Name: _____ Learner Number: _ _ _ _

Centre Name: _____ Centre Number: _ _ _ _ _

Learner Work Booklet

for

Mechanical Systems in Bikes (117894)

This workbook was created by Breaking Cycles CIC in partnership with The Bikeability Trust as part of the widening participation project in 2022.

These resources are free to use and intended to be used, alongside L3 Bikeability training, as part of your alternative curriculum.

(Outcome 1) It'd be better if…

The basic mechanical principles of how bicycle components work doesn't change significantly, but components are constantly being re-engineered and improved upon. This includes things like making them lighter, more hardwearing, or stronger.

Sometimes, this is born of necessity, for example, suspension components that have been developed as mountain biking progresses into more challenging terrain.

Improvements can sometimes be made to gain a competitive edge, e.g. designing lighter frames for racing.

Choose a component that you think could be improved, state what the current issue is and describe how it could be improved.

Component	
Issue	
Improvement	

(Outcome 2) Choosing the best tool for the job

Working with bikes can involve using a wide range of tools, some simple things that are in most peoples' toolkits, like Allen keys, screw drivers and spanners, and some very specific tools.

Which tool would you choose for each of the following jobs?

1. Setting the limit screws on a derailleur. _____
2. Adjusting the cones on a hub with cup and cone bearings. _____
3. Fitting new handlebars. _____

(Outcome 3) Problem solving

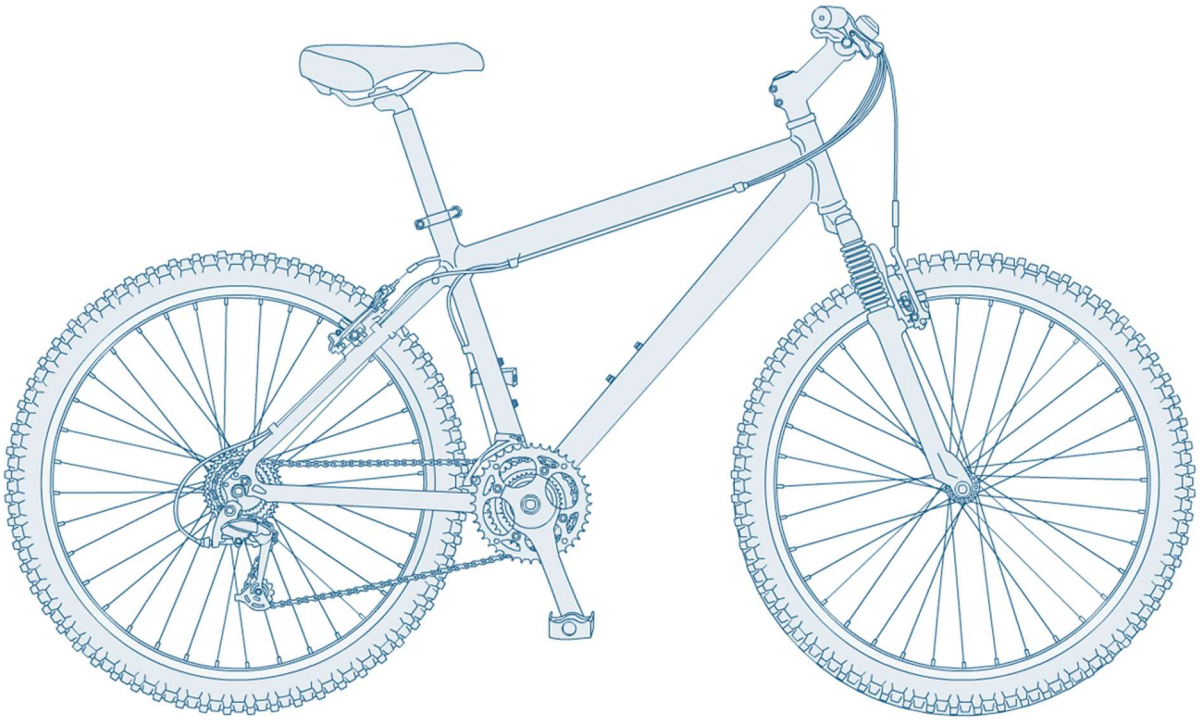
Occasionally, you will encounter issues with bikes that need some problem solving skills. These are often relating to things wearing in ways that are not expected, exposure to the elements or things having not been properly maintained previously.

What would you do if you needed to replace the handlebars on a bike and two of the four Allen bolts on the front of the stem have become rounded?

(Outcome 5) Bearings

Bearings are used to ensure that components that rotate and bear pressure or weight can move smoothly and freely whilst being secure.

Label the bike diagram, showing the location of three components that use bearings.



(Outcome 6) Chemicals used in bike maintenance

Bikes use a wide range of materials and therefore require a range of different lubricants, cleaning products and other chemicals to maintain them properly.

What product would you use to clean a chain and drivetrain components that have compacted dirt and grease on built up on them?

Hydraulic brakes use a fluid to transfer pressure from the lever to the calliper. Depending on which model you are using this could be one of a few different chemicals. Which one is the most commonly used?

(Outcome 7) Protecting components from the elements

Many bike components are fitted externally to the frame, rather than being encased like they would be on a motorbike.

Name two design features that protect components from water ingress of excess wear from grit and dirt and explain how the feature works.

1.
2.

(Outcome 8) Components that are prone to wear

Bicycle components are often prone to wear much quicker than on vehicles with engines. This is due to the need to keep thigs relatively light. These are generally the components that we check most frequently.

Name 5 components that are prone to wear and should be checked regularly.

1. _____
2. _____
3. _____
4. _____
5. _____

(Outcome 9) Maintaining small parts.

Many components consist of multiple pars, some of which require regular maintenance to ensure that they work properly and reduce excessive wear.

Derailleurs consist of many small parts and when they collect dirt and moisture, this can affect how well they work. Regular maintenance can keep a derailleur working well for a long time.

Label, name and describe parts of a derailleur and how you would maintain them.

_____

_____

_____

_____

_____

_____

_____

(Outcome 10) Wearable components

Knowing when to replace wearable parts like tyres and braking components helps you to keep safe and get the most out of your equipment.

Use the pictures to explain what you should check and how you know that whether it is worn out or safe to use.

Component	How to check for wear
Tyres   	
Brake Blocks 	

Rims

Disc brake rotors

Disc brake pads

(Outcome 11) Hydraulic systems

Hydraulic braking systems are becoming increasingly common. Even though they vary significantly, they all work on the basic principle, using a fluid to apply equal pressure on multiple pistons and apply even pressure over two or four pistons which drive the brake pad into the braking surface.

Design a model, that you could make with readily available materials, that demonstrates how the mechanical principle works.

Use water as your hydraulic fluid.

What could you use as a reservoir?

_____

What could you use to represent the pistons?

_____

_____

What could you use as a hose?

_____

_____

Draw your design here

How will you seal the system to prevent the fluid from leaking?

_____

_____

_____

(Outcome 12) Cables & Springs in braking and gear systems.

Have a look at a brake calliper and a derailleur without the cable connected. You can leave it attached to a bike and disconnect the cable to do this if you don't have one to work with.

Using your fingers, rather than the cable tension, to close the mechanism and notice how the spring makes it return to its original position.

Look for the limit screws on the derailleur and centring screw(s) on the brake calliper. Notice if they have an affect on the range of movement of the mechanism. When the mechanism is correctly set up, it should not need any cable tension to limit it movement.

Draw and label a diagram of your derailleur and brake calliper in its open (low cable tension) and closed (high cable tension) position. Comment on the sprint tension in each position.

Brake Calliper – Open	Brake Calliper – Closed
Derailleur – Open	Derailleur – Closed