

Science

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Changes and Amendments 2022

1. Practicals can be taught by teacher demonstrations or simulations.
2. Advance information on exams will be available
 1. To help students focus their exam preparation, there will be advance information on what exams will cover.
 2. This advance information will be available by 7 February 2022, or sooner if the pandemic worsens.
3. Revised physics equation sheet
 - There will be a revised equation sheet for the GCSE Physics exam in Summer 2022 which will cover all the equations required in the subject content.
 - AQA are looking into its design and considering the implications for question papers and mark schemes.

Exams



Biology Paper 1

1 hr 45, 100 marks
F or H

Chemistry Paper 1

1 hr 45, 100 marks
F or H

Physics Paper 1

1 hr 45, 100 marks
F or H

Biology Paper 1

1 hr 15, 70 marks
F or H

Biology Paper 2

1 hr 15, 70 marks
F or H

Biology Paper 2

1 hr 45, 100 marks
F or H

Chemistry Paper 2

1 hr 45, 100 marks
F or H

Physics Paper 2

1 hr 45, 100 marks
F or H

Chemistry Paper 1

1 hr 15, 70 marks
F or H

Chemistry Paper 2

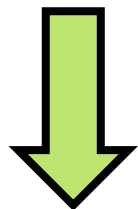
1 hr 15, 70 marks
F or H

Physics Paper 1

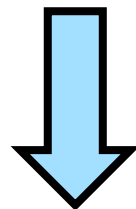
1 hr 15, 70 marks
F or H

Physics Paper 2

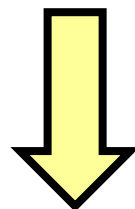
1 hr 15, 70 marks
F or H



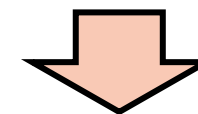
GCSE BIOLOGY



**GCSE
CHEMISTRY**



GCSE PHYSICS



**GCSE
COMBINED
SCIENCE**

ASPIRE • BELIEVE • ACHIEVE

Top Tips for Science Revision

1. Start early – there is a lot of content to cover!
2. Divide time between Biology, Chemistry and Physics – doesn't have to be equal. Make a revision timetable.
3. Remember that revision is an ***active*** process – you will need to do more than read through information!
4. Learn the key ideas – you can gain up to a grade 4 with just recall of information.
5. Familiarise yourself the physics equations ***and their units***.
6. Don't forget the required practicals.

Science Revision sources

1. AQA past papers
2. Seneca online question bank
3. Revision guides
4. GCSE Bitesize online revision
5. YouTube videos – e.g. Cognito, Malmesbury Education



Find past papers and mark schemes for your exams, and specimen papers for new courses.

Find papers

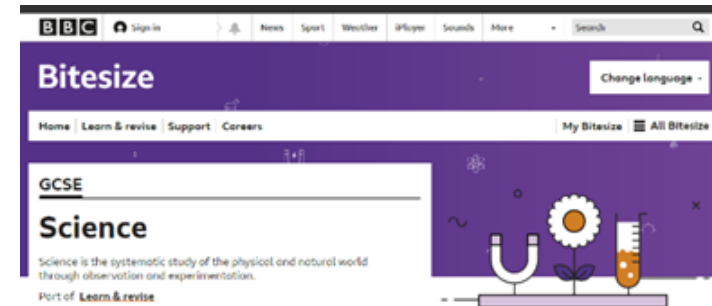
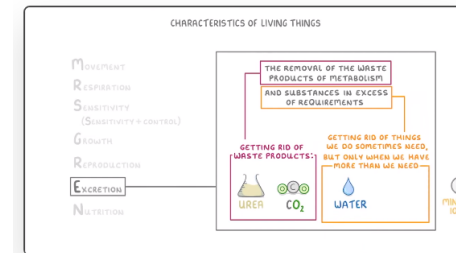


Subject

Qualification

Specification

Series




ASPIRE ♦ BELIEVE ♦ ACHIEVE

Using your revision guides

- The revision guides are organised into three sections:
 - Knowledge
 - Retrieval
 - Practice
- The last two sections are the most important. This revision guide is not something for you to passively highlight, but a resource that helps you to actively work at revision.

Contents

 Knowledge

 Retrieval

 Practice









Shade in each level of the circle as you feel more confident and ready for your exam.







How to use this book

iv







B1 Cell biology 2

-  Knowledge 
-  Retrieval 
-  Practice 







B2 Cell transport 12

-  Knowledge 
-  Retrieval 
-  Practice 







B3 Cell division 24

-  Knowledge 
-  Retrieval 
-  Practice 







B4 Organisation in animals 34

-  Knowledge 
-  Retrieval 
-  Practice 







B5 Enzymes 46

-  Knowledge 
-  Retrieval 
-  Practice 







B6 Organisation in plants 60

-  Knowledge 
-  Retrieval 
-  Practice 







B7 The spread of diseases 72

-  Knowledge 
-  Retrieval 
-  Practice 







B8 Preventing and treating disease 84

-  Knowledge 
-  Retrieval 
-  Practice 







B9 Monoclonal antibodies 96

-  Knowledge 
-  Retrieval 
-  Practice 







B10 Non-communicable diseases 106

-  Knowledge 
-  Retrieval 
-  Practice 







B11 Photosynthesis 118

-  Knowledge 
-  Retrieval 
-  Practice 







B12 Respiration 130

-  Knowledge 
-  Retrieval 
-  Practice 







B13 Nervous system & homeostasis 142

-  Knowledge 
-  Retrieval 
-  Practice 







B14 Hormonal coordination 156

-  Knowledge 
-  Retrieval 
-  Practice 







B15 Variation 168

-  Knowledge 
-  Retrieval 
-  Practice 







B16 Reproduction 180

-  Knowledge 
-  Retrieval 
-  Practice 







B17 Evolution 194

-  Knowledge 
-  Retrieval 
-  Practice 







B18 Adaptation 208

-  Knowledge 
-  Retrieval 
-  Practice 

B19 Organising an ecosystem 220

-  Knowledge 
-  Retrieval 
-  Practice 

B20 Humans and biodiversity 232

-  Knowledge 
-  Retrieval 
-  Practice 

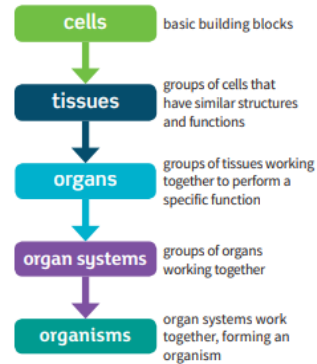
Track your revision progress by shading the circles.

*Have you revised this section?
How confident do you feel?*

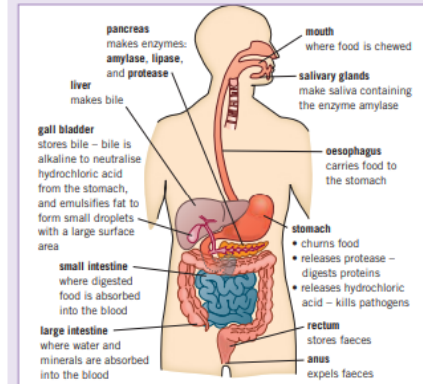


B4 Organisation in animals

There are five **levels of organisation** in living organisms:



Digestive system



Blood vessels

The structure of each blood vessel relates to its functions.

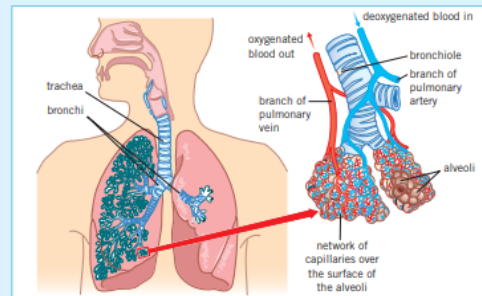
Vessel	Function	Structure	Diagram
artery	carries blood away from the heart (high pressure)	<ul style="list-style-type: none"> thick, muscular, and elastic walls the walls can stretch and withstand high pressure small lumen 	
vein	carries blood to the heart (low pressure)	<ul style="list-style-type: none"> have valves to stop blood flowing the wrong way thin walls large lumen 	
capillary	<ul style="list-style-type: none"> carries blood to tissues and cells connects arteries and veins 	<ul style="list-style-type: none"> one cell thick – short diffusion distance for substances to move between the blood and tissues (e.g., oxygen into cells and carbon dioxide out) very narrow lumen 	

Lungs

When breathing in, air moves

- 1 into the body through the mouth and nose
- 2 down the trachea
- 3 into the **bronchi**
- 4 through the **bronchioles**
- 5 into the **alveoli** (air sacs).

Oxygen then diffuses into the blood in the network of **capillaries** over the surface of the alveoli.



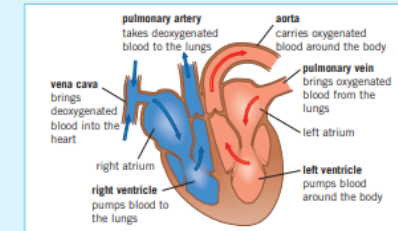
The circulatory system

blood is a tissue made up of four main components

- red blood cells – bind to oxygen and transport it around the body
- plasma – transports substances and blood cells around the body
- platelets – form blood clots to create barriers to infections
- white blood cells – part of the immune system to defend the body against pathogens

The heart

The heart is the organ that pumps blood around your body. It is made from **cardiac** muscle tissue, which is supplied with oxygen by the **coronary artery**.

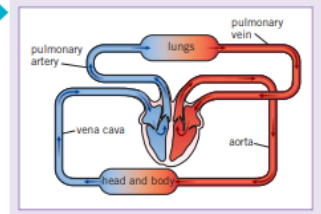


Heart rate is controlled by a group of cells in the right atrium that generate electrical impulses, acting as a pacemaker. Artificial pacemakers can be used to control irregular heartbeats.

Double circulatory system

The human circulatory system is described as a **double circulatory system** because blood passes through the heart twice for every circuit around the body:

- the right ventricle pumps blood to the lungs where gas exchange takes place
- the left ventricle pumps blood around the rest of the body.



Key terms

Make sure you can write a definition for these key terms.

alveoli amylase aorta artery atrium bronchi bronchiole capillary cardiac
coronary double circulatory system lipase organ organ system plasma platelet
protease pulmonary tissue vein vena cava ventricle

Read through the revision organisers.

Pay particular attention to any 'learn' symbols, exam tips and the key words.

Using correct scientific language is vital!



Retrieval



Learn the answers to the questions below, then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

B4 questions

Answers

1	Name the five levels of organisation.	cells → tissues → organs → organ systems → organisms
2	What is a tissue?	group of cells with similar structures and functions
3	What is an organ?	group of tissues working together to perform a specific function
4	What is the function of the liver in digestion?	produces bile, which neutralises hydrochloric acid from the stomach and emulsifies fat to form small droplets with a large surface area
5	What is the function of saliva in digestion?	lubrication to help swallowing – contains amylase to break down starch
6	Name three enzymes produced in the pancreas.	amylase, protease, lipase
7	Name the four main components of blood.	red blood cells, white blood cells, plasma, platelets
8	What is the function of platelets?	form blood clots – prevent the loss of blood and stop wounds becoming infected
9	Describe three adaptations of a red blood cell.	<ul style="list-style-type: none"> • bi-concave disc shape – large surface area-to-volume ratio for diffusion of oxygen • contains haemoglobin – binds to oxygen • no nucleus – more space for oxygen
10	How do white blood cells protect the body?	<ul style="list-style-type: none"> • engulf pathogens • produce antitoxins to neutralise toxins, or antibodies
11	Name the substances transported in the blood plasma.	hormones, proteins, urea, carbon dioxide, glucose
12	Why is the human circulatory system a double circulatory system?	blood passes through the heart twice for every circuit around the body – deoxygenated blood is pumped from the right side of the heart to the lungs, and the oxygenated blood that returns is pumped from the left side of the heart to the body
13	How does the structure of an artery relate to its function?	carries blood away from the heart under high pressure – has a small lumen and thick, elasticated walls that can stretch
14	How does the structure of a vein relate to its function?	carries blood back to the heart at low pressure – doesn't need thick, elasticated walls, but has valves to prevent blood flowing the wrong way
15	How does the structure of a capillary relate to its function?	carries blood to cells and tissues – has a one-cell-thick wall to provide a short diffusion distance
16	List the structures air passes through when breathing in.	mouth/nose → trachea → bronchi → bronchioles → alveoli

Now go back and use the questions below to check your knowledge from previous chapters.

Previous questions

Answers

1	What is the purpose of active transport in the small intestine?	sugars can be absorbed when the concentration of sugar in the small intestine is lower than the concentration of sugar in the blood
2	What is therapeutic cloning?	patient's cells are used to create an early embryo clone of themselves – stem cells from the embryo can then be used to treat the patient's medical conditions
3	What is a stem cell?	undifferentiated cell that can differentiate into one or more specialised cell types
4	Give one disadvantage of using plant meristems to clone plants.	no genetic variation, so, for example, an entire cloned crop could be destroyed by a disease
5	What is active transport?	movement of particles against a concentration gradient – from a dilute solution to a more concentrated solution – using energy from respiration



Required Practical Skills

Practise answering questions on the required practicals using the example below. You need to be able to apply your skills and knowledge to other practicals too.

Food tests	Worked Example	Practice
<p>There are different ways to test for four different compounds found in food:</p> <ul style="list-style-type: none"> • ethanol test for lipids (fats) – colour change from colourless to cloudy if present • Benedict's test for sugars – colour change from blue to red if present • iodine test for starch (carbohydrates) – colour change from brown to blue-black if present • Biuret reagent test for protein – colour change from blue to purple if present. <p>You need to be able to identify and describe the correct method, and results, for each test.</p>	<p>A student wanted to test a sample for the presence of protein using Biuret reagent. Write a risk assessment for this activity.</p> <p>Answer:</p> <p>Write down general safety practices in labs:</p> <ul style="list-style-type: none"> • wear goggles to protect your eyes • wash hands at the end of the practical • clear up any spills quickly • do not eat any of the food <p>Write down what things could hurt you in the practical, and how they could hurt you:</p> <ul style="list-style-type: none"> • Biuret reagent – irritant • glass – can break • pipette – can poke you in the eyes <p>Write down how you can prevent these hurting you:</p> <ul style="list-style-type: none"> • wash hands after touching Biuret reagent, do not eat in the lab, and if ingested or it gets into the eyes inform the teacher immediately • if glass is broken inform a teacher immediately • point pipettes downwards 	<p>1 A student picked up solution A and added it to a sample of food. Solution A was blue and turned purple after adding to the food. Name solution A, and identify the food present in the sample.</p> <p>2 Benedict's test for sugar requires the solution to be heated. One way to do this is heating the test tube in a beaker of water using a Bunsen burner. Give an alternative method of heating the solution.</p> <p>3 When testing a sample for protein in a test tube, a student found that the top of the sample tested positive whereas the bottom did not. Give the reason for this result.</p>

Use the retrieval section to check your knowledge.

Cover up the 'answers' with a piece of paper and write yours down from memory. Check back and see how many you got correct. Repeat until you have all the knowledge memorised.

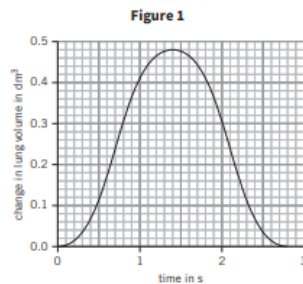


Practice

Exam-style questions

- 01** The events that occur during one breath – one inhalation and one exhalation – are known as one respiratory cycle.

Figure 1 shows change in the volume of the lungs in one respiratory cycle. The data were taken when the person was resting.



Exam Tip

Draw lines on the graph to help you work it out!

- 01.1** Use **Figure 1** to determine the volume of air taken in when the person inhales. **[1 mark]**

_____ dm³

- 01.2** The person's total lung volume after inhalation was 6.00 dm³. Calculate their total lung volume after exhalation. **[2 marks]**

_____ dm³

- 01.3** Calculate how many respiratory cycles will take place in one minute. Give your answer to **two** significant figures. **[3 marks]**

_____ per minute

- 01.4** Explain how the structures in the chest cavity cause the changes in lung volume shown between 0 s and 1 s. **[4 marks]**

- 01.5** A doctor measured another person's resting respiratory cycle. This person had 25 respiratory cycles per minute. Suggest and explain **one** possible cause of this difference. **[2 marks]**

- 02** A student carried out a number of food tests on an unknown sample. Their results are shown in **Table 1**.

Table 1

Reagent used	Result
iodine	yellow-orange
Benedict's solution	blue
Biuret reagent	purple
ethanol	cloudy white layer formed

- 02.1** Suggest and explain **one** safety precaution that the student should have taken when using the Biuret reagent. **[2 marks]**

- 02.2** Identify which of the following statements is a correct description of the student's findings. **[1 mark]**

Tick **one** box.

The food sample contains starch, protein, and fat.

☐

The food sample contains starch and sugar.

☐

The food sample contains fat and protein.

☐

The food sample contains fat and sugar.

☐

Exam Tip

An 'explain' question, wants to know why things are happening.

Exam Tip

'Suggest and explain' means you need to say *what* you think will happen and *why*.

Exam Tip

The question has asked for a specific safety precaution when using Biuret reagent, so a general safety measure isn't going to get the marks!

Attempt all the practice questions, then check your answers using the weblink.

Have you memorised the key ideas?

Can you apply this knowledge to new situations?

Can you interpret data and make conclusions?

Can you perform the required calculations?


Using past papers effectively

- Answer the questions; if you can't do it move on – it isn't a test.
- Use the mark scheme to correct your answers.
- Review what you needed to know to answer the questions and record these on a crib sheet.
- Next time you come to revise/practise more exam questions, start by looking at the crib sheet – it will remind you what you need to know.

1. Answer an exam question

03 Figure 5 shows a girl skateboarding on a semi-circular ramp.

Figure 5



The girl has a mass of 50 kg

03.1 Calculate the gravitational potential energy (g.p.e.) of the girl at the top of the ramp.

Use the equation:

$$\text{g.p.e.} = \text{mass} \times \text{gravitational field strength} \times \text{height}$$

gravitational field strength = 9.8 N/kg

[2 marks]

g.p.e. = _____ J

03.2 The girl has a speed of 7 m/s at the bottom of the ramp.

Calculate the kinetic energy of the girl at the bottom of the ramp.

Use the equation:

$$\text{kinetic energy} = 0.5 \times \text{mass} \times (\text{speed})^2$$

[2 marks]

Kinetic energy = _____ J

2. Mark the question using the mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	$E_p = 50 \times 9.8 \times 4.0$ $E_p = 1960 \text{ (J)}$	an answer of 1960 scores 2 marks allow an answer rounded to 2000 (J) allow a maximum of 1 mark if $g = 10 \text{ N/kg}$ is used	1 1	AO2 6.1.1.2
03.2	$E_k = 0.5 \times 50 \times 7^2$ $E_k = 1225 \text{ (J)}$	an answer of 1225 scores 2 marks allow 1200 or 1230 (J)	1 1	AO2 6.1.1.2

3. Review what you need to know for next time

Topic:	Equations/Calculations:
Key facts:	
	Diagrams:
	Topic links:

Exam tips

1. Basic equipment – black pens, pencils, eraser, ruler with mm scale
2. Calculator – always needed.
3. Read questions twice before answering. Don't ignore information in diagrams or text.
4. Check command words carefully – especially describe/explain and for 'multiple choice' .
5. BUG the questions
6. Questions can be answered in any order, but always read each one from the start.

Useful Websites



- AQA past papers: <https://www.aqa.org.uk/find-past-papers-and-mark-schemes>
- Cognito science revision videos and resources: <https://cognitoedu.org/home.html>
- Malmesbury Education - Required practicals: https://www.youtube.com/playlist?list=PLAd0MSIZBSsF3vV_uxzbcNHuDrQ6Hc-UI