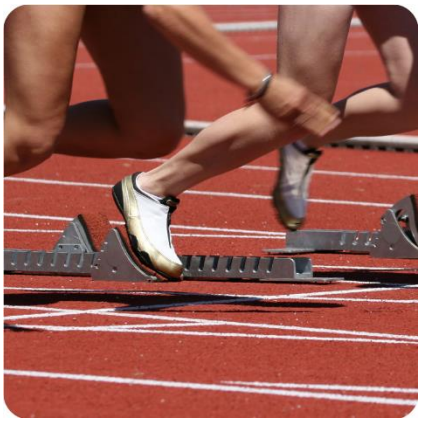
Name _____

Class_____

The Principles of Training & Training



	Description from Specification	Pupil comments – How confident do you feel on this topic?
3.3.1	Planning training using the principles of training: individual needs, specificity, progressive overload, FITT (frequency, intensity, time, type), overtraining, reversibility, thresholds of training (aerobic target zone: 60–80% and anaerobic target zone: 80%–90% calculated using simplified Karvonen formula i.e. (220) – (your age) = MaxHR; (MaxHR) x (60% to 80%) = aerobic training zone; (MaxHR) x (80% to 90%) = anaerobic training zone).	

The Principles of Training:

There are four main **principles of training** which must be put in place in order for a fitness programme to work and result in progression or improvement.

1. **Individual Needs**

The first thing an athlete must consider when creating an exercise programme is their own **individual needs**. The needs of an individual could alter due to their fitness level, weight, gender or previous injuries.

Why would it not be a good idea for a first time marathon runner to follow the training programme of an elite athlete?

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_____

2. **Specificity**

This means matching training to the requirements of an activity. Different sports (and different positions within sport) require athletes to excel in different components of fitness.

How would the training programme of a marathon runner and a weight lifter differ?

_____

_____

How would the training programme in football differ for a goalkeeper and a striker?

_____

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3. Progressive Overload

This means **gradually** increasing the amount of overload during training in order to improve fitness but without injury. In other words, if you increase the intensity of your workouts **gradually** you will make steady improvements.

Explain how an athlete could use **progressive overload** to increase their muscular endurance whilst using a bench press. Give an example in your answer.

_____

_____

_____

_____

Explain how an athlete could use **progressive overload** to increase their muscular strength whilst using a bench press. Give an example in your answer.

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_____

4. The FITT Principle

The **FITT principle** works closely with progressive overload to ensure that training results in progression. If you constantly look to overload the following during training, progression should occur.

- Frequency (how often)
- Intensity (how hard)
- Time (how long)
- Type (method)

Fill in the table below to show how a weight lifter could apply the FITT principle to their training programme…

	How would a weight lifter use this principle to ensure progressive overload takes place?
Frequency	
Intensity	
Time	
Type	

Rest and Recovery:

This is very important during an exercise programme and without rest, progressive overload is unlikely to occur.

Why is it important for a marathon runner to rest following a heavy training session?

_____

_____

_____

Overtraining:

This occurs when your body trains beyond its ability to recover. Without adequate rest your fitness can get worse or you may become ill. This can result in time away from training.

Reversibility:

This means gradually losing fitness and occurs to anybody who stops training. Give 3 reasons why reversibility might occur to an individual.

John used to be a competitive cross-country runner but for the last 18 months he has not taken part in the sport due to a leg injury. John has put on weight and lost fitness during his injury. John is looking to design his own training programme in order to get back into cross-country running and compete at a high level.

How can John use the FITT principle effectively in his training programme?

_____

_____

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_____

What are John's individual needs that he must account for in his training programme?

_____

_____

_____

How can John use progressive overload in his training programme?

_____

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How can John include specificity in his training programme?

_____

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Training Thresholds:

These are set to make sure that people train at an effective but safe level.

The calculation of your target zones is known as **The Karvonen Formula.**

<u>The Karvonen Formula (simplified):</u>

Firstly work out your maximum heart rate with the formula: _____

What is your maximum heart? _____

Your aerobic zone is what percentage of your maximum HR? _____

Therefore what is your aerobic target zone? _____

Your anaerobic zone is what percentage of your maximum HR? _____

Therefore what is your anaerobic target zone? _____

Sample Exam Questions

Emma is 20 and is training for a marathon. Using the karvonen formula (simplified), how would you work out Emma's aerobic training zone? (**3 marks)**

_____

_____

_____

_____

_____

Tom is 16, has a resting heart rate of 64 bpm and has just completed a six-week personal exercise programme (PEP).

Week 1 – 180
Week 2 – 172
Week 3 – 160
Week 4 – 175
Week 5 – 145
Week 6 - 150

State the total number of weeks Tom's heart rate was within his aerobic target zone.
(1 mark)

A One
B Two
C Three
D Four

Answer: _____

State the total number of weeks Tom's heart rate was within his anaerobic target zone.

(1)
A One
B Two
C Three
D Four

Answer: _____

Key Terms:

Individual Needs – The needs of an individual could alter due to their fitness level, weight, gender or previous injuries.

Specificity – The particular requirements of an activity

Progressive Overload – Gradually increasing the amount of overload to improve fitness but without injury

FITT Principle – Training principle linked to progressive overload, based on frequency, intensity, time and type

Overtraining – Training beyond your body's ability to recover

Reversibility – Gradually losing fitness instead of progressing

Target Zone – The range within which an individual needs to work

Training Threshold – A safe and effective level to train at

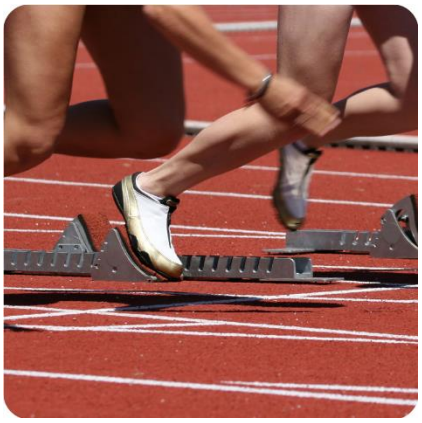
Karvonen Formula – A test to find out an individual's optimum heart rate

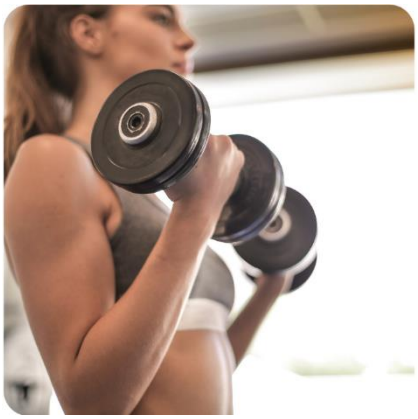
Resting Heart Rate – The amount of times your heart beats per minute at rest (normal RHR is 60-80 BPM)

Maximum Heart Rate – Your highest possible heart rate. 220 – Age

Teacher Answer Booklet

The Principles of Training





	Description from Specification	Pupil comments – How confident do you feel on this topic?
3.3.1	Planning training using the principles of training: individual needs, specificity, progressive overload, FITT (frequency, intensity, time, type), overtraining, reversibility, thresholds of training (aerobic target zone: 60–80% and anaerobic target zone: 80%–90% calculated using simplified Karvonen formula i.e. (220) – (your age) = MaxHR; (MaxHR) x (60% to 80%) = aerobic training zone; (MaxHR) x (80% to 90%) = anaerobic training zone).	

The Principles of Training:

There are four main **principles of training** which must be put in place in order for a fitness programme to work and result in progression or improvement.

1. **Individual Needs**

The first thing an athlete must consider when creating an exercise programme is their own **individual needs**. The needs of an individual could alter due to their fitness level, weight, gender or previous injuries.

Why would it not be a good idea for a first time marathon runner to follow the training programme of an elite athlete?

A first time runner would not cope with the intensity of a programme for an elite athlete, which would likely result in an injury occurring or the runner becoming fatigued and demotivated.

2. **Specificity**

This means matching training to the requirements of an activity. Different sports (and different positions within sport) require athletes to excel in different components of fitness.

How would the training programme of a marathon runner and a weight lifter differ?

A marathon runner would be looking to do hours of running in order to build their muscular endurance and cardiovascular fitness. A weight lifter would be hoping for muscular hypertrophy and focussing on lifting heavy weights in order to improve muscular strength and power.

How would the training programme in football differ for a goalkeeper and a striker?

A goalkeeper in football requires agility, balance and good hand-eye coordination, so they must use drills and practices to improve these skills. A striker requires speed to beat a defender and muscular strength in the quadriceps to enforce a powerful shot. Therefore they must focus on these components in their training.

3. Progressive Overload

This means **gradually** increasing the amount of overload during training in order to improve fitness but without injury. In other words, if you increase the intensity of your workouts **gradually** you will make steady improvements.

Explain how an athlete could use **progressive overload** to increase their muscular endurance whilst using a bench press. Give an example in your answer.

In order to improve muscular endurance steadily the performer should use a relatively light weight such as 30kg. In their first session they might complete 20 reps but every session thereafter increase the amount of reps by 5. This will result in a gradual improvement.

Explain how an athlete could use **progressive overload** to increase their muscular strength whilst using a bench press. Give an example in your answer.

In order to improve muscular strength steadily the performer could start with a relatively heavy weight such as 70kg and perform 4-6 reps. They could then increase the weight by 2.5kg every session whilst always maintaining the 4-6 reps. This will result in a gradual improvement.

4. The FITT Principle

The **FITT principle** works closely with progressive overload to ensure that training results in progression. If you constantly look to overload the following during training, progression should occur.

- Frequency (how often)
- Intensity (how hard)
- Time (how long)
- Type (method)

Fill in the table below to show how a weight lifter could apply the FITT principle to their training programme…

	How would a weight lifter use this principle to ensure progressive overload takes place?
Frequency	Increase the amount of sessions that they are taking part in per week
Intensity	Increase the weight that they are lifting (muscular strength) or the number of reps that they are performing (muscular strength)
Time	Increase the total time spent during sessions, for example increasing the time spent on each activity in the gym
Type	It would be most appropriate for a weight lifter to use weight training in the gym

Rest and Recovery:

This is very important during an exercise programme and without rest, progressive overload is unlikely to occur.

Why is it important for a marathon runner to rest following a heavy training session?

A heavy training session will result in a runner performing close to their 'lactate threshold'. These means that even though the respiration has been aerobic, there will be some lactic acid build up and muscle aches. It is not a good idea to train until this aching has stopped.

The leg muscles will also have been damaged slightly during a session and rest will be required for repair and recovery.

Overtraining:

This occurs when your body trains beyond its ability to recover. Without adequate rest your fitness can get worse or you may become ill. This can result in time away from training.

Reversibility:

This means gradually losing fitness and occurs to anybody who stops training. Give 3 reasons why reversibility might occur to an individual.

John used to be a competitive cross-country runner but for the last 18 months he has not taken part in the sport due to a leg injury. John has put on weight and lost fitness during his injury. John is looking to design his own training programme in order to get back into cross-country running and compete at a high level.

How can John use the FITT principle effectively in his training programme?

Frequency – As he has been of action for a while start with one or two sessions per week and slowly build this up

Intensity – Start by running and a steady pace during sessions and gradually look to get quicker

Time – Start with short sessions, maybe only for 20 minutes and build this up each session.

Type – Continuous Training will be important for John to regain his fitness

What are John's individual needs that he must account for in his training programme?

John has a low level of fitness, excess weight and a history of a leg injury. It is important John starts his training at a low level as he will not be able to cope with the demands of an intense exercise programme.

How can John use progressive overload in his training programme?

John must gradually build up his training using the FITT principle, particularly because he is starting at a low level. If he tries to build up his training too quickly John will become demotivated and fatigued which could easily lead to an injury.

How can John include specificity in his training programme?

Specificity means making your training specific for your sport. John needs to take part in continuous training such as long distance runs using his cardiovascular fitness in order to improve for cross-country running. He may also include some fartlek training in his programme as this will include some work over different terrains.

Training Thresholds:

These are set to make sure that people train at an effective but safe level.

The calculation of your target zones is known as **The Karvonen Formula.**

<u>The Karvonen Formula (simplified):</u>

Firstly work out your maximum heart rate with the formula: 220

What is your maximum heart? 205bpm (for a 15 year old)

Your aerobic zone is what percentage of your maximum HR? 60-80%

Therefore what is your aerobic target zone? 123 – 164bpm

Your anaerobic zone is what percentage of your maximum HR? 80-90%

Therefore what is your anaerobic target zone? 164-184.5bpm

Sample Exam Questions

Emma is 20 and is training for a marathon. Using the karvonen formula (simplified), how would you work out Emma's aerobic training zone? (**3 marks)**

Mark One – Aerobic training zone is 60-80% of your maximum heart rate

Mark Two – Maximum heart rate is 220-Age, so Emma's heart rate is 220-20 = 200BPM

Mark Three - Therefore her aerobic target zone is 120-160bpm

Tom is 16, has a resting heart rate of 64 bpm and has just completed a six-week personal exercise programme (PEP).

Week 1 – 180
Week 2 – 172
Week 3 – 160
Week 4 – 175
Week 5 – 145
Week 6 - 150

State the total number of weeks Tom's heart rate was within his aerobic target zone.
(1 mark)

A One
B Two
C Three
D Four

Answer: C - Three

State the total number of weeks Tom's heart rate was within his anaerobic target zone.

(1)
A One
B Two
C Three
D Four

Answer: C - Three

Key Terms:

Individual Needs – The needs of an individual could alter due to their fitness level, weight, gender or previous injuries.

Specificity – The particular requirements of an activity

Progressive Overload – Gradually increasing the amount of overload to improve fitness but without injury

FITT Principle – Training principle linked to progressive overload, based on frequency, intensity, time and type

Overtraining – Training beyond your body's ability to recover

Reversibility – Gradually losing fitness instead of progressing

Target Zone – The range within which an individual needs to work

Training Threshold – A safe and effective level to train at

Karvonen Formula – A test to find out an individual's optimum heart rate

Resting Heart Rate – The amount of times your heart beats per minute at rest (normal RHR is 60-80 BPM)

Maximum Heart Rate – Your highest possible heart rate. 220 – Age

3.3 The Principles of Training

Mark Scheme

Q1. Emily is getting back into weight training following a lengthy knee injury. Explain what could happen if she does not consider her Individual Needs when designing a training plan? **(2 marks)**

Mark One – She could take part in intense training which could make her knee injury return or worsen.

Mark Two – This could lead her to becoming **demotivated** by the training.

Q2. Describe **one way** Emily could use the FITT principle in her training programme **(1 mark)**

Mark One – She could **increase** the frequency of training so that she begins with only one session per week, but gradually increases this so that improvement occurs.

Accept other appropriate answers

Q3. Jasper is a cyclist. He is going to use the FITT principle to apply overload to his training programme. Explain how Jasper can apply the principles of 'frequency' and 'intensity'. **(2 marks)**

Mark One – Jasper can apply 'frequency' by increasing the number of cycling sessions that

he takes part in each week

Mark Two – Jasper can apply the principle of 'intensity' by cycling at a faster pace during his training sessions

Q4. Evaluate how a rugby player can implement specificity into their training programme in order to improve performance. **(3 marks)**

Mark One – Specificity is when training is matched to the requirements of an activity/sport

Mark Two – A rugby player can focus their training on improving the component of fitness 'power'. This may involve weight training or plyometrics

Mark Three – This will improve their performance as they will be more powerful in the skill of tackling/srummaging/sprinting with the ball

Accept other appropriate answers

Q5. A netball team have been learning about the principles of training. Giving a sporting example for each, explain what is meant by the terms 'overtraining' and 'reversibility'. **(4 marks)**

Mark One – Overtraining occurs when your body trains beyond its ability to recover.

Mark Two – For example a netball player may train too frequently which can lead to injury or illness

Mark Three – Reversibility means gradually losing fitness and occurs to anybody who stops training

Mark Four - For example a netball player may miss two weeks of training due to illness and this may lead to reversibility

Accept other appropriate answers/examples

Name: _____

3.3 The Principles of Training

Date:

Total marks available: 12

Total marks achieved: _____

Percentage: _____

Q1. Emily is getting back into weight training following a lengthy knee injury. Explain what could happen if she does not consider her Individual Needs when designing a training plan? **(2 marks)**

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Q2. Describe **one way** Emily could use the FITT principle in her training programme **(1 mark)**

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Q3. Jasper is a cyclist. He is going to use the FITT principle to apply overload to his training programme. Explain how Jasper can apply the principles of 'frequency' and 'intensity'. **(2 marks)**

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Q4. Evaluate how a rugby player can implement specificity into their training programme in order to improve performance. **(3 marks)**

Q5. A netball team have been learning about the principles of training. Giving a sporting example for each, explain what is meant by the terms 'overtraining' and 'reversibility'. **(4 marks)**

PE COMPONENT 1 - PRINCIPLES OF TRAINING

Principles of Training

1. Individual Needs
2. Specificity
3. Progressive Overload
4. FITT Principle
5. Rest & Recovery
6. Overtraining
7. Reversibility
8. Training Thresholds

Individual Needs

- The needs of an individual could alter due to their fitness level, weight, gender or previous injuries

Specificity

- This means matching training to the requirements of an activity
- Different sports and different positions require athletes to use different training methods in order to reach their potential

Training Thresholds

Aerobic Training Threshold → 60-80% of Max HR

Anaerobic Training Threshold → 80-90% of Max HR

Maximum Heart Rate = 220 - Age

Rest & Recovery

- This is very important during an exercise programme and without adequate rest, injury or burnout become likely

Reversibility

- This means gradually losing fitness and occurs to anybody who stops training

Reasons for Reversibility:

- Injury
- Demotivation
- Off-Season
- Illness
- Fatigue

Progressive Overload

- This means gradually increasing the amount of overload during training in order to improve fitness but without injury
- If you increase the intensity of your workouts gradually you will make steady improvements

Overtraining

- Occurs when your body trains beyond its ability to recover
- Without adequate rest your fitness can get worse or you may become ill. This can result in time away from training

The FITT Principle is used to make sure that Progressive Overload takes place

Frequency	How often training takes place
Intensity	How 'hard' training is
Time	How long training lasts
Type	What type of training is uses

PE COMPONENT 1 - PRINCIPLES OF TRAINING

Principles of Training

1. Individual Needs
2. Specificity
3. Progressive Overload
4. FITT Principle
5. Rest & Recovery
6. Overtraining
7. Reversibility
8. Training Thresholds

_____ _____

- The needs of an individual could alter due to their fitness level, weight, gender or previous injuries

_____

- This means matching training to the requirements of an _____
- Different sports and different positions require athletes to use different training methods in order to reach their potential

_____ _____

_____Training Threshold → 60-80% of Max HR

_____ Training Threshold → 80-90% of Max HR

Maximum Heart Rate = 220 - Age

_____ & _____

- This is very important during an exercise programme and without adequate rest, injury or burnout become likely

_____

- This means gradually losing fitness and occurs to anybody who stops training

Reasons for Reversibility:

- Injury
- Demotivation
- Off-Season
- Illness
- Fatigue

_____ _____

- This means gradually increasing the amount of overload during training in order to improve fitness but without injury
- If you increase the intensity of your workouts gradually you will make steady improvements

_____

- Occurs when your body trains beyond its ability to recover
- Without adequate rest your fitness can get _____ or you may become ill. This can result in time away from training

The FITT Principle is used to make sure that Progressive Overload takes place

_____	How often training takes place
_____	How 'hard' training is
_____	How long training lasts
_____	What type of training is uses