Year 7 Science
Distance Learning Quiz and Learn Booklet
Summer 2

Name:

Form:
Guidance
Scientists have proven that when we do not use information we know, the pathways in our brain actually decay (breakdown) - this is what happens when we forget something.
By engaging with your study (reading and doing quizzes) you are not just learning new information you are actually holding on to the information you have already have!

Well done on all the work you have done to this point, you are not letting all your hard school work and study go to waste! ☺

This booklet has contains:
- Information for you to read and make notes on
- Practice questions and answers for you to complete and self mark
- Paper copies of the online quizzes that all other students will be taking.

There are a couple of methods to submit your paper quiz
• -If you can, drop it off in the post box in the school reception
• -Take a picture and email it to your teacher

Your responses in this quiz allows your teacher to give you specific instructions on how to improve, only by doing this can we make sure you make the progress you deserve!

If you have any questions please email your teacher.

<table>
<thead>
<tr>
<th>Week</th>
<th>Learn</th>
<th>Complete?</th>
<th>Quiz</th>
<th>Complete?</th>
<th>All done for this week?</th>
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<tbody>
<tr>
<td>1 (1st June)</td>
<td>Reproductive Systems and Puberty</td>
<td></td>
<td>Bio Week 1</td>
<td></td>
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<td>2 (8th June)</td>
<td>Menstrual Cycle and Fertilisation</td>
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<td>Bio week 2</td>
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<td>Diffusion</td>
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<td>4 (22nd June)</td>
<td>Atoms, Elements and Compounds</td>
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<td>Chemistry week 4</td>
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<td>Moments and Deformation</td>
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<td>Physics week 7</td>
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Topic 10.2 Human reproduction

What causes puberty?

- Changes occur in both males and females.
- Puberty is triggered by hormones.
- Hormones affect the growth of body hair and glands.
- Hormones affect the growth of pubic hair and breasts.
- Hormones affect the growth of the reproductive system.

What happens during puberty?

- There are changes in both males and females.
- Changes occur in both males and females.
- Changes occur in both males and females.
- Changes occur in both males and females.

Learning objectives

- Identify the changes that occur during puberty.
- Describe the effects of hormones on the reproductive system.
- Explain the importance of health and wellness during puberty.

Study tips

- Take breaks during study sessions.
- Review notes and summarize key concepts.
- Practice self-care and maintain a healthy lifestyle.

Key words

- Puberty
- Hormones
- Reproductive system
- Health and wellness

Summary questions

1. What are the changes that occur during puberty?
2. How do hormones affect the growth of body hair and glands?
3. What are the effects of hormones on the reproductive system?
4. What are the important aspects of health and wellness during puberty?
## Adolescence

### In-text questions

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
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<tbody>
<tr>
<td>A</td>
<td>The period of time in which a person changes from a child into an adult.</td>
</tr>
<tr>
<td>B</td>
<td>The physical changes a person’s body experiences when changing from a child to an adult.</td>
</tr>
<tr>
<td>C</td>
<td>Any two from: breasts develop, ovaries release eggs, periods start, hips widen.</td>
</tr>
<tr>
<td>D</td>
<td>Any two from: voice breaks, testes/penis get bigger, testes start to produce sperm, shoulders widen, growth of facial hair/chest hair.</td>
</tr>
</tbody>
</table>

### Activity

**Problem pages**

The reply should include the following points:

Kyle is undergoing puberty, caused by male sex hormones. He is changing from a child into an adult.

A number of changes will occur, including his voice deepening, getting taller, and his genitals growing.

The whole process takes several years but the precise start and finish time is different for everyone. This is something that happens to everyone and we cannot stop puberty. It is nothing to worry about.

### Summary questions

1. 1 mark for each correct match. (6 marks)
   - 1 adolescence, physical, puberty, hormones
   - 2 pubic hair/underarm hair growth, body odour, growth spurt (3 marks)
   - 3 Give two marks for general changes (pubic hair/underarm hair growth, body odour, emotional changes, and growth spurt).

   Give two marks for male-only changes (voice breaks, testes/penis get bigger, shoulders widen, facial/chest hair).

   Give two marks for reasons (hormones/released from testes/chemical messengers/reproductive system needs to become fully functional).

## Reproductive Systems

### In-text questions

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>A</td>
<td>Produce sperm and release them inside the female.</td>
</tr>
<tr>
<td>B</td>
<td>Produce egg and allow a baby to grow until it is ready to be born.</td>
</tr>
<tr>
<td>C</td>
<td>Uterus (womb)</td>
</tr>
<tr>
<td>D</td>
<td>Female: egg cell, male: sperm</td>
</tr>
</tbody>
</table>

### Activity

**Glossary**

The students’ glossaries should contain key words from Big Idea 10.

### Summary questions

1. 1 mark for each correct match. (6 marks)
   - 1 vagina – receives sperm during sexual intercourse
   - 2 Sperm are male sex cells; semen is a fluid containing both sperm and the nutrients to keep sperm alive. (2 marks)

   3 4 marks for identifying the correct structure 1 mark for the correct order, and 1 mark for a well organised flow chart. testicles → sperm duct → urethra/penis → vagina
**Summary Questions**

1. Name two different methods of contraception.
   - Contraception: These are the methods used to prevent pregnancy.
   - The contraceptive pill is one of the most common forms of contraception. It works by releasing hormones into the body, which prevent the release of an egg from the ovaries. The pill is taken daily, usually in a pack, and can be discontinued at any time. If the pill is missed, careful consideration is given to the timing of the missed dose.

2. What is contraception?
   - Contraception is the term used to describe any method used to prevent pregnancy. It includes a variety of methods, such as barriers (e.g., condoms, diaphragms), hormonal methods (e.g., the contraceptive pill, implants, injections), and permanent methods (e.g., sterilization).

3. Key Words
   - How does the contraceptive pill work?
   - The contraceptive pill is a form of hormonal contraception that contains estrogen and progesterone. These hormones work to prevent the release of an egg from the ovaries, which can result in pregnancy. The pill is taken daily, usually in a pack, and can be discontinued at any time. If the pill is missed, careful consideration is given to the timing of the missed dose.

4. The menstrual cycle
   - The menstrual cycle is the monthly cycle of changes that occurs in a woman’s reproductive system. It is divided into three phases: the follicular phase, ovulation, and the luteal phase.

5. Learning objectives
   - Students will learn about the menstrual cycle, the contraceptive pill, and other methods of contraception.
   - They will understand the importance of contraception and the consequences of unintended pregnancy.
   - Students will be able to identify the different types of contraception and their mechanisms of action.
   - They will be able to discuss the benefits and side effects of each method of contraception.
**Answers**

**Fertilisation and Implantation**

| In-text questions | A moved along by cilia  
|                   | B Penis releases sperm/semen into the vagina.  
|                   | C Fertilised egg (or embryo) attaches to the lining of the uterus. |

| Summary questions | 1 fertilisation – the nuclei of the sperm and egg cell join together  
|                   | ejaculation – semen is released into the vagina  
|                   | implantation – the fertilised egg attaches to the lining of the uterus  
|                   | cilia – the little hairs that move the egg cell along the oviduct (4 marks)  
| 2a Penis becomes erect and vagina becomes moist. Penis inserted into vagina. Sperm/semen released/ejaculated into vagina. (3 marks)  
|                   | b male: low sperm count/sperm that do not swim properly (1 mark); female: egg cells not being released-blocked fallopian tubes (1 mark)  
| 3 Example answers (6 mark):  
|                   | Eggs are larger; sperm are smaller.  
|                   | Sperm can swim; eggs must be moved by cilia.  
|                   | Eggs are made before birth/only mature; sperm are made constantly. Only one egg released per month; millions of sperm released each ejaculation. |

**Development of a Fetus**

| In-text questions | A about 9 months (40 weeks)  
|                   | B nutrients and oxygen  
|                   | C about 4 weeks  
|                   | D cervix relaxes and uterus muscle contracts, pushing the baby out of the vagina. |

| Activity          | Elephant gestation  
|                   | 22 x 4 = 88 weeks. This is more than twice the length of the gestation period in humans (40 weeks). |

| Summary questions | 1 fetus, uterus, gestation, amniotic fluid, umbilical cord, blood (7 marks)  
|                   | 2 Any three from: Substances transferred between maternal and fetal blood. Occurs in the placenta. Oxygen and nutrients diffuse from mother to baby. Waste substances, like carbon dioxide, diffuse from baby to mother. (3 marks)  
|                   | 3 Extended response question (6 marks). Example points: Placenta is an area where substances pass between the mother’s and fetus blood. It acts as a barrier, stopping infections and harmful substances reaching the fetus. Umbilical cord connects the fetus to the placenta. It carries the fetus blood/oxygen/nutrients from the placenta to the baby and carries carbon dioxide from the fetus to the placenta. Amniotic fluid acts as a shock absorber/protects the fetus from bumps. |

**The Menstrual Cycle**

| In-text questions | A 28 days  
|                   | B The release of an egg cell from one of the ovaries.  
|                   | C condoms and the contraceptive pill  
|                   | D barrier method |

| Summary questions | 1 menstrual cycle, lining, vagina, period, condoms, pregnancy (6 marks)  
|                   | 2 period – lining is lost as blood through the vagina ovulation – egg is released  
|                   | Uterus lining thickens ready for a fertilised egg to implant. If egg is not fertilised, the lining breaks down and the cycle starts again. (4 marks)  
|                   | 3 Around day 14 (1 mark) as this is when an egg is present/ovulation has just occurred to meet the sperm (1 mark) and the lining of the uterus is thick to receive a fertilised egg. (1 mark)  
|                   | 4 Extended response question (6 marks). Example answers: Condoms are used by males during intercourse. They are an example of the barrier method of contraception. The barrier method protects against STIs and is highly effective at preventing pregnancy. The contraceptive pill is taken by females. It must be taken daily and gives no protection against STIs. It is highly effective at protecting pregnancy. |
8.2.4 Movement of Substances

How do substances move in and out of cells?

- Name one substance that moves out of a body cell.
- Name two substances that move into a body cell.
- Can substances move out of cells?
- Can substances move into cells?

- What are the three processes that occur in the cell membrane?
- What are the three processes that occur in the cell membrane?
- What are the three processes that occur in the cell membrane?

- How do substances move out of or into the cell membrane?
- How do substances move out of or into the cell membrane?
- How do substances move out of or into the cell membrane?

Key Words
- Diffusion
- Osmosis
- Active transport

Learning Objectives
- Describe the process of diffusion.
- Explain how active transport occurs.
- Describe the process of osmosis.
| Answers |
|-----------------|--------------------------------------------------------------------------------------------------|
| In-text questions | A Food particles/glucose, and oxygen  
B carbon dioxide |
| Activity         | **Stink-bomb alert!**  
In diffusion, particles travel from an area of high concentration to an area of low concentration. Initially, the smell from the stink bomb is only found in the immediate vicinity but, through diffusion, the smell will spread until the concentration of stink bomb particles becomes constant. |
| Summary questions | 1 high, low, diffusion (3 marks)  
2 The smell diffuses from an area of high concentration to one of low concentration. (3 marks)  
3 Diagram should show understanding of the following concepts (6 marks): Substances moving in and out of red blood cells through diffusion, smells diffusing across a room, water diffusing into plant cells, including the difference between a healthy plant and a wilting plant. Credit correct use of diagrams. |
What are elements?

A Name the elements in a smartphone

- Lithium (Li)
- Oxygen (O)
- Carbon (C)
- Silicon (Si)
- Copper (Cu)
- Gold (Au)

They all play a vital role in our lives, from powering our devices to ensuring our health and safety.

In your phone:

- Lithium ion batteries store energy for your smartphone.
- Copper wires transport electricity.
- Gold is used in the circuitry to facilitate signal transmission.

Learning objectives:

- Understand the importance of elements in technology and daily life.
- Recognize the role of lithium, oxygen, carbon, silicon, copper, and gold in smartphones.
- Explore how the chemical properties of these elements work together to make electronic devices function.
## Elements

| In-text questions | A Any three elements that are shown as smartphone elements  
B H, Al, Mg, Na |
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<thead>
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<tbody>
<tr>
<td>Activity</td>
<td><strong>Golden smartphones</strong></td>
</tr>
<tr>
<td></td>
<td>40 phones</td>
</tr>
<tr>
<td></td>
<td>1300 phones</td>
</tr>
</tbody>
</table>
| Summary questions | 1 Any six elements that are shown as smartphone elements, and their correct symbols. (6 marks)  
2 Elements cannot be broken down into other substances. Since the substance breaks down when electricity passes through it, it cannot be an element. (2 marks)  
3 Chemists can communicate about elements, whatever language they normally use. Chemical symbols avoid possible confusion resulting from an element having different names in different languages. (2 marks) |

## Atoms

| In-text questions | A An atom is the smallest particle of an element that can exist.  
B Gold atoms are bigger and heavier than silicon atoms. |
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<tbody>
<tr>
<td>Activity</td>
<td><strong>Going for gold</strong></td>
</tr>
<tr>
<td></td>
<td>In 1000 g of gold there are about $3 \times 10^{24}$ atoms. So in 10 g there are about $(3 \times 10^{24})/100 = 3 \times 10^{22}$ atoms.</td>
</tr>
</tbody>
</table>
| Summary questions | 1 atom, same, different (3 marks)  
2 There are three types of atoms in the medal, since there are three different elements, and each element has a different type of atom from every other element. (2 marks)  
3 Credit sensible visual summaries. Key points to include – key words, meanings of key words, examples to illustrate key words. Visual summary should be logically organised. (6 marks) |

## Compounds

| In-text questions | A A pure substance made up of atoms of two or more elements strongly joined together.  
B The boiling point of water is higher than the boiling point of hydrogen.  
C For example, sodium is silver-coloured and shiny; sodium chloride is white and not shiny. |
<table>
<thead>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Activity</td>
<td><strong>Organising ideas</strong></td>
</tr>
</tbody>
</table>
|                   | **Name of substance**  
**State at room temperature**  
**Colour**  
**Other properties** |
| sodium            | solid  
silver  
fizzes in water |
| chlorine          | gas  
green  
op poisonous and smelly |
| sodium chloride   | solid  
white  
no smell, not poisonous, does not fizz in water |
|                   | Sodium is made up of sodium atoms only, and chlorine is made up of chlorine atoms only. The compound – sodium chloride – is made up of atoms of sodium and chlorine that are joined together to make one substance. This explains why the compound has different properties from the elements it is made from. |
| Summary questions | 1 two, different to, two, strongly (4 marks)  
2 A mixture of elements. The diagram shows two types of particle, each made up of two atoms of the same element. (2 marks)  
3 The boiling point of water is higher than the boiling point of oxygen. This is because weak forces hold molecules close to each other in liquid oxygen. Stronger forces hold molecules close together in liquid water. You need to transfer more energy to water to separate the molecules from each other than to oxygen to separate oxygen molecules from each other. (3 marks)  
4 Example answers (6 marks): Water is liquid at room temperature but hydrogen and oxygen are gases. There are weaker forces holding molecules close to each other in liquid hydrogen and |
liquid oxygen than there are in liquid water. You need to transfer more energy to water to separate the molecules from each other than to hydrogen to separate hydrogen molecules from each other. You cannot see oxygen and hydrogen at room temperature but you can see water. Oxygen and hydrogen are bonded differently to water. Oxygen is only two oxygen atoms bonded together, hydrogen is only two hydrogen atoms bonded together, but water is made from oxygen and hydrogen bonded to each other. Oxygen and hydrogen are elements, water is a compound.

Chemical Formulae

| In-text questions          | A One carbon atom and two oxygen atoms  
|                           | B sodium chloride                      
|                           | C sulfur, copper, oxygen               |

| Activity                   | **What’s water?**  
|                           | Water has 2 g of hydrogen to every 16 g of oxygen.  
|                           | The ratio is mass of hydrogen : mass of oxygen  
|                           | 2 g : 16 g  
|                           | The ratio in nitrogen dioxide is  
|                           | mass of nitrogen : mass of oxygen  
|                           | 14 g : 32 g  
|                           | This is  
|                           | 7 g : 16 g  
|                           | So water has the higher proportion of oxygen. |

| Summary questions          | 1 CO₂, one, two, oxygen (4 marks)  
|                           | 2a nitrogen monoxide b nitrogen dioxide c hydrogen chloride  
|                           | d potassium hydroxide e zinc sulfate f copper carbonate (6 marks)  
|                           | 3a Two hydrogen atoms and one oxygen atom.  
|                           | b Two nitrogen atoms and four oxygen atoms.  
|                           | c One carbon atom and four hydrogen atoms. (6 marks)  
|                           | 4a A diagram of an oxygen molecule, made up of two identical circles joined together.  
|                           | b A diagram of one argon atom, consisting of one single circle.  
|                           | c A diagram of four nitrogen molecules, each made up of two identical circles joined together.  
|                           | d A diagram of one carbon dioxide molecule, made up of one circle in the centre joined to two circles that are different from the central circle, but identical to each other.  
|                           | e A diagram showing all the atoms and molecules above. (5 marks)  
|                           | 5 LiOH. The formulae of compounds shows a pattern, and this formula fits the pattern. (2 marks)  

5.4.2 The Elements of Group 1

Learning Objectives

- Describe the properties of any element of Group 1
- Describe the key points of the periodic table for Group 1 elements
- Describe trends and periodicity in the Group 1 elements

Key Words

- Alkali metals
- Group 1 elements
- Periodic table

Summary Questions

1. Why are the elements in Group 1 considered alkali metals?
2. What are the physical properties of Group 1 elements?
3. What are the chemical properties of Group 1 elements?
4. What are the trends observed in Group 1 elements across the periodic table?
Where do Noble Gases Come From?

- Noble gases are elements that do not form compounds with other substances.
- They are found in the rare gas deposits on earth.

Chemical Properties

- Noble gases do not react with other elements.
- They are used in many industries due to their unique chemical properties.

The Elements of Group 0

- Group 0 elements are called noble gases.
- They are characterized by their low reactivity and are mostly found in the atmosphere and in the interstellar space.
Relative atomic masses for Cu and Cl have not been rounded to the nearest whole number.

The lanthanides (atomic numbers 58 - 71) and the actinides (atomic numbers 90 - 103) have been omitted.

<table>
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<tr>
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<td>C</td>
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<td>132.905</td>
</tr>
<tr>
<td>Ba</td>
<td>56</td>
<td>137.33</td>
</tr>
<tr>
<td>La</td>
<td>57</td>
<td>138.91</td>
</tr>
<tr>
<td>Ce</td>
<td>58</td>
<td>140.119</td>
</tr>
<tr>
<td>Pr</td>
<td>59</td>
<td>140.908</td>
</tr>
<tr>
<td>Nd</td>
<td>60</td>
<td>144.24</td>
</tr>
<tr>
<td>Pm</td>
<td>61</td>
<td>145.00</td>
</tr>
<tr>
<td>Sm</td>
<td>62</td>
<td>150.36</td>
</tr>
<tr>
<td>Eu</td>
<td>63</td>
<td>151.964</td>
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<tr>
<td>Gd</td>
<td>64</td>
<td>157.25</td>
</tr>
<tr>
<td>Tb</td>
<td>65</td>
<td>158.932</td>
</tr>
<tr>
<td>Dy</td>
<td>66</td>
<td>162.50</td>
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<tr>
<td>Ho</td>
<td>67</td>
<td>164.93</td>
</tr>
<tr>
<td>Er</td>
<td>68</td>
<td>167.26</td>
</tr>
<tr>
<td>Tm</td>
<td>69</td>
<td>168.934</td>
</tr>
<tr>
<td>Yb</td>
<td>70</td>
<td>173.04</td>
</tr>
<tr>
<td>Lu</td>
<td>71</td>
<td>174.967</td>
</tr>
<tr>
<td>Hf</td>
<td>72</td>
<td>178.49</td>
</tr>
<tr>
<td>Ta</td>
<td>73</td>
<td>180.95</td>
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<tr>
<td>W</td>
<td>74</td>
<td>183.84</td>
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<tr>
<td>Re</td>
<td>75</td>
<td>186.21</td>
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<td>Os</td>
<td>76</td>
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<td>Ir</td>
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<td>192.22</td>
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<td>Pt</td>
<td>78</td>
<td>195.08</td>
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<tr>
<td>Au</td>
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<td>196.97</td>
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<td>Hg</td>
<td>80</td>
<td>200.59</td>
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<tr>
<td>Tl</td>
<td>81</td>
<td>204.385</td>
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<tr>
<td>Pb</td>
<td>82</td>
<td>207.2</td>
</tr>
<tr>
<td>Bi</td>
<td>83</td>
<td>208.98</td>
</tr>
<tr>
<td>Po</td>
<td>84</td>
<td>209.00</td>
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<tr>
<td>At</td>
<td>85</td>
<td>210.00</td>
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<tr>
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<td>Fr</td>
<td>87</td>
<td>223.00</td>
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<tr>
<td>Ra</td>
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<td>226.03</td>
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<tr>
<td>Ac</td>
<td>89</td>
<td>227.03</td>
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<tr>
<td>Th</td>
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<td>232.04</td>
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<td>Pa</td>
<td>91</td>
<td>231.04</td>
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<td>U</td>
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<td>Pu</td>
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<td>Am</td>
<td>95</td>
<td>243.06</td>
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<tr>
<td>Cm</td>
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<tr>
<td>Bk</td>
<td>97</td>
<td>247.07</td>
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<td>252.04</td>
</tr>
<tr>
<td>Fm</td>
<td>100</td>
<td>257.07</td>
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</table>
The Periodic Table

In-text questions

<table>
<thead>
<tr>
<th>Activity</th>
<th>Predictable patterns?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictable patterns? Credit bar charts to show atomic radii of elements in Period 2 and Period 3. For both periods, atomic radii are larger at the start of the period (Li and Na) than at the end (F and Cl). Atomic radii decrease more rapidly at the start of a period than at the end. Atomic radii for Period 3 are larger than those of Period 2.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summary questions</th>
<th>1 groups, periods, down, across left, right (6 marks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Credit suitable bar charts for density data (one for cobalt, rhodium, and iridium, and another for nickel and platinum). Credit a predicted palladium density of 9–15 g/cm³. The actual density of palladium is 10.4 g/cm³. (3 marks)</td>
<td></td>
</tr>
<tr>
<td>3 Example answers (6 marks): Vertical columns are called groups. Horizontal rows are called periods. Numerical data for one element can be predicted given data of surrounding elements. These elements can be neighbouring elements in periods or groups. Melting points increase down a group. Atomic radii decrease across a period. The density of elements increases down a group.</td>
<td></td>
</tr>
</tbody>
</table>

Elements of Group 1

In-text questions

<table>
<thead>
<tr>
<th>Activity</th>
<th>Which conclusion?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which conclusion? Credit reasonable explanations that support either Sam’s or Ben’s theory. A more detailed description of the pattern may be: The density of Group 1 metals increases down the group in a roughly linear fashion. Potassium is an anomaly because it has a smaller density than that of sodium. Densities of caesium and francium are required to understand the trend in Group 1 metal densities better.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summary questions</th>
<th>1 Any five of the following, for one mark each: From top to bottom of Group 1, boiling point decreases (1). From top to bottom of Group 1, the vigour of the reaction with water increases (1). From bottom to top of Group 1, melting point increases (1). All Group 1 elements have low densities (1). All Group 1 elements conduct electricity (1). All Group 1 elements react with water to make hydrogen and an alkaline solution (1).</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a Credit appropriate bar chart, with hardness decreasing from Li to Cs. (6 marks)</td>
<td></td>
</tr>
<tr>
<td>2b Hardness decreases down Group 1. (2 marks)</td>
<td></td>
</tr>
<tr>
<td>e 0.4, because hardness decreases by 0.1 for each element down Group 1. (2 marks)</td>
<td></td>
</tr>
<tr>
<td>3 Very vigorous reaction, which is more violent than that of potassium with water. Rubidium is below potassium in Group 1. Bright flame, bubbles of hydrogen produced as for potassium. Products are hydrogen and rubidium hydroxide. The other elements in the group also react with water to make hydrogen and a solution of a hydroxide. (6 marks)</td>
<td></td>
</tr>
<tr>
<td>4 Example answers (6 marks): Physical properties down Group 1: decreasing hardness, decreasing melting point, decreasing boiling point. Chemical properties down Group 1: increased reactivity with water.</td>
<td></td>
</tr>
</tbody>
</table>

Elements of Group 7

In-text questions

<table>
<thead>
<tr>
<th>Activity</th>
<th>A Destroy bacteria to make water safe to drink or swim in. B fluorine, chlorine, bromine, iodine, astatine C Boiling points increase down Group 7. D Reactions become less vigorous down the group.</th>
</tr>
</thead>
</table>

Activity

**Better bar charts**
Credit correctly drawn bar charts where boiling points increase down Group 7 (from F to At). Students should offer suggestions on how to improve each other’s bar charts.

Summary questions

1. Halogens, increase, less (3 marks)
2. Reactions a, c, and d will happen. In each case the Group 7 element on its own is more reactive/higher up in Group 7 than the Group 7 element in the compound. A displacement reaction occurs. (3 marks)
3. The product is iron fluoride. Products of other Group 7 elements with iron are iron chloride, iron bromide, iron iodide, so this fits the pattern. The reaction would be very vigorous, with a flame and the production of brown fumes. It is like the reaction of iron with chlorine, but more vigorous. (4 marks)
4. The halogen is below chlorine in Group 7. If it were above chlorine, it would displace chlorine from its compound, potassium chloride, so a reaction would occur. (3 marks)

Elements of Group 0

| In-text questions | A helium, neon, argon, krypton, xenon, radon
|                  | B Boiling points increase down the group.
|                  | C Unreactive means that the elements take part in very few reactions. |

Activity

**Using Group 0**
Credit suitable eye-catching and persuasive adverts about the merits of using Group 0 elements or compounds in the correct product. For example, neon in advertising signs, helium in balloons, argon as insulating gas between the layers in double glazing, or krypton in lasers.

Summary questions

1. The noble gases are all in Group 0 of the Periodic Table. The element at the top of the group is helium. The noble gases are non-metals. They have very few reactions. From bottom to top of the group, boiling point decreases. (5 marks)
2. Melting point increases down Group 0. Credit predictions for the melting point of argon between –180 and –220 °C. (The melting point of argon is –189.4 °C.) (2 marks)
3. In Group 7 the boiling points increase from top to bottom of the group. This is the same as for Group 0, in which the boiling points also increase from top to bottom of the group. The highest boiling point for a Group 7 element is greater than the highest boiling point for a Group 0 element. (4 marks)
Section C: State the units of Force

- A student is balancing the books with a force of 5 N.

- An object is attached to a spring balance with a force of 10 N.

Summary Questions

1. What are the units of force?
2. How do you measure force?

Key Words

- Newton (N)
- Force
- Measurement

Learning Objectives

- Describe the difference between a contact force and a non-contact force.
- Describe how to measure force using a spring balance.
- Explain how to calculate the force acting on an object.

Introduction to Forces

- Force is a push or a pull that acts on an object.
- There are different types of forces:
  - Contact forces
  - Non-contact forces

Introduction to Forces

- Force is measured in Newtons (N).
- A force of 10 N is stronger than a force of 5 N.

Learning Objectives

- Describe the difference between a contact force and a non-contact force.
- Explain how to measure force using a spring balance.

What does a doctor do?

- Doctor's are medical professionals who diagnose and treat diseases.
- They use diagnostic tools to identify health issues and prescribe treatments.

Learning Objectives

- Describe what a doctor does.
- Explain how doctors work with patients.

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T.1.2 Balanced and unbalanced

Balanced forces

A force is balanced when the forces acting on the object cancel each other out. The object will remain at rest or move at a constant speed in a straight line.

Unbalanced forces

A force is unbalanced when the forces acting on the object do not cancel each other out. The object will accelerate or decelerate.

Key Words

- Balanced
- Unbalanced
- Force
- Acceleration
- Deceleration

Summary

1. What are balanced forces?
   - Balanced forces are forces that act in opposite directions and cancel each other out.
2. What are unbalanced forces?
   - Unbalanced forces are forces that do not act in opposite directions and do not cancel each other out.

Practice

- Identify the balanced and unbalanced forces in the following images.
- Explain how the forces in each image affect the motion of the object.
**Summary Questions**

1. What is gravity?
2. What are the effects of gravity on the Earth and Moon?
3. How does gravity affect the path of objects in space?
4. What causes the gravitational attraction between objects?

**Key Words**

- Mass
- Weight
- Force
- Gravitational force
- Acceleration due to gravity

**Learning Objectives**

- Define gravity and its role in our solar system.
- Explain the relationship between mass and weight.
- Understand how gravity affects motion in space.
- Explore the effects of gravity on different planets.

**Focus Fields**

A point mass is a point object with no size or shape.

**Example**

1. **What is gravity?**
   - Gravity is the force that attracts two bodies with mass for each other.

2. **How does gravity affect the path of objects in space?**
   - Objects in space follow curved paths due to gravitational forces.

3. **What are the effects of gravity on the Earth and Moon?**
   - Gravity causes the Earth and Moon to orbit each other.

4. **What is the difference between mass and weight?**
   - Mass is a measure of the amount of matter in an object, while weight is the force due to gravity on an object.
**Answers**

**Introduction to Forces**

| In-text questions | A Forces change the shape, speed, or direction of motion.  
|                   | B For a contact force to act the objects have to be touching (e.g., the air and a car for air resistance) but non-contact forces act at a distance.  
|                   | C newtons |

| Summary questions | 1 push, pull, arrows, interaction, newtonmeter (5 marks)  
|                  | 2 The force of the Earth on the apple AND the force of the apple on the Earth OR the force of the tree on the apple AND the force of the apple on the tree. (2 marks)  
|                  | 3 Extended response question. Example answers (6 marks):  
|                  | The Earth exerts a force on you.  
|                  | You exert a force on the Earth.  
|                  | The chair exerts a force on you.  
|                  | You exert a force on the chair.  
|                  | These are two interaction pairs.  
|                  | The two forces acting on you are from two different interaction pairs.  
|                  | This means one can be bigger than the other. |

**Balanced and Unbalanced Forces**

| In-text questions | A An object is in equilibrium of the forces on it are balanced, or if the resultant force is zero.  
|                  | B Zero  
|                  | C Balanced forces cancel out/are equal in size and opposite in direction.  
|                  | Unbalanced forces are not of equal size/direction/do not cancel out. |

| Summary questions | 1 size, opposite/opposing, equilibrium, balanced unbalanced, direction (6 marks)  
|                  | 2a Force diagram with an arrow showing that the resistive force is smaller than the driving force. (1 mark)  
|                  | b Arrow pointing backwards labelled resistive, arrow pointing forwards labelled driving. (1 mark)  
|                  | c She continues to speed up but not as much, until she moves at a steady speed because the forces are balanced. (3 marks)  
|                  | 3 The newtonmeter reads zero. (1 mark)  
|                  | The resultant force on the spring inside the newtonmeter is zero. (1 mark)  
|                  | For the reading to be bigger than zero, the Earth and the diver have to exert forces in opposite directions. (1 mark) |

**Gravity**

| In-text questions | A masses of both bodies, distance between the bodies  
|                  | B A field is a region in which certain objects experience a force. The object does not need to be touching anything to experience this force.  
|                  | C The force on 1 kg in a gravitational field.  
|                  | D The Sun exerts a gravitational force on the Earth. |

| Activity | Units of mass a 2000 g b 3500 g c 400 g d 4.7 kg e 0.25 kg |

| Summary questions | 1 mass, force, newtons, mass, kilograms (5 marks)  
|                  | 2 weight = mass x gravitational field strength (1 mark)  
|                  | = 60 kg x 27 N/kg (1 mark) = 1620 N (1 mark)  
|                  | 3a As the distance increases the force of gravity decreases. (1 mark)  
|                  | b As the mass increases the force of gravity increases. (1 mark)  
|                  | 4 Example answers (6 marks):  
|                  | Because the gravitational field strength is less, objects will travel further before they hit the ground. As such, events that involve throwing something a distance would produce new records; such as javelin/shot put/hammer throw. Because the gravitational field strength is less, events that involve lifting things would also produce new records as mass would weigh less on the Moon than it did on Earth; such as weightlifting. |
# Friction and Drag

## In-text questions

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>A rough</td>
<td></td>
</tr>
<tr>
<td>B Diagram of stone with force arrow labelled gravity going downwards, and force arrow labelled water resistance going upwards.</td>
<td></td>
</tr>
<tr>
<td>C moves with a steady speed or remains stationary</td>
<td></td>
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</tbody>
</table>

## Activity

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Testing a parachute</strong></td>
<td></td>
</tr>
<tr>
<td>Keep these things the same: the weight of the object beneath the parachute, the area of the parachute, and the thickness of the material.</td>
<td></td>
</tr>
</tbody>
</table>

## Summary questions

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 friction, rough, force, air resistance, water resistance, air/gas, water (7 marks)</td>
<td></td>
</tr>
<tr>
<td>2 type of surface, weight of object (2 marks)</td>
<td></td>
</tr>
<tr>
<td>3a The drag cancels out the weight of the bird. (1 mark)</td>
<td></td>
</tr>
<tr>
<td>The bird travels at a steady speed through the water. (1 mark)</td>
<td></td>
</tr>
<tr>
<td>b Diagram showing downwards force on bird, labelled weight. (1 mark)</td>
<td></td>
</tr>
<tr>
<td>Upwards forces, labelled drag. (1 mark)</td>
<td></td>
</tr>
<tr>
<td>4 Example answers (6 marks):</td>
<td></td>
</tr>
<tr>
<td>Air resistance depends on area. Bigger area means that more molecules hit the parachute. The air resistance is bigger with a bigger parachute. Air resistance depends on speed. Bigger speed means that more molecules hit the parachute. The air resistance is bigger with a bigger speed. The biggest air resistance will act on a large parachute attached to a fast car.</td>
<td></td>
</tr>
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</table>
Chapter 13: Contract Forces

Topic 13.1: Contract Forces

3. **Statics**
   - The free body diagram for a body in static equilibrium must satisfy the conditions:
   - The net force acting on the body is zero.
   - The net torque acting on the body is zero.

2. **Dynamics**
   - Forces are vectors, and their effects are described by their magnitude and direction.
   - The net force on a body is the vector sum of all the forces acting on it.

1. **Equilibrium**
   - A body is in equilibrium if the net force and net torque acting on it are both zero.

### Summary Questions

- How do you determine the forces acting on a body in static equilibrium?
- What is the significance of the force diagram in the context of static equilibrium?
- How do you calculate the net force and net torque for a body in equilibrium?

### Learning Objectives

- **Key Words**
  - Statics
  - Dynamics

- **Link**
  - Force diagrams
  - Equilibrium conditions

- **Practice Problems**
  - Statics application problems
  - Dynamics problem sets

---

**Key Words**

- Statics
- Dynamics
- Force diagrams
- Equilibrium conditions

**Learning Objectives**

- **Understanding Contract Forces**
  - Recognize the forces acting on a body in equilibrium.
  - Apply the principles of statics and dynamics to solve problems.

- **Analyzing Problems**
  - Use force diagram and equations of motion to analyze static equilibrium.

- **Solving Equations**
  - Solve for unknown forces using the equilibrium conditions.
Summary Questions

1. What is a moment in a force system?
2. How do you determine the moment of a force about a point?
3. What is the law of moments?

1.3.3 Turning Forces

A force that turns an object is called a moment.

Measuring a moment in a system means finding the turning effect of a force on an object.

1. Calculate the moment of a force.
2. Describe what is meant by a turning force.

A light pole was a long pole to help him to balance.
### Answers

#### Squashing and Stretching

<table>
<thead>
<tr>
<th>In-text questions</th>
<th>Activity</th>
<th>Summary questions</th>
</tr>
</thead>
</table>
| A The shape of the tennis ball changes/is deformed.  
B It gets longer, then shorter. | **A straight-line graph**  
When the force is 3 N the extension is 6 cm and when the force is 6 N the extension is 12 cm. This shows that if you double the force the extension doubles.  
The spring obeys Hooke’s Law.  
**How long**  
The extension = 6 cm – 4 cm = 2 cm  
If you doubled the force the extension would be 4 cm. | 1 deform, particles, push, support, reaction, compress, stretch (7 marks)  
2 It doubles. The extension is proportional to the force. (2 marks)  
3 Example answers (6 marks):  
The spring obeys Hooke’s Law. There is a linear relationship between force and extension. If you double the force on the spring the extension will double. The relationship between force and extension for polythene is not linear. The polythene does not obey Hooke’s Law. So doubling the force on the polythene means the extension may be more or less than double. |

#### Turning Forces

<table>
<thead>
<tr>
<th>In-text questions</th>
<th>Activity</th>
<th>Summary questions</th>
</tr>
</thead>
</table>
| A newton metre (Nm)  
B An object is in equilibrium if the total anticlockwise moments equal the total clockwise moments.  
C The point through which all the weight of an object seems to act. | **Sitting on a see-saw**  
If the child sits on one end she is 1 m from the pivot.  
Clockwise moment = 150 N × 1 m = 150 Nm  
You need the anticlockwise moment to be the same:  
600 N × distance from the pivot = 150 Nm  
Distance from the pivot = \[
\frac{150 \text{ Nm}}{600 \text{ N}} = 0.25 \text{ m}
\] | 1 turning, force, distance, equilibrium, law, weight, gravity (7 marks)  
2 moment = force × distance, so 5 N × 0.75 m = 3.75 Nm (2 marks)  
3 Example answers (6 marks):  
A ruler or beam that you hang things from, or something that can balance.  
A system of adding things to one side or the other.  
An explanation of what is meant by a moment.  
An explanation of the law of moments.  
A scoring system that uses the law of moments, for example, predicting where you have to put something before you add it.  
An element of skill in terms of the items you can hang, or where you can put them. |