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There's a lot to learn for Edexcel's Grade 9-1 GCSE Combined Science exams... sometimes it can be hard to get motivated for a big revision session.

That's why we've made this fantastic book — it's brimming with bite-sized tests covering every topic from the Foundation Level course. And since they only take ten minutes each, they won't take over your life (unless you're really keen).

To round things off, all the answers are included at the back, along with a chart to keep track of your marks. It's a brilliant revision companion!

CGP — still the best ☺

Our sole aim here at CGP is to produce the highest quality books — carefully written, immaculately presented and dangerously close to being funny.

Then we work our socks off to get them out to you — at the cheapest possible prices.

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Published by CGP

Editors:
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ISBN: 978 1 78908 074 2

With thanks to Susan Alexander, Mark Edwards, Glenn Rogers, Camilla Simson, Jamie Sinclair and Karen Wells for the proofreading.

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Printed by Elanders Ltd, Newcastle upon Tyne

Based on the classic CGP style created by Richard Parsons.

Test 1: Key Concepts in Biology

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Which of these parts is **not** found in a bacterial cell?

A Nucleus

B Cell membrane

C Ribosomes

[1]

2. Perfume particles spread out in the air by...

A ... active transport.

B ... osmosis.

C ... diffusion.

[1]

3. Chloroplasts...

A ... strengthen a plant cell.

B ... store all the genetic material of a cell.

C ... absorb light energy to make glucose.

[1]

4. True or False? "If the concentration of the solution inside a cell is higher than outside the cell, water will move into the cell."

A True

B False

[1]

5. When using a light microscope to view a slide, which lens should be selected to start with?

A Lowest-powered objective lens

B Highest-powered objective lens

[1]

6. At 37 °C, amylase took 40 seconds to break down all of the starch in a solution. What was the rate of reaction?

A $0.04\ s^{-1}$

B $25\ s^{-1}$

[1]

7. Why is the shape of an enzyme important for its function?

A So that it can enter the cells of the body.

B So that it fits the substance involved in the reaction it is catalysing.

[1]

8. Proteases catalyse the breakdown of...

A ... lipids into glycerol.

B ... proteins into amino acids.

C ... carbohydrates into simple sugars.

[1]

9. Give **one** factor that affects enzyme activity.

.....

[1]

10. What is the role of lipase enzymes?

.....

.....

[1]

11. The structure of the egg cell membrane changes after fertilisation.
How does this affect sperm cells?

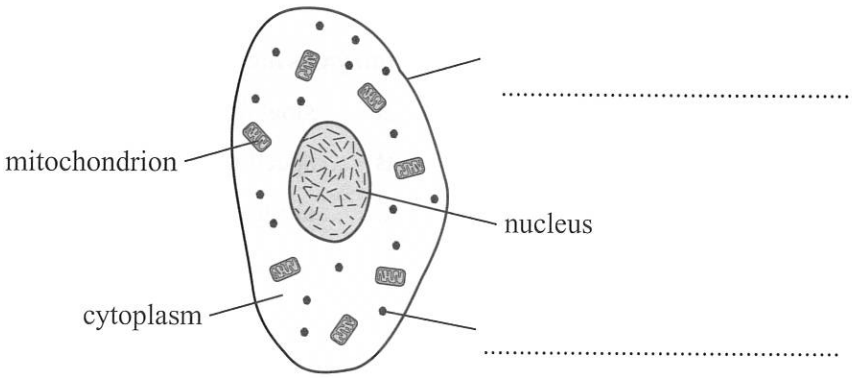
.....

Why is this important for the fertilised cell?

.....

[2]

12. Complete this diagram of an animal cell.



What role do mitochondria have in the cell?

.....

.....

[3]

15

Test 2: Key Concepts in Biology

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Diffusion is where particles spread out from...

A ... an area of lower concentration to an area of higher concentration.

B ... an area of higher concentration to an area of lower concentration.

[1]

2. What is a vacuole?

A The space in a plant cell which is filled with cell sap.

B The space in a plant cell which contains chlorophyll.

[1]

3. Which of the following is a function of plant cell walls?

A To carry out protein synthesis.

B To strengthen and support the cell.

[1]

4. A ribosome is 0.000021 mm in diameter. What is the diameter in nanometres?

A 2100 nm

B 210 nm

C 21 nm

[1]

5. True or False? "An increase in pH will always increase enzyme activity."

A True

B False

[1]

6. Enzymes are biological catalysts that...

A ... slow down reactions in the body.

B ... speed up reactions in the body.

C ... are used up in reactions in the body.

[1]

7. What is the function of cilia on ciliated epithelial cells?

A Producing chemicals that kill bacteria.

B Moving substances along the surface of the tissue.

[1]

8. Which type of microscope has a higher magnification?

A Electron microscope

B Light microscope

[1]

9. Give **one** way in which a sperm cell is adapted to carry out its function.

.....

[1]

10. Give **one** benefit of viewing cells with an electron microscope rather than a light microscope.

.....

.....

[1]

11. What is the function of a flagellum?

.....

[1]

12. What is active transport?

.....

.....

.....

[2]

13. What happens to the active site of an enzyme if it is 'denatured'?

.....

Explain how this affects how well the enzyme works.

.....

.....

[2]

15

Test 3: Cells and Control

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Which is the correct pathway for stimuli along a reflex arc?

A relay neurone → sensory neurone → motor neurone

B sensory neurone → relay neurone → motor neurone

[1]

2. A baby in the 25th percentile for weight is heavier than...

A ... 25% of babies of the same age.

B ... 75% of babies of the same age.

[1]

3. What happens inside a cell during the interphase stage of mitosis?

A The number of subcellular structures increases.

B The cytoplasm divides.

[1]

4. Plants grow via the processes of...

A ... cell division and cell elongation only.

B ... cell division, cell differentiation and cell elongation.

[1]

5. Which of the following diseases is caused by uncontrolled cell division?

A Cardiovascular disease

B Cancer

C Cholera

[1]

6. True or False? "Mitosis results in two cells that are genetically different."

A True

B False

[1]

7. What is a cell called when it has differentiated?

A A specialised cell.

B An unspecialised cell.

C A stem cell.

[1]

8. What is the central nervous system made up of?

A The brain and receptors

B The spinal cord and receptors

C The brain and the spinal cord

[1]

9. What type of stem cell can differentiate into any kind of cell?

.....

[1]

10. What type of neurone carries impulses from receptors to the central nervous system?

.....

What is the role of a receptor in the nervous system?

.....

[2]

11. Give **two** uses of mitosis in multicellular organisms.

1. .....

2. .....

[2]

12. Describe how electrical impulses are transferred across synapses.

.....

.....

.....

[2]

15

Test 4: Genetics

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. What effect do mutations have on variation?

A They decrease it.

B They increase it.

C There is no effect.

[1]

2. True or False? "Some gametes are genetically identical to each other."

A True

B False

[1]

3. What sex chromosomes does someone who is biologically male have?

A XY

B XXX

C XX

[1]

4. True or False? "A mutation always has an effect on a species."

A True

B False

[1]

5. What structure does DNA have?

A A long, single, straight chain

B A triple helix structure

C A double helix structure

[1]

6. What is an organism's genotype?

A The characteristics that the organism has.

B The alleles that the organism has.

[1]

7. Complementary base pairing means that in DNA...

A ... A always pairs with T and C always pairs with G.

B ... A always pairs with C and G always pairs with T.

[1]

8. Which of the following describes an organism that has two different alleles for a trait.

A Homozygous

B Heterozygous

C Haploid

[1]

9. What is the meant by 'the human genome'?

.....

[1]

10. What is environmental variation?

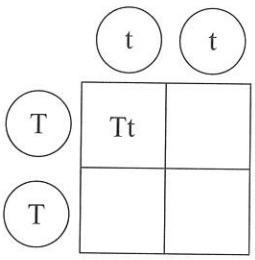
.....

.....

[1]

11. The allele for a tall pea plant is 'T'. The allele for a dwarf pea plant is 't'.
A pea plant with the alleles TT is crossed with a pea plant with the alleles tt.

The Punnett square for this cross is shown below.
Fill in the missing squares in the Punnett square.



[2]

12. Name the **three** parts of a nucleotide.

1. .....

2. .....

3. .....

[3]

15

Test 5: Natural Selection & Genetic Modification

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "It's completely random which organisms survive and pass on their genes to the next generation."

A True

B False

[1]

2. True or False? "The spread of antibiotic resistance provides evidence for evolution."

A True

B False

[1]

3. If a farmer wants to increase the meat yield of his cattle, he would breed from...

A ... the biggest cows.

B ... the cows that produce the most milk.

[1]

4. The three domain system is made up of which three domains?

A Plants, Animals and Fungi

B Eukarya, Archaea and Bacteria

C Eukarya, Prokaryotes and Protists

[1]

5. How old is the fossil hominid 'Ardi'?

A 1.6 million years old

B 3.2 thousand years old

C 4.4 million years old

[1]

6. True or False? "Selective breeding can happen without humans carrying it out."

A True

B False

[1]

7. The five kingdom classification system is made up of which five kingdoms?

A Animals, Plants, Insects, Bacteria and Eukaryotes

B Animals, Plants, Fungi, Prokaryotes and Protists

[1]

8. Stone tools provide evidence for the evolution of...

A ... antibiotic resistance in bacteria.

B ... leg length in humans.

C ... the size of human brains.

[1]

9. Give **one** way that stone tools can be dated.

.....

.....

[1]

10. What is genetic engineering?

.....

.....

[2]

11. Give **one** risk and **one** benefit of using genetic engineering on crops.

Benefit: .....

.....

Risk: .....

.....

[2]

12. Explain how a useful characteristic becomes more common in a population.

.....

.....

.....

.....

[2]

15

Test 6: Health, Disease & the Development of Medicines

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Diseases that can be passed from one person to another are known as...

A ... communicable diseases.

B ... non-communicable diseases.

[1]

2. Which of the following types of treatment for cardiovascular disease has fewer risks?

A Surgical procedures

B Lifestyle changes

[1]

3. Chalara ash dieback causes...

A ... damage to the liver.

B ... leaf loss and bark lesions.

C ... AIDS.

[1]

4. What is the first stage of testing a new medicinal drug?

A The drug is tested on human cells and tissues in the lab.

B The drug is tested on human volunteers in a clinical trial.

[1]

5. The stomach helps to kill pathogens by...

A ... secreting hydrochloric acid.

B ... secreting antibodies.

[1]

6. What is an organism that causes disease called?

A An antibody

B An antigen

C A pathogen

[1]

7. True or False? "Antibiotics can kill viruses."

A True

B False

[1]

8. True or False? "Using insect repellent can reduce the spread of *Chlamydia*?"

A True

B False

[1]

9. Describe how cholera is spread.

.....

[1]

10. Give **one** physical barrier in the nose that helps to defend the body against disease.

.....

[1]

11. Describe how malaria is spread.

.....

.....

Give **one** way to prevent the spread of malaria.

.....

[2]

12. Explain how immunisation can protect against a disease.

.....

.....

.....

.....

[3]

15

Test 7: Health, Disease & the Development of Medicines

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "Preclinical trials test drugs on healthy volunteers."

A True

B False

[1]

2. What do white blood cells produce to help defend against pathogens?

A Antigens

B Antibiotics

C Antibodies

[1]

3. Which of the following diseases is caused by a protist?

A Cholera

B Malaria

C Chalara ash dieback

[1]

4. How is tuberculosis spread?

A By contaminated water

B By air

C By a vector

[1]

5. Which of the following is a non-communicable human disease?

A Cancer

B Tuberculosis

C HIV

[1]

6. True or False? "There are three types of pathogens — bacteria, protists and fungi."

A True

B False

[1]

7. Health is...

A ... the state of physical well-being only.

B ... the state of physical, mental and social well-being.

[1]

8. True or False? "Making changes to a patient's lifestyle can reduce their risk of developing cardiovascular disease."

A True

B False

[1]

9. A person has a mass of 89.1 kg and is 1.80 m tall. Calculate their BMI.

$$\text{BMI} = \frac{\text{mass (kg)}}{(\text{height (m)})^2}$$

.....

..... kg m^{-2}

[1]

10. Give **two** examples of chemical defences of the human body.

1. .....

2. .....

[2]

11. Give **one** way to prevent the spread of HIV.

.....

.....

[1]

12. Name a bacterial disease and give one symptom of this disease.

Disease: .....

Symptom: .....

[2]

13. Describe how antibiotics kill bacteria.

.....

.....

[1]

15

Test 8: Biology 1 Mixed Topics

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "Immunisations usually involve injecting small amounts of dead or inactive pathogens into the body."

A True

B False

[1]

2. What is a fertilised egg cell also known as?

A A daughter cell

B A gamete

C A zygote

[1]

3. True or False? "DNA in plant cells is found within a nucleus."

A True

B False

[1]

4. If you place a slice of potato in a solution that has a higher sugar concentration, the potato will...

A ... release water and decrease in mass.

B ... absorb water and increase in mass.

[1]

5. What is the fossil hominid found 3.2 million years ago known as?

A Ardi

B Lucy

C Turkana boy

[1]

6. If human body cells have 46 chromosomes, how many chromosomes does a gamete have?

A 46

B 92

C 23

[1]

7. True or False? "Most characteristics are controlled by a single gene."

A True

B False

[1]

8. A reflex arc...

A ... only involves the conscious part of the brain.

B ... doesn't involve the conscious part of the brain.

[1]

9. A student investigates the effect of pH on the reaction rate of amylase on starch solution. Give **one** example of a variable that must be controlled in this investigation.

.....

How could this variable be controlled?

.....

[2]

10. Give **one** risk factor that can increase a person's chance of developing liver disease.

.....

[1]

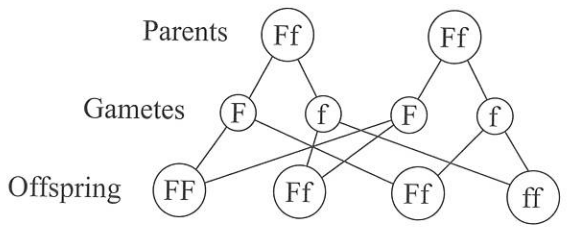
11. Give the **two** processes by which animals grow.

1. .....

2. .....

[2]

12. Cystic fibrosis is a genetic disorder caused by a recessive allele. The genetic diagram below shows a cross between two people who both have one normal allele, **F**, and one cystic fibrosis allele, **f**.



What genotype would mean a person has cystic fibrosis?

.....

What is the chance that the offspring will have cystic fibrosis?

.....

[2]

15

Test 9: Biology 1 Mixed Topics

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Which process allows particles to move across a membrane from a higher concentration to a lower concentration?

A Active transport

B Diffusion

[1]

2. What is a gene?

A An amino acid

B A protein

C A section of DNA

[1]

3. True or False? "Having a disease can make a person more likely to get other diseases."

A True

B False

[1]

4. Which of the following is used to break down cell membranes when extracting DNA from fruit?

A Alcohol

B Salt

C Detergent

[1]

5. True or False? "Synapses connect receptors."

A True

B False

[1]

6. What are alleles?

A Two gametes fused together

B Different versions of the same gene

[1]

7. Which scientist found hominid fossils that were 1.6 million years old?

A Darwin

B Leakey

[1]

8. What type of pathogen causes cholera?

A A fungus

B A virus

C A bacterium

[1]

9. What is a dominant allele?

.....

[1]

10. Give **one** risk factor for cardiovascular disease.

.....

[1]

11. Name the next two stages of mitosis that come after metaphase.

1. .....

2. .....

[2]

12. Complete this equation for magnification.

$$\text{magnification} = \frac{\text{.....}}{\text{.....}}$$

[1]

13. A potato cylinder was placed in a sucrose solution for an hour. Its mass decreased from 7.8 g to 6.6 g. Calculate the percentage change in mass.

.....

.....

.....%

[2]

15

Test 10: Plant Structures and Their Functions

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. What do phloem tubes transport?

A Oxygen

B Sucrose

C Minerals

[1]

2. What is the name of the cells that control the opening and closing of stomata?

A Palisade cells

B Guard cells

C Meristem cells

[1]

3. As the level of carbon dioxide increases, the rate of photosynthesis will...

A ... increase.

B ... decrease.

[1]

4. Other than oxygen, what does photosynthesis produce?

A Carbon dioxide

B Glucose

[1]

5. Which of these factors affects the rate of photosynthesis?

A Amount of soil

B Temperature

[1]

6. What group of organisms are the main producers of biomass on Earth?

A Photosynthetic organisms

B Primary consumers

C Predators

[1]

7. Which of the following processes requires energy from respiration?

A Translocation

B Transpiration

[1]

8. A plant is likely to take up more water on a...

A ... windy day.

B ... still day.

[1]

9. Describe **one** way in which a root hair cell is adapted to absorb water and mineral ions from the soil.

.....

[1]

10. A piece of pondweed is placed in a beaker of water.
What variable could be measured in order to calculate its rate of photosynthesis?

.....

[1]

11. What happens to the rate of photosynthesis of a plant if it is put in a dark place?

.....

Explain your answer.

.....

.....

[2]

12. How does an increase in temperature affect the rate of transpiration?

.....

[1]

13. A plant lost 1.8 cm^3 of water by transpiration over 30 minutes.
Calculate the transpiration rate.

.....

.....

..... $cm^3\ min^{-1}$

[2]

15

Test 11: Animal Coordination, Control & Homeostasis

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. What is the main hormone secreted by the testes?

A Oestrogen

B Adrenaline

C Testosterone

[1]

2. How does insulin affect a person's blood glucose level?

A It increases it.

B It decreases it.

[1]

3. True or False? "High levels of oestrogen can be used to prevent pregnancy."

A True

B False

[1]

4. How are hormones transported around the body?

A Along neurones.

B By translocation.

C In the blood.

[1]

5. Which of the following is a barrier method of contraception?

A Diaphragm

B Contraceptive patch

C Combined pill

[1]

6. True or False? "Even when used correctly, hormonal contraceptives are less effective than barrier methods."

A True

B False

[1]

7. Which of the following is a function of progesterone?

A Maintaining the lining of the uterus.

B Causing the lining of the uterus to thicken.

[1]

8. The gland which releases thyroxine is...

A ... the pituitary gland.

B ... the pancreas.

C ... the thyroid gland.

[1]

9. What stage of the menstrual cycle occurs after the level of oestrogen rises?

.....

[1]

10. Name the hormone produced by the adrenal glands.

.....

[1]

11. Give **two** ways of controlling type 2 diabetes.

1. .....

2. .....

[2]

12. Explain why it is important to maintain a constant internal environment.

.....

.....

[1]

13. What is type 1 diabetes?

.....

Explain why type 1 diabetes can be dangerous.

.....

.....

[2]

15

Test 12: Exchange and Transport in Animals

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Which of these is **not** a chamber of the heart?

A Left ventricle

B Right atrium

C Vena cava

[1]

2. Aerobic respiration produces...

A ... glucose.

B ... water and carbon dioxide.

[1]

3. What is the function of platelets in the blood?

A They help the blood to clot at a wound.

B They produce antibodies against microorganisms.

[1]

4. True or False? "Blood flows to the organs through veins."

A True

B False

[1]

5. True or False? "Respiration occurs in plants and animals all the time."

A True

B False

[1]

6. Which type of respiration transfers more energy?

A Aerobic respiration

B Anaerobic respiration

[1]

7. Which of the following substances do animals need to take in from the environment?

A Urea

B Oxygen

C Carbon dioxide

[1]

8. A rhino has an estimated surface area of 24 m^2 and a volume of 6 m^3. What is its surface area to volume ratio?

A 2 : 1

B 3 : 1

C 4 : 1

[1]

9. What is the function of valves in the heart?

.....

[1]

10. Write the equation that links cardiac output, stroke volume and heart rate.

.....

Calculate the cardiac output of a person with an average stroke volume of 88 cm^3 and an average heart rate of 80 bpm.

.....

.....

..... cm^3 min^{-1}

[2]

11. Give **two** components of blood that are carried in the blood plasma.

1. .....

2. .....

[2]

12. Give **two** differences between arteries and veins.

1. .....

.....

2. .....

.....

[2]

15

Test 13: Exchange and Transport in Animals

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Respiration is an...

A ... exothermic reaction.

B ... endothermic reaction.

[1]

2. Which of these characteristics makes the alveoli efficient at gas exchange?

A They have thick walls.

B They have a large surface area.

[1]

3. Which of these are **not** features of arteries?

A Elastic fibres

B Thick walls

C Valves

[1]

4. True or False? "Anaerobic respiration requires oxygen."

A True

B False

[1]

5. What is cardiac output?

A The number of times the heart beats per minute.

B The total volume of blood pumped by a ventricle every minute.

[1]

6. Which ventricle has the thickest wall?

A The left ventricle

B The right ventricle

[1]

7. Capillaries are able to exchange substances with cells in the body because...

A ... they have permeable walls.

B ... they have a large lumen.

[1]

8. Which of the following is a product of anaerobic respiration in animals?

A Ethanol

B Lactic acid

C Hydrochloric acid

[1]

9. Red blood cells contain haemoglobin.
Explain how this is related to their function.

.....

[1]

10. What is the function of lymphocytes?

.....

[1]

11. What is a respirometer used to measure?

.....

[1]

12. Name the blood vessel that carries blood from the lungs to the heart.

.....

Name the blood vessel that carries blood from the heart to the body.

.....

[2]

13. Multicellular organisms have a small surface area to volume ratio.
Explain why this means multicellular organisms need transport systems.

.....

.....

.....

.....

[2]

15

Test 14: Ecosystems and Material Cycles

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "Reforestation can help to increase biodiversity."

A True

B False

[1]

2. What is a quadrat?

A A line through a habitat along which distribution is studied.

B A square frame enclosing a known area.

[1]

3. True or False? "When studying the distribution of an organism it is best to use a large sample size."

A True

B False

[1]

4. What is meant by a 'population'?

A All the organisms of different species in a habitat.

B All the organisms of one species in a habitat.

C A community of organisms and all the abiotic conditions.

[1]

5. True or False? "Communities are affected by both abiotic and biotic factors."

A True

B False

[1]

6. True or False? "Photosynthesis and respiration are two processes in the water cycle."

A True

B False

[1]

7. What are species that aren't naturally found in an area known as?

A Indigenous species

B Native species

C Non-indigenous species

[1]

8. Desalination...

A ... removes salt from sea water.

B ... is a type of precipitation.

[1]

9. How does respiration add to the carbon cycle?

.....

[1]

10. Suggest **two** biotic factors that might cause a decrease in the population of a species.

1. .....

2. .....

[2]

11. What is crop rotation?

.....

.....

Why might a nitrogen-fixing crop be used in crop rotation?

.....

.....

[2]

12. Fish in fish farms can be infected with parasites.
Explain how this can affect the biodiversity of wild fish.

.....

.....

.....

[2]

15

Test 15: Ecosystems and Material Cycles

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Biodiversity is...

A ... all the organisms of one species living in a habitat.

B ... the variety of living organisms in an ecosystem.

[1]

2. Competition is an example of...

A ... a biotic factor.

B ... an abiotic factor.

[1]

3. If a new predator arrives in an area, will the size of the prey population increase or decrease?

A Increase

B Decrease

[1]

4. True or False? "Photosynthesis removes carbon dioxide from the air."

A True

B False

[1]

5. It's important to maintain a high level of global biodiversity because...

A ... it protects the human food supply.

B ... it will decrease the amount of waste.

[1]

6. True or False? "In the water cycle, water falls from clouds in a process called evaporation."

A True

B False

[1]

7. All the organisms of different species living in a habitat are know as...

A ... a population.

B ... a genus.

C ... a community.

[1]

8. In the carbon cycle, material is broken down by...

A ... plants.

B ... microorganisms.

C ... animals.

[1]

9. Give **one** example of an abiotic factor that can affect a community.

.....

[1]

10. In a community, different species depend on each other for things like food or shelter. What is this called?

.....

[1]

11. Mutualism is a relationship between two organisms. Describe this relationship.

.....

.....

[1]

12. Sometimes fertilisers leak into lakes. This adds too many nitrates into the water. Explain how this can cause the plants in a lake to die.

.....

.....

The dead plants cause an increase in microorganisms that feed on them. Explain how this can lead to the death of fish in the lake.

.....

.....

.....

[4]

15

Test 16: Biology 2 Mixed Topics

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "Prokaryotic organisms can be multicellular."

A True

B False

[1]

2. Which of the following may be used to control type 2 diabetes?

A Taking injections of oestrogen.

B Avoiding all forms of exercise.

C Eating a healthy diet.

[1]

3. An ecosystem is...

A ... the individuals of a species that live in a habitat.

B ... a community of living organisms and the non-living conditions of their environment.

[1]

4. What is the function of red blood cells?

A They carry oxygen from the lungs to all the cells in the body.

B They defend the body against microorganisms.

[1]

5. Reforestation is...

A ... growing crops in forests.

B ... replanting deforested areas.

C ... cutting down trees.

[1]

6. Why do alveoli need a good blood supply?

A To maintain the concentration gradients of oxygen and carbon dioxide.

B To minimise the distances the gases have to move.

[1]

7. How is a decrease in temperature likely to affect water uptake by a plant?

A It will increase water uptake.

B It will decrease water uptake.

[1]

8. True or False? "When the guard cells are swollen, the stomata are open."

A True

B False

[1]

9. Give **two** substances that plants need to take in from the environment.

1. .....

2. .....

[2]

10. Give **one** example of a type of hormonal contraceptive.

.....

[1]

11. Name the hormone released by the pancreas when blood glucose concentration is too high.

.....

[1]

12. Give **one** difference between aerobic and anaerobic respiration.

.....

[1]

13. What is the function of xylem tubes?

.....

Give **one** way in which they're adapted for this function.

.....

.....

[2]

15

Test 17: Biology 2 Mixed Topics

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. The right ventricle pumps blood to...

A ... the brain.

B ... the muscles.

C ... the lungs.

[1]

2. Hormones are transported in the blood from...

A ... endocrine glands to target organs.

B ... target organs to endocrine glands.

[1]

3. True or False? "Quadrats can be used with transects."

A True

B False

[1]

4. Carbohydrates are broken down by enzymes into...

A ... amino acids.

B ... simple sugars.

C ... glycerol.

[1]

5. Enzymes only work with one substrate, so they are said to...

A ... have low specificity.

B ... have high specificity.

[1]

6. What is stroke volume?

A The volume of blood pumped by one ventricle each time it contracts.

B The total volume of blood pumped by a ventricle every minute.

[1]

7. Photosynthesis is an...

A ... exothermic reaction.

B ... endothermic reaction.

[1]

8. True or False? "If taken every day, oestrogen can be used to prevent the release of an egg from the ovaries."

A True

B False

[1]

9. Complete the equation for photosynthesis.

..... energy

..... + water ⟶ ..... + oxygen

[2]

10. Explain how conservation schemes protect biodiversity.

.....

[1]

11. Give **one** health risk of a high waist-to-hip ratio.

.....

.....

[1]

12. What causes transpiration?

.....

.....

Describe how transpiration leads to more water being drawn up from the roots.

.....

.....

.....

.....

[3]

15

Test 18: Key Concepts in Chemistry

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Magnesium has 12 electrons.
What is its electronic configuration?

A 6.6

B 8.4

C 2.8.2

[1]

2. Which of the following is a typical property of non-metals?

A Good conductors of electricity

B Shiny

C Low boiling points

[1]

3. What type of bond is formed when two hydrogen atoms form a molecule?

A An ionic bond

B A covalent bond

[1]

4. True or False? "Ions are particles that have either a positive or negative charge."

A True

B False

[1]

5. What name is given to the total number of protons and neutrons in an atom?

A Atomic number

B Mass number

[1]

6. True or False? "A group is a vertical column in the periodic table."

A True

B False

[1]

7. True or False? "Ionic compounds do not conduct electricity when dissolved in water."

A True

B False

[1]

8. Which of the following is a feature of metallic bonding?

A Delocalised electrons

B A shared pair of electrons

C Two oppositely charged ions

[1]

9. An atom of a group 1 element forms an ionic bond with an atom of a group 7 element. State which element gains an electron to form this bond.

.....

[1]

10. Elements Q and R are in the same group of the periodic table.
What do the electronic configurations of elements Q and R have in common?

.....

[1]

11. Balance the following chemical equation:

$$2Li + 2H_2O \rightarrow .....LiOH + ...H_2$$

[1]

12. 66 g of carbon are burnt completely in oxygen to produce 242 g of CO_2.

The equation for the reaction is: $C + O_2 \rightarrow CO_2$.

Calculate the mass of O_2 that reacted with the carbon.

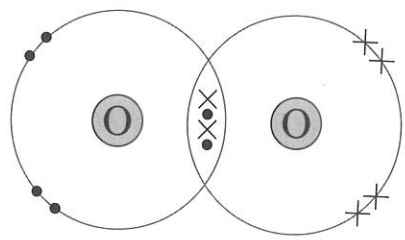
.....

.....

..... g

[2]

13. The diagram on the right shows an O_2 molecule.
Name the type of bond in this molecule.
Describe how this bond forms.



.....

.....

.....

.....

[2]

15

Test 19: Key Concepts in Chemistry

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Giant covalent structures have...

A ...high melting points.

B ...low melting points.

[1]

2. True or False? "During a chemical reaction no atoms are gained or lost."

A True

B False

[1]

3. Poly(ethene) is an example of...

A ...an ionic compound.

B ...a metal.

C ...a polymer.

[1]

4. Why do ionic compounds have high boiling points?

A The bonds between the ions are weak.

B It takes a lot of energy to break the bonds between the ions.

[1]

5. The molecular formula of butene is C_4H_8. What is its empirical formula?

A C_2H_4

B CH_2

C CH

[1]

6. True or False? "Simple molecular substances are generally good conductors of electricity."

A True

B False

[1]

7. What is the relative formula mass (M_r) of KOH? Relative atomic masses (A_r): H = 1, O = 16, K = 39

A 39

B 28

C 56

[1]

8. Mendeleev arranged the elements in his periodic table. He started by putting them in order of their...

A ...chemical symbols.

B ...atomic masses.

C ...boiling points.

[1]

9. Sodium chloride (NaCl) is an ionic compound. Sodium ions have the formula Na^+.
What is the formula of a chloride ion?

.....

[1]

10. What are isotopes?

.....

.....

.....

[1]

11. Give **one** example of a substance which has a giant covalent structure.

.....

[1]

12. 0.25 g of NaOH is dissolved in 0.5 dm^3 of water.
What is the concentration of the solution in g dm^{-3}?

.....

.....

.....

..... g dm^{-3}
[2]

13. Explain why diamond cannot conduct electricity.

.....

.....

.....

[2]

15

Test 20: States of Matter and Mixtures

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. A liquid turns into a solid. What is this process called?

A Condensation

B Freezing

[1]

2. Which of the following processes could be used to make sea water potable?

A Distillation

B Filtration

[1]

3. True or False? "Simple distillation can be used to separate mixtures of liquids with similar boiling points."

A True

B False

[1]

4. In which state of matter are the particles furthest apart?

A Solid

B Liquid

C Gas

[1]

5. In paper chromatography...

A ...the solvent is the stationary phase.

B ...the solvent is the mobile phase.

[1]

6. True or False? "Air is a chemically pure substance."

A True

B False

[1]

7. Which stage of the water treatment process involves removing large, solid impurities?

A Filtration

B Sedimentation

C Chlorination

[1]

8. What would be the best way to separate a mixture of salt, water and sand?

A Evaporation

B Filtration and crystallisation

C Chromatography

[1]

9. A substance changes state from a liquid to a gas. Describe how the arrangement and the movement of particles changes during this change of state.

.....

.....

.....

[2]

10. A student is using fractional distillation to separate a mixture of two liquid compounds. Some information about the compounds is shown in the table below.

Compound	Boiling point (°C)
Compound 1	97
Compound 2	65

The student puts the mixture in a flask, with a fractionating column and condenser attached. They heat the flask, so that the mixture boils.
The temperature at the top of the fractionating column is 70 °C.
What happens to the compounds in the mixture as they rise up the fractionating column?

.....

.....

.....

.....

[2]

11. In chemistry, what is a mixture?

.....

.....

[1]

12. A student is doing a paper chromatography experiment. Describe how the pattern of spots produced will be different for a pure substance and an impure substance.

.....

.....

[2]

15

Test 21: States of Matter and Mixtures

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "Paper chromatography can be used to separate out the different elements within a compound."

A True

B False

[1]

2. When a substance changes from a gas into a liquid...

A ...the particles gain energy and move around faster.

B ...the particles lose energy and move closer together.

[1]

3. Fractional distillation is used to separate a mixture of liquids. Which liquid will be collected first?

A The liquid with the lowest boiling point.

B The liquid with the highest boiling point.

[1]

4. How many different phases are used in chromatography?

A 1

B 2

C 3

[1]

5. Which change of state does **not** take place at the boiling point of a substance?

A Freezing

B Condensing

C Boiling

[1]

6. True or False? "When using water to make a solution, the water should not contain any dissolved salts."

A True

B False

[1]

7. Which of these processes could you use to get a sample of solid sugar from a water and sugar solution?

A Filtration

B Chromatography

C Crystallisation

[1]

8. What is meant by a chemically pure substance?

A A mixture in which all substances are in the same state of matter.

B A substance that contains only one element or chemical compound.

C A substance that is clear and transparent.

[1]

9. What is the name of the change of state being described below?
"During this process, particles gain enough energy to break free from their fixed positions. After the change, the particles stick together, but are free to move past each other."

.....

[1]

10. Look at the table below. Which substance is a gas at 90 °C?

	Ethanol	Water	Iodine
Melting point (°C)	−114	0	114
Boiling point (°C)	78	100	184

.....

[1]

11. A scientist is testing the melting point of water using a block of ice. They take samples of the ice, and find that the samples they test reach their melting points over a range of temperatures. Suggest why this is.

.....

[1]

12. A student is using paper chromatography to separate the dyes in an ink. He draws a start line on filter paper in pencil and puts one spot of ink on the line. He then puts the paper in a beaker and adds solvent to the beaker until it covers the start line. Give **one** thing the student has done wrong. Explain your answer.

.....

.....

.....

[2]

13. A student carried out paper chromatography on a pure substance. The solvent travelled 4.8 cm up the chromatography paper. The substance left a spot 4.2 cm up the paper. What is the R_f value of the substance? Give your answer to 2 significant figures.

$$R_f = \frac{\text{distance travelled by spot}}{\text{distance travelled by solvent}}$$

.....

.....

R_f = ...

[2]

15

Test 22: Chemical Changes

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. An alkali reacts with an acid to produce...

A ...carbon dioxide and water.

B ...a salt and water.

[1]

2. True or False? "Electrolysis can be used to purify copper."

A True

B False

[1]

3. What is an alkali?

A A soluble base

B A soluble acid

C An insoluble base

[1]

4. A few drops of phenolphthalein are added to a colourless alkaline solution. What colour does the solution turn?

A blue

B yellow

C pink

[1]

5. True or False? "All nitrates are soluble in water."

A True

B False

[1]

6. What does a pH of 7 indicate?

A An acidic solution

B An alkaline solution

C A neutral solution

[1]

7. What are the products in the electrolysis of molten potassium bromide?

A Potassium metal and oxygen

B Potassium metal and bromine gas

[1]

8. True or False? "Hydroxide ions make solutions acidic."

A True

B False

[1]

9. How can limewater be used to test for carbon dioxide?

.....

.....

[1]

10. Give the two ions which react to form water in a neutralisation reaction.

1. .....

2. .....

[2]

11. A student is preparing a soluble salt by reacting an acid with an insoluble base. Explain why excess base should be added to the acid.

.....

.....

[1]

12. Name the two gases formed in the electrolysis of sodium chloride solution.

1. .....

2. .....

Explain why sodium is not produced during the electrolysis of sodium chloride solution.

.....

.....

[3]

15

Test 23: Chemical Changes

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Which of the following reactions does **not** produce water?

A Hydrochloric acid with magnesium.

B Sulfuric acid with magnesium oxide.

C Nitric acid with magnesium carbonate.

[1]

2. How can a solid salt be obtained from a salt solution?

A By adding an indicator.

B By adding a catalyst.

C By crystallisation of the salt solution.

[1]

3. True or False? "A neutral solution is produced at the end point of an acid-alkali titration."

A True

B False

[1]

4. Which of the following is an electrolyte?

A A molten or dissolved ionic compound.

B An electric current running through a solution.

C A positively charged electrode.

[1]

5. Which of the following compounds is insoluble in water?

A Potassium nitrate

B Calcium carbonate

C Sodium sulfate

[1]

6. What colour is litmus in alkaline solutions?

A Red

B Blue

[1]

7. During electrolysis, anions migrate towards the...

A ...positively charged electrode

B ...negatively charged electrode

[1]

8. True or False? "An insoluble base will react with an acid."

A True

B False

[1]

9. A solution of copper sulfate is electrolysed using inert electrodes.
What substance is formed at the negative electrode?

.....

[1]

10. Most chloride compounds are soluble. Name **one** insoluble chloride compound.

.....

[1]

11. Name the two products formed in the reaction between sulfuric acid and zinc oxide.

1. .....

2. .....

[2]

12. A student adds a few drops of methyl orange to some dilute hydrochloric acid.
She then slowly adds calcium oxide powder to the solution, until no more will react.
Describe how the colour of the solution changes during the reaction.

.....

[1]

13. A student adds calcium chloride solution to magnesium sulfate solution.
They react to form magnesium chloride solution and solid calcium sulfate.
How should the student separate the calcium sulfate from the solution?

.....

When it is removed from the solution, the student rinses the calcium sulfate with deionised water. Why do they do this?

.....

.....

[2]

15

Test 24: Extracting Metals and Equilibria

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Which reaction shows the oxidation of iron?

A $Zn + FeSO_4 \rightarrow ZnSO_4 + Fe$

B $4Fe + 3O_2 \rightarrow 2Fe_2O_3$

[1]

2. True or False? "All metals are found in the ground as ores."

A True

B False

[1]

3. True or False? "Metals below carbon in the reactivity series can be extracted by reduction using carbon."

A True

B False

[1]

4. The main goal of a life-cycle assessment is to assess...

A ...the total environmental impact of a product.

B ...the economic cost of a product.

C ...how long a product will be in use.

[1]

5. Which of these is highest in the reactivity series?

A Gold

B Silver

C Potassium

[1]

6. If a reversible reaction occurs in a sealed reaction vessel, when is dynamic equilibrium reached?

A When the amounts of products and reactants are equal.

B When the rates of the forward and reverse reactions are equal.

[1]

7. True or False? "Recycling metals usually uses more energy than extracting metal from ores."

A True

B False

[1]

8. True or False? "The Haber process is carried out at a very low temperature."

A True

B False

[1]

9. Why is electrolysis used to extract aluminium from its ore?

.....

[1]

10. Name **one** metal that can be extracted from its ore by reduction with carbon.

.....

[1]

11. A student places a small piece of magnesium in a beaker of dilute hydrochloric acid, and a chemical reaction occurs. Describe what the student will observe.

.....

.....

The student places a small piece of iron in a beaker of dilute hydrochloric acid. How will the reaction be different to the reaction between magnesium and hydrochloric acid?

.....

.....

Explain why these reactions are different.

.....

.....

[3]

12. The reaction used to produce ammonia is: $N_2 + 3H_2 \rightleftharpoons 2NH_3$

Suggest a source for the nitrogen and hydrogen used in this reaction.

Nitrogen: .....

Hydrogen: .....

[2]

15

Test 25: Extracting Metals and Equilibria

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "The direction of some reversible reactions can be changed by changing the reaction conditions."

A True

B False

[1]

2. True or False? "The reaction of nitrogen and hydrogen to form ammonia cannot reach a dynamic equilibrium."

A True

B False

[1]

3. Which of the following non-metals is often included in the reactivity series?

A Helium

B Oxygen

C Carbon

[1]

4. The reaction between zinc and copper(II) oxide is:

$Zn + CuO \rightarrow ZnO + Cu$

Which metal has been oxidised during this reaction?

A Zinc

B Copper

[1]

5. Which of the following metals is most easily oxidised?

A Sodium

B Silver

C Aluminium

[1]

6. Which of the following is used as a catalyst in the Haber process?

A Iron

B Hydrochloric acid

C Aluminium oxide

[1]

7. Iron is usually extracted from its ores by reduction with carbon rather than by electrolysis. This is because...

A ...iron can't be produced from its ores by electrolysis.

B ...reduction with carbon is cheaper.

[1]

8. What does the symbol '$\rightleftharpoons$' tell you about the reaction shown below?

$$2SO_2 + O_2 \rightleftharpoons 2SO_3$$

A The reaction is exothermic.

B The reaction is an oxidation reaction.

C The reaction is reversible.

[1]

9. Give **two** stages of a product's life that may be examined during a life cycle assessment.

1. .....

2. .....

[2]

10. Three metals, P, Q and R, are tested for their reactions with water.
Metal P doesn't react with cold water or steam.
Metal Q reacted with cold water.
Metal R reacted with steam, but not with cold water.
Which is the most reactive metal?

.....

[1]

11. Name **one** metal which is found as an uncombined element in the Earth's crust.

.....

[1]

12. Recycling metals is generally better for the environment than extracting new metals from their ores. Suggest **two** reasons for this.

1. .....

.....

2. .....

.....

[2]

13. A sample of metal A is added to a solution of a salt of metal B.
Metal A reacts with the salt. What does this tell you about metal A?

.....

[1]

15

Test 26: Chemistry 1 Mixed Topics

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Evaporation is an example of a...

A ...chemical change.

B ...physical change.

[1]

2. Hydrogen gas will...

A ...burn with a squeaky pop.

B ...turn limewater cloudy.

[1]

3. In the following example, what physical state is the hydrochloric acid in?

$Mg_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2\,(aq)} + H_{2\,(g)}$

A Solid

B Gas

C Aqueous solution

[1]

4. What is the relative formula mass of $CaBr_2$?
Relative atomic masses:
Ca = 40, Br = 80

A 120

B 160

C 200

[1]

5. Which of the following is **not** a method used to extract metals from their ores?

A Reduction of ores by carbon

B Oxidation of ores by carbon

C Electrolysis

[1]

6. Which gas is produced when a metal carbonate reacts with dilute acid?

A Carbon dioxide

B Hydrogen

[1]

7. Which of the following **cannot** be used to show that a sample of a solid, soluble dye is impure?

A Melting point data

B Paper chromatography

C Sedimentation

[1]

8. True or False? "When forming an ionic bond, metal atoms generally lose electrons to form positive ions."

A True

B False

[1]

9. What is electrolysis?

.....

.....

[1]

10. In the Haber process, hydrogen gas (H_2) and nitrogen gas (N_2) react together to make ammonia (NH_3). This reaction is reversible.
Write a balanced equation for the reaction used in the Haber process.

.....

[2]

11. Hexaborane is a compound with the molecular formula B_6H_{10}.
What is the empirical formula of hexaborane?

.....

.....

.....

Empirical formula = ...

[2]

12. Some copper chloride solution was electrolysed using inert electrodes.
Identify the product that will be formed at the cathode.
Explain why hydrogen gas is **not** formed at the cathode in this experiment.

Product: .....

Explanation: .....

.....

[2]

15

Test 27: Chemistry 1 Mixed Topics

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. An ionic compound is made up of Na^+ ions and Br^- ions. What is its formula?

A $NaBr_2$

B Na_2Br

C NaBr

[1]

2. An atom of phosphorus has atomic number 15 and mass number 31. Which of the following statements about this atom is true?

A It has 15 protons and 16 electrons.

B It has 15 electrons and 16 neutrons.

C It has 15 neutrons and 16 protons.

[1]

3. In paper chromatography, what is an R_f value?

A The amount of solute that has travelled above the baseline.

B The ratio between the distance travelled by the solute and the solvent.

[1]

4. Which of the following salts is soluble in water?

A Lead chloride

B Barium sulfate

C Sodium nitrate

[1]

5. True or False? "A solution with a pH of less than 7 is acidic."

A True

B False

[1]

6. True or False? "In the Earth's crust, metals are only found as parts of compounds."

A True

B False

[1]

7. What pressure is used in the Haber process?

A 20 atmospheres

B 200 atmospheres

[1]

8. Oxidation is...

A ...gain of oxygen.

B ...loss of oxygen.

[1]

9. Reversible reactions can reach 'dynamic equilibrium'. What is meant by this?

.....

.....

[1]

10. Soluble salts can be prepared from an acid and an alkali.
A student prepares a soluble salt.
Why shouldn't the student add the alkali in excess to the acid?

.....

.....

[1]

11. A student has a mixture of magnesium sulfate and copper filings.
Magnesium sulfate is a solid that is soluble in water.
Outline a method the student could use to obtain a pure sample of the magnesium sulfate.

.....

.....

.....

.....

.....

[3]

12. 1.84 g of ethanol (C_2H_5OH) is burnt completely in oxygen.
The reaction produced 3.52 g of carbon dioxide and 2.16 g of water.
Calculate the mass of oxygen that reacted with the ethanol.

$$C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$$

.....

.....

..... g

[2]

15

Test 28: Groups in the Periodic Table

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "Alkali metals are soft."

A True

B False

[1]

2. What happens to the boiling points of the elements as you go down Group 0?

A They decrease

B They increase

C They remain constant

[1]

3. Lithium reacts with water to produce a solution that is...

A ...acidic.

B ...alkaline.

[1]

4. Which of these is a chemical test for chlorine?

A It burns with a squeaky pop.

B It turns damp blue litmus paper white.

[1]

5. The first three elements of Group 7 are fluorine, chlorine and bromine. Which is the most reactive?

A Bromine

B Chlorine

C Fluorine

[1]

6. Which Group 7 element is a dark grey crystalline solid at room temperature?

A Bromine

B Iodine

[1]

7. True or False? "Alkali metals have relatively high melting points."

A True

B False

[1]

8. Which of the following halogens has the lowest melting point?

A Bromine

B Iodine

C Chlorine

[1]

9. Chlorine gas is bubbled through a solution of potassium bromide.
The equation for the reaction that occurs is shown below.

$$Cl_2 + 2KBr \rightarrow Br_2 + 2KCl$$

Why does this reaction occur?

.....

What would happen if bromine vapour was bubbled through potassium chloride solution?

.....
[2]

10. Complete the word equation below for the reaction between sodium and water.

sodium + water → sodium hydroxide + ...

[1]

11. Why do Group 1 elements become more reactive as you go down the group?

.....

.....

.....
[2]

12. Explain why the noble gases do not easily react.

.....

.....

.....
[2]

15

Test 29: Rates of Reaction and Energy Changes

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. To break a chemical bond...

A ...energy must be supplied.

B ...energy must be released.

[1]

2. How does a catalyst increase a reaction's rate?

A It increases the energy of the reactants.

B It decreases the activation energy needed.

[1]

3. True or False? "The rate of a reaction can be found by measuring the amount of reactant used over a period of time."

A True

B False

[1]

4. True or False? "Increasing the pressure of a reaction between gases will increase the reaction rate."

A True

B False

[1]

5. In an endothermic reaction, the energy released when bonds are formed is...

A ...less than the energy used in breaking old bonds.

B ...greater than the energy used in breaking old bonds.

[1]

6. Which of the following can be used to measure the energy change of a chemical reaction?

A Change in colour

B Change in mass

C Change in temperature

[1]

7. Which of the following affects the energy of colliding reactant particles?

A The concentration of the reactants.

B The temperature of the reactants.

[1]

8. What is the activation energy of a reaction?

A The total energy of the reactants.

B The minimum amount of energy needed by the particles to react.

C The maximum amount of energy needed by the particles to react.

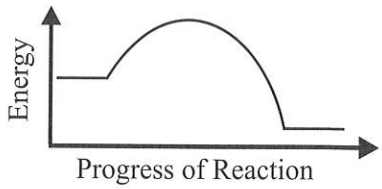
[1]

9. A student carries out a displacement reaction. The reaction is exothermic.
How will the temperature of the reaction mixture change over the course of the reaction?

.....

[1]

10. The reaction profile for an exothermic reaction is shown on the right.



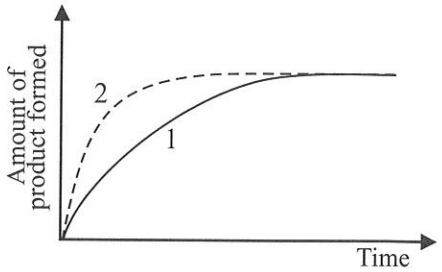
How can you tell from the diagram that the reaction is exothermic?

.....

.....

[1]

11. The diagram shows the results of the same reaction carried out in two different experiments.



Was the initial rate of reaction greater in Experiment 1 or Experiment 2?

.....

Suggest **one** way in which the conditions in Experiment 2 may have been different to the conditions in Experiment 1.

.....

[2]

12. Marble chips react with hydrochloric acid. A gas is produced in the reaction.
Describe how you could use a gas syringe and a stopwatch to measure the average rate of this reaction.

.....

.....

.....

.....

[3]

15

Test 30: Rates of Reaction and Energy Changes

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. In an endothermic reaction, the products are at...

A ...a lower energy than the reactants.

B ...a higher energy than the reactants.

[1]

2. True or False? "Catalysts aren't chemically changed during a reaction."

A True

B False

[1]

3. In a reaction between marble and hydrochloric acid, using small marble chips instead of a large piece of marble will produce...

A ...no difference in the rate of reaction.

B ...a slower rate of reaction.

C ...a faster rate of reaction.

[1]

4. If the surroundings increase in temperature during a reaction...

A ...the reaction is endothermic.

B ...the reaction is exothermic.

[1]

5. True or False? "There is never a change in heat energy during a precipitation reaction."

A True

B False

[1]

6. On a graph showing the quantity of product formed against time, the gradient of the line gives the...

A ...concentration of the product.

B ...rate of reaction.

[1]

7. True or False? "A colour change occurs when hydrochloric acid reacts with sodium thiosulfate."

A True

B False

[1]

8. Why does increasing the temperature increase the rate of a reaction?

A The higher temperature reduces the activation energy.

B The reactant particles move faster, so collide more often and with more energy.

C The reactant particles stick together more.

[1]

9. What is meant by the term 'enzyme'?

.....

[1]

10. The equation for the decomposition of hydrogen peroxide is shown below:

$$2H_2O_{2(aq)} \rightarrow 2H_2O_{(l)} + O_{2(g)}$$

How would you expect the products of the completed reaction to be affected by the presence of a catalyst? Explain your answer.

.....

.....

.....

[2]

11. Increasing the concentration of reacting solutions increases the rate of a reaction. Explain why this occurs, in terms of particle collisions.

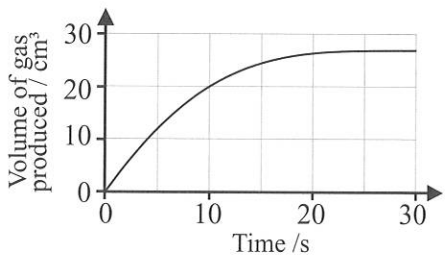
.....

.....

.....

[2]

12. A student reacts calcium with water. She measures the volume of gas produced at regular intervals. Her results are shown in the graph on the right.



Use the graph to calculate the mean rate of reaction during the first 10 seconds.

.....

.....

.....

..... $cm^3\ s^{-1}$

[2]

15

Test 31: Fuels and Earth Science

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Crude oil is...

A ...a renewable resource.

B ...a finite resource.

[1]

2. True or False? "Acid rain is caused when sulfur dioxide mixes with clouds."

A True

B False

[1]

3. Which of these gases is **not** a greenhouse gas?

A Water vapour

B Methane

C Nitrogen

[1]

4. Carbon monoxide is...

A ...a toxic gas.

B ...a hydrocarbon.

[1]

5. Which technique is used to separate the components of crude oil?

A Cracking

B Filtration

C Fractional distillation

[1]

6. Which of the following is **not** a use of the fuel oil fraction of crude oil?

A Fuel for some power stations

B Fuel for cars

C Fuel for large ships

[1]

7. The Earth's oceans were formed by...

A ...melting of prehistoric ice caps.

B ...earthquakes releasing liquid water trapped beneath the Earth's surface.

C ...condensation of water vapour in the early atmosphere.

[1]

8. True or False? "Short-chain hydrocarbons are generally more useful than long-chain hydrocarbons."

A True

B False

[1]

9. Which gas is thought to have made up most of the Earth's early atmosphere?

.....

Name **one** other gas present in the Earth's early atmosphere.

.....

Where are these gases thought to have come from?

.....

[3]

10. Alkanes are an example of a homologous series of compounds.
Give **one** feature of a homologous series of compounds.

.....

[1]

11. Explain why raising large amounts of livestock contributes to the greenhouse effect.

.....

.....

.....

[2]

12. Hexane and octane are two alkanes.
Hexane has the molecular formula C_6H_{14}. Octane has the molecular formula C_8H_{18}.
Explain why hexane has a lower viscosity than octane.

.....

.....

[1]

15

Test 32: Fuels and Earth Science

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "Cracking is used to turn long-chain hydrocarbons into short-chain hydrocarbons."

A True

B False

[1]

2. True or False? "All hydrocarbons contain carbon and hydrogen, but some hydrocarbons also contain oxygen."

A True

B False

[1]

3. Which of these is thought to be increasing the average global temperature?

A An increasing amount of greenhouse gases in the atmosphere.

B A decreasing amount of water vapour in the atmosphere.

[1]

4. When the oceans formed, the amount of CO_2 in the atmosphere...

A ...increased.

B ...stayed the same.

C ...decreased.

[1]

5. True or False? "Nitrogen oxides can be formed by the chemical reactions in car engines."

A True

B False

[1]

6. Which of the following does **not** vary between members of the alkane family of compounds?

A Boiling point

B General formula

C Length of molecule

[1]

7. Which of the following is a crude oil fraction that is used to surface roads?

A Diesel oil

B Kerosene

C Bitumen

[1]

8. Which of these is **not** produced when a fuel undergoes complete combustion?

A Carbon monoxide

B Carbon dioxide

C Water

[1]

9. Describe the chemical test for oxygen.

.....

[1]

10. Name the process used by green plants that removes carbon dioxide from the atmosphere.

.....

How else does this process affect the gases in the Earth's atmosphere?

.....

[2]

11. Hydrogen gas can be used as a fuel to power cars. Give **one** advantage and **one** disadvantage of using hydrogen instead of petrol as a fuel for cars.

Advantage: .....

.....

Disadvantage: .....

.....

[2]

12. Fractionating columns are hottest at the bottom and coolest at the top. Vaporised crude oil is piped into the bottom of a fractionating column. Explain how the properties of crude oil fractions allow them to be separated by a fractionating column.

.....

.....

.....

.....

[2]

15

Test 33: Chemistry 2 Mixed Topics

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "Argon is not suitable for use in light bulbs because it is highly flammable."

A True

B False

[1]

2. Which of the following will increase the rate of reaction between two aqueous solutions?

A Diluting the solutions.

B Increasing the average energy of the collisions.

[1]

3. True or False? "Chlorine will displace iodine from a solution of potassium iodide."

A True

B False

[1]

4. CH_4 and Cl_2 are...

A ...simple molecules.

B ...giant covalent structures.

[1]

5. Why is cracking of hydrocarbons carried out?

A To purify the fractions of crude oil.

B To generate electricity.

C To convert long alkane molecules into smaller, more useful molecules.

[1]

6. Which of the following is **not** a reason that carbon dioxide levels decreased in the Earth's early atmosphere?

A Lots of carbon dioxide dissolved into the oceans.

B The carbon dioxide reacted with oxygen in the atmosphere.

C Green plants began to photosynthesise.

[1]

7. What colour is bromine at room temperature?

A Cream

B Purple

C Red-brown

[1]

8. Carbon and carbon monoxide can be produced in combustion reactions where...

A ...there is not enough fuel.

B ...there is not enough oxygen.

[1]

9. State the relative charges of protons, neutrons and electrons in an atom.

proton: ..... neutron: ..... electron: .....

[1]

10. Breaking a solid reactant up into smaller pieces increases the rate of a reaction. Explain why this occurs, in terms of particle collisions.

.....

.....

.....

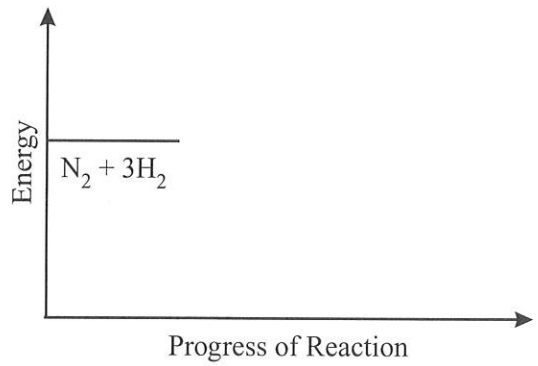
[2]

11. Give **one** human activity that increases the amount of greenhouse gases in the atmosphere.

.....

[1]

12. The equation for the formation of ammonia is: $N_2 + 3H_2 \rightarrow 2NH_3$
This reaction is exothermic.
Complete the reaction profile for this reaction below. Label the activation energy.



[3]

15

Test 34: Chemistry 2 Mixed Topics

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. In an exothermic reaction the energy required to break bonds is...

A ...less than the energy released when new bonds form.

B ...greater than the energy released when new bonds form.

[1]

2. Which of the following are produced by cracking?

A Alkanes and water vapour.

B Alkanes and alkenes.

[1]

3. Which of the following statements about catalysts is true?

A They don't alter the products of a reaction.

B They alter the overall heat change of a reaction.

C They are used up in a reaction.

[1]

4. Hydrogen chloride dissolves in water to form...

A ...a neutral solution.

B ...an alkaline solution.

C ...an acidic solution.

[1]

5. During a displacement reaction...

A ...there is a change in heat energy.

B ...there is no change in heat energy.

[1]

6. True or False? "Oxides of nitrogen are harmful pollutants."

A True

B False

[1]

7. True or False? "The nucleus of an atom is very small compared to the overall size of the atom."

A True

B False

[1]

8. Which of the following statements about crude oil is true?

A It is a mixture of ionic compounds.

B It can be separated by fractional distillation.

[1]

9. The table on the right shows the melting points of some Group 7 elements.

	Melting point (°C)
Fluorine	–220
Bromine	–7.2
Iodine	114

Predict the melting point of chlorine.

.....

[1]

10. A student stands a flask containing hydrochloric acid over a black cross. She adds some sodium thiosulfate solution and measures the time taken for the solution to turn cloudy enough for the black cross to disappear.

She repeats the experiment at a higher temperature.
What effect will this have on the amount of time taken for the black cross to disappear?

.....

Explain your answer.

.....

.....

[2]

11. Explain why the halogens become less reactive down the group.

.....

.....

.....

[2]

12. The relative atomic mass of chlorine is 35.5.
Explain why the relative atomic mass of chlorine is not a whole number.

.....

.....

.....

[2]

15

Test 35: Motion, Forces and Conservation of Energy

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. The acceleration of an object is equal to...

A ... the change in its velocity over time.

B ... the change in its height over time.

[1]

2. True or False? "Energy can be created but not destroyed."

A True

B False

[1]

3. What happens to the amount of energy in a car's kinetic energy store when the car slows down?

A It remains the same.

B It increases.

C It decreases.

[1]

4. Which equation correctly links weight, W, mass, m, and gravitational field strength, g?

A $W = g \div m$

B $W = m \times g$

C $W = m \div g$

[1]

5. True or False? "The greater the speed of a car, the greater its stopping distance."

A True

B False

[1]

6. What is the gradient of a velocity-time graph equal to?

A Speed

B Distance

C Acceleration

[1]

7. Which of the following would decrease the rate of cooling of a garage?

A Decreasing the thickness of its walls.

B Increasing the thickness of its walls.

[1]

8. 4 J of energy is supplied to a device with an efficiency of 50%. How much energy is transferred usefully by the device?

A 2 J

B 4 J

C 6 J

[1]

9. What is the difference between speed and velocity?

.....

.....

[1]

10. State **one** problem with generating electricity using nuclear power.

.....

.....

[1]

11. A student runs at a speed of 3.5 m/s for 26 seconds.

What equation links distance travelled, speed and time?

.....

Calculate the distance the student runs during this time.

.....

.....

Distance = ... m

[3]

12. A 0.5 kg object is at the top of a 30 m high cliff. The equation below relates the amount of energy in an object's gravitational potential energy store to its mass, the gravitational field strength and the height of the object.

Gravitational potential energy = mass × gravitational field strength × height

Calculate the energy in the object's gravitational potential energy store.
(gravitational field strength, g = 10 N/kg)

.....

.....

.....

Energy = ... J

[2]

15

Test 36: Motion, Forces and Conservation of Energy

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Which of these does not affect the braking distance of a car?

A The car's speed

B The condition of the car's tyres

C The driver's reaction time

[1]

2. A cannon uses explosives to launch a ball into the air. Which is a wasteful energy transfer that occurs when the cannon is fired?

A Chemical energy store of explosives → Kinetic energy store of ball

B Chemical energy store of explosives → Thermal energy store of ball

[1]

3. A resultant force of 3 N acts on a 3 kg trolley. What is the acceleration of the trolley?

A 9 m/s^2

B 6 m/s^2

C 1 m/s^2

[1]

4. What is the typical speed of sound in air?

A 330 m/s

B 3×10^8 m/s

C 3.3 m/s

[1]

5. What is the name of a system in which there is no net change in the total energy?

A A closed system

B An open system

[1]

6. A ball hits a wall with a force of 5 N. What is the force exerted on the ball by the wall?

A 0 N

B –5 N

C –10 N

[1]

7. When an apple falls from a tree, energy is transferred...

A ... away from its gravitational potential energy store.

B ... to its gravitational potential energy store.

[1]

8. How could you reduce unwanted energy transfers in a battery-powered toy car?

A Increase the input energy to the car.

B Lubricate any moving parts in the car.

[1]

9. Give **two** examples of scalar quantities.

1. .....

2. .....

[2]

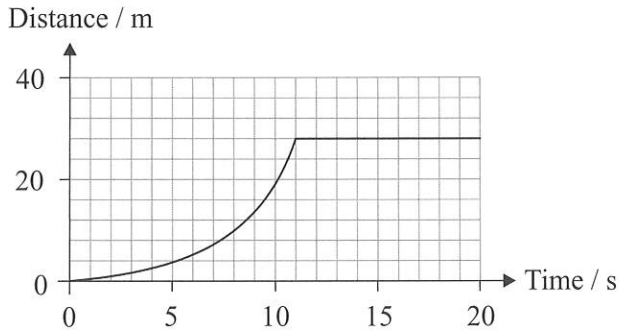
10. State **one** environmental disadvantage of using tidal-powered turbines to generate electricity.

.....

.....

[1]

11. The graph on the right shows the motion of a cyclist. Describe the cyclist's motion during the 20 s shown.



.....

.....

.....

[2]

12. A go-kart travels along a straight track at 10 m/s. The go-kart and its driver have a combined mass of 160 kg. The equation below gives the energy in the kinetic energy store of a moving object.

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

Calculate the total energy in the kinetic energy stores of the go-kart and driver.

.....

.....

Energy = ... J

[2]

15

Test 37: Waves and the Electromagnetic Spectrum

There are **11 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "Changes in atoms can cause electromagnetic waves to be absorbed or emitted."

A True

B False

[1]

2. What units are used for wave speed?

A Metres, m

B Metres per second, m/s

C Hertz, Hz

[1]

3. Waves can change direction as they cross a boundary between two different substances. What is this called?

A Absorption

B Reflection

C Refraction

[1]

4. True or False? "Radio waves are used for television broadcasts."

A True

B False

[1]

5. The amplitude of a wave is...

A ... the distance from one crest on a wave to the next crest.

B ... the maximum displacement from the rest position, e.g. to a crest or a trough.

[1]

6. Which of the following statements about electromagnetic (EM) waves is correct?

A All EM waves travel through a vacuum at the same speed.

B The higher the frequency of an EM wave, the faster it travels through a vacuum.

[1]

7. Which of these is an example of a longitudinal wave?

A Ripples on the surface of water

B Sound waves

C X-rays

[1]

8. True or False? "Waves transfer matter."

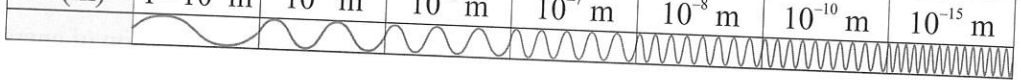
A True

B False

[1]

9. Name the regions of the electromagnetic spectrum labelled **A** and **D** in the diagram below.

Region	Radio waves	**A**	**B**	Visible light	**C**	**D**	Gamma rays
λ (m)	$1 - 10^{4}$ m	10^{-2} m	10^{-5} m	10^{-7} m	10^{-8} m	10^{-10} m	10^{-15} m



A: ..... **D**: .....

[2]

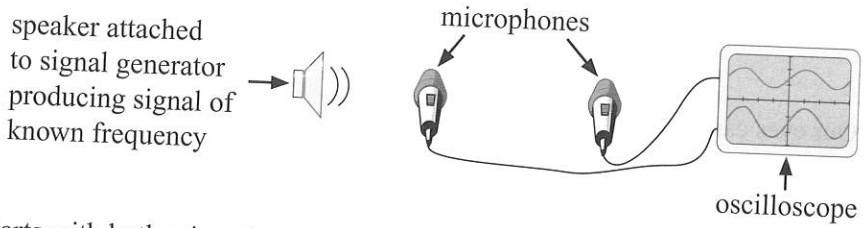
10. Name one type of electromagnetic radiation that can cause harm to people. State a harmful effect of this type of radiation.

Type of radiation: .....

Harmful effect: .....

[2]

11. A student is using the equipment shown below to measure the velocity of sound in air.



She starts with both microphones next to the speaker. The two traces on the oscilloscope line up. She moves one microphone away from the speaker until the traces line up again.

What property of the sound waves is equal to the distance between the microphones?

.....

Describe how the student could use this measurement and information from the signal generator to calculate the speed of the sound waves in air.

.....

.....

.....

[3]

15

Test 38: Waves and the Electromagnetic Spectrum

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. The different types of electromagnetic waves...

A ... all have the same wavelength.

B ... all have the same frequency.

C ... form a continuous spectrum.

[1]

2. In a longitudinal wave, the vibrations are...

A ... parallel to the direction of energy transfer.

B ... perpendicular to the direction of energy transfer.

[1]

3. Which of these is a use of gamma radiation?

A Cooking food

B Communications

C Cancer treatment

[1]

4. X-rays are...

A ... electromagnetic waves.

B ... sound waves.

C ... radio waves.

[1]

5. True or False? "Our eyes can detect all types of electromagnetic waves."

A True

B False

[1]

6. What is the frequency of a wave?

A The number of waves passing a point per second.

B The distance travelled by the wave each second.

[1]

7. How does the potential danger of electromagnetic radiation change as the frequency of the radiation increases?

A It stays the same.

B It increases.

C It decreases.

[1]

8. True or False? "Waves are only refracted if they're travelling along the normal to the boundary they are crossing."

A True

B False

[1]

9. Give **two** different uses of infrared radiation.

1. .....

2. .....

[2]

10. What are transverse waves?

.....

.....

[1]

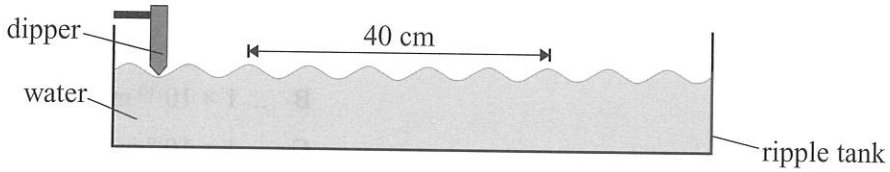
11. A pebble is dropped into a pond and creates water ripples. Explain why a leaf on the surface of the water is not carried across the pond by the ripples.

.....

.....

[1]

12. A student uses a dipper to set up water waves in a ripple tank.
She measures the distance shown in the diagram to be 40 cm.
The time taken for the peak of one wave to travel this distance is 2.5 s.



State the equation linking wave speed, distance and time.

.....

Calculate the speed of the waves.

.....

.....

Wave speed = ... m/s

[3]

15

Test 39: Radioactivity

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. What is the name for atoms with the same number of protons but different numbers of neutrons?

A Ions

B Isotopes

[1]

2. The count rate of a radioactive sample falls from 130 Bq to 65 Bq in 15 minutes. What is its half-life?

A 15 minutes

B 30 minutes

C 1 hour

[1]

3. True or False? "Living cells can be damaged by ionising radiation."

A True

B False

[1]

4. True or False? "The results of the alpha scattering experiment led to the development of the plum pudding model of the atom."

A True

B False

[1]

5. Which type of radiation is the least ionising?

A Alpha

B Beta

C Gamma

[1]

6. The typical size of an atom is approximately...

A ... 1×10^{-12} m.

B ... 1×10^{-10} m.

C ... 1×10^{10} m.

[1]

7. True or False? "When a radioactive nucleus emits a beta-minus particle, its atomic number increases."

A True

B False

[1]

8. What is the unit of activity of a radioactive isotope?

A Hertz, Hz

B Becquerel, Bq

[1]

9. Name **one** piece of equipment that can be used to detect radioactivity.

.....

[1]

10. Give **one** source of background radiation.

.....

[1]

11. The decay of phosphorus-32 is shown below.

$$^{32}_{15}\mathrm{P} \rightarrow \ ^{32}_{\ldots\ldots}\mathrm{S} + ^{0}_{-1}\mathrm{e}$$

Complete the equation by writing in the missing atomic number of the product.

[1]

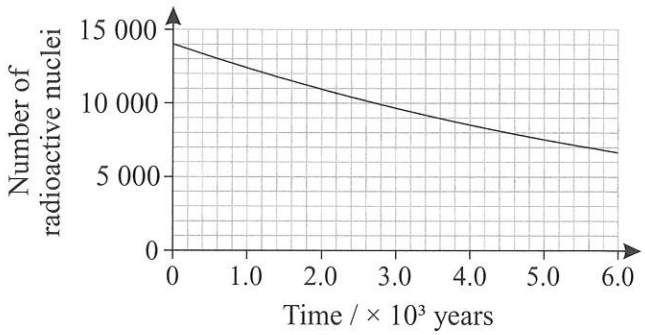
12. A number of machines found in hospitals use ionising radiation. Explain how standing behind lead barriers when using these machines helps to keep medical staff safe.

.....

.....

[1]

13. The graph on the right shows the number of radioactive nuclei in a sample over time. Use the graph to calculate how long it would take for the number of radioactive nuclei in the sample to fall to one quarter of its initial amount.



.....

.....

.....

Time = ... years

[3]

15

Test 40: Radioactivity

There are **13 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "The longer the half-life of a radioactive sample, the sooner it will stop being radioactive."

A True

B False

[1]

2. True or False? "In the plum pudding model, an atom was a positive sphere with small negative electrons stuck in it."

A True

B False

[1]

3. True or False? "It is not possible to predict when a particular unstable nucleus will decay."

A True

B False

[1]

4. In β^+ decay, a proton changes into...

A ... a neutron and an electron.

B ... a neutron and a positron.

[1]

5. Which of these statements is correct?

A Background radiation is around us all the time.

B Background radiation is only caused by fallout from nuclear weapons tests.

C Background radiation is hard to detect.

[1]

6. Which type of radiation is the same as a helium nucleus?

A Alpha

B Beta

C Gamma

[1]

7. Which of the following gives the number of neutrons in the nucleus of an atom?

A The mass number

B The mass number + the atomic number

C The mass number – the atomic number

[1]

8. Which of these is **not** found in the nucleus of an atom?

A Protons

B Electrons

C Neutrons

[1]

9. What is the difference between an atom and an ion?

.....

.....

[1]

10. A student has a source of radiation that emits either alpha, beta or gamma radiation. She wants to identify the type of radiation that it emits.

What type of radiation would it be if it was stopped by a sheet of paper?

.....

What type of radiation would it be if it was stopped by a sheet of aluminium, but not paper?

.....

[2]

11. A sample contains 1.2×10^5 radioactive nuclei of isotope Y.
How many nuclei of isotope Y will there be after one half-life?

.....

Number of nuclei = ...

[1]

12. An electron is in orbit around an atom's nucleus. The electron absorbs an electromagnetic wave. What happens to the electron's orbit?

.....

[1]

13. Describe the difference between irradiation and contamination.

.....

.....

.....

[2]

15

Test 41: Physics 1 Mixed Topics

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. A car accelerates from 0 m/s to 10 m/s in 2 s. What is the average acceleration of the car?

A 2 m/s^2

B 5 m/s^2

C 10 m/s^2

[1]

2. Which of these is true in the current model of the atom?

A Almost all of the mass of the atom is concentrated at its centre.

B The nucleus in the atom is uncharged.

[1]

3. True or False? "Energy transfers can increase or decrease the total energy of a closed system."

A True

B False

[1]

4. True or False? "If an object is moving, there must be a non-zero resultant force acting on it."

A True

B False

[1]

5. The wavelength of a wave is...

A ... the length of a full cycle of the wave, e.g. from crest to crest.

B ... the distance travelled by the wave each second.

[1]

6. What happens to a nucleus when it emits a gamma ray?

A Its mass decreases

B Its charge decreases

C Its mass and charge remain unchanged

[1]

7. According to Newton's Third Law, when two objects interact, the forces they exert on each other are...

A ... equal and in opposite directions.

B ... equal and in the same direction.

[1]

8. Which of these is a typical value for a person's reaction time?

A 0.04 s

B 0.4 s

C 4 s

[1]

9. The following equation links the wave speed, frequency and wavelength of a wave.

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

Calculate the speed of a wave with a frequency of 6.0×10^7 Hz and a wavelength of 1.4 m.

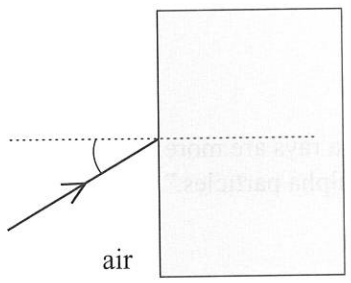
.....

.....

Wave speed = ... m/s

[2]

10. A light ray enters the block to the right at an angle to the normal. The block has a higher optical density than air. Sketch a light ray on the ray diagram to the right to show how the light ray may refract when it enters the block from air.



[1]

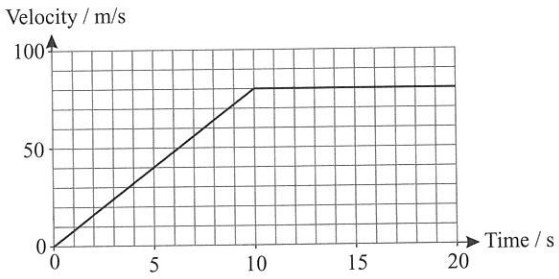
11. The equation below shows the alpha decay of an isotope of americium. Complete the equation by writing the missing atomic number and mass number of the product.

$$^{241}_{95}\text{Am} \rightarrow \,^{\ldots\ldots}_{\ldots\ldots}\text{Np} + ^{4}_{2}\text{He}$$

[2]

12. A velocity/time graph for a racing car is shown on the right.

Calculate the acceleration of the car during the first 10 s of its journey.



.....

.....

Acceleration = ... m/s^2

[2]

15

Test 42: Physics 1 Mixed Topics

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. What happens to the atomic number of a radioactive nucleus when it emits an alpha particle?

A It increases

B It decreases

[1]

2. The rate of energy transfer from a house can be reduced by...

A ... having walls with a low thermal conductivity.

B ... having walls with a high thermal conductivity.

[1]

3. True or False? "Gamma rays are more strongly ionising than alpha particles."

A True

B False

[1]

4. True or False? "Two isotopes of carbon have the same number of neutrons but a different number of protons."

A True

B False

[1]

5. Which of the following is a possible reason for why we continue to use non-renewable resources?

A Because non-renewable resources are more reliable than renewable alternatives.

B Because non-renewable resources will never run out.

[1]

6. Two toy cars with the same mass are pushed with different forces. The car pushed with a greater force has...

A ... a greater acceleration than the other car.

B ... a lower acceleration than the other car.

C ... the same acceleration as the other car.

[1]

7. Which of the following types of electromagnetic radiation is potentially the most dangerous?

A Ultraviolet

B Gamma rays

C X-rays

[1]

8. A cyclist travels at 4 m/s for 8 s. How far do they move in this time?

A 2 m

B 12 m

C 32 m

[1]

9. State **one** factor that can cause a driver's reaction time to increase.

.....

[1]

10. State **one** useful application of microwaves.

.....

[1]

11. 560 J is supplied to an electric pencil sharpener. The pencil sharpener transfers 420 J of this energy usefully. The equation below gives the efficiency of a device.

efficiency = useful energy transferred by the device ÷ total energy supplied to the device

Calculate the efficiency of the pencil sharpener.

.....

.....

Efficiency = ...

[2]

12. A car is stationary. The driver starts the car and accelerates at 3.0 m/s^2.
Calculate the velocity of the car when it has travelled 24 m.

$$(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$$

.....

.....

.....

Velocity = ... m/s

[3]

15

Test 43: Forces and Energy

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. When a racket hits a ball, energy is transferred from the racket's kinetic energy store to the ball's kinetic energy store. This energy is transferred...

A ... by heating.

B ... by forces doing work.

[1]

2. Which of these statements is true?

A When an object is lifted, work is done against gravity.

B When an object falls, work is done against gravity.

[1]

3. Electric heater A has a power of 1 kW. Electric heater B has a power of 880 W. Which transfers the most energy in 2 hours?

A Heater A

B Heater B

[1]

4. A teapot is at rest on a table. The teapot exerts a force of 10 N on the table. What force does the table exert on the teapot?

A 0 N

B –10 N

C –20 N

[1]

5. What unit is the watt equal to?

A J/s

B J/kg

[1]

6. Which of the following is a contact force?

A Gravitational force

B Electrostatic force

C Friction

[1]

7. A kettle is supplied with 100 kJ of energy. It usefully transfers 75 kJ of energy to the water inside it. What is the efficiency of the kettle?

A 25%

B 75%

[1]

8. True or False? "Work done is equal to energy transferred."

A True

B False

[1]

9. State what is meant by power.

.....

.....

[1]

10. Give **one** of the energy stores that energy is usefully transferred to in a hairdryer when it is switched on.

.....

[1]

11. A robot has a power output of 50 W. The equation below gives the work done by a device with a given power in a given period of time.

work done = power × time taken

How much work does the robot do in 2 minutes?

.....

.....

.....

Energy = ... J

[2]

12. A builder does 84 J of work lifting some bricks from the ground to a height of 1.2 m.

Calculate the force exerted by the builder to lift the bricks.

work done = force × distance moved in the direction of the force

.....

.....

Force = ... N

[3]

15

Test 44: Electricity and Circuits

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "The resistance of a thermistor is higher in hot conditions than in the cold."

A True

B False

[1]

2. What is the unit of power?

A Joule, J

B Ohm, Ω

C Watt, W

[1]

3. One volt is equal to...

A ... one joule per ampere.

B ... one joule per coulomb.

[1]

4. Which type of current is supplied by a battery?

A Direct current (dc)

B Alternating current (ac)

[1]

5. Electric current is...

A ... the driving force that pushes charges around a circuit.

B ... the rate of flow of electrical charge.

[1]

6. As the current through a filament lamp increases, the resistance of the lamp...

A ... increases.

B ... decreases.

C ... stays the same.

[1]

7. A current of 2 A passes through an electric motor over a period of 60 s. What is the total charge transferred through the motor in this time?

A 30 C

B 60 C

C 120 C

[1]

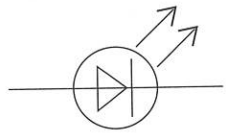
8. Current flows into an electrical appliance through the...

A ... live wire.

B ... earth wire.

[1]

9. Name the circuit component shown on the right.



.....

[1]

10. Describe the difference between direct current and alternating current.

.....

.....

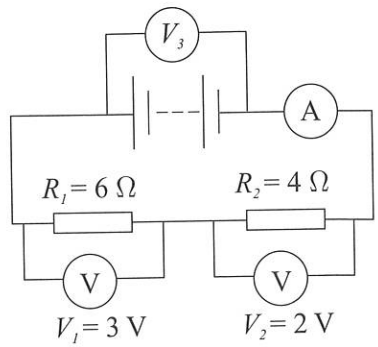
[1]

11. The circuit diagram below shows two resistors connected in series with a battery.

Find the reading on voltmeter V_3.

.....

Potential difference = ... V



Find the total resistance, R, of the circuit.

.....

Resistance = ... Ω

[2]

12. A current of 2.5 A passes through a device with a resistance of 12 Ω.

State the equation linking power, current and resistance.

.....

Calculate the power of the device.

.....

.....

Power = ... W

[3]

15

Test 45: Electricity and Circuits

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "The UK mains electricity supply is direct current."

A True

B False

[1]

2. An ammeter is used to measure the current through a component. The ammeter must be connected...

A ... in parallel with the component.

B ... in series with the component.

[1]

3. In a circuit with a fixed potential difference, what would happen to the current if you increased the resistance?

A The current would decrease.

B The current would stay the same.

[1]

4. In the UK, what is the typical potential difference between the live wire and earth wire in an electrical appliance?

A 0 V

B 12 V

C 230 V

[1]

5. When two resistors are connected in parallel, their combined resistance is...

A ... lower than it would be if they were connected in series.

B ... higher than it would be if they were connected in series.

C ... the same as it would be if they were connected in series.

[1]

6. A 0.5 A and a 1.5 A current flow into a junction. Current leaves the junction through one wire. What is the current in this wire?

A 1 A

B 2 A

C 3 A

[1]

7. Which of these is needed for a current to flow in a closed circuit?

A A source of potential difference

B Resistance

[1]

8. True or False? "Two components connected in parallel will each have the same potential difference across them."

A True

B False

[1]

9. Every electrical appliance has a fuse connected in its live wire.
Explain how the fuse makes the appliance safer to use.

.....

.....

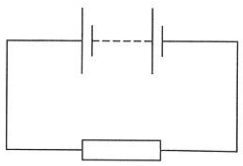
[1]

10. A current is flowing through a diode in a circuit.
The direction of the potential difference across the diode is reversed.
What happens to the size of the current through the diode?

.....

[1]

11. A current is flowing through the resistor in the circuit shown below.



What happens to the temperature of the resistor as the current flows through it?

.....

How does this temperature change affect the resistance of the resistor?

.....

[2]

12. An electric iron draws a current of 10 A from a 230 V mains supply.
The iron is used for 4 minutes. How much energy is transferred by the iron?

energy transferred = current × potential difference × time

.....

.....

.....

Energy = ... J

[3]

15

Test 46: Magnetic Fields

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. Induced magnets produce a magnetic field...

A ... all the time.

B ... only while they are in another magnetic field.

[1]

2. True or False? "Electricity is transferred from power stations at a high potential difference and a low current."

A True

B False

[1]

3. True or False? "The magnetic field of a bar magnet is strongest at the poles."

A True

B False

[1]

4. The force between the north poles of two bar magnets is...

A ... attractive.

B ... repulsive.

[1]

5. A plotting compass tells you...

A ... the direction of a magnetic field only.

B ... the strength and direction of a magnetic field.

[1]

6. The magnetic field produced when current flows through a wire...

A ... is parallel to the wire.

B ... goes round the wire in circles centred on the wire.

[1]

7. True or False? "Step-up transformers are used to increase the potential difference of electricity."

A True

B False

[1]

8. Which of the following is a magnetic material?

A Copper

B Silver

C Nickel

[1]

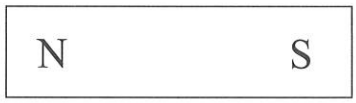
9. The image below shows the national grid.

State the name given to the electrical devices labelled X.

.....

[1]

10. A bar magnet is shown below. Draw the magnetic field pattern of the bar magnet on the diagram. Include arrows on your field lines to show the direction of the field.



[2]

11. State the **two** factors which affect the strength of the magnetic field around a current-carrying wire.

1. .....

2. .....

[2]

12. A solenoid is a long coid of many loops of wire. When a current flows through the wire, a magnetic field is produced around the solenoid. Explain why the magnetic field along the centre of the solenoid is much stronger than the magnetic field outside the solenoid.

.....

.....

.....

[2]

15

Test 47: Matter

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "Liquids are generally denser than solids."

A True

B False

[1]

2. What are the units for density?

A m^3/kg

B kg/m^2

C kg/m^3

[1]

3. Which of the following equations shows the correct relationship between the force exerted on a spring (F), the spring constant (k) and the extension of the spring (x)?

A $F = k \times x$

B $F = k \div x$

C $F = x \div k$

[1]

4. True or False? "The higher the temperature of a gas, the slower its particles will move."

A True

B False

[1]

5. True or False? "More than one force must be applied to compress an object."

A True

B False

[1]

6. What happens to the mass of a substance when it changes from a solid to a liquid?

A It increases

B It decreases

C It stays the same

[1]

7. What quantity gives the energy released when 1 kg of a liquid becomes a solid with no change in temperature?

A Specific heat capacity

B Specific latent heat

[1]

8. A sealed glass box filled with air is cooled. Which of the following statements is true?

A The pressure of the gas will decrease.

B The pressure of the gas will increase.

C The volume of the gas will decrease.

[1]

9. What happens to the average energy of the particles in a system when the system is heated?

.....

[1]

10. State what is meant by the term absolute zero, in terms of the movement of particles.

.....

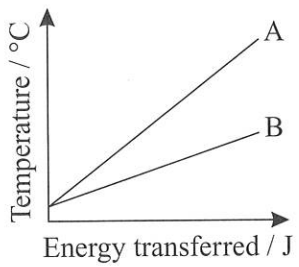
.....

What is the temperature of absolute zero on the Celsius scale?

Temperature = ... °C

[2]

11. A student uses a heater to provide energy to two 0.5 kg blocks made from different materials. The student supplies the same amount of energy to each block. She measures their temperatures at regular intervals for five minutes. The graph on the right shows her results.



State and explain which block of material has the highest specific heat capacity.

.....

.....

[2]

12. Substance Y has a specific heat capacity of 400 J/kg°C.

Calculate the amount of energy needed to increase the temperature of 0.5 kg of substance Y by 15 °C.

change in thermal energy = mass × specific heat capacity × temperature change

.....

.....

Energy = ... J

[2]

15

Test 48: Matter

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. True or False? "Changes of state can be reversed to recover the original properties of the material."

A True

B False

[1]

2. What is the specific heat capacity of a substance?

A The total energy stored by the particles in a system.

B The energy needed to raise the temperature of 1 kg of a substance by 1°C.

[1]

3. Which of the following statements about gas particles is **false**?

A Gas particles generally travel at higher speeds than liquid and solid particles.

B Gas particles travel in random directions.

C Gas particles generally have less energy than liquid and solid particles.

[1]

4. True or False? "An object will return to its original shape and length after it has been inelastically distorted."

A True

B False

[1]

5. True or False? "Gas pressure is caused by the particles of the gas colliding with the walls of their container."

A True

B False

[1]

6. What will happen to the pressure of a fixed volume of gas if its temperature is increased?

A It will increase

B It will decrease

[1]

7. Which of the following changes in state is called 'sublimation'?

A gas to liquid

B solid to gas

C solid to liquid

[1]

8. What is 25 °C in kelvin?

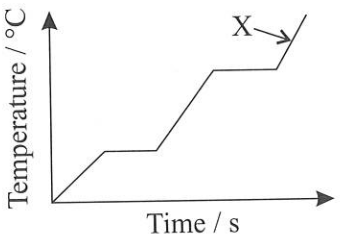
A –248 K

B 25 K

C 298 K

[1]

9. A temperature-time graph for a substance that is being heated up is shown on the right. Identify the state of the substance at point X.



State = ...

[1]

10. Describe how the arrangement of particles in a solid is different to the arrangement of particles in a gas.

.....

.....

[1]

11. A spring with a spring constant of 2000 N/m is extended by 0.03 m. Assuming the spring's limit of proportionality has not been reached, calculate the energy transferred to stretch the spring.

energy transferred in stretching = 0.5 × spring constant × (extension)^2

.....

.....

Energy = ... J

[2]

12. A piece of gold has a volume of 2.00×10^{-5} m^3 and a density of 20 000 kg/m^3. Calculate the mass of the piece of gold.

density = mass ÷ volume

.....

.....

.....

Mass = ... kg

[3]

15

Test 49: Physics 2 Mixed Topics

There are **11 questions** in this test. Give yourself **10 minutes** to answer them all.

1. What unit is specific heat capacity measured in?

A J/kg

B J/kg°C

C J/°C

[1]

2. What is the power of a device that transfers 20 J in five seconds?

A 4 W

B 20 W

C 100 W

[1]

3. True or False? "If a resistor is added to a circuit in parallel, the total resistance of the circuit will increase."

A True

B False

[1]

4. The amount of energy transferred by an appliance depends on...

A ... its power and size.

B ... its power and the time it is on for.

[1]

5. Which is the correct equation for density?

A density = mass × volume

B density = volume ÷ mass

C density = mass ÷ volume

[1]

6. The magnetic field inside a solenoid is...

A ... strong and uniform.

B ... strong and irregular.

C ... weak and uniform.

[1]

7. Electricity is transferred across step-up transformers to...

A ... increase its potential difference for domestic use.

B ... increase its potential difference for transmission from power stations.

[1]

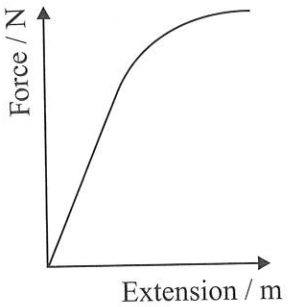
8. If the live wire of an electrical appliance touches its metal case...

A ... a large current will flow through the case and out through the earth wire.

B ... a large current will flow through the case and out through the neutral wire.

[1]

9. The graph on the right shows how much force must be applied to an elastic object to produce a given extension.



Mark with a cross the point on the graph where the relationship between force and extension becomes non-linear.

[1]

10. Silver has a specific latent heat of fusion of 111 000 J/kg. The equation below links the thermal energy for a change of state with the mass of a material and its specific latent heat.

thermal energy for a change of state = mass × specific latent heat

Calculate the minimum amount of energy needed to melt 0.25 kg of silver.

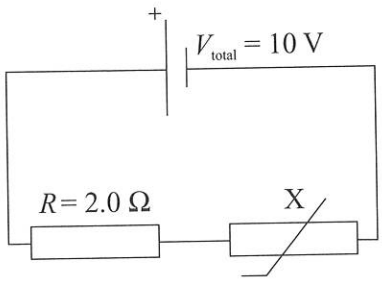
.....

.....

Energy = ... J

[2]

11. A circuit diagram is shown on the right.



Identify component X.

.....

Calculate the current passing through the circuit when component X has a resistance of 3.0 Ω.

.....

.....

.....

Current = ... A

[4]

15

Test 50: Physics 2 Mixed Topics

There are **12 questions** in this test. Give yourself **10 minutes** to answer them all.

1. A speaker is connected to a 2 V battery. How much energy is transferred to the speaker when 80 C of charge passes through it?

A 40 J

B 82 J

C 160 J

[1]

2. True or False? "The pressure of a gas held at constant volume decreases if the temperature is decreased."

A True

B False

[1]

3. When two unlike magnetic poles are brought together, they...

A ... repel each other.

B ... attract each other.

[1]

4. What is 100 °C in kelvin?

A –173 K

B 100 K

C 373 K

[1]

5. True or False? "In a series circuit, the power supply's potential difference is shared between all components."

A True

B False

[1]

6. True or False? "The magnetic field of a bar magnet is strongest at the poles."

A True

B False

[1]

7. Two materials are cooled by 10° C. They have the same mass and different specific heat capacities. Which material emits more energy?

A The material with the lower specific heat capacity

B The material with the higher specific heat capacity

[1]

8. Which of the equations below correctly links work done, E, by a force, F, to the distance moved in the direction of the force, d?

A $E = F \div d$

B $E = d \div F$

C $E = F \times d$

[1]

9. What happens to the resistance of a light-dependent resistor (LDR) as light intensity increases?

.....

[1]

10. Hair straighteners with a power of 57.5 W are plugged into a 230 V mains supply. The equation below shows the relationship between power, potential difference and current.

$$\text{current} = \text{power} \div \text{potential difference}$$

Calculate the current through the hair straighteners.

.....

.....

Current = ... A

[2]

11. State the approximate direction in which a compass will point if it is not near to any magnetised materials. Explain why the compass points in this direction.

.....

.....

.....

[2]

12. The potential difference across the primary coil of a transformer is 12 V and the potential difference across the secondary coil is 8 V. The current in the primary coil is a 4 A. Calculate the current in the secondary coil.

$$I_S = (V_P \times I_P) \div V_S$$

where V_P = potential difference across primary coil, I_P = current in primary coil, V_S = potential difference across secondary coil and I_S = current in secondary coil.

.....

.....

Current in secondary coil = ... A

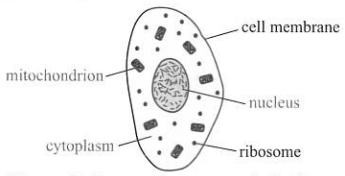
[2]

15

Answers

Key Concepts in Biology

Test 1: Key Concepts in Biology
Pages 2–3

1. A *[1 mark]* 2. C *[1 mark]*
3. C *[1 mark]* 4. A *[1 mark]*
5. A *[1 mark]* 6. B *[1 mark]*
7. B *[1 mark]* 8. B *[1 mark]*
9. Temperature / pH / Substrate concentration *[1 mark]*
10. They break down lipids into glycerol and fatty acids *[1 mark]*.
11. Sperm cells can no longer enter the egg cell *[1 mark]*.
    It makes sure the fertilised cell has the correct amount of DNA / only one sperm fertilises the egg *[1 mark]*.
12. 

    [1 mark for each correct label]
    Mitochondria are where most of the reactions for aerobic respiration take place *[1 mark]*.

Test 2: Key Concepts in Biology
Pages 4–5

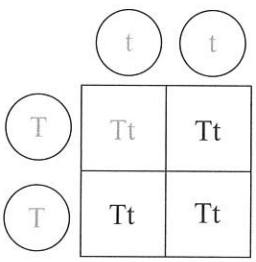
1. B *[1 mark]* 2. A *[1 mark]*
3. B *[1 mark]* 4. C *[1 mark]*
5. B *[1 mark]* 6. B *[1 mark]*
7. B *[1 mark]* 8. A *[1 mark]*
9. E.g. it has a long tail. / It has lots of mitochondria. / It has an acrosome which contains enzymes. / It has a haploid nucleus. *[1 mark]*
10. E.g. an electron microscope can show cells/subcellular structures in more detail than a light microscope *[1 mark]*.
11. It helps the cell to move *[1 mark]*.
12. It is the movement of particles across a membrane against a concentration gradient *[1 mark]* using energy transferred during respiration *[1 mark]*.
13. It changes shape *[1 mark]*.
    The substrate won't fit any more, so the enzyme won't work *[1 mark]*.

Biology Paper 1

Test 3: Cells and Control
Pages 6–7

1. B *[1 mark]* 2. A *[1 mark]*
3. A *[1 mark]* 4. B *[1 mark]*
5. B *[1 mark]* 6. B *[1 mark]*
7. A *[1 mark]* 8. C *[1 mark]*
9. Embryonic stem cells *[1 mark]*
10. Sensory neurones *[1 mark]*.
    A receptor detects a stimulus *[1 mark]*.
11. Any two from: e.g. repair/replacing damaged cells / Growth / Asexual reproduction *[1 mark for each]*
12. When an electrical impulse reaches a synapse, neurotransmitters move across the synapse *[1 mark]*. The neurotransmitters then set off a new electrical impulse in the next neurone *[1 mark]*.

Test 4: Genetics
Pages 8–9

1. B *[1 mark]* 2. B *[1 mark]*
3. A *[1 mark]* 4. B *[1 mark]*
5. C *[1 mark]* 6. B *[1 mark]*
7. A *[1 mark]* 8. B *[1 mark]*
9. All human DNA *[1 mark]*.
10. The difference in characteristics between organisms caused by their environment *[1 mark]*.
11. 

    [2 marks for all three genotypes correct, or 1 mark for two correct]
12. A sugar *[1 mark]*
    A phosphate group *[1 mark]*
    A base *[1 mark]*

Test 5: Natural Selection & Genetic Modification
Pages 10–11

1. B *[1 mark]* 2. A *[1 mark]*
3. A *[1 mark]* 4. B *[1 mark]*
5. C *[1 mark]* 6. B *[1 mark]*
7. B *[1 mark]* 8. C *[1 mark]*
9. E.g. by looking at the structural features of the tools. / By studying the rock layers the tools are found in. *[1 mark]*
10. Changing the genome of an organism *[1 mark]* to introduce new/useful characteristics *[1 mark]*.
11. Benefit: e.g. crops can be genetically engineered to increase yields *[1 mark]*.
    Risk: e.g. genes used in genetic engineering may get out into the environment. / Genetically modified crops might have a negative effect on food chains / Genetically modified crops might be a danger to human health. *[1 mark]*
12. Organisms that have the useful characteristic are more likely to survive and reproduce than other organisms in the population *[1 mark]*. This means that the useful characteristic is more likely to be passed on to the next generation, so it becomes more common over time *[1 mark]*.

Test 6: Health, Disease & the Development of Medicines
Pages 12–13

1. A *[1 mark]* 2. B *[1 mark]*
3. B *[1 mark]* 4. A *[1 mark]*
5. A *[1 mark]* 6. C *[1 mark]*
7. B *[1 mark]* 8. B *[1 mark]*
9. Cholera is spread via contaminated water sources *[1 mark]*.
10. E.g. mucus *[1 mark]*.
11. Mosquitoes pass the protist/pathogen that causes malaria between people *[1 mark]*.
    Using mosquito nets. / Using insect repellent. *[1 mark]*

Answers

12. The injected dead or inactive pathogens carry antigens *[1 mark]*. The antigens cause the body to make memory lymphocytes *[1 mark]*. If live pathogens of the same type enter the body after that, memory lymphocytes quickly make antibodies to destroy them *[1 mark]*.

Test 7: Health, Disease & the Development of Medicines Pages 14–15

1. B *[1 mark]* 2. C *[1 mark]*
3. B *[1 mark]* 4. B *[1 mark]*
5. A *[1 mark]* 6. B *[1 mark]*
7. B *[1 mark]* 8. A *[1 mark]*
9. BMI = mass ÷ height^2
   = 89.1 ÷ 1.8^2
   = 89.1 ÷ 3.24
   = 27.5 kg m^{-2} *[1 mark]*
10. E.g. lysozyme, hydrochloric acid. *[2 marks]*
11. E.g. using a condom when having sex. / Drug users avoiding sharing needles. / Using medication to reduce the risk of an infected individual passing on the virus. *[1 mark]*
12. E.g.
    Disease: Cholera / Tuberculosis *[1 mark]*
    Symptoms:
    For Cholera: diarrhoea
    For Tuberculosis: coughing / lung damage *[1 mark]*
13. They inhibit/stop cell processes in bacteria *[1 mark]*.

Test 8: Biology 1 Mixed Topics Pages 16–17

1. A *[1 mark]* 2. C *[1 mark]*
3. A *[1 mark]* 4. A *[1 mark]*
5. B *[1 mark]* 6. C *[1 mark]*
7. B *[1 mark]* 8. B *[1 mark]*
9. E.g. temperature *[1 mark]*.
   By using an electric water bath / a Bunsen burner and a beaker of water *[1 mark]*.
10. E.g. drinking alcohol *[1 mark]*.
11. Cell division *[1 mark]*.
    Cell differentiation *[1 mark]*.
12. ff *[1 mark]*
    25% / 1 in 4 *[1 mark]*

Test 9: Biology 1 Mixed Topics Pages 18–19

1. B *[1 mark]* 2. C *[1 mark]*
3. A *[1 mark]* 4. C *[1 mark]*
5. B *[1 mark]* 6. B *[1 mark]*
7. B *[1 mark]* 8. C *[1 mark]*
9. An allele for a characteristic that is always shown *[1 mark]*.
10. E.g. smoking *[1 mark]*
11. Anaphase *[1 mark]*
    Telophase *[1 mark]*
12. $\text{magnification} = \frac{\text{size of image}}{\text{size of real object}}$ *[1 mark]*
13. $\text{Percentage change} = \frac{6.6 - 7.8}{7.8} \times 100$
    $= -15.384...$
    $= -15\%$ (to 2 s.f.)
    [2 marks for correct answer, or 1 mark for correct answer without minus sign]

Biology Paper 2

Test 10: Plant Structures and Their Functions Pages 20–21

1. B *[1 mark]* 2. B *[1 mark]*
3. A *[1 mark]* 4. B *[1 mark]*
5. B *[1 mark]* 6. A *[1 mark]*
7. A *[1 mark]* 8. A *[1 mark]*
9. E.g. it has a large surface area *[1 mark]*.
10. The volume of oxygen it produces *[1 mark]*.
11. It will slow down *[1 mark]*. Because there will be less light present to transfer the energy needed for photosynthesis *[1 mark]*.
12. It causes an increase in the rate of transpiration *[1 mark]*.
13. Transpiration rate
    = 1.8 cm^3 ÷ 30 mins *[1 mark]*
    = 0.06 cm^3 min^{-1} *[1 mark]*

Test 11: Animal Coordination, Control & Homeostasis Pages 22–23

1. C *[1 mark]* 2. B *[1 mark]*
3. A *[1 mark]* 4. C *[1 mark]*
5. A *[1 mark]* 6. B *[1 mark]*
7. A *[1 mark]* 8. C *[1 mark]*
9. Ovulation / the release of an egg from an ovary *[1 mark]*.
10. Adrenaline *[1 mark]*.
11. Any two from: e.g. eating a healthy diet / getting regular exercise / losing weight / medication / insulin injections *[2 marks]*.
12. E.g. because cells need the right conditions in order to work properly *[1 mark]*.
13. Type 1 diabetes is a condition where the pancreas doesn't make insulin *[1 mark]*.
    It can cause a person's blood sugar level to rise to a level that can kill them *[1 mark]*.

Test 12: Exchange and Transport in Animals Pages 24–25

1. C *[1 mark]* 2. B *[1 mark]*
3. A *[1 mark]* 4. B *[1 mark]*
5. A *[1 mark]* 6. A *[1 mark]*
7. B *[1 mark]* 8. C *[1 mark]*
9. To prevent backflow of blood in the heart *[1 mark]*.
10. cardiac output = heart rate × stroke volume *[1 mark]*
    cardiac output = 88 × 80
    = 7040 cm^3 min^{-1} *[1 mark]*
11. Any two from: e.g. red blood cells / white blood cells / platelets *[2 marks]*.
12. Any two from: e.g. arteries carry blood away from the heart, whilst veins carry blood to the heart. / Arteries have thick walls, whilst veins have thin walls. / Veins contain valves, but arteries don't. *[2 marks]*

Test 13: Exchange and Transport in Animals Pages 26–27

1. A *[1 mark]* 2. B *[1 mark]*
3. C *[1 mark]* 4. B *[1 mark]*
5. B *[1 mark]* 6. A *[1 mark]*
7. A *[1 mark]* 8. B *[1 mark]*

Answers

9. Haemoglobin allows red blood cells to carry oxygen *[1 mark]*.
10. They produce antibodies / defend the body against microorganisms *[1 mark]*.
11. The rate of respiration / the amount of oxygen taken in over time *[1 mark]*.
12. Pulmonary vein *[1 mark]*
    Aorta *[1 mark]*
13. It makes it difficult to exchange enough substances across their outside surface to supply their entire volume *[1 mark]*. So they need transport systems to move substances between exchange surfaces and the rest of the body *[1 mark]*.

Test 14: Ecosystems and Material Cycles
Pages 28–29

1. A *[1 mark]* 2. B *[1 mark]*
3. A *[1 mark]* 4. B *[1 mark]*
5. A *[1 mark]* 6. B *[1 mark]*
7. C *[1 mark]* 8. A *[1 mark]*
9. It releases carbon dioxide into the air *[1 mark]*.
10. E.g. an increase in the number of predators *[1 mark]*. An increase in competition *[1 mark]*.
11. A farming method where different crops are grown in the same field each year in a cycle *[1 mark]*.
    A nitrogen-fixing crop has nitrogen-fixing bacteria in its roots, which helps to put nitrates back into the soil *[1 mark]*.
12. The parasites can get out of the farms and infect wild fish *[1 mark]*. This can kill the wild fish and reduce biodiversity *[1 mark]*.

Test 15: Ecosystems and Material Cycles
Pages 30–31

1. B *[1 mark]* 2. A *[1 mark]*
3. B *[1 mark]* 4. A *[1 mark]*
5. A *[1 mark]* 6. B *[1 mark]*
7. C *[1 mark]* 8. B *[1 mark]*
9. E.g. temperature / light / water / pollutants *[1 mark]*.
10. Interdependence *[1 mark]*.
11. It's a relationship where both of the organisms benefit *[1 mark]*.
12. The nitrates cause algae to grow fast and stop light entering the water *[1 mark]*. The plants die because they can't photosynthesise without light *[1 mark]*.
    The large number of microorganisms use up oxygen in the water *[1 mark]*. This can cause fish to die because they need oxygen for aerobic respiration *[1 mark]*.

Test 16: Biology 2 Mixed Topics
Pages 32–33

1. B *[1 mark]* 2. C *[1 mark]*
3. B *[1 mark]* 4. A *[1 mark]*
5. B *[1 mark]* 6. A *[1 mark]*
7. B *[1 mark]* 8. A *[1 mark]*
9. Any two from: oxygen / carbon dioxide / water / mineral ions *[2 marks]*
10. E.g combined pill / contraceptive patch / mini-pill / contraceptive injection *[1 mark]*.
11. Insulin *[1 mark]*
12. E.g. aerobic respiration uses oxygen while anaerobic respiration does not *[1 mark]*.
13. Function: xylem tubes transport water and mineral ions from the roots to the leaves *[1 mark]*.
    Adaptation: e.g. the cells have no end walls and there is a hole down the middle to allow water and mineral ions to pass through. / The cells are made stronger by lignin. *[1 mark]*

Test 17: Biology 2 Mixed Topics
Pages 34–35

1. C *[1 mark]* 2. A *[1 mark]*
3. A *[1 mark]* 4. B *[1 mark]*
5. B *[1 mark]* 6. A *[1 mark]*
7. B *[1 mark]* 8. A *[1 mark]*
9. $\text{carbon dioxide} + \text{water} \xrightarrow{\text{light energy}} \text{glucose} + \text{oxygen}$
   [2 marks for whole equation completed correctly, 1 mark for one or two gaps filled correctly.]
10. By preventing species from dying out *[1 mark]*.
11. E.g. people with a high waist-to-hip ratio are more likely to develop type 2 diabetes *[1 mark]*.
12. The evaporation and diffusion of water from a plant's surface/leaves *[1 mark]*.
    The loss of water creates a shortage of water in the leaf *[1 mark]*. This means more water is drawn up from the rest of the plant, which in turn draws more water up from the roots *[1 mark]*.

Key Concepts in Chemistry

Test 18: Key Concepts in Chemistry
Pages 36-37

1. C *[1 mark]* 2. C *[1 mark]*
3. B *[1 mark]* 4. A *[1 mark]*
5. B *[1 mark]* 6. A *[1 mark]*
7. B *[1 mark]* 8. A *[1 mark]*
9. The group 7 element *[1 mark]*.
10. They have the same number of outer electrons/electrons in their outer shell *[1 mark]*.
11. $2Li + 2H_2O \rightarrow \mathbf{2}LiOH + H_2$ *[1 mark]*
12. Mass is conserved in chemical reactions, so mass of reactants = mass of products.
    So the mass of O_2 = mass of CO_2 – mass of C = 242 – 66 *[1 mark]*
    = 176 g *[1 mark]*.
    [Or 2 marks for the correct answer via any other method.]
13. The molecule contains a (double) covalent bond *[1 mark]*. This bond forms when the two oxygen atoms share two pairs of electrons *[1 mark]*.

Answers

Test 19: Key Concepts in Chemistry
Pages 38-39

1. A *[1 mark]* 2. A *[1 mark]*
3. C *[1 mark]* 4. B *[1 mark]*
5. B *[1 mark]* 6. B *[1 mark]*
7. C *[1 mark]* 8. B *[1 mark]*
9. Cl^- *[1 mark]*
10. Isotopes are different forms of the same element, which have the same number of protons but a different number of neutrons *[1 mark]*.
11. E.g. graphite / diamond *[1 mark]*
12. Concentration = mass ÷ volume
    = 0.25 ÷ 0.5 *[1 mark]*
    = 0.5 g dm^{-3} *[1 mark]*
    [Or 2 marks for the correct answer via any other method.]
13. All of the outer electrons of the carbon atoms in diamond are in covalent bonds *[1 mark]*, so aren't free to move *[1 mark]*.

Chemistry Paper 1

Test 20: States of Matter and Mixtures
Pages 40–41

1. B *[1 mark]* 2. A *[1 mark]*
3. B *[1 mark]* 4. C *[1 mark]*
5. B *[1 mark]* 6. B *[1 mark]*
7. A *[1 mark]* 8. B *[1 mark]*
9. As a liquid changes into a gas, the particles move from their close, irregular arrangement in the liquid state to being far apart in the gas state *[1 mark]*. In the gas state, the particles move faster than in the liquid state *[1 mark]*.
10. As they rise up the column the compounds will start to cool down *[1 mark]*. Compound 1 will condense back to a liquid before it reaches the top of the column, but compound 2 will reach the top as a gas *[1 mark]*.
11. A substance that is made up of more than one compound or element (that are not chemically bonded together). *[1 mark]*
12. A pure substance will always leave a single spot on the chromatography paper *[1 mark]*. An impure substance will usually leave multiple spots *[1 mark]*.

Test 21: States of Matter and Mixtures
Pages 42–43

1. B *[1 mark]* 2. B *[1 mark]*
3. A *[1 mark]* 4. B *[1 mark]*
5. A *[1 mark]* 6. A *[1 mark]*
7. C *[1 mark]* 8. B *[1 mark]*
9. melting *[1 mark]*
10. Ethanol (it boils at 78 °C) *[1 mark]*
11. The ice/water is impure *[1 mark]*.
12. E.g the solvent should not cover the start line *[1 mark]*, because if the solvent level is above the ink, the ink will be washed away instead of carried up the paper *[1 mark]*.
13. $R_f = 4.2 \div 4.8$
    = 0.875 *[1 mark]*
    = 0.88 (to 2 s.f.) *[1 mark]*

Test 22: Chemical Changes
Pages 44–45

1. B *[1 mark]* 2. A *[1 mark]*
3. A *[1 mark]* 4. C *[1 mark]*
5. A *[1 mark]* 6. C *[1 mark]*
7. B *[1 mark]* 8. B *[1 mark]*
9. Bubble the gas through the limewater. If the gas is carbon dioxide, the limewater will turn cloudy *[1 mark]*.
10. H^+ / hydrogen (ions) *[1 mark]*
    OH^- / hydroxide (ions) *[1 mark]*
11. E.g. to make sure all the acid has reacted / to make sure there is no leftover acid in the product / the base is insoluble, so it is easier to remove than excess acid *[1 mark]*.
12. Hydrogen *[1 mark]*
    Chlorine *[1 mark]*
    Sodium is not produced because it is more reactive that hydrogen *[1 mark]*.

Test 23: Chemical Changes
Pages 46–47

1. A *[1 mark]* 2. C *[1 mark]*
3. A *[1 mark]* 4. A *[1 mark]*
5. B *[1 mark]* 6. B *[1 mark]*
7. A *[1 mark]* 8. A *[1 mark]*
9. copper *[1 mark]*
10. E.g. lead chloride / silver chloride *[1 mark]*
11. zinc sulfate *[1 mark]*
    water *[1 mark]*
12. The solution will change from red to yellow *[1 mark]*.
13. Filtration / filter out the solid from the solution *[1 mark]*
    To remove any excess magnesium chloride solution from the solid *[1 mark]*.

Test 24: Extracting Metals and Equilibria
Pages 48–49

1. B *[1 mark]* 2. B *[1 mark]*
3. A *[1 mark]* 4. A *[1 mark]*
5. C *[1 mark]* 6. B *[1 mark]*
7. B *[1 mark]* 8. B *[1 mark]*
9. E.g. because it's too reactive to be extracted by reduction with carbon/it is above carbon in the reactivity series *[1 mark]*.
10. Any one from: e.g. zinc / iron / copper / silver *[1 mark]*
11. The magnesium will produce bubbles/effervescence *[1 mark]*.
    The reaction with iron will produce fewer bubbles than with magnesium *[1 mark]*.
    Because magnesium is more reactive than iron / is higher than iron in the reactivity series *[1 mark]*.
12. Nitrogen: e.g. obtained from the air *[1 mark]*.
    Hydrogen: e.g. produced from natural gas *[1 mark]*.

Test 25: Extracting Metals and Equilibria
Pages 50–51

1. A *[1 mark]* 2. B *[1 mark]*
3. C *[1 mark]* 4. A *[1 mark]*
5. A *[1 mark]* 6. A *[1 mark]*
7. B *[1 mark]* 8. C *[1 mark]*

Answers

9. Any two from: e.g. getting the raw materials, manufacturing the product, using the product, disposing of the product. *[2 marks]*
10. Metal Q *[1 mark]*
11. E.g. gold / silver *[1 mark]*
12. Any two from: e.g. new ore has to be mined, which damages the landscape. / Metal that is not recycled is likely to be sent to landfill, which takes up space and can pollute the surroundings. / Extracting from ores generally uses more energy than recycling, and this energy is often produced by burning fossil fuels. *[2 marks]*
13. Metal A is more reactive than metal B *[1 mark]*.

Test 26: Chemistry 1 Mixed Topics
Pages 52–53

1. B *[1 mark]* 2. A *[1 mark]*
3. C *[1 mark]* 4. C *[1 mark]*
5. B *[1 mark]* 6. A *[1 mark]*
7. C *[1 mark]* 8. A *[1 mark]*
9. The breaking down of a substance/electrolyte using electricity *[1 mark]*.
10. $3H_2 + N_2 \rightleftharpoons 2NH_3$
[1 mark for correctly-balanced equation, 1 mark for reversible arrow]
11. The numbers in the molecular formula are 6 and 10. The largest number that divides 6 and 10 is 2. $6 \div 2 = 3$, $10 \div 2 = 5$ *[1 mark]*
So the empirical formula is B_3H_5 *[1 mark]*
[Or 2 marks for the correct answer via any other method.]
12. Copper (metal) *[1 mark]*
Hydrogen is more reactive than copper (so copper will be produced at the cathode instead of hydrogen gas) *[1 mark]*.

Test 27: Chemistry 1 Mixed Topics
Pages 54–55

1. C *[1 mark]* 2. B *[1 mark]*
3. B *[1 mark]* 4. C *[1 mark]*
5. A *[1 mark]* 6. B *[1 mark]*
7. B *[1 mark]* 8. A *[1 mark]*
9. The forward and backward reactions are occurring at exactly the same rate *[1 mark]*.
10. The salt is soluble, so would be contaminated by the excess alkali *[1 mark]*.
11. E.g. add water to the mixture to dissolve the soluble magnesium sulfate *[1 mark]*. Filter the mixture to remove the insoluble copper filings *[1 mark]*. Crystallise the remaining solution to obtain a pure sample of the magnesium sulfate *[1 mark]*.
12. mass of products = 3.52 + 2.16 = 5.68 g *[1 mark]*
mass of products = mass of reactants so mass of O_2 = 5.68 – 1.84 = 3.84 g *[1 mark]*
[Or 2 marks for the correct answer via any other method.]

Chemistry Paper 2

Test 28: Groups in the Periodic Table
Pages 56–57

1. A *[1 mark]* 2. B *[1 mark]*
3. B *[1 mark]* 4. B *[1 mark]*
5. C *[1 mark]* 6. B *[1 mark]*
7. B *[1 mark]* 8. C *[1 mark]*
9. Chlorine is more reactive than bromine so displaces it from the salt *[1 mark]*.
No reaction will occur (between bromine vapour and potassium chloride solution) *[1 mark]*.
10. hydrogen *[1 mark]*
11. As you move down the group, the outer electron is further away from the nucleus *[1 mark]*. So it is less strongly attracted to the nucleus and is lost more easily *[1 mark]*.
12. The noble gases have a full outer shell of electrons *[1 mark]*, so they don't easily lose or gain electrons *[1 mark]*.

Test 29: Rates of Reaction and Energy Changes
Pages 58–59

1. A *[1 mark]* 2. B *[1 mark]*
3. A *[1 mark]* 4. A *[1 mark]*
5. A *[1 mark]* 6. C *[1 mark]*
7. B *[1 mark]* 8. B *[1 mark]*
9. It will increase *[1 mark]*.
10. The reactants are at a higher energy than the products *[1 mark]*.
11. Experiment 2 *[1 mark]*
The temperature/concentration of reactants/pressure (with gases) could have been higher. / A catalyst could have been used / Solid reactants may have been crushed into smaller parts *[1 mark]*.
12. E.g. use a gas syringe to record the volume of gas given off *[1 mark]* and use a stopwatch to record the time it takes for the reaction to finish *[1 mark]*. Calculate the average rate of reaction by dividing the volume of gas by the time taken *[1 mark]*.

Test 30: Rates of Reaction and Energy Changes
Pages 60–61

1. B *[1 mark]* 2. A *[1 mark]*
3. C *[1 mark]* 4. B *[1 mark]*
5. B *[1 mark]* 6. B *[1 mark]*
7. A *[1 mark]* 8. B *[1 mark]*
9. A biological catalyst. / A substance that speeds up chemical reactions in living cells *[1 mark]*.
10. The products of the reaction will stay the same *[1 mark]*. The presence of a catalyst only affects the rate of the reaction/doesn't affect the products of the reaction *[1 mark]*.
11. Increasing the concentration of the reactants increases the number of reactant particles in a given volume/causes the particles to move closer together *[1 mark]* so will increase the frequency of collisions/cause the particles to collide more often *[1 mark]*.

Answers

12. Volume of gas produced in the first 10 seconds = 20 − 0
= 20 cm^3 *[1 mark]*
Rate of reaction =
Amount of product formed ÷ time
= 20 ÷ 10
= 2 cm^3 s^{-1} *[1 mark]*

Test 31: Fuels and Earth Science
Pages 62–63

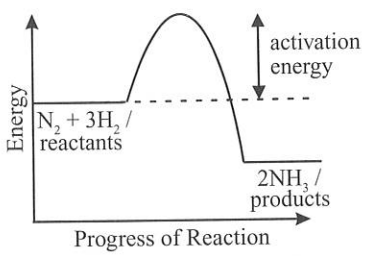
1. B *[1 mark]* 2. A *[1 mark]*
3. C *[1 mark]* 4. A *[1 mark]*
5. C *[1 mark]* 6. B *[1 mark]*
7. C *[1 mark]* 8. A *[1 mark]*
9. Carbon dioxide *[1 mark]*.
E.g. methane / ammonia / water vapour (steam) / nitrogen *[1 mark]*.
From volcanic activity *[1 mark]*.
10. E.g. the same general formula / similar chemical properties *[1 mark]*.
11. Livestock produce carbon dioxide and methane *[1 mark]*. These are greenhouse gases and so contribute to the greenhouse effect *[1 mark]*.
12. Hexane molecules are shorter than octane molecules, so there are weaker intermolecular forces holding the molecules together (so the liquid can flow more easily) *[1 mark]*.

Test 32: Fuels and Earth Science
Pages 64–65

1. A *[1 mark]* 2. B *[1 mark]*
3. A *[1 mark]* 4. C *[1 mark]*
5. A *[1 mark]* 6. B *[1 mark]*
7. C *[1 mark]* 8. A *[1 mark]*
9. Oxygen gas will relight a glowing splint *[1 mark]*.
10. photosynthesis *[1 mark]*
E.g. photosynthesis produces oxygen / increases the amount of oxygen in the atmosphere *[1 mark]*.
11. Advantage: e.g. the only waste product from hydrogen is water so hydrogen fuels cells don't produce pollutants. / Hydrogen can be obtained from water so it is a renewable resource. *[1 mark]*
Disadvantage: e.g. a hydrogen-powered car needs a special, expensive engine. / A lot of energy is needed to extract hydrogen. / Hydrogen is hard to store. / Hydrogen is not widely available. *[1 mark]*
12. The fractions have different boiling points *[1 mark]* so they condense and drain out at different levels of the fractionating column *[1 mark]*.

Test 33: Chemistry 2 Mixed Topics
Pages 66–67

1. B *[1 mark]* 2. B *[1 mark]*
3. A *[1 mark]* 4. A *[1 mark]*
5. C *[1 mark]* 6. B *[1 mark]*
7. C *[1 mark]* 8. B *[1 mark]*
9. proton: +1
neutron: 0
electron: −1
[1 mark for all three correct]
10. The surface area of the solid is increased *[1 mark]*, meaning there are more frequent collisions between reactants *[1 mark]*.
11. E.g. raising livestock / burning fossil fuels for energy/transport / deforestation *[1 mark]*.
12.



[1 mark for labelled product line below and to the right of labelled reactant line, 1 mark for correct shape of curve linking reactants to products, 1 mark for correct labelling of activation energy]

Test 34: Chemistry 2 Mixed Topics
Pages 68–69

1. A *[1 mark]* 2. B *[1 mark]*
3. A *[1 mark]* 4. C *[1 mark]*
5. A *[1 mark]* 6. A *[1 mark]*
7. A *[1 mark]* 8. B *[1 mark]*
9. E.g. −102 °C (Accept any value between −220 °C and −7.2 °C) *[1 mark]*.
10. The amount of time taken for the black cross to disappear will decrease *[1 mark]*.
This is because increasing the temperature increases the rate of the reaction *[1 mark]*.
11. Atomic radius increases down the group / the outer shell of electrons is further from the nucleus *[1 mark]*, so it is harder to attract/gain an extra electron *[1 mark]*.
12. Chlorine has more than one isotope *[1 mark]*. Relative atomic mass is an average that takes into account the relative abundances of all the isotopes of an element *[1 mark]*.

Physics Paper 1

Test 35: Motion, Forces and Conservation of Energy
Pages 70–71

1. A *[1 mark]* 2. B *[1 mark]*
3. C *[1 mark]* 4. B *[1 mark]*
5. A *[1 mark]* 6. C *[1 mark]*
7. B *[1 mark]* 8. A *[1 mark]*
9. E.g. speed is a scalar quantity, velocity is a vector. / Speed is how fast an object moves, velocity is how fast it moves in a given direction *[1 mark]*.
10. E.g. radioactive waste is produced, which is difficult to dispose of safely. / It's expensive to set up and close down nuclear power stations. / There is a risk of radiation leaks and catastrophes. *[1 mark]*
11. distance travelled = speed × time *[1 mark]*
distance travelled
= 3.5 × 26 *[1 mark]*
= 91 m *[1 mark]*

Answers

12. Gravitational potential energy = mass × gravitational field strength × height
= 0.5 × 10 × 30 *[1 mark]*
= 150 J *[1 mark]*

Test 36: Motion, Forces and Conservation of Energy Pages 72–73

1. C *[1 mark]* 2. B *[1 mark]*
3. C *[1 mark]* 4. A *[1 mark]*
5. A *[1 mark]* 6. B *[1 mark]*
7. A *[1 mark]* 8. B *[1 mark]*
9. Any two from: e.g. distance / speed / mass / energy *[2 marks]*
10. E.g. they can alter the landscape/ spoil the view. / They can alter the local habitat for wildlife. *[1 mark]*
11. E.g. the cyclist accelerates for the first 11 seconds / until they have travelled 28 m *[1 mark]*. The cyclist then stops and remains stationary for the next 9 seconds *[1 mark]*.
12. kinetic energy
= 0.5 × mass × (speed)^2
= ½ × 160 × 10^2 *[1 mark]*
= 8000 J *[1 mark]*

Test 37: Waves and the Electromagnetic Spectrum Pages 74–75

1. A *[1 mark]* 2. B *[1 mark]*
3. C *[1 mark]* 4. A *[1 mark]*
5. B *[1 mark]* 6. A *[1 mark]*
7. B *[1 mark]* 8. B *[1 mark]*
9. **A**: Microwaves *[1 mark]*
D: X-rays *[1 mark]*
10. E.g. microwaves — internal heating of body cells / infrared — skin burns / ultraviolet — damage to surface cells and eyes/skin cancer/ eye conditions / X-rays or gamma rays — mutation or damage to cells in the body/cancer *[1 mark for a correct type of radiation, 1 mark for a correct harmful effect of that type of radiation]*
11. wavelength *[1 mark]*
The frequency of the wave will be the same as the frequency set by the signal generator *[1 mark]*. The student should substitute both this frequency and her measurement of the wavelength into the equation wave speed = frequency × wavelength / $v = f \times \lambda$ to find the speed of the sound waves *[1 mark]*.

Test 38: Waves and the Electromagnetic Spectrum Pages 76–77

1. C *[1 mark]* 2. A *[1 mark]*
3. C *[1 mark]* 4. A *[1 mark]*
5. B *[1 mark]* 6. A *[1 mark]*
7. B *[1 mark]* 8. B *[1 mark]*
9. Any two from: e.g. cooking / thermal imaging / short range communications / optical fibres / television remote controls / security systems *[2 marks]*
10. Waves which oscillate at 90° to the direction of energy transfer *[1 mark]*.
11. The ripples don't carry the leaf away with them because waves don't transfer matter (only energy) *[1 mark]*.
12. wave speed = distance ÷ time *[1 mark]*
distance = 40 cm = 0.40 m
wave speed = 0.40 ÷ 2.5 *[1 mark]*
= 0.16 m/s *[1 mark]*
[Or 3 marks for the correct answer via any other method.]

Test 39: Radioactivity Pages 78–79

1. B *[1 mark]* 2. A *[1 mark]*
3. A *[1 mark]* 4. B *[1 mark]*
5. C *[1 mark]* 6. B *[1 mark]*
7. A *[1 mark]* 8. B *[1 mark]*
9. photographic film / Geiger-Müller tube *[1 mark]*
10. E.g. naturally occurring unstable isotopes in the air/some foods/ building materials/rocks / cosmic rays / human activity, e.g. fallout from nuclear explosions/nuclear waste *[1 mark]*
11. $^{32}_{16}S$ *[1 mark]*
12. E.g. the lead barriers will absorb ionising radiation, stopping it from reaching the medical staff / decreasing how much ionising radiation the staff are exposed to *[1 mark]*.
13. There are initially 14 000 radioactive nuclei, so after one half-life there will be 7000 radioactive nuclei. Reading from graph:
half-life = 56 000 years *[1 mark]*
To fall to one quarter of the initial amount, the number of radioactive nuclei must halve and halve again *[1 mark]*. So the time taken is equal to two half lives, or:
2 × 5600 = 11 200 years *[1 mark]*

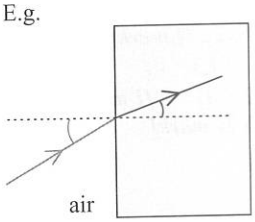
Test 40: Radioactivity Pages 80–81

1. B *[1 mark]* 2. A *[1 mark]*
3. A *[1 mark]* 4. B *[1 mark]*
5. A *[1 mark]* 6. A *[1 mark]*
7. C *[1 mark]* 8. B *[1 mark]*
9. An atom is electrically neutral, but an ion is charged. / An atom has the same number of protons and electrons, but an ion doesn't *[1 mark]*.
10. alpha *[1 mark]*
beta *[1 mark]*
11. After one half-life, the number of radioactive nuclei in the sample will halve. So the number of nuclei left
= (1.2 × 10^5) ÷ 2
= 6.0 × 10^4 *[1 mark]*
12. The electron orbits further from the nucleus *[1 mark]*.
13. Irradiation is when an object is exposed to radiation emitted by a radioactive source *[1 mark]* while contamination is when (unwanted) atoms of a radioactive source get on/ inside another object *[1 mark]*.

Answers

Test 41: Physics 1 Mixed Topics
Pages 82–83

1. B *[1 mark]*
2. A *[1 mark]*
3. B *[1 mark]*
4. B *[1 mark]*
5. A *[1 mark]*
6. C *[1 mark]*
7. A *[1 mark]*
8. B *[1 mark]*
9. wave speed = frequency × wavelength
   $= 6.0 \times 10^7 \times 1.4$ *[1 mark]*
   $= 8.4 \times 10^7$ m/s (or 84 000 000 m/s) *[1 mark]*
10. E.g.



[1 mark for a ray drawn from the point of incidence, inside the block, on the opposite side of and at a smaller angle to the normal than the incident ray].

11. $^{241}_{95}\text{Am} \rightarrow {}^{237}_{93}\text{Np} + {}^{4}_{2}\text{He}$
    [1 mark for correct mass number and 1 mark for correct atomic number]
12. The acceleration is equal to the gradient, so:
    acceleration
    = change in y ÷ change in x
    = 80 ÷ 10 *[1 mark]*
    = 8 m/s² *[1 mark]*

Test 42: Physics 1 Mixed Topics
Pages 84–85

1. B *[1 mark]*
2. A *[1 mark]*
3. B *[1 mark]*
4. B *[1 mark]*
5. A *[1 mark]*
6. A *[1 mark]*
7. B *[1 mark]*
8. C *[1 mark]*
9. E.g. tiredness / alcohol / drugs / distractions *[1 mark]*
10. E.g. cooking / communications / satellite transmissions *[1 mark]*
11. efficiency
    = useful energy transferred by the device
    ÷ total energy supplied to the device
    = 420 ÷ 560 *[1 mark]*
    = 0.75 (or 75%) *[1 mark]*
12. (final velocity)² – (initial velocity)²
    = 2 × acceleration × distance
    or $v^2 - u^2 = 2 \times a \times x$
    $v^2 - 0^2 = 2 \times 3.0 \times 24 = 144$ *[1 mark]*
    $v = \sqrt{144}$ *[1 mark]*
    = 12 m/s *[1 mark]*

Physics Paper 2

Test 43: Forces and Energy
Pages 86–87

1. B *[1 mark]*
2. A *[1 mark]*
3. A *[1 mark]*
4. B *[1 mark]*
5. A *[1 mark]*
6. C *[1 mark]*
7. B *[1 mark]*
8. A *[1 mark]*
9. Power is the rate at which energy is transferred *[1 mark]*.
10. The thermal energy store of the hairdryer heater / air. / The kinetic energy store of the fan blades / air. *[1 mark]*
11. 2 mins = 2 × 60 = 120 s *[1 mark]*
    work done = power × time taken
    = 50 × 120
    = 6000 J *[1 mark]*
12. work done = force × distance
    Rearrange for force and substitute in the values:
    force = work done ÷ distance *[1 mark]*
    = 84 ÷ 1.2 *[1 mark]*
    = 70 N *[1 mark]*

Test 44: Electricity and Circuits
Pages 88–89

1. B *[1 mark]*
2. C *[1 mark]*
3. B *[1 mark]*
4. A *[1 mark]*
5. B *[1 mark]*
6. A *[1 mark]*
7. C *[1 mark]*
8. A *[1 mark]*
9. LED *[1 mark]*
10. In direct current, charge moves in one direction only, while in alternating current the movement of charge changes direction *[1 mark]*.
11. In a series circuit, the supply potential difference is shared, so:
    $V_3 = V_1 + V_2 = 3 + 2 = 5$ V *[1 mark]*
    Resistances add up, so:
    $R = R_1 + R_2 = 6 + 4 = 10\ \Omega$ *[1 mark]*
12. power = (current)² × resistance *[1 mark]*
    power = $(2.5)^2 \times 12$ *[1 mark]*
    = 75 W *[1 mark]*

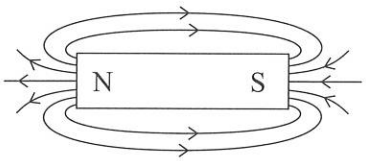
Test 45: Electricity and Circuits
Pages 90–91

1. B *[1 mark]*
2. B *[1 mark]*
3. A *[1 mark]*
4. C *[1 mark]*
5. A *[1 mark]*
6. B *[1 mark]*
7. A *[1 mark]*
8. A *[1 mark]*
9. If the current through the appliance becomes dangerously high, the fuse melts and breaks the circuit, which means current can no longer flow through the appliance *[1 mark]*.
10. The current through the diode will decrease/stop flowing *[1 mark]*.
11. The temperature of the resistor increases *[1 mark]*.
    As the temperature of the resistor increases, its resistance increases *[1 mark]*.
12. 4 minutes = 4 × 60 = 240 s *[1 mark]*
    energy transferred = current × potential difference × time
    = 10 × 230 × 240 *[1 mark]*
    = 552 000 J (or 600 000 J to 1 s.f.) *[1 mark]*

Test 46: Magnetic Fields
Pages 92–93

1. B *[1 mark]*
2. A *[1 mark]*
3. A *[1 mark]*
4. B *[1 mark]*
5. A *[1 mark]*
6. B *[1 mark]*
7. A *[1 mark]*
8. C *[1 mark]*
9. Transformers *[1 mark]*

Answers

10. 

[1 mark for lines (at least 3) drawn to show the correct field shape, 1 mark for arrows drawn in correct direction on every field line.]

11. The size of the current ***[1 mark]*** and the distance from the wire ***[1 mark]***.
12. Inside the solenoid, the magnetic fields from the individual loops of wire add together, so the overall magnetic field is very strong ***[1 mark]***. Outside the solenoid, the magnetic fields from the individual loops of wire cancel out, so the overall magnetic field is weaker ***[1 mark]***.

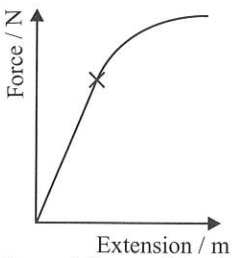
Test 47: Matter
Pages 94–95

1. B ***[1 mark]***
2. C ***[1 mark]***
3. A ***[1 mark]***
4. B ***[1 mark]***
5. A ***[1 mark]***
6. C ***[1 mark]***
7. B ***[1 mark]***
8. A ***[1 mark]***
9. It increases ***[1 mark]***.
10. Absolute zero is the temperature at which particles have as little energy in their kinetic energy stores as possible, they're (almost) still ***[1 mark]***.
    Temperature = –273 °C ***[1 mark]***
11. Block B ***[1 mark]***, as it has the lowest temperature change for the given amount of energy supplied ***[1 mark]***.
12. change in thermal energy = mass × specific heat capacity × temperature change
    = 0.5 × 400 × 15 ***[1 mark]***
    = 3000 J ***[1 mark]***

Test 48: Matter
Pages 96–97

1. A ***[1 mark]***
2. B ***[1 mark]***
3. C ***[1 mark]***
4. B ***[1 mark]***
5. A ***[1 mark]***
6. A ***[1 mark]***
7. B ***[1 mark]***
8. C ***[1 mark]***
9. gas ***[1 mark]***
10. Particles in a solid are held close together in a regular arrangement, whereas particles in a gas are far apart and are free to move ***[1 mark]***.
11. energy transferred in stretching
    = 0.5 × spring constant × (extension)^2
    = 0.5 × 2000 × (0.03)^2 ***[1 mark]***
    = 0.9 J ***[1 mark]***
12. density = mass ÷ volume
    mass = density × volume ***[1 mark]***
    = 20 000 × 2.00 × 10^{-5} ***[1 mark]***
    = 0.4 kg ***[1 mark]***

Test 49: Physics 2 Mixed Topics
Pages 98–99

1. B ***[1 mark]***
2. A ***[1 mark]***
3. B ***[1 mark]***
4. B ***[1 mark]***
5. C ***[1 mark]***
6. A ***[1 mark]***
7. B ***[1 mark]***
8. A ***[1 mark]***
9. 

[1 mark for marking the point where the graph begins to curve]

10. thermal energy for a change of state
    = mass × specific latent heat
    = 0.25 × 111 000 ***[1 mark]***
    = 27 750 J (or 28 000 J to 2 s.f.)
    [1 mark]
11. Thermistor ***[1 mark]***
    Total circuit resistance
    = 2.0 + 3.0 = 5.0 Ω ***[1 mark]***
    Rearrange $V = I \times R$ for I:
    $I = V \div R$ = 10 ÷ 5.0 ***[1 mark]***
    = 2.0 A ***[1 mark]***

Test 50: Physics 2 Mixed Topics
Pages 100–101

1. C ***[1 mark]***
2. A ***[1 mark]***
3. B ***[1 mark]***
4. C ***[1 mark]***
5. A ***[1 mark]***
6. A ***[1 mark]***
7. B ***[1 mark]***
8. C ***[1 mark]***
9. It decreases ***[1 mark]***.
10. current = power ÷ potential difference
    = 57.5 ÷ 230 ***[1 mark]***
    = 0.25 A ***[1 mark]***
11. The compass will point north ***[1 mark]***. This is because it aligns with the Earth's magnetic field / the magnetic field generated by the Earth's core ***[1 mark]***.
12. $I_S = (V_P \times I_P) \div V_S$
    = (12 × 4) ÷ 8 ***[1 mark]***
    = 6 A ***[1 mark]***

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