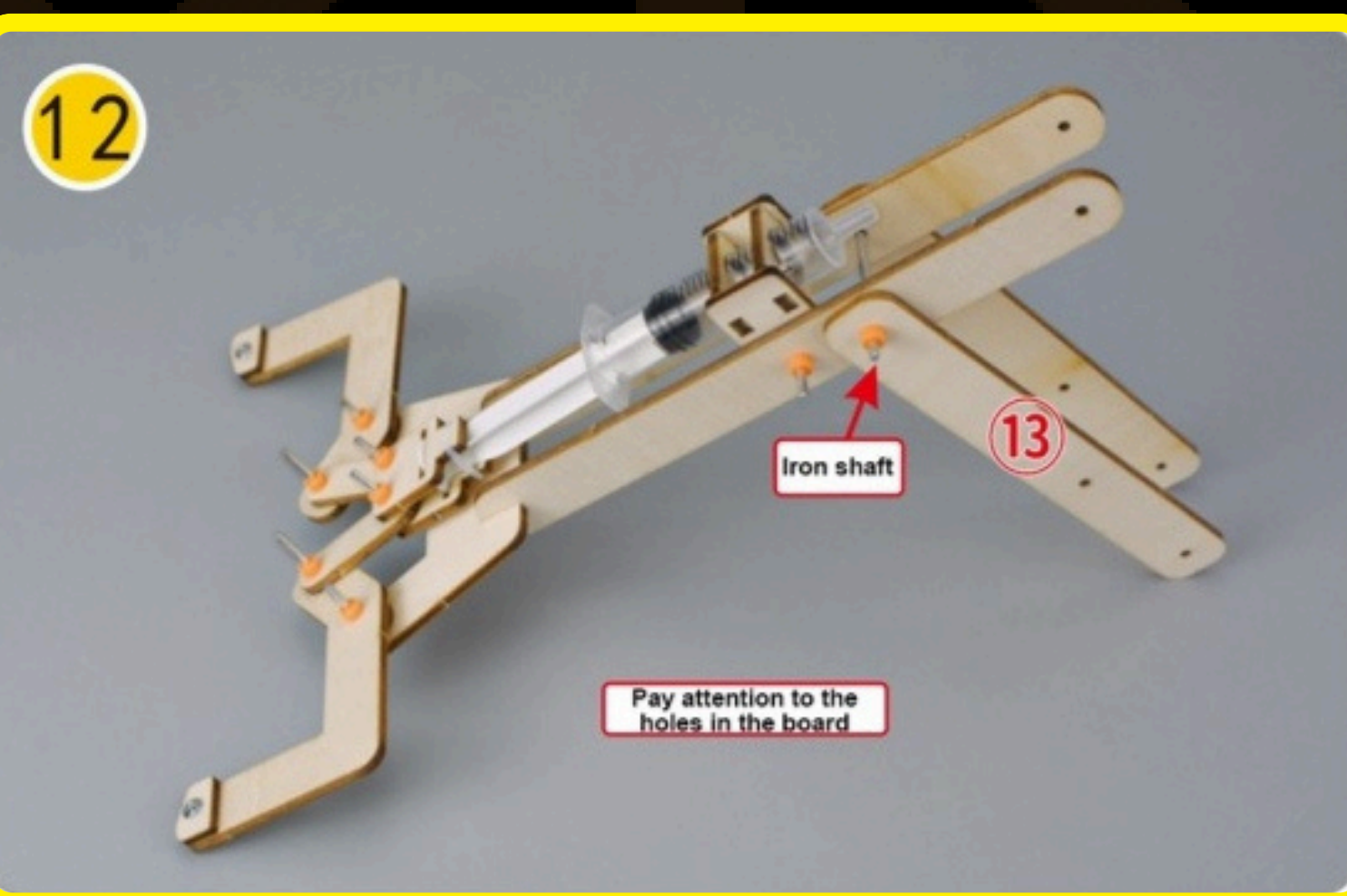
"Children must be taught how to think. Not what to think."

Margaret Mead

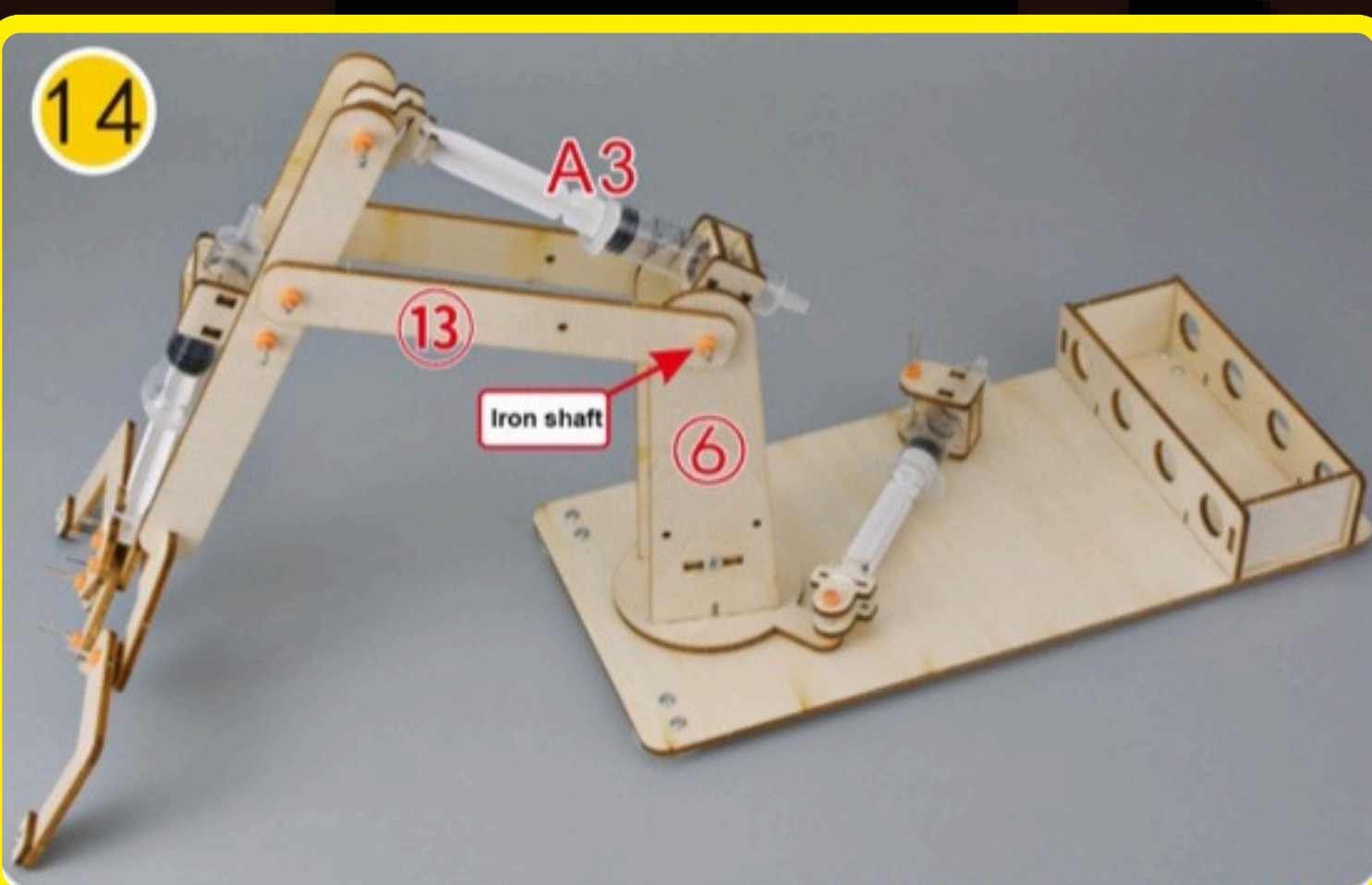


10. The gripper should look like this after the installation.

Note : Be mindful of the cascading order.



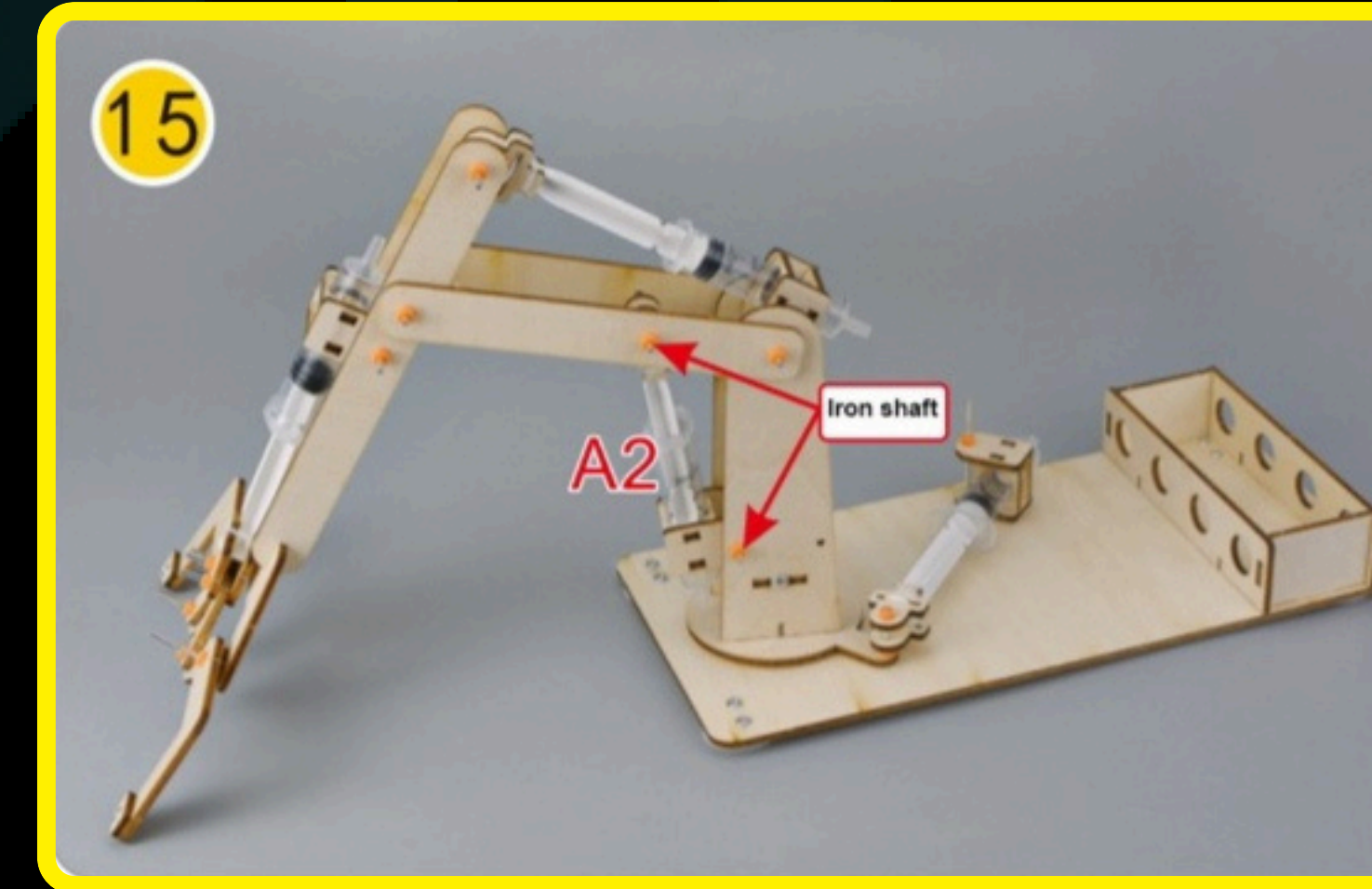
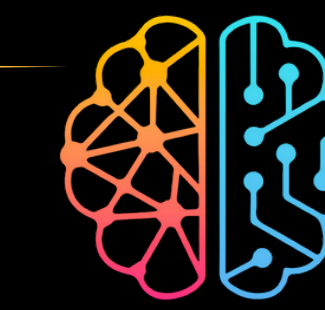
12. Attach the two (13) pieces onto the (12) pieces as shown using a 5 cm iron shaft and secure it with shaft sleeves on both sides. The (13) pieces should be attached from the outside as shown.



14. Now insert the ring fixed on A3 syringe through the (06) boards of the rotary arm rod and the (13)s from outside of the (06) boards.

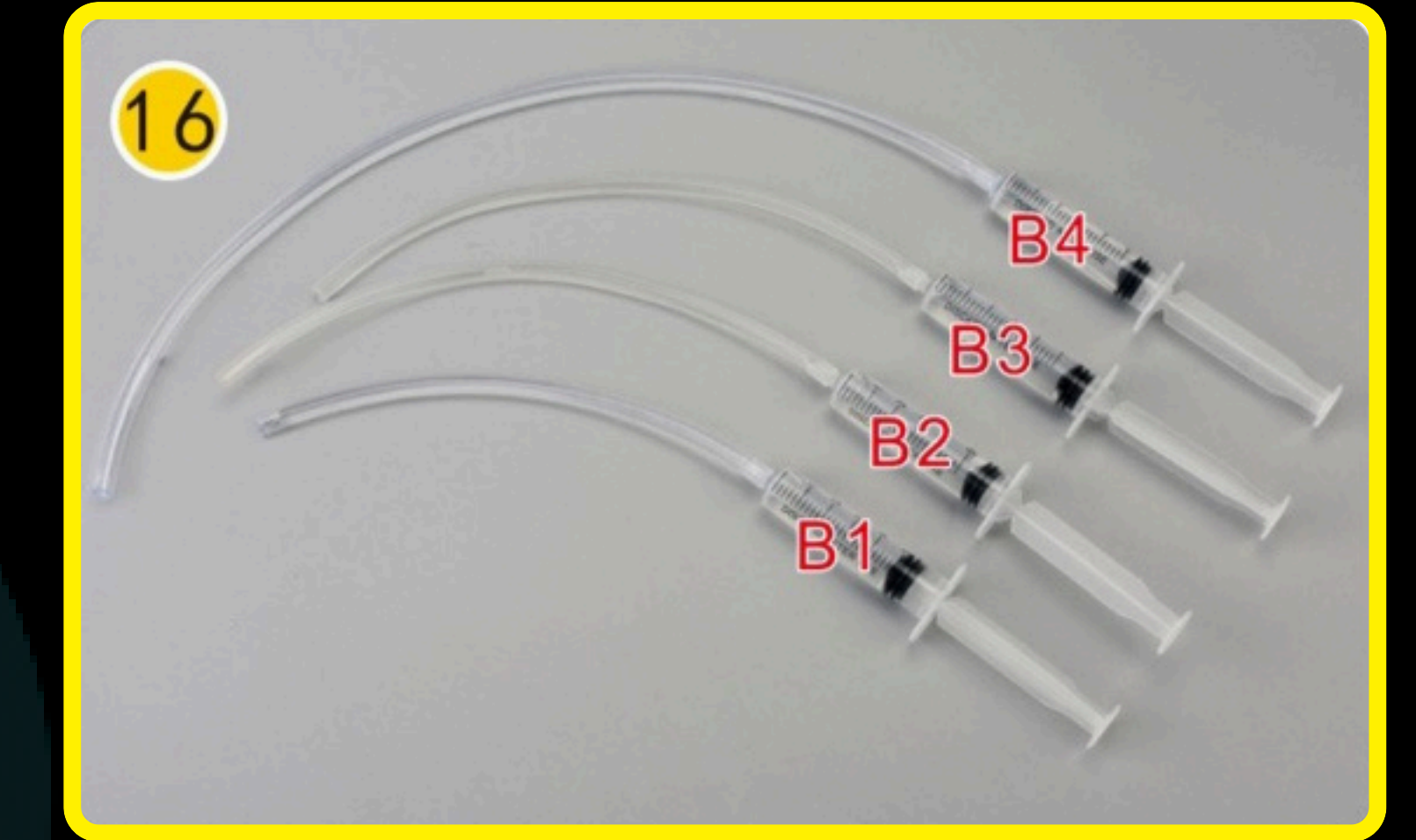
Then fix them all together with a 5 cm iron shaft inserted through them and secure the iron shaft with sleeves on both sides.

Note : Be mindfull of the installation order of each piece to ensure proper functionality.



15. Install A2 syringe with the plunger inserted between (13)s and the syringe ring between (06)s.

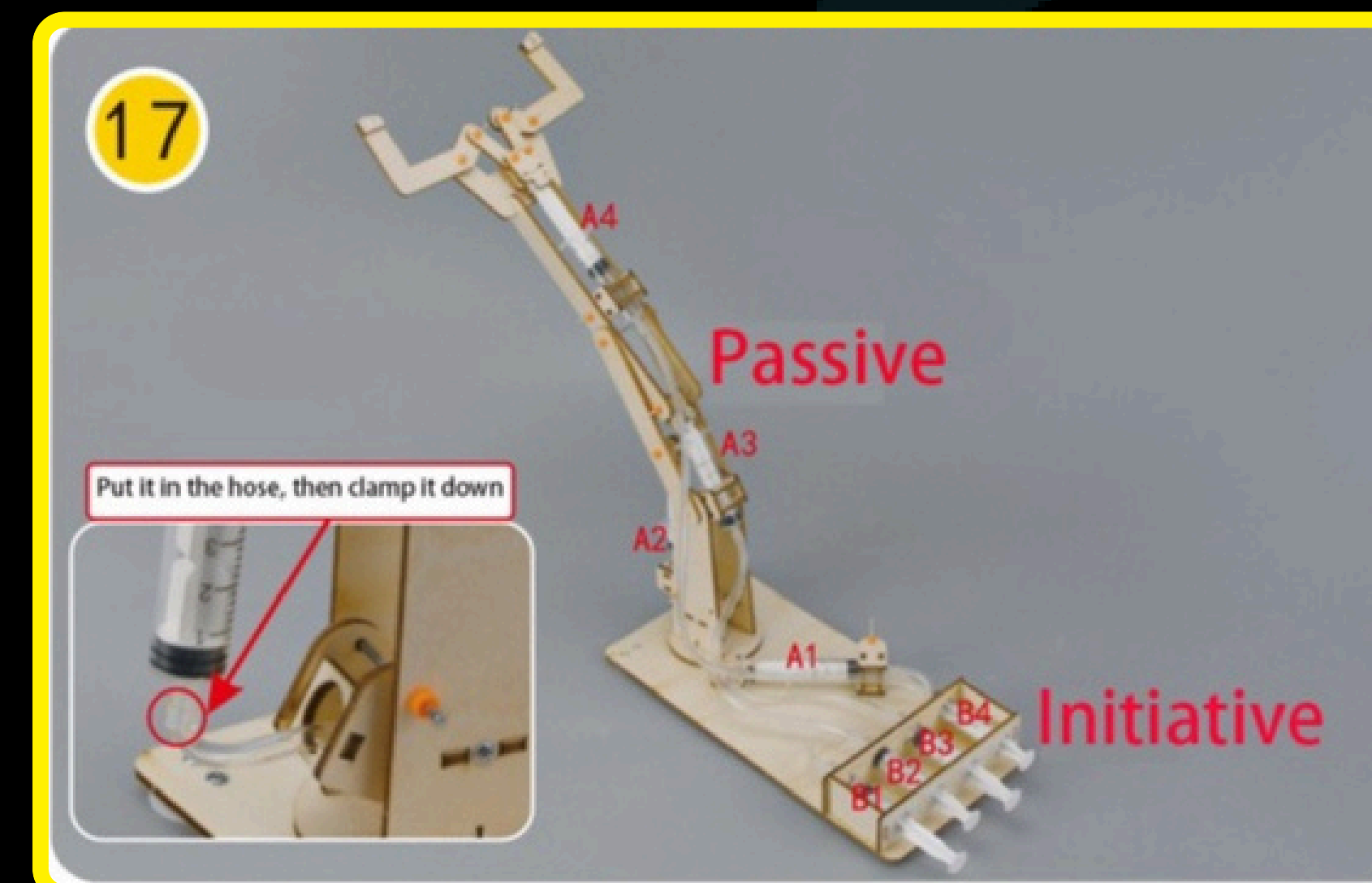
Insert iron shafts to both ends and seal them with the shaft sleeves as illustrated.



16. Take the remaining four syringes and insert them into the four hoses provided.

Then fill all of them with water (try to remove air out of the hoses as much as possible)

Note : The completed syringes are named B1, B2, B3, & B4 for easy reference in installation.



17. Insert B1, B2, B3, & B4 syringes through the holes of the fixing seat (made in step 3).

Clear out all air in the A(1-4) syringes by pressing each plunger down and then insert them into the other end of the hoses.

The order of syringe connectivity is to the corresponding number.

(Eg : B1 to A1, B2 to A2, B3 to A3, and B4 to A4)

Now assembly of your own Hydraulic Mechanical Arm is complete. You can take it for a test run!



TROUBLESHOOTING

The mechanical arm is not working? These troubleshooting steps should help ensure smooth operation of your hydraulic mechanical arm.

1. Arm Movement is Stiff or Restricted (Cause: Excessive tightness in the shaft sleeves or improper assembly of joints.)
Solution: Loosen the shaft sleeves slightly. Ensure all joints and moving parts are properly aligned and can rotate freely.

2. Hydraulic System Fails to Operate (Cause: Air bubbles in the syringe or tubing, or insufficient water in the system.)
Solution: Remove the syringe and refill it with water, ensuring no air bubbles remain. Check the tubing for leaks or loose connections and secure them tightly.

3. Gripper Does Not Open or Close Properly. (Cause: Misalignment of components or a loose fixing ring)
Solution: Verify that the gripper assembly is aligned according to the instructions. Tighten the fixing rings while ensuring the gripper's range of motion is not restricted.

4. Syringe Becomes Loose from the Board. (Cause: Insufficient glue application or wear over time.)
Solution: Reapply hot-melt glue to secure the syringe to the board. Allow the glue to dry completely before operating. Check the joint regularly for stability.

5. Parts Do Not Fit Together During Assembly (Cause: Incorrect part identification or failure to remove excess material.)
Solution: Double-check the part numbers and illustrations to ensure the correct parts are being used. Sand down any rough edges or excess material on wooden components

General Maintenance Tips:

- Periodically check the arm for wear and tear.
- Store in a dry environment to prevent damage to wooden components.
- Avoid overfilling syringes to maintain proper hydraulic pressure.

