

SCIENCE

Paper 5124/01, 5125/01, 5126/01,
Multiple Choice

Paper 5124/01 (Physics, Chemistry)

<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	B	21	B
2	C	22	A
3	B	23	B
4	B	24	C
5	A	25	D
6	D	26	A
7	C	27	C
8	A	28	D
9	A	29	C
10	D	30	A
11	D	31	D
12	D	32	C
13	B	33	B
14	C	34	A
15	A	35	B
16	D	36	C
17	D	37	D
18	A	38	A
19	C	39	A
20	B	40	B

Paper 5125/01 (Physics, Biology)

<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	B	21	A
2	C	22	C
3	B	23	C
4	B	24	C
5	A	25	A
6	D	26	D
7	C	27	D
8	A	28	A
9	A	29	B
10	D	30	B
11	D	31	B
12	D	32	B
13	B	33	A
14	C	34	A
15	A	35	A
16	D	36	A
17	D	37	D
18	A	38	C
19	C	39	C
20	B	40	B

Paper 5126/01 (Chemistry, Biology)

Question Number	Key	Question Number	Key
1	B	21	A
2	A	22	C
3	B	23	C
4	C	24	C
5	D	25	A
6	A	26	D
7	C	27	D
8	D	28	A
9	C	29	B
10	A	30	B
11	D	31	B
12	C	32	B
13	B	33	A
14	A	34	A
15	B	35	A
16	C	36	A
17	D	37	D
18	A	38	C
19	A	39	C
20	B	40	B

Physics, Paper 5124/01 and 5125/01 – Questions 1 to 20**General comments**

Scores ranged from 6 to 34 with a mean score of 22.14, a pleasing increase over the 20.32 of 2006, and a standard deviation of 6.29. Candidates found **Questions 16 and 18** very easy, **Question 13** very difficult and a number of other questions, in particular **Questions 5 and 7**, caused problems even to the more able, who resorted to guessing.

Question 1 and **Question 2** both showed excellent discrimination. Of the incorrect options in **Question 1**, the less able candidates favoured option **A**; in **Question 2** they preferred option **D** although a significant number also chose option **B**.

Question 3 also discriminated well with **C**, candidates ignoring the presence of the frictional force, the most popular incorrect option. A significant number also chose option **D** with evidence that it included some more able candidates.

Question 4 showed good discrimination with the less able candidates showing uncertainty in choosing each of the incorrect options in significant numbers.

Question 5 relied on simple knowledge recall and yet produced a discrimination value well below the design limit, a 'positive' distractor in option **B** and, in **C**, an option attracting a greater response than the key, option **A**; all indicative of uncertainty and guessing among the better candidates.

Question 6 The transfer of thermal energy in a solid was well known by the majority of candidates.

Question 7 A classic example of a question in which the majority of candidates correctly work out an answer but where the final choice, between **two** options, depends on how closely the candidate has read the question. On this occasion more candidates, including some of the better ones, did not read the question closely enough and chose the incorrect option, **B**.

Question 8 showed guessing among some of the better candidates with options **B** and **C** attracting their attention.

Question 9 and Question 12 both showed excellent discrimination. In **Question 9** the less able candidates, interestingly, favoured option **B**, amplitude correct, wavelength incorrect, over their more usual response of amplitude incorrect, wavelength correct, option **C**. In **Question 12** the less able candidates' choice of option **B** once again emphasises that, given two figures, their usual response is often to multiply them!

Question 10 The less able candidates showed uncertainty and guessing and divided their responses equally between the three incorrect options, **A**, **B** and **C**.

Question 11 relied on simple knowledge recall. It was therefore surprising to find a significant number of more able candidates showing uncertainty and guessing, with option **A** attracting a greater response than the key, option **D**. Option **B** also proved a popular choice among more able candidates.

Question 13 also showed uncertainty and guessing among the more able candidates, with option **C**, a 'positive' distractor, attracting a significant number of responses, possibly because of the link between the joule and work.

Question 14 was answered correctly by 78% of candidates.

Question 15 Excellent discrimination with the better candidates correctly choosing option **A** and the less able ones option **C**.

Question 17 was correctly answered by the majority of candidates. The less able candidates not answering correctly were divided equally between options **A** and **B**.

Question 19 Well answered although some more able candidates appear to think, in choosing option **A**, that the electron is positively charged!

Question 20 Only 49% of the candidates understood half-life well enough to enable them to make the correct choice. The remainder included some of the more able who preferred option **A** ahead of option **C**.

Chemistry, Paper 5124/01 – Questions 21 to 40 and 5126/01 – Questions 1 to 20.

Question 21

An easy question for many of the candidates.

Question 22

The majority of the candidates were able to identify the change of state from a gas to a liquid as condensation.

Question 23

The electronic structure of atoms and ions is well understood by many of the better candidates. However, almost a third of the candidates chose option **D**, thinking that the nucleon number, 18, referred to the number of neutrons rather than the number of neutrons **and** protons. These candidates did not recognise that the question was about the ion of element X, X^{2-} .

Question 24

A significant number of the candidates chose option **D**, the combination of two non-metals, which bond together covalently. Candidates should know that ionic compounds are formed by the combination of a metal and a non-metal and recognise them by their electronic structures.

Question 25

Over 50% of the candidates simply counted the covalent bonds in the structure of sulphuric acid and chose option **B**. Candidates should know that a covalent bond is made by a pair of electrons being shared between two atoms.

Question 26

This was a difficult question for the majority of the candidates. Many candidates chose option **B**, which indicated that the candidates had not allowed for the two in the formula of copper(I) oxide.

Question 27

An easy question for the better candidates.

Question 28

A significant number of candidates thought that changing the size of the particles of calcium carbonate increases the volume of gas produced in the reaction and chose option **B**.

Question 29

Many of the better candidates recognised that the reaction between the hydrogen and hydroxide ions is a neutralisation reaction. Over a quarter of the candidates chose option **B**, ionisation, presumably because the word ion was in the stem of the question.

Question 30

The general properties of the alkali metals are not well known by the candidates. A large number of candidates thought that the alkali metals form oxides on reacting with water, whereas, in fact, they form hydroxides.

Question 31

Another disappointingly answered question even by the better candidates. Many candidates are not aware that copper, one of the least reactive metals, does not react with either water or steam. However, almost 70% of the candidates did know that the gas produced, when metals react with water, is hydrogen.

Question 32

The majority of the better candidates knew that metals have either one, two or three electrons in the outer electron shell and that hydrogen, a non-metal, has only one electron.

Question 33

An easy question for the majority of the candidates.

Question 34

The source of pollutants is well known by the vast majority of the candidates.

Question 35

An easy question for the better candidates but nitrogen was a popular choice amongst the weaker candidates.

Question 36

A significant number of candidates thought that nitrogen and hydrogen are compounds rather than elements and chose option A.

Question 37

The uses of the fractions obtained from the fractional distillation of crude oil are well known by the majority of the candidates.

Question 38

There was evidence of guesswork amongst the weaker candidates. The better candidates knew that aqueous bromine is used to test for the presence of a carbon to carbon double bond in an organic compound.

Question 39

Over 80% of the candidates knew that alcohols are made by fermentation but the fact that alcohols are oxidised to carboxylic acids is less well known.

Question 40

This question was well answered by the majority of the candidates.

Biology, Paper 5125/01 and 5126/01 – Questions 21 to 40

Question 21

This question was an easy starter to the Biology section.

Question 22

Many candidates thought that the water was moving (by osmosis) in precisely the opposite direction to the correct one.

Question 23

Candidates needed to spot that the optimum temperature for most enzymes is around body temperature.

Question 24

This was an easy question.

Question 25

The most popular answer, including among many of the better candidates, was the exact reverse of the correct one.

Question 26 and Question 27

Some candidates were evidently guessing here.

Question 28

This question worked well. Candidates had to look for the plant that was losing more water than it took up.

Question 29

The majority of candidates were able to interpret the pressure graph of the heart correctly.

Question 30

In this question, some of the better candidates confused the aorta and the pulmonary artery.

Question 31

Some candidates did not read the question properly, and looked for “inspired” rather than “expired” air.

Question 32

This question proved difficult.

Question 33–36

These questions all worked well, although **Questions 34** and **35** proved difficult.

Question 37

Candidates needed to recognise that soil erosion will reduce agricultural yield.

Question 38

This question discriminated well, but some candidates misread “asexual” as “sexual”.

Question 39

This question discriminated well.

Question 40

Weaker candidates were confused about the distinction between genes and alleles.

SCIENCE

Paper 5126/03 Theory (Chemistry)
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Section A

Question 1

Purification of water

- (a) Few candidates did not know that small, insoluble particles are removed from river water by filtration and harmful bacteria are removed by chlorination.
- (b) 'Fractional distillation' was accepted as a means of removing dissolved substances from water. Only the weakest of candidates failed to give the correct chemical formula for water.

Question 2

Properties of acids, alkalis and salt solutions.

- (a) A pH range of 1-3 was accepted for the red colour obtained with Universal Indicator and 10-14 for blue.
- (b) Many substances, when mixed together, form sodium sulphate. Sodium metal and sulphuric acid, while not to be recommended in practice, were accepted as being chemically correct.

Question 3

Carbon and its compounds.

- (a) The structures of diamond and graphite were commonly identified correctly. However, only the better candidates were able to use the given structures to explain why diamond is hard and graphite is slippery, diamond being hard because each of its carbon atom is joined to four other carbon atoms by strong covalent bonds, and graphite being slippery because the layers of its atoms are bonded to one another by weak bonds which allow one layer to slip over another.
- (b) Many candidates believed that calcium hydroxide acts as a fertiliser, whereas it is used on farmers' fields, normally, to reduce the soil's acidity. Other, less common, uses for calcium carbonate were accepted besides those listed in the syllabus.

Question 4

Reaction rates and kinetic particle theory.

- (a/b) There are several factors which can be determined from the graph supplied when comparing reactions at temperature **A** and at temperature **C** – the most commonly given was that while reaction **A** has stopped, reaction **C** has not. Another factor is that after 70 seconds reaction at temperature **A** has produced more carbon dioxide than the reaction at temperature **C**.
- (c/d) If the reaction were repeated but with five tablets rather than ten then the reaction rate would be lower and less total gas would be liberated.

Question 5

Structures and properties of common organic substances.

- (a) The structure for ethane was often incorrectly given as the structure for ethene. That ethene contains a double bond was not well known.
- (b) 'CH₂ = CHCl' was enough to earn the two marks available for this monomer – a missing double bond lost a single mark.

It was well known that being 'non-biodegradable' is the major reason why PVC causes long-term pollution problems.

Question 6

The properties and reactions of three metals.

- (a) How metals react with cold water and steam was well known.
- (b) There are many reasons for recycling metals and many good answers were provided by candidates. The more important reasons include: metal ores are finite; recycling is normally cheaper than mining/extracting; recycling usually needs less energy than mining/extracting; recycling reduces pollution.

Question 7

Elements, compounds and mixtures.

Very well answered as 'compound, compound, element and mixture'.

Question 8

Explaining the properties of materials using a knowledge of their structures.

By no means an easy question. Correct answers were only supplied by candidates with a good grasp of what is a very difficult concept.

- (a) Hydrogen chloride has a low melting point.
- Some confusion between ions and molecules. Some candidates incorrectly believed that the covalent bonding was weak and would not need much energy to break the bonding.
- (b) Most candidates realised that copper conducts electricity at room temperature but not that sodium chloride will also do so when molten at a very high temperature. In an explanation of this mentioning 'ions' was considered important. If a candidate used the term 'particles', he/she had somewhere to mention that they held an electrical charge. If these factors were included in an answer, the next stage of explaining that ions could move in a melt and not in a solid, so being able when molten to carry the current was fairly straightforward.

Section B**Question 9**

Fractional distillation of petroleum and a chemical calculation

- (a) Many candidates incorrectly believed that the separation of fractions from petroleum is primarily dependent upon their density – those with the greatest density settle to the bottom of the tower and those with the least density rise to the top. Those components with low boiling points pass upwards through the lower, hotter parts of the tower without condensing and so, unlike those with higher boiling points, reach the higher, colder parts of the tower. A very difficult concept.
- (b) Many candidates attempted, incorrectly, to use relative molecular masses to determine the volumes of gases produced when methane burns in oxygen.

Question 10

The constituents of atoms and of isotopes.

- (a) In general, candidates did not find difficult the determination of the type and number of particles present in an atoms with a nucleon number of 7, nor did they find difficulty in comparing the properties of these protons and neutrons. A common error amongst the less able of candidates was in giving the mass of a neutron and a proton each as one gram.
- (b) The concept of isotopes was well understood. Many candidates were able to identify the nuclei of these two isotopes as differing only by their number of neutrons, four in one case and three in the other.

Question 11

The properties and reactions of a metallic salt.

- (a/b) While the ammonia gas that results from the treatment of a nitrate with aluminium and aqueous sodium hydroxide was often correctly identified, the metal that provides a white precipitate of zinc hydroxide when mixed with aqueous ammonia and dissolves in excess was not. The correct response to **H** was 'zinc nitrate'. The 'zinc' and 'nitrate' were marked independently of one another, with 'zinc sulphate' earning a single mark as did just 'zinc'. Incorrectly identifying the metal as aluminium was penalised once only.

The chemical formula accepted as correct included compounds of both zinc and aluminium.

- (c) Chemical equations were rarely written correctly, even though there was a considerable number of changes from which to choose.
- (d) The uses of zinc were well known, but if a candidate had already lost the 'zinc' mark for writing 'aluminium nitrate' then two marks could be earned for giving the correct uses of aluminium.

SCIENCE

Paper 5126/04
Theory (Biology)

General comments

Whilst a small number of candidates showed a reasonable knowledge and understanding of the syllabus, none excelled. The majority could manage to gain a few marks, mainly from recalled facts, but rarely managed to give interpretations or explanations that were worthy of marks. Many of the answers that required the writing of sentences were incoherent. It was often difficult to discern what the candidate was trying to say. Many wrote answers that had little relevance to the question asked, but most candidates showed a high standard of graph plotting. The standard of English was often poor and must have contributed significantly to the very low scores achieved by many candidates. Performance was particularly poor in **Section B**, where candidates were given less guidance in how to frame their answers. The time allowed was adequate for candidates to complete all of the questions, but a number attempted only one question from **Section B**.

Comments on specific questions

Section A

Question 1

Though most candidates could recognise and name the cells, most could go little or no further in framing answers to the other questions.

- (a)** Almost all candidates could recognise a root hair cell to gain this first mark.
- (b)(i)** Most candidates could state one function, and the more able could state both water transport and holding the plant upright. Many weaker candidates gave incorrect responses such as transport of food and oxygen. Others described structures such as chloroplasts, vacuoles and cell membranes instead of functions.
- (ii)** Only a few of the most able candidates could describe another difference such as lack of cytoplasm or presence of lignin. Most restated one of the differences given in the question or made incorrect responses such as size or surface area.
- (iii)** Only a very few of the most able candidates could suggest a function that matched the difference in **(b)(i)**.
- (c)(i)** Almost all candidates correctly named the red blood cell. The most common incorrect answer was white blood cell.
- (ii)** Unfortunately most candidates presented a memorised answer that referred to the biconcave shape of red blood cells and the relationship this has to function. Only a very few candidates referred to the lack of nucleus given in the question. Of these even fewer could relate the lack of nucleus to the ability to carry haemoglobin and therefore more oxygen.

Question 2

Very few candidates evidenced a sound knowledge of this area of the syllabus, and few could make a sensible interpretation of the graph.

- (a)(i) Most candidates incorrectly thought that food is digested to make it easier to swallow or pass along the digestive tract. Many referred to the cutting of food into small pieces by the teeth. Very few mentioned the breakdown of large molecules, solubility or absorption.
- (ii) Only a small number of candidates could correctly name either of the substrate as starch or the product as maltose. Many incorrect suggestions were seen, including food, amylase, protein and amino acids for either answer.
- (b)(i) More able candidates realised that the enzyme had been denatured. Others simply attempted to describe the graph or gave irrelevant answers referring to rate of reaction.
- (ii) A few candidates realised that this is body temperature whilst others gained credit for suggesting it is the optimum temperature for the enzyme. Others referred to it being a suitable temperature, which did not gain credit, or referred to irrelevancies such as pH.
- (c) A significant number of candidates correctly suggested pH. Many others suggested temperature.

Question 3

Most candidates could draw the graph with efficacy, but very few could then interpret it or use their knowledge to offer sensible explanations.

- (a)(i) The standard of graph plotting was good, with many candidates scoring both marks.
- (ii) Many candidates drew a good straight line of best fit. The most common error was to neglect to use a ruler, even though this was clearly stated in the question.
- (b) The majority of candidates recognised this process as osmosis. Common errors were diffusion and transpiration.
- (c)(i) Some of the more able candidates knew that water had entered the potato, but very few could explain movement from higher to lower water potential. Some weaker candidates gave answers based on movement of the sugar.
- (ii) Some of the more able candidates knew that water had left the potato, but again very few could explain movement from higher to lower water potential. Again some weaker candidates gave answers based on movement of the sugar.
- (d)(i) Few candidates could read this value correctly from their graph. 0.00 was a common incorrect answer.
- (ii) Very few candidates made a sensible attempt at this question based on the idea of equal water potential inside and outside the potato. A wide variety of incorrect answers were seen.

Question 4

Only the more able candidates were able to make successful interpretations of the information in the diagram. Answers from weaker candidates often made little sense.

- (a) Only a tiny number of candidates could successfully write a symbol equation for photosynthesis. Many attempted a word equation, but few could get this correct.
- (b) Very few candidates realised that this was to de-starch the plant.

- (c)(i) Most of the more able candidates made two of the three suggestions correctly: sunlight present, chlorophyll or chloroplasts present, photosynthesis takes place; but few gave all three. Many weaker candidates could not frame a sensible enough answer to score a mark.
- (ii) Most of the more able candidates correctly suggested that there was no chlorophyll or chloroplasts. Many candidates made vague and irrelevant reference to the use of iodine or the colour of the leaf.
- (iii) Most of the more able candidates correctly suggested that there was no sunlight. Many candidates made vague and irrelevant reference to the paper covering part of the leaf..
- (d) Only the most able knew that both sunlight and chlorophyll/chloroplasts were absent. A significant number of candidates managed to suggest one of these, but most gave vague and often incoherent answers based on leaf colour and/or paper covering.

Question 5

Whilst some candidates managed to gain some marks for their knowledge of the function of the eye, very few could relate ideas of reflex action to the response of the iris to bright light.

- (a)(i) Many of the more able candidates gained one mark for lens or cornea, but very few suggested both. The most common incorrect answer was ciliary muscle.
- (ii) Only the most able candidates knew that to focus on a closer object the ciliary muscle contracts and the lens gets thicker. Many opposite suggestions were seen.
- (b) Only a tiny number of candidates presented a coherent and sensible answer. Most simply strung together sentences that contained the words given in the question but had no relevance to reflex action. A number of weaker candidate thought that light passes along the neurones.

Section B

Question 6

Few candidates could make a sensible interpretation of the graph and even fewer could demonstrate knowledge and understanding of this area of the syllabus.

- (a) Many candidates ignored the graph and simply wrote a memorised account of the menstrual cycle. Those who did try to use the graph could often describe but not explain. Most candidates could give at least one factor that may cause variation in menstrual cycle length.
- (b) Few candidates could show sound knowledge of the process of fertilisation. Mention of the fusion of nuclei was never seen, and most candidates had little idea of how or where fertilisation takes place. Repeating of words from the question was common.

Question 7

It is difficult to say whether the poor performance of most candidates at this question was caused more by lack of knowledge or by lack of ability to write logically and clearly.

- (a) The majority of answers were simply vague and rambling descriptions of the transport of oxygen and/or carbon dioxide in the blood. Few actually described what happens at the alveoli and the process of diffusion was rarely mentioned. Whilst some of the most able candidate did mention that alveoli have thin walls, very few candidates mentioned that they have large surface area or that they have a moist surface.
- (b) Only a few of the most able candidates approached this question with some logical planning. Most wrote a semi-coherent jumble of ideas, some correct and some incorrect, without making a comparison. Many candidates could not remember the equations for aerobic and anaerobic respiration, or which one required oxygen. Ideas of different energy output were very rarely seen. Whilst some candidates realised that anaerobic respiration occurs in human muscle during strenuous exercise, the majority had little idea. Many thought it takes place when the person is at rest.

Question 8

This was the least popular of the **Section B** questions. Most of those who chose the correct diagram managed to score some marks in **part (a)** but **part (b)** showed both lack of knowledge and a poor ability to frame a sensible answer for most candidates.

- (a) Some candidates managed to draw a reasonable diagram of the water cycle which gained them some marks. Many drew diagrams so vague that they were almost worthless. Some weaker candidates drew diagrams that were clearly attempts at the carbon cycle. Written answers were often rambling and incoherent.
- (b) The vague and rambling answers given by most candidates usually contained enough sense to gain one or two marks. Very few had a logical approach to the question. Sewage was rarely mentioned, though throwing faeces into the river was. Acid rain was occasionally seen, but fertilisers, herbicides and pesticides were not included in any answers.