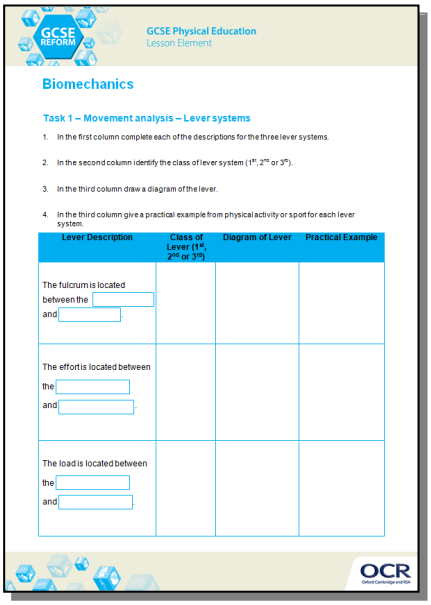
Biomechanics, Psychology and Physical Training

PROVISIONAL

Instructions and answers for teachers

These instructions should accompany the OCR resource* 'Biomechanics, Psychology and Physical Training' ***activity*** *which supports OCR GCSE (9–1) Physical Education.*



GCSE Physical Education
Lesson Element

Biomechanics

Task 1 – Movement analysis – Lever systems

1. In the first column complete each of the descriptions for the three lever systems.
2. In the second column identify the class of lever system (1st, 2nd or 3rd).
3. In the third column draw a diagram of the lever.
4. In the third column give a practical example from physical activity or sport for each lever system.

Lever Description	Class of Lever (1st, 2nd or 3rd)	Diagram of Lever	Practical Example
The fulcrum is located between the _____ and _____			
The effort is located between the _____ and _____			
The load is located between the _____ and _____			

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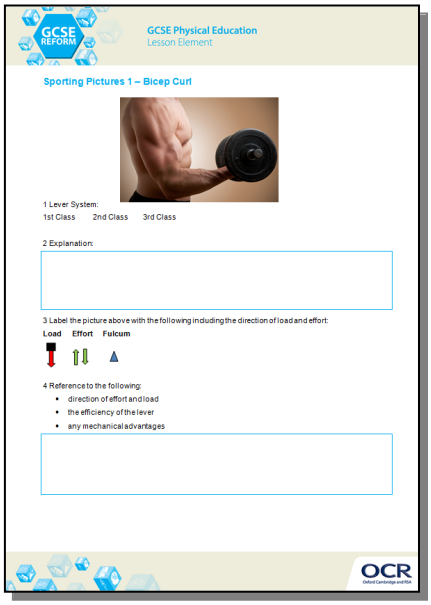


GCSE Physical Education
Lesson Element

Sporting Pictures 1 – Bicep Curl

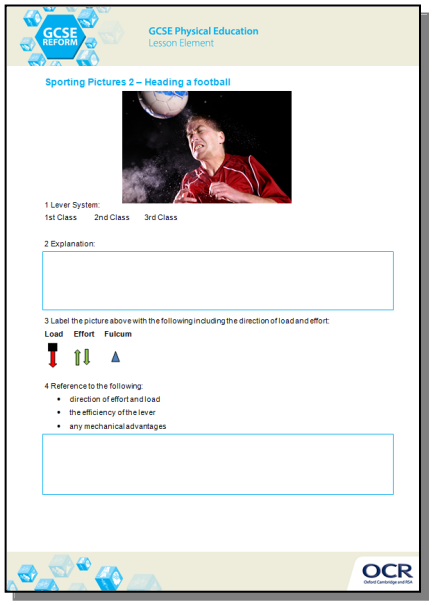
1 Lever System:
1st Class 2nd Class 3rd Class

2 Explanation:

3 Label the picture above with the following including the direction of load and effort:
Load Effort Fulcum

4 Reference to the following:
- direction of effort and load
- the efficiency of the lever
- any mechanical advantages

OCR



GCSE Physical Education
Lesson Element

Sporting Pictures 2 – Heading a football

1 Lever System:
1st Class 2nd Class 3rd Class

2 Explanation:

3 Label the picture above with the following including the direction of load and effort:
Load Effort Fulcum

4 Reference to the following:
- direction of effort and load
- the efficiency of the lever
- any mechanical advantages

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The Activity:

This resource comprises of four tasks covering the following:

- Task 1 and 2 - **Movement analysis – Lever systems**
- Task 3 – **Sport psychology – Use of goal-setting**
- Task 4 – **Physical training – Warm up**

This activity offers an opportunity for English skills development.

Learner Activity Sheets (all included within the 'Biomechanics, Psychology and Physical Training' Learner file):

1. Sporting Pictures 1, 2 and 3.
2. Football warm up.
3. Warm up template.

PROVISIONAL

This resource is an exemplar of the types of materials that will be provided to assist in the teaching of the new qualifications being developed for first teaching in 2016. It can be used to teach existing qualifications but may be updated in the future to reflect changes in the new qualifications. Please check the OCR website for updates and additional resources being released. We would welcome your feedback so please get in touch.

Task 1 – Movement analysis – Lever systems

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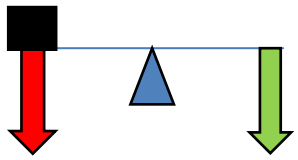
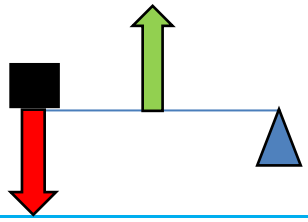
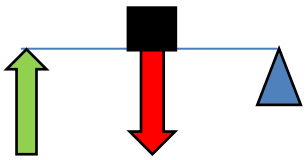
Lever Description	Class of Lever (1st, 2nd or 3rd)	Diagram of Lever	Practical Example
The fulcrum is located between the **load** and **effort**.	1st		A player nodding their head in agreement with the official. Fulcrum = Joint between head and first vertebra Load = Weight of the head (cranium) and ball Effort = Muscles attaching to cranium eg trapezius
The effort is located between the **load** and **fulcrum**.	3rd		The elbow joint when flexing to lift a dumbbell. Fulcrum = Joint between humerus and radius Load = Weight of forearm, wrist, hand and dumbell Effort = Biceps muscle when flexing
The load is located between the **effort** and **fulcrum**.	2nd		A diver standing on tiptoes before they dive into the swimming pool. Fulcrum = Metatarsophalangeal Joint Load = Weight of the body Effort = Gastrocnemius and soleus muscles through the Achilles tendon.

Symbols	Key Word	Alternative Key Words
	Load	Weight/Resistance
	Effort	Force/Action of muscle
	Fulcrum	Axis/Joint

5. Match the different parts of a lever to the correct description:

Fulcrum: muscles used to move the load.

Load: the pivot that is the point of movement

Effort: the body's own weight/piece of sporting equipment.

Task 2 – Movement analysis – Lever systems

Using the associated material 'Sporting Pictures' activity sheets, complete the following tasks:

1. Circle the class of lever system being used (1st Class, 2nd Class and 3rd Class).

2. Explain reasons for your answer (Refer to positioning of effort, load and fulcrum).

3. Using the key below, label the following including the direction of load and effort:

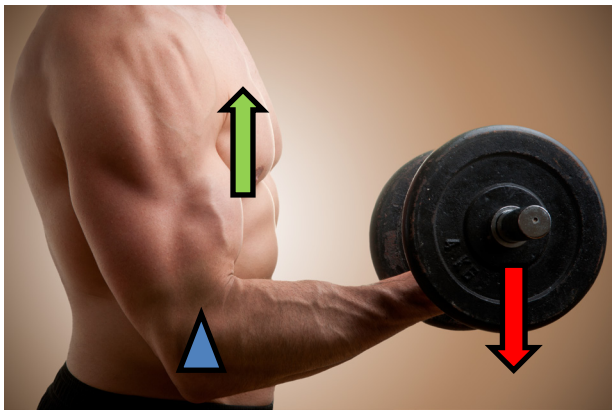
Symbols	Key Word
	Load
	Effort
	Fulcrum

4. Comment on each of the following:

- direction of effort and load
- the efficiency of the lever
- any mechanical advantages

5. Describe other practical examples of the lever.

Sporting Pictures 1 – Bicep Curl



1. Lever System:

1st Class 2nd Class **<u>3rd Class</u>**

2. Explanation:

The fulcrum and load are at opposite ends of the lever and the effort lies between. An example of this is a biceps curl. The load is in the hand, the fulcrum is at the elbow and the biceps make the effort.

Fulcrum = Elbow joint.

Load = Weight of the forearm and dumbbell.

Effort = Bicep muscles working to flex arm and lift weight.

3. Label the picture above with the following including the direction of load and effort:

Load **Effort** **Fulcrum**

4. Reference to the following:

- direction of effort and load
- the efficiency of the lever
- any mechanical advantages

Third class levers are the most common in the human body but are not that efficient (in comparison to second class levers) in terms of applying force. The location of the fulcrum, load and effort determines the mechanical advantage and the lever class. The force you apply in third class levers must always be greater than the load.

5 Identify other practical examples of this type of lever:

A javelin throw

Sporting Pictures 2 – Heading a football

1. Lever System:

1st Class 2nd Class 3rd Class

2. Explanation:

The fulcrum is between the effort and the load and both.

An example of this can be heading a football where the neck and head are being flexed and extended. The head pivots on the atlas (fulcrum). The load is the weight of the head going down and the effort is the muscles at the back of the neck pulling down.

Fulcrum = Joint between head and first vertebra

Load = Weight of the head (cranium)

Effort = Muscles used to flex and extend the head and neck (eg trapezius).

3. Label the picture above with the following including the direction of load and effort:

Load **Effort** **Fulcrum**

4. Reference to the following:

- direction of effort and load
- the efficiency of the lever
- any mechanical advantages

Effort and load are acting in the same direction. There are very few first class levers in the human body.

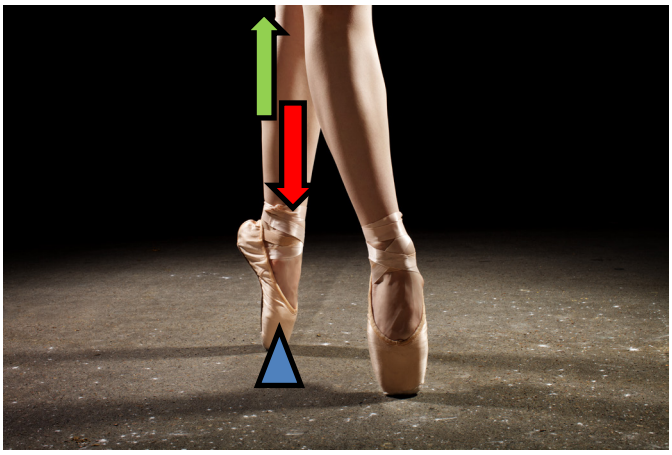
5 Identify other practical examples of this type of lever:

Tricep dips.

A football player moving their head backwards to perform a glancing header.

A gymnast tucking their chin to chest to perform a forward roll.

Sporting Pictures 3 – Pointe in ballet



1. Lever System:

1st Class **<u>2nd Class</u>** 3rd Class

2. Explanation:

The fulcrum is at one end of the lever and the effort is at the opposite end with the load in the middle of the lever.

An example of this is stepping up onto your toes. The fulcrum is at the toes. The load is that of the body going through the middle of the foot and the effort is in the calf muscles pulling the body upon to the toes.

Fulcrum = Joints between metatarsals

Load = Weight of the body

Effort = Muscles used to create the movement of plantar flexion (eg gastrocnemius).

3. Label the picture above with the following including the direction of load and effort:

Load **Effort** **Fulcrum**

4. Reference to the following:

- direction of effort and load
- the efficiency of the lever
- any mechanical advantages

The direction of effort is the opposite direction to the load.

5 Identify other practical examples of this type of lever:

A diver on their tip toes at the edge of the board before they dive.

Task 3 - Sport psychology – Use of goal-setting Answer Sheet

1. Highlight which part of the sentence is too vague for a description of each component of the SMART principle.
2. Replace the word(s) you have identified with a more suitable description.
3. Give a practical example from one of your practical activities to each component.

Characteristic	Description (Highlight vague word(s) for description	Replacement Word (s)	Practical Example
Specific	A performer needs to set a **specific** target to achieve.	A performer needs to set a **particular** target to achieve.	A tennis player aiming to improve their serve in tennis.
Measurable	During the goal a performer needs to **measure** how well are doing.	During the goal a performer needs to **assess progress** on how well they are doing.	A javelin thrower measuring the distances thrown to monitor improvements.
Achievable	All goals set need to be **achieved** by the performer.	All goals set need to be **within the capabilities** of the performer.	A trampolinist having both the physical and mental capability of performing a somersault.
Recorded	Goals should be **recorded** throughout the training programme.	Goals should be **written down** throughout the training programme to	A gymnast writing down the floor routine that they need to be able to learn and perform.
Timed	Any goals set should be achieved in a certain amount of **time**.	Any goals set need to be achieved in **6 weeks** (or other realistic time frame depending on the actual goal).	A rugby player improving their upper body strength in two months.

4. What are the other benefits of a performer setting a goal?

Goal setting can help motivate and encourage a performer as well as helping to control stress or anxiety. A performer who sets themselves achievable goals will improve their confidence as they experience success.

Task 4 – Physical training – Warm up

Warm ups play an important part in the physiological and psychological preparation of a performer before any training, match or competition in physical activity and sport.

Using the 'Learner Activity Sheet - Football Warm Up' answer the following questions:

1. Reason why a pulse raiser is used:

To gradually increase heart rate and body temperature.

2. Reason why a skill rehearsal is used:

Helps to prepare the body for the different types of movement required.

3. Examples of static stretching

Hamstring and quadriceps stretch.

4. Physical benefits of warming up:

Reduced chances of injury and improved performance/technique.

5. Cardio benefit and description of warming up:

Increase heart rate that helps with increase delivery of oxygen to working muscles.

6. Respiratory benefit of warming up:

Increase breathing rate.

7. Examples of skill rehearsal:

Passing and dribbling the football.

8. Mental benefits of warming up:

Increased focus and motivation.

9. Example of dynamic stretching

Lunges.

10. Muscular benefit of warming up:

Increase temperature of muscles which allows muscles to be stretched easier

Using the warm up template and the comment box complete the following tasks:

- Using the comment box, select different statements you plan to include within a warm up for one of your chosen practical activities.
- Write these comments in Columns A and B.
- Write your own warm up that includes descriptions and examples of the physiological and psychological benefits of warming up that can match up with the statements you selected from the comment box.
- Swop warm up descriptions with a partner and match the end columns (A and B) with the correct part of the warm up.

Example of Warm Up Template

A	Example of a Football Warm Up	B
Whole body benefit	Warming up before a game of football will help a player prepare both physiologically and psychologically as well improving overall performance and techniques. A warm up should gradually become more intense. A goalkeeper will take part in a slightly different warm up to that of the rest of the team including skills such as ball handling. Outfield players may perform a steady jog on the pitch for five minutes to raise their heart rate and breathing rate which ensures more oxygen is delivered to working muscles. Jogging increases the temperature of the body and muscles which makes muscles and tendons easier to stretch. This reduces the chances of injury such as muscle strains. The coach may then gather the team around in a circle and demonstrates a series of different stretches including hamstring and quadriceps to increase flexibility and the range of movement. The players copy the stretches without moving. The players then follow a number of different stretches whilst moving such as lunges as well as carrying out exercises such as arm swings and hip circles. The team then practice various skills in small groups such as passing and dribbling the ball to help prepare the body for the types of movements required as well as focusing the mind and increasing motivation.	**Example of dynamic stretching**
Example of a pulse raiser		
Mental benefits		
Example of a skill rehearsal		
Example of a mobility exercise		
Cardio/Respiratory benefits and description		

Comment Box

Whole body benefit	**Cardio benefit and description**	**Respiratory benefit and description**
Example of a pulse raiser	**Reason we need a pulse raiser**	**Other physical benefits**
Mental benefits	**Example of dynamic stretching**	**Reason we need a skill rehearsal**
Example of a skill rehearsal	**Example of a mobility exercise**	**Muscular benefit and description**

NB – Other responses within the warm up may match up to other comment boxes.

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