SCIENCE

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

Paper 5124/01 (Physics, Chemistry)

Question Number	*Key*	*Question Number*	*Key*
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)

Question Number	*Key*	*Question Number*	*Key*
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 5124/02
Theory (Physics)

Most candidates showed evidence of being well-prepared and performed well. There was the usual range of ability with a pleasing number gaining higher marks. It was pleasing to see that there were good answers to almost all questions, although some of the more difficult concepts were answered well by only the most able candidates.

There was evidence that a significant number of candidates experienced some difficulty with questions that required use of knowledge in new situations rather than just recall.

Calculations were well done by many and descriptions of experiments were clear and concise.

Question 1

(a) Almost all candidates plotted the points accurately and drew an appropriate line.

(b) This question was also well done by most candidates. The mark was awarded for a value that was consistent with their graph.

(c) This question was also well done by most candidates. Almost all gained the mark by quoting a value that was consistent with their graph. In most cases, this was 5.4N or 5.5N. A very small minority misread the scale of the graph and quoted a value of 5.2N.

Question 2

This was well done with many candidates scoring full marks.

(a) This was well done by most candidates who knew the appropriate formula and were able to use it to find the correct answer of 0.2 m/s^2. A mark was also given for showing that the candidates knew how to work the acceleration out by either using change in speed divided by time or by finding the gradient of the graph.

(b) Although most candidates gained the mark for identifying **BC** as the part of the journey where the forces were balanced, and gained the second mark by explaining that there was no acceleration during this part, a minority of candidates displayed some misunderstanding. A significant minority identified **AB** as the region and claimed that this was because the acceleration was constant. Even some of those who had correctly given **BC** went on to claim that it was because the acceleration was constant. This was not given the mark

Question 3

(a) The majority of candidates gave an acceptable definition of mass.

(b) Almost all candidates gained a mark for knowing that density is found by dividing mass by volume. A further mark was given for calculating the correct volume (27 cm^3). A significant number of candidates were unable to do this correctly and used 9 cm^3 or 18 cm^3. The third mark was awarded for calculating the correct answer of 2 g/cm^3. All candidates who used the correct volume went on to gain this mark.

(c) The majority of candidates gave an answer of 540N. They gained a mark for knowing that weight is mass multiplied by *g* but did not gain the mark for the correct answer because they had not converted the mass into kilograms. Only the most able gained both marks by calculating the weight as 0.54N.

Question 4

(a) The majority of candidates gained a mark for giving the energy transfer as kinetic to electrical. Common errors, made by a minority of candidates, were to state potential to electrical or kinetic to light.

(b) (i) Most candidates recalled the formula for kinetic energy and so gained the first mark. A small number quoted the formula as 'mv^2' or '½ mv'. The majority then went on to gain the second mark for working out the correct answer as 6.4 J. A small number, having given the correct formula, failed to square the speed and so did not gain the second mark.

(ii) The majority gained the mark for stating that the extra energy had been lost to the surroundings or by stating that some had become heat or sound or that water escaped so still had some kinetic energy.

Question 5

(a) Only the most able suggested that the liquid bubble would rise further than the coloured water and so gained the mark. Many simply restated that gases expand more than liquids.

(b) This question was not well done. Only a small minority identified the larger bulb of thermometer **A** as the key factor and so gained a mark. Even fewer then went on to relate this to a greater expansion of mercury in **A**. The most common answer was **B** because, being smaller it responded more rapidly. There were many other similar answers that displayed a poor understanding of sensitivity and so did not gain the mark.

Question 6

(a) A slight majority stated that the magnet would be attracted to the coil because the left hand side of the coil was a S-pole and so gained both marks. A small number stated that the magnet would be repelled because the coil had a N-pole. A number of candidates answered in terms of the magnet becoming magnetised or demagnetised and so gained no credit.

(b) Those who had suggested the correct direction in **(a)** then went on to show that they knew that the motion would be reversed in **(b)**. A number of others also gained the mark for giving a direction that was opposite to the one given in **(a)**.

(c) Very few candidates were able to combine their answers to **(a)** and **(b)** to state that the magnet or cone vibrates and fewer went on to gain the second mark by explaining that this was due to the polarity of the coil being repeatedly reversed. A number gained some credit by stating that there are compressions and rarefactions coming from the cone or by describing the longitudinal wave that is formed.

(d) (i) This question was well done with the majority of the candidates gaining both marks for the correct answer of 1.3 m.

(ii) The majority scored a mark for stating that the speed increases but fewer went on to gain the second mark for deducing that the wavelength also increases.

Question 7

Although the majority gained one mark for stating that the foil was repelled because it had the same charge as the rod, few gained the second mark for explaining why the foil and the rod have a negative charge. A small number were denied credit because they stated that like poles repel.

Question 8

(a) The majority gained a mark by quoting the formula $Q = It$. A large number, however, failed to gain the second mark for working out the current through the battery as 1.5A. The main reason for this was that many candidates did not convert the time into seconds.

(b) (i) This question was not well done. Only a minority of candidates realised that the current through the battery was divided between the two resistors. Most of those who did realise this wrongly answered that the 8Ω resistor has the greater current and gave their answer as 1 A. The correct answer is 0.5A.

(ii) The majority gained a mark for stating that the p.d. is found by multiplying current by voltage and most of those went on to gain the second mark by working out the value correctly. Full marks were available for those who used the incorrect current that they had worked out in **(b) (i)**. The correct answer is 4V.

(iii) Most candidates identified the 4Ω resistor as the one which transfers more energy per second but few were able to state that this was because there is a greater current in it. The majority were able to offer nothing more than a statement that low resistances transfer more energy.

(c) This was disappointingly badly done. Few candidates displayed a clear idea of the function or action of the earth wire. Almost all believed that it provides a path to earth so that the current does not run through the body. Only the most able scored two marks for stating that the earth comes into operation if a live wire touches the exposed part of the case and very few of these went on to gain the second mark for stating that this causes a large current that blows the fuse and leaves the appliance safe.

Question 9

(a) This was well done with most candidates stating the correct answer of 84.

(b) This question was also well done. The majority gained two marks for stating that β-radiation is emitted and for stating how the numbers in the nuclear symbols showed that this must have happened.

(c) Almost all candidates were able to state that γ rays are part of the electromagnetic spectrum and so gained the mark.

Question 10

(a) This question was very well done by almost all who answered it. There were many detailed descriptions of how the candidate would set about measuring the refractive index. Almost all gained the mark for stating that the block should be outlined. There were three marks available for details of how rays should be drawn and candidates gained at least two of these. The last two marks available were for describing the measurements to be taken and explaining how these are used to find the refractive index. Most candidates scored five marks for this part. The most common mistake, made by very few, was to describe an experiment about reflection which was given no credit.

(b) (i) This question differentiated well. The able candidates gained all three marks for a clear ray diagram with the object closer to the lens than the principal focus with rays correctly drawn through the lens and the rays projected backwards to find the position of the image. A significant minority drew the ray diagram for a slide projector.

(ii) Again this question differentiated well. A slight majority stated that the image was virtual but few of them went on to gain a further mark for explaining that the rays did not actually pass through the image or that it could not be cast on to a screen.

Question 11

(a) This question was not well done. Only a minority gained 5 marks for using Leslie's cube or equivalent apparatus, for specifying how the radiation would be detected, for stating that hot water is used to heat the cube, for stating what readings should be taken and what readings are expected. The majority of candidates described experiments to show different rates of absorption of radiation and thus gained very little credit. Candidates should be told that, particularly when answering questions about heat radiation, they must be careful to answer the question that is asked.

(b) This question differentiated well. Most candidates recognised that conduction was involved. The better candidates then went on to gain two further marks for stating that heating the rod caused greater molecular movement and that this was passed on from particle to particle. A small number of candidates showed misunderstanding by describing diffusion of molecules through the rod.

(c) Few candidates gave a convincing explanation of the need for the cooling coils being at the top to allow for convection, although many did gain a mark for stating that cooler air is denser than warm air.

Question 12

(a) Only a minority of candidates attempted this question but most of those who did scored well. Clear descriptions of experiments to demonstrate electromagnetic induction were common as was the ability to state at least two different factors that affected the magnitude of the induced e.m.f.

(b) This question was quite well done by the most able who drew a good simple diagram of the transformer and explained how it worked linking the change of current in the primary to the changing magnetic flux in the secondary and the consequent induced e.m.f. A small number confused the transformer with the dynamo and gained little credit.

(c) Almost all candidates attempting this question gained the mark for drawing a sine wave. Only a small minority failed to gain this mark.

SCIENCE

Paper 5124/03
Theory (Chemistry)

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) 'CH_2 = CHC*l*' 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.