THE DUSTON SCHOOL
Knowledge itself is power
4-19

Year 10 Science Knowledge Booklet

Term 6

Name:	Class:

Year 10 CGP Workbook Deadlines	
10/06/2025	B2
24/06/2025	C6
08/07/2025	P4

Science Homework 1

Complete the section of the homework workbook identified on the front of this Knowledge organiser and learn the key knowledge questions and answers ready for the knowledge quiz.

Big questions: What is homeostasis and response?

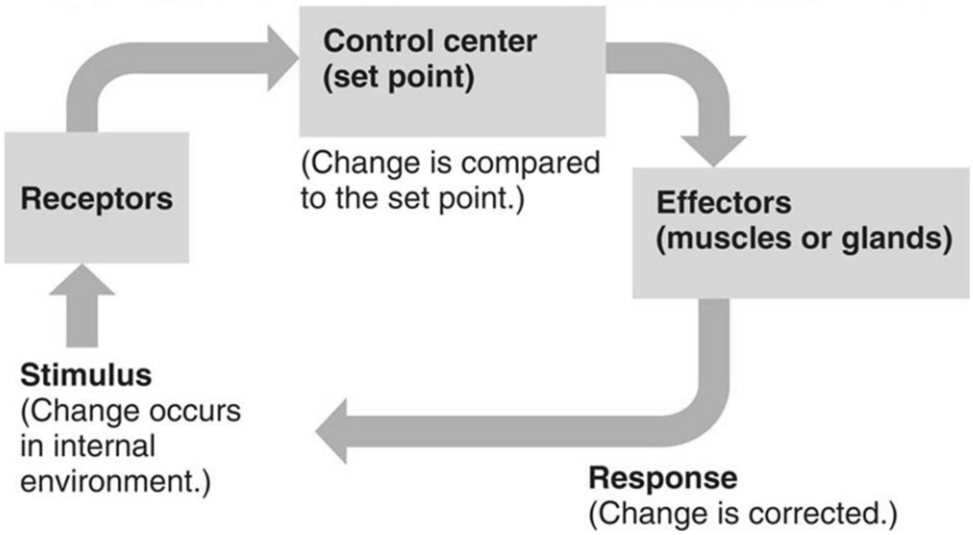
What would happen if you didn't drink enough water?
How does the nervous system work?
How does the reflex arc protect us?
How do drugs affect reactions?
How does the endocrine system work?
How do we control blood glucose?
How is the menstrual cycle controlled?
What is contraception and how does it work?
How do we treat infertility?

Key vocabulary

Adrenaline	Hormone produced by the adrenal gland in times of fear/stress.
Barrier method (of contraception)	Condom or diaphragm. Prevents sperm from reaching the egg.
Central Nervous System	The brain and spinal cord together. Coordinates the response of the effectors.
Chemical method (of contraception)	Contraceptive pill/implant/patch. Prevents ovulation (release of the egg).
Coordination centre	Receives and processes information from receptors e.g. CNS, pancreas
Endocrine system	The system of glands that secrete hormones.
FSH	Produced by the pituitary gland. A hormone that causes an egg to mature in the ovary. Causes oestrogen to be produced.
Glucagon	A hormone produced when blood glucose concentration is too low.
Glycogen	A storage molecule made from many glucose molecules bonded together. Found in the liver and muscle cells.
Homeostasis	Maintenance of internal conditions, so they are kept at optimum.
Hormone	A chemical secreted by a gland that travels in the blood and has an effect on a target organ. The effects are slower and longer-lasting than the responses from the nervous system.
Insulin	A hormone produced when blood glucose concentration is too high.
LH	Produced by the pituitary gland. A hormone that causes ovulation.
Negative feedback	Negative feedback ensures that the changes are reversed and returned back to optimum level.
Oestrogen	Produced by the ovaries. Causes blood lining of the uterus to develop. Stops FSH being produced. Stimulates the release of LH.
Oral contraceptives	The contraceptive pill.
Pituitary gland	A gland that secretes several hormones into the blood. It is also known as the master gland.
Progesterone	Produced by the ovary. Maintains the blood lining in the uterus. Stops the production of the LH and FSH.
Reflex action	A fast, automatic. Does not involve thinking parts of the brain.
Testosterone	Males hormone produced by the testes. Stimulates sperm production.
Thyroxine	Hormone produced by the thyroid gland. Stimulated the metabolic rate. Important in growth and development.

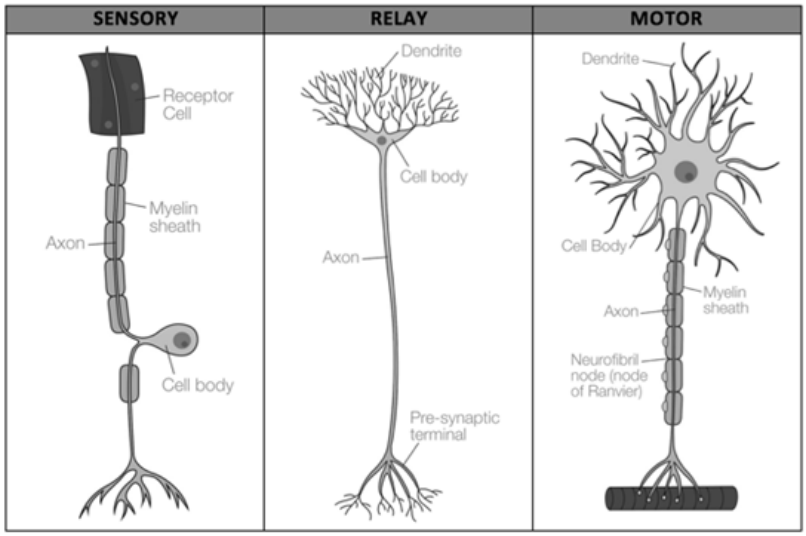
What would happen if you didn't drink enough water?

Negative Feedback



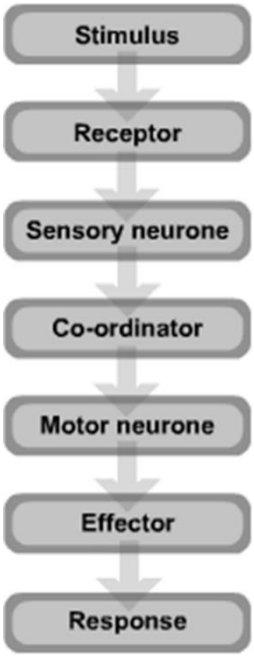
How does the nervous system work?

Neurones

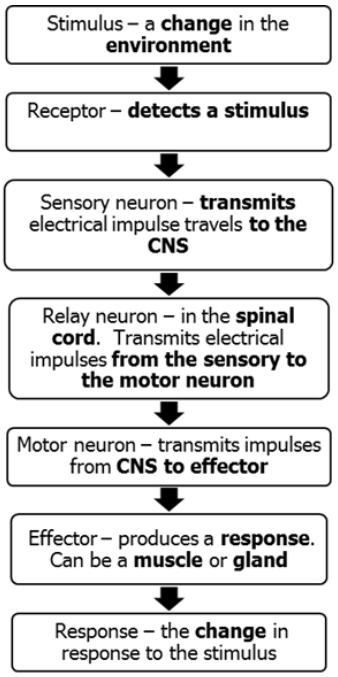


How does the reflex arc protect us?

Nervous pathway

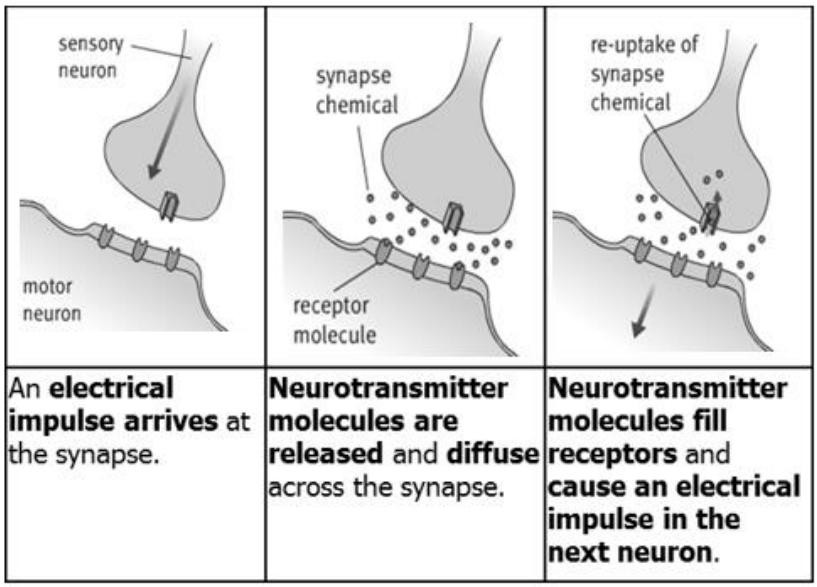


The Reflex Arc

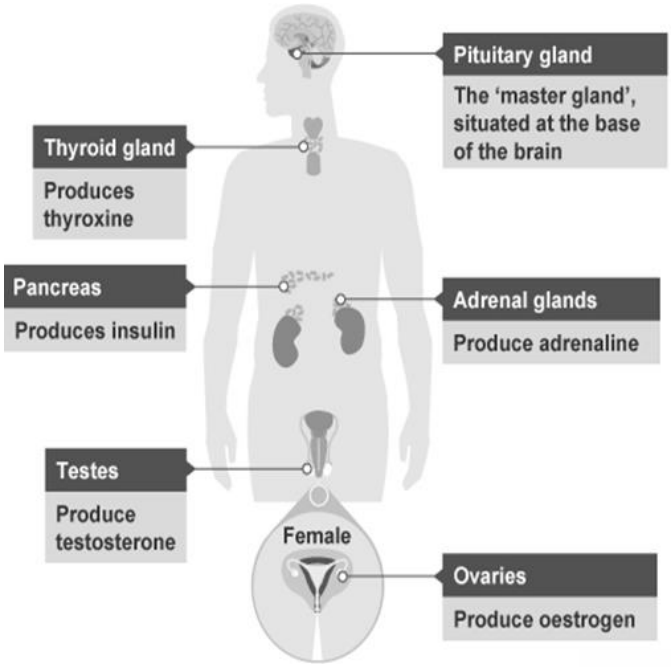


How do drugs affect reactions?

The synapse

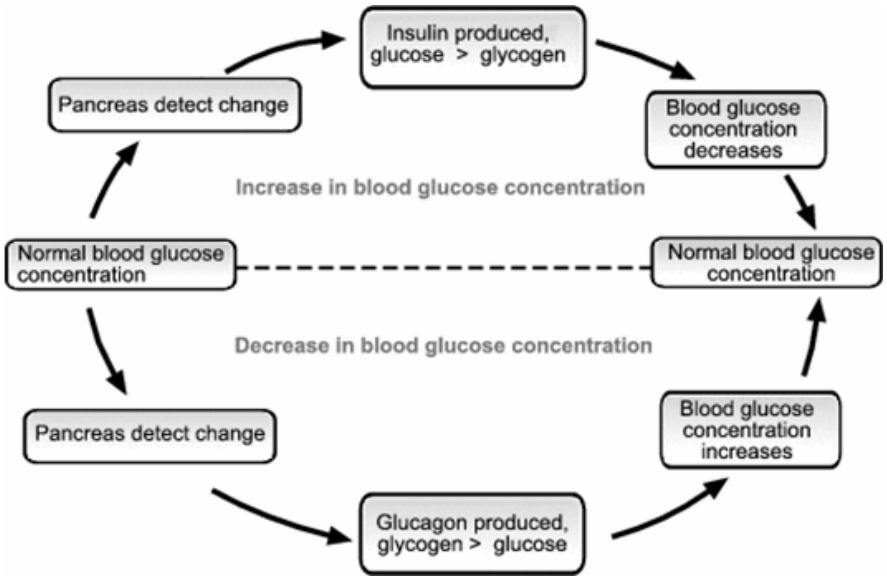


How does the endocrine system work?



How do we control blood glucose?

Blood Glucose Regulation

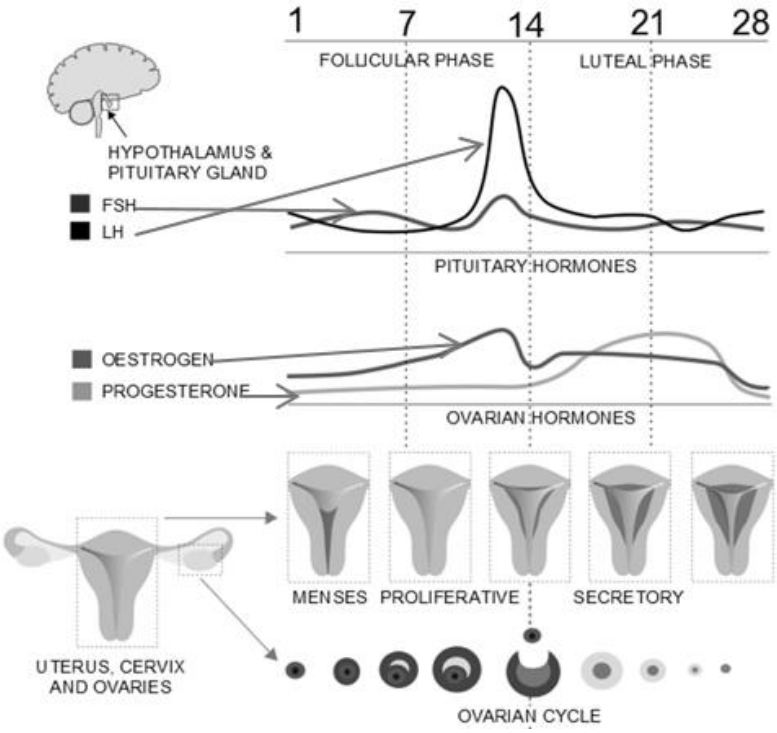


What is contraception and how does it work?

Name of contraception method	Hormonal or non-hormonal?	How does it work?
Oral Contraceptives	Hormonal	Contain hormones to inhibit FSH production so no eggs mature
Injection/Implant/Skin patch	Hormonal	Slow release of progesterone inhibits the maturation and release of eggs
Barrier method	Non-hormonal	Stops sperm reaching the egg
Intrauterine devices	Can be Hormonal	Prevents implantation of an embryo or releases a hormone
Spermicidal agents	Non-hormonal	Kill or disable sperm
Rhythm method	Non-hormonal	Abstaining from intercourse when an egg may be in the oviduct
Surgical sterilisation	Non-hormonal	Cut oviduct/sperm duct so gametes can pass along

How is the menstrual cycle controlled?

Menstrual Cycle



How do we treat infertility?

47 Give mother FSH and LH to stimulate production of several eggs → Collect eggs and fertilise with father's sperm in the lab → Fertilised eggs develop into embryos → One or two embryos inserted into mother's uterus

Science Homework 2

Complete the second section of the homework workbook identified on the front and learn the key knowledge questions and answers for all of the areas covered in this knowledge organiser ready for the end of term test.

Wider reading

https://www.bbc.co.uk/news/health-47691567

Male pill - why are we still waiting?

By Michelle Roberts
Health editor, BBC News online

- Published 26 March 2019

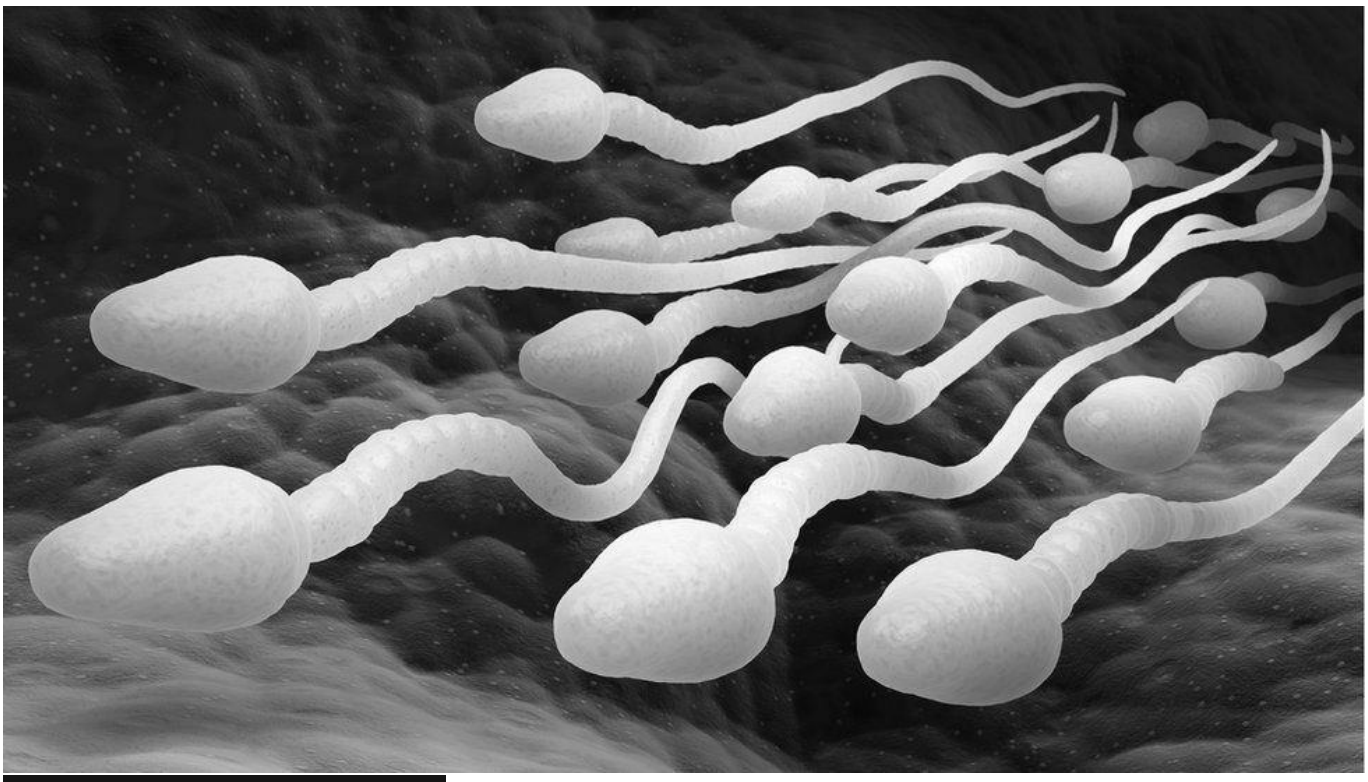


IMAGE SOURCE,GETTY IMAGES

A birth control pill for men has passed initial human safety tests, experts at a leading medical conference have heard.
The once-daily pill contains hormones designed to stop sperm production.
It would be a welcome addition to condoms or vasectomy - the only options currently available to men.
But doctors at the Endocrine Society's annual meeting were told it could still take a decade to bring it to market.

Sex drive

The female pill was launched in the UK more than 50 years ago. So why is a male pill proving so difficult?

Some say there has been less societal and commercial will to get a male pill off the ground - but **opinion polls** suggest many men would consider taking it if a pill did become available. Whether women would trust men to reliably take it is another issue.

A UK survey by Anglia Ruskin University, in 2011, found 70 out of 134 women would worry that their male partner would forget to take a pill.

Biologically, the challenge of creating a hormone-based pill for men is making sure that it doesn't blunt sex drive or reduce erections.

Sperm production

In fertile men, new sperm cells are constantly made in the testicles, triggered by hormones. Temporarily blocking this effect without lowering hormone levels to such an extent that it creates side-effects is the issue.

But this latest male pill, being tested by researchers from LA BioMed and the University of Washington, should hopefully achieve this goal, researchers say.

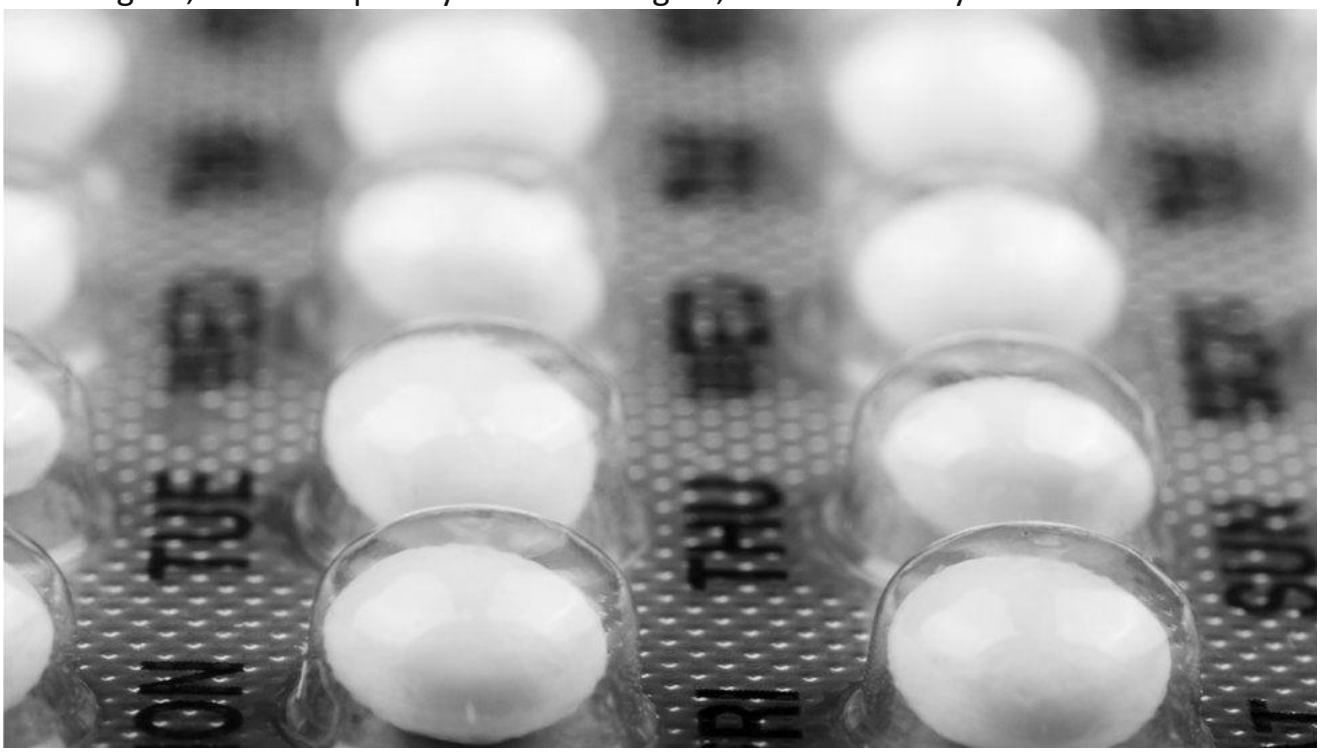


IMAGE SOURCE,GETTY IMAGES

Initial "phase one" safety tests with 40 men looked promising, they told the Endocrine 2019 meeting in New Orleans.

For the 28 days of the study:

- 10 took a placebo, or dummy pill
- 30 took the experimental male pill, 11-beta-MNTDC

And among those taking the androgen-based drug, levels of hormones required for sperm production dropped greatly compared with placebo, returning to normal after the trial.

Erectile dysfunction

Side-effects, meanwhile, were few and mild.

Five men on the pill reported mildly decreased sex drive - and two described mild erectile dysfunction - but sexual activity was not decreased, no participant stopped taking it because of side-effects and all passed safety tests.
The researchers behind the work, Prof Christina Wang and colleagues, are excited but cautious about the findings.
"Our results suggest that this pill, which combines two hormonal activities in one, will decrease sperm production while preserving libido," she said.
But bigger, longer trials were needed to check it would work well enough as a birth control.

Body gel

And this is not the only prototype hormone-based male contraceptive Prof Wang has been testing.
She and colleagues have come up with a body gel **men in the UK will be trying as part of an international trial**.
Users apply it daily to their back and shoulders, where it can be absorbed through the skin.
Progestin hormone in the gel blocks natural testosterone production in the testicles, reducing sperm production to low or nonexistent levels, while replacement testosterone in the gel maintains sex drive and other functions that rely on the hormone.
Meanwhile, Prof Wang, Dr Stephanie Page, and colleagues at the University of Washington School of Medicine, have been testing another compound - DMAU - that they believe men could take as an oral daily contraceptive pill.
And **trials in 100 men** have suggested this is safe enough to move into the next phase of testing.

Mood disorders

Other scientists have been trying delivering longer-acting birth control hormones in a jab given every other month.
But they **stopped enrolling men to their phase-two study**, looking at the safety and effectiveness of the injection, after some of the volunteers reported side-effects, including mood disorders or depression.
For men who don't fancy taking hormones, researchers have been looking at ways to block sperm flow, stopping it from ever leaving the penis - effectively, a non-surgical vasectomy.
Vasalgel - a polymer material that is injected into the two ducts that transports sperm from the left and right testicles to the penis - is being developed as a non-hormonal, reversible, long-acting male contraceptive.
So far, **it has been tested in animals only** - but the researchers behind it have recently received funding to look to begin human trials.

Potential market

Prof Richard Anderson, of the University of Edinburgh, is leading one of the UK trials that will test a contraceptive body gel on men.
He said the pharmaceutical industry had been slow to get behind the idea of a new male contraceptive despite good evidence that both men and their female partners would welcome the additional choice.
"I think that industry has not been convinced about the potential market," he said.
"It's certainly been a long story - part of it is lack of investment."

Chequered history

With little industry involvement, he said, researchers had had to rely on charitable and academic funding, which took time.

Allan Pacey, professor of andrology, at the University of Sheffield, said: "The development of a male birth control pill, or injection, has had a chequered history without much success so far and so it is good to see that new preparations are being tested.

"The key will be if there is enough pharmaceutical company interest to bring this product to market if their trials are successful.

"Unfortunately, so far, there has been very little pharmaceutical company interest in bringing a male contraceptive pill to the market, for reasons that I don't fully understand but I suspect are more down to business than science."

Key knowledge question	**Answer**
What are the three types of neurone?	motor neurone, sensory neurone, relay neurone
What is the order of how the nervous system works?	stimuli, receptor, sensory neurone, CNS, motor neurone, effector, response (this orders only)
What parts make up the central nervous system (CNS)	Brain and spinal cord
Why are reflexes important?	to protect you from danger
What hormone is produced if blood glucose is too high?	Insulin
What is a hormone?	A chemical that cause a response in the body
In what order are the hormones released in the menstrual cycle?	FSH, oestrogen, LH, progesterone
What is ovulation?	The release of a mature egg from the ovary
What is the male reproductive hormone?	testosterone

P5 Forces

Big questions:

What are forces and how do we describe them?
How can we find the resultant force on an object?
How do we calculate the weight of an object?
How do we calculate the work done by a force?
How do forces change the shape of things?
How can we investigate the relationship between force and extension?
How can we calculate the energy stored in a spring?
How is velocity different from speed?
What does a distance-time graph show us?
What is acceleration and how is it calculated?
What does a velocity-time graph show us?
What are Newton's first and second laws of motion?
What factors affect the acceleration of an object?
What is Newton's third law of motion and what does it tell us?
What affects the stopping distance of a car?
How do we find the momentum of an object?

Key vocabulary

Contact force	A force that only occurs when two objects are touching. e.g. friction, air/water resistance, normal contact force etc.
Non-contact force	A force that occurs between two objects that are not touching e.g. gravitational force, magnetic force, electric force
Scalar quantity	A scalar quantity only has magnitude (size). e.g. distance, speed, mass.
Vector quantity	A vector quantity has magnitude and direction. e.g. displacement, velocity, force
Resultant force	The overall force on an object taking the direction of all the forces into account.
Work done	Energy transferred by a force. Work done = force x distance moved
Velocity	Speed in a given direction.
Acceleration	Change in speed per unit time.
Directly proportional	If one variable doubles, the other variable doubles.
Inversely proportional	If one variable doubles, the other variable halves.
Stopping distance	The distance travelled between seeing a hazard and coming to a stop. Stopping distance = thinking distance + braking distance
Thinking distance	The distance travelled between seeing a hazard and pressing the brakes.
Braking distance	The distance travelled between pressing the brakes and coming to a stop
Momentum	The tendency for an object to keep moving with the same velocity.

What are forces and how do we describe them?

Forces are an interaction between two objects. We can describe forces using the phrase "the _____ force of the _____ on the _____"

e.g. The gravitational force of the Earth on the book.

Contact forces - A force that only occurs when two objects are touching. e.g. friction, air/water resistance, normal contact force etc.

Non-contact force - A force that occurs between two objects that are not touching e.g. gravitational force, magnetic force, electric force

How can we find the resultant force on an object?

The resultant force is the overall force taking the direction of all the forces into account e.g. if a car has a forward force of 50N and a friction force of 20N the resultant will be 50-20 = 30N forwards.

How do we calculate the weight of an object?

Weight = mass x gravitational field strength W = mg

g = 9.8 N/kg on Earth.

How do we calculate the work done by a force?

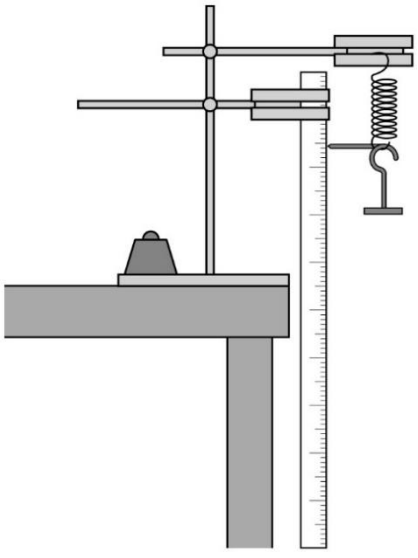
Work done = Force x distance W = Fs

How do forces change the shape of things?

Hooke's law: the force on a spring is directly proportional to the extension of the sprint up to the limit of proportionality.

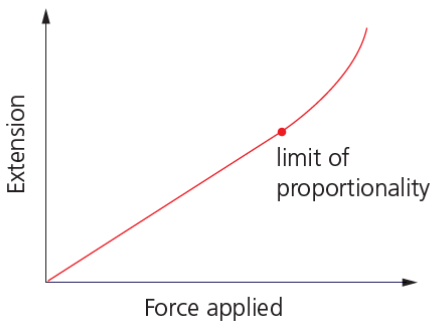
Force = spring constant x extension F = ke

How can we investigate the relationship between force and extension?



1) the original length of the spring with no mass on it.
2) Add a mass and measure the new length.
3) Calculate the force = mass x gravitational field strength
4) Calculate the extension = new length – original length.
5) Repeat steps 2 and 3 for a range of masses

Plot a graph for extension vs force. The graph should be a straight line through 0,0 (directly proportional) up to the limit of proportionality where the graph starts to curve.



Science Homework 3

Complete the section of the homework workbook identified on the front of this Knowledge organiser and learn the key knowledge questions and answers ready for the knowledge quiz.

How can we calculate the energy stored in a spring?

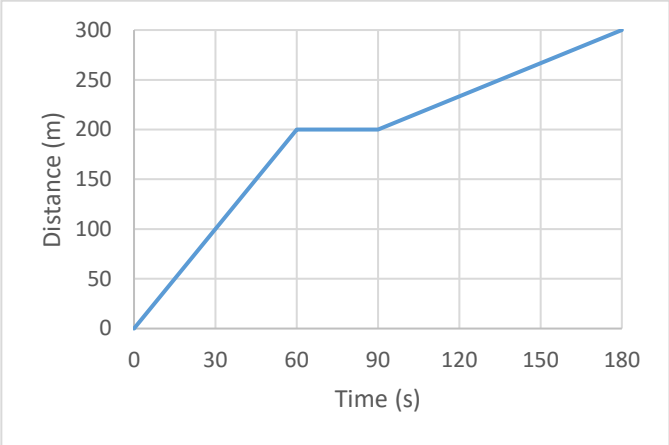
Elastic potential energy = 0.5 x mass x (extension)^2 $E_e = ½ ke^2$

How is velocity different from speed?

Velocity is speed in a given direction.

Speed = $\frac{\text{distance}}{\text{time}}$ velocity = $\frac{\text{displacement}}{\text{time}}$ average speed = $\frac{\text{total distance}}{\text{total time}}$

What does a distance-time graph show us?



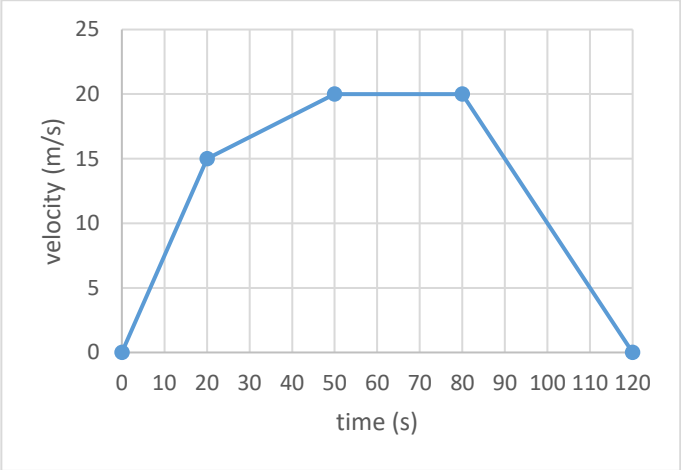
- horizontal line = stationary
- gradient = velocity (or speed)
- the steeper the gradient the faster the object
- A curved line means the object is accelerating or decelerating

What is acceleration and how is it calculated?

Acceleration = = $\frac{\text{change in speed}}{\text{time}}$ $a = \frac{v-u}{t}$

Where v is final velocity and u is initial velocity

What does a velocity-time graph show us?



- horizontal line = constant velocity (speed)
- gradient = acceleration
- the steeper the gradient the greater the acceleration
- negative gradient = deceleration (slowing down)
- area under graph = displacement

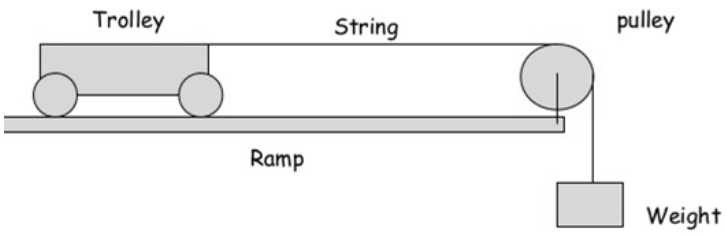
What are Newton's first and second laws of motion?

Newton's First Law: if the resultant force on an object is zero, the object will remain stationary or moving at constant velocity

Newton's Second Law: the acceleration of an object is directly proportional to the resultant force on the object and inversely proportional to the mass of the object.

Force = mass x acceleration F = ma

What factors affect the acceleration of an object?



Newton's Second Law can be investigated by:

- Changing the force pulling a trolley and measuring the time for the trolley to travel 1m.
- Adding mass on top of the trolley and measuring the time for the trolley to travel 1m.
- The shorter the time, the greater the acceleration.

What is Newton's third law of motion and what does it tell us?

Forces always come in pairs as an interaction between two objects.

Newton's Third Law: If object A exerts a force on object B, object B exerts an equal and opposite force on object A.

What affects the stopping distance of a car?

Stopping distance	The distance travelled between seeing a hazard and coming to a stop. Stopping distance = thinking distance + braking distance
Thinking distance	The distance travelled between seeing a hazard and pressing the brakes.
Braking distance	The distance travelled between pressing the brakes and coming to a stop

Stopping distance is the distance travelled between seeing a hazard and coming to a stop.

Stopping distance = thinking distance + braking distance

Thinking distance is the distance travelled between seeing a hazard and pressing the brakes.

Thinking distance is related to the driver's reactions times which is affected by: age, tiredness, alcohol or drugs, distractions. The speed of the car also affects thinking distance.

Braking distance is the distance travelled between pressing the brakes and coming to a stop.

Braking distance is affected by: the road condition (e.g. wet, icy), the condition of the tyres and brakes, the speed of the car, the mass of the car.

How do we find the momentum of an object?

Momentum = mass x velocity $p = mv$

The total momentum before a collision is equal to the total momentum after the collision.

Key knowledge question	Answer
What is a scalar quantity?	a quantity with magnitude only
What is a vector quantity?	a quantity with magnitude and direction
Write the equation that links weight, mass and gravitational field strength	W = mg weight = mass x gravitational field strength
Write the equation that links force, spring constant and extension	F = ke Force = spring constant x extension
Write the equation that links speed, distance and time	speed = distance / time
Write the equation for acceleration	a = (v-u) / t acceleration = change in speed / time or acceleration = (final velocity - initial velocity) / time
What does a horizontal line on a distance-time graph mean?	the object is stationary
What does a straight diagonal line on a distance-time graph mean?	the object is moving at constant speed
What does a horizontal line on a speed-time graph mean?	the object is moving at constant speed
What does a diagonal line on a speed-time graph mean?	the object is accelerating at a constant rate
Describe the forces when a falling object reaches terminal velocity	weight = (-) drag
Complete Newton's first law: If the resultant force on an object is zero it will remain _____ or travelling at _____.	stationary, constant velocity (in that order)
Complete Newton's second law: the acceleration of an object is directly proportional to the _____ on the object and inversely proportional to the _____ of the object.	force, mass (in that order)
Complete Newton's third law: if object A exerts a force on object B, object B exerts an _____ and _____ force on object A.	equal, opposite (in either order)
Write the equation that links force, mass and acceleration	Force = mass x acceleration
Write the equation that links stopping distance, thinking distance and braking distance	stopping distance = thinking distance + braking distance
Define thinking distance	The distance travelled between seeing a hazard and pressing the brakes
Define braking distance	The distance travelled between pressing the brakes and coming to a stop
Define stopping distance	Thinking distance + braking distance
State 2 factors that affect thinking distance	tiredness, age, influence of drugs/alcohol, distractions, speed of the car
State 2 factors that affect stopping distance	condition of tyres, condition of brakes, road surface, ice/water on the road, speed of the car
Write the equation that links momentum, mass and velocity	p = mv momentum = mass x velocity

Wider reading

How to get the most out of your knowledge organiser:

- To get the most use out of the knowledge organisers you should be learning sections and then self-testing.

- There are several different things you can do
  - Look, cover, write, check, correct
  - Read through the organisers
  - Mind maps
  - Key spellings
  - Make a glossary
  - Missing out key words
  - Questions/answers answers/questions
  - Flash cards
  - Revision clock learning
  - Mnemonics

Science Learning Tools and wider study:

The Oak Academy – Online Science lessons
BBC Bitesize science
<u>You tube channels:</u>
Fuse school
Ted talks
Free science lessons
Primrose Kitten
<u>Shows on Netfilx</u>
Our planet
Tiny creatures
A life on our planet