

SCIENCE

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

Paper 5125/01 (Physics, Biology)

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

Paper 5126/01 (Physics, Biology)

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

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

Question 17 proved to be very easy and **Question 15** very difficult. Some more able candidates also found problems with **Questions 4** and **10**. Many of the questions discriminated well, in particular **Questions 3, 6, 7, 9** and **16**.

Question 1 was well-answered with less able candidates divided evenly between options **C** and **D**.

Question 2 was well-known with option **D** attracting the majority of less able candidates.

Question 3 showed very good discrimination, with less able candidates, ever keen to *multiply* numbers, favouring option **A** over option **D**.

Question 4 showed guessing among more able candidates with significant numbers choosing either option **A** (a positive distractor) or **D** suggesting uncertainty over the meaning of *elastic* deformation.

Question 5 divided candidates almost equally between option **B** and the key, option **D**.

Questions 6, 7 and **9** all showed good discrimination with a suggestion that some more able candidates chose option **B** in **Question 6** and option **D** in **Question 9**. In **Question 7**, option **D** attracted the less able candidates.

Question 8 discriminated well with less able candidates favouring option **C** but also making significant contributions to both options **A** and **D**.

Question 10 In the reflection and refraction of light there is a long held belief that angles are measured between the light ray and the boundary. This misconception appears to be alive and well with more candidates, including the more able, choosing option **C** rather than the key, option **A**.

Question 11 showed good discrimination with less able candidates choosing option **A**.

Question 12 Less able candidates were undecided and were divided almost equally between options **B** and **C**.

Question 13 discriminated well with options **A** and **D** dividing the less able candidates.

Question 14 In choosing option **A**, less able candidates again failed to convert time into seconds.

Question 15 showed uncertainty and guessing among candidates, including significant numbers of the more able who preferred option **A** over the key, option **C**. Option **B** was the most popular choice.

Question 16 showed very good discrimination with options **A** and **C** attracting the less able.

Questions 18 and 19 were well-known with many correct responses.

Question 20 was not well-known, with options **B** and **C** attracting a significant response from more able candidates.

Chemistry, Paper 5124/01 – Questions 21 to 40.

Question 21

A large number of candidates did not recognise that a pipette measures whole number volumes of liquid and chose option **D**, whilst other candidates did not appreciate that a measuring cylinder only has limited accuracy.

Question 22

The better candidates found this question easy. A large number of the weaker candidates did not understand the significance of the nucleon and proton numbers, and simply added the two together and chose option **D**.

Question 23

This question was well-answered, particularly by the better candidates.

Question 24

Another easy question for the majority of the candidates.

Question 25

Many of the candidates were unable to deduce the charge on the uranium, or did not know that oxygen and chlorine have different charges. Over half of the candidates chose option **A**, which simply replaced O in the formula with Cl.

Question 26

An easy question for the majority of the candidates.

Question 27

Another easy question for the majority of the candidates.

Question 28

There was evidence of guesswork, particularly amongst the weaker candidates. Candidates should understand that it is the presence of hydrogen ions in a solution that causes the solution to be acidic.

Question 29

Almost 80% of the candidates recognised option **D** as the electronic structure of argon and the fact that it is used to fill light bulbs.

Question 30

Over 50% of the candidates thought that the regular structure in option **C**, an ionic substance, represents the structure of an alloy. Candidates should be aware that an alloy is a mixture of two elements arranged in an irregular pattern.

Question 31

There was evidence of widespread guesswork in this question. Candidates should know that a metal oxide is more difficult to reduce as the reactivity of the metal increases.

Question 32

The majority of the candidates recognised option **C** as the acid base reaction, but a significant proportion, particularly the weaker candidates, chose option **D**, the reduction of iron(III) oxide by carbon monoxide.

Question 33

There was evidence of guesswork, particularly amongst the weaker candidates, but the better candidates knew that oxygen reacts with the copper in the apparatus and that there is approximately 20% of oxygen in the air so that 80 cm³ of gas remains at the end of the experiment.

Question 34

An easy question particularly for the better candidate.

Question 35

This question was poorly answered. Almost half of the candidates, including many of the better candidates, thought that slaked lime is produced when limestone is heated and chose option **D**. Less than a third of the candidates knew that lime and carbon dioxide are produced when limestone is decomposed by heat.

Question 36

Almost half of the candidates identified lubricating oil as the source of polishes and waxes. A significant proportion of the candidates thought that gasoline is the feedstock for the chemical industry and did not recognise that it is used as fuel for motor vehicles.

Question 37

The better candidates found this an easy question. A large proportion of the weaker candidates thought that substance **X** is ethane rather than ethene and chose option **A**.

Question 38

An easy question for the majority of the candidates.

Question 39

Another easy question for many of the candidates.

Question 40

This question proved difficult for many candidates. A significant proportion chose option **A**, a carbohydrate. Candidates should be able to identify a carboxylic acid and an alcohol and know that they react to produce an ester.

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

Question 21

Candidates needed to recognise that plants produce starch in their chloroplasts.

Questions 22-23

These questions worked well.

Question 24

Candidates were unclear as to which leaf cells contained chloroplasts.

Question 25

Some candidates thought that amylase converts starch to glucose.

Question 26

This was an easy question.

Questions 27-28

These questions worked well.

Question 29

Some candidates confused aerobic and anaerobic respiration.

Question 30

This proved to be a difficult question.

Question 31

Candidates seemed to believe that water moves up a plant stem by osmosis.

Question 32

This was an easy question.

Question 33

This question discriminated well.

Question 34

Some candidates picked the peak of the graph, instead of the section with the steepest decline.

Question 35

This question, about a control experiment, proved to be difficult.

Question 36

This question worked well.

Question 37

Evidently, candidates were guessing at the answer here.

Questions 38-40

These questions discriminated well.

SCIENCE

Paper 5124/02 Theory (Physics)
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General comments

Most candidates showed evidence of being well-prepared and performed well. There was the usual range of ability but a greater number than last year gained 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 a minority of 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. A large number of candidates, however, lost marks by not describing an experiment when asked to do so. Candidates should be reminded that if a question asks them to describe an experiment, they must outline the procedure they would follow and state clearly what readings they would take and how they would measure them. A reference to related theory, rather than a description of what they would do, is rarely creditworthy.

Question 1

A mark was awarded for using the extensions, rather than the lengths of the springs. Many failed to do this; the most popular, though incorrect, answer being 5.1. A further mark was awarded for using the idea of proportionality to arrive at the answer. A large number did this successfully and gained full marks for the correct answer which was 3.5 N.

Question 2

This was well done with most candidates scoring full marks. The formula $\text{density} = \text{mass} \div \text{volume}$ was well known and was given 1 mark. A further mark was given for using the correct volume of 20 cm^3 . The most common mistake was to use a volume of 50 cm^3 . The majority of candidates gained full marks for working out the density as 1.5 g/cm^3 .

Question 3

- (a) The majority of candidates identified the opposing force as friction or air resistance and so gained the mark for this part. The most common mistakes were to state that the force was gravitational force or resultant force, neither of which was credited.
- (b) A large majority of candidates correctly stated that the speed of the car did not change because the forces on the car were balanced or equal and so gained the mark given for **part (i)**.

In **part (ii)** fewer, but still a majority, gained a mark for stating that the speed decreased and then went on to gain a further mark for explaining that this was because the retarding force was greater than the driving force, although some had difficulty in expressing this.
- (c) Whilst a majority knew that acceleration is force divided by mass, and so gained a mark, a large number thought, mistakenly, that the answer could be gained by using $\text{acceleration} = \text{change in speed} \div \text{time}$. A further mark was gained by the majority for recognising that the resultant force on the car was 2000 N. A minority failed to gain this mark because they used a force of 5000 N. Many candidates gained full marks by calculating the correct answer of 2 m/s^2 .

Question 4

- (a) The majority gained the mark for showing that they knew what a moment was and then went on to gain a further mark for equating moments about the pivot. The majority of candidates then went on to calculate the correct answer of 450 N.
- (b) A small majority gained two marks for using work done = force $\times$ distance moved to obtain a correct answer of 2 J. Almost all who calculated the correct values in **Question 4** gained the final mark for stating the units correctly.

Question 5

- (a) The majority of candidates worked out the acceleration correctly using an appropriate method and so gained 2 marks. The correct answer is 3.3 m/s^2 .
- (b) This question was not done well. Few candidates attempted to find the area under the graph, suggesting that this part of the syllabus is not well known. Almost all candidates used distance = speed $\times$ time but made the mistake of using the final speed, rather than the average speed. The correct answer, found by only the most able, was 240 m.

Question 6

- (a) This question was not done well. The first mark was given for stating that the lower fixed point is a temperature. Most candidates wrote only that it is a point. The second mark was gained by more candidates for stating that ice melts or water freezes (at this temperature). Only a few candidates scored any marks at all since the majority clearly did not know what the lower fixed point is. A large number of candidates thought that it is the lowest temperature that the thermometer can measure or that it was the point where the meters start to work. Neither of these responses gained any credit.
- (b) Only a small minority of the most able was able to calculate the correct answer to this part and so gained 2 marks. A large number gained one of the marks for attempting to use the idea of proportionality to calculate the temperature but failed to get the correct answer because they used the actual resistances rather than the differences between the resistances. The correct answer is 75°C .

Question 7

- (a) Most candidates thought, wrongly, that the speed of sound decreases when it passes from air into glass. Others failed to gain the mark for stating that the volume of the sound decreases. Only the most able gained a mark for stating that the speed increases when sound travels from air into glass.
- (b) The majority of candidates gained 2 marks for stating that the sound decreases or cannot be heard and for explaining this by stating that sound requires a medium to travel or that it cannot travel through a vacuum. The most common mistakes were stating that the frequency or speed changes.

Question 8

- (a) A large number of the most able candidates gained a mark for identifying the wave as a transverse wave and explaining that it is because the direction of vibration is at right angles to the direction of propagation of the wave. Many candidates lost credit by stating that the wave in water is a longitudinal wave and others lost credit for imprecise explanations such as the vibrations are at right angles to the source which were not creditworthy.
- (b) This question was surprisingly badly done. Only a minority gained a mark for stating that $v = f \times \lambda$. Most seemed to think that the answer could be gained by dividing the frequency by the wavelength. Almost all who quoted the correct formula went on to gain a further mark for the correct answer which is 40 cm/s.

Question 9

- (a) Although the majority gained a mark for stating that the rods are magnetised, only a small minority went on to gain 2 further marks for stating that the rods would repel due to their having the same poles at the same ends.
- (b) Only a very few of the most able gained any credit for this part. The majority thought that the rods would be demagnetised. Most of those who realised that the rods would still be magnetised did not gain credit because they thought that the rods would now attract each other. The small minority who realised that the rods would still repel because the poles would be reversed in both rods are to be congratulated for their clear thinking and good knowledge of Physics.

Question 10

This question was well done by most candidates although others revealed some misunderstanding.

- (a) (i) The majority knew that a beta particle is an electron and so gained the mark for this part.
- (ii) Many candidates gave the number of protons in the nucleus of iodine and so failed to score the mark for the correct answer of 54.
- (iii) The majority gained the mark for knowing that the number of electrons in the neutral atom is equal to the number of protons. This mark was given for the same answer that they had given in **part (ii)** whether this was correct or not.
- (iv) The majority gained a mark for correctly subtracting the proton number from the mass number to get the number of neutrons. The correct answer is 77 but full credit was given for correct evaluations of 131 minus their answer to **b(i)** even if **b(i)** was incorrect.
- (b) The majority knew that gamma rays are also a part of the electromagnetic spectrum and so gained the mark for this part.

Question 11

- (a) This question was not well done. Many candidates drew diagrams of rays hitting a plane mirror and labelled a variety of angles without outlining the procedures they would adopt if doing the experiment. Most candidates gained only the mark for stating that they would expect the angle of incidence to be equal to the angle of reflection. A mark was awarded for stating that the position of the mirror needs to be marked on a sheet of paper; only a few candidates gained this mark. A further mark was given for a description of how the rays are traced. Credit was given for either a method using pins or a ray box but few stated how they would find the path of the rays. Another mark was for stating that a normal is drawn and angles measured from this line. Again, only a minority mentioned this. Very few gained the fifth mark for stating that they needed to repeat the procedure to get a series of readings.
- (b) Most candidates were able to state one property of the image in a plane mirror although a large number believe that the image is real. It was surprising how many stated that the image is both real and virtual, which gained no credit. Fewer candidates stated that the image is as far behind the mirror as the object is in front and so gained the second mark.
- (c) There were many good ray diagrams showing how a diminished real image is formed in a converging lens. Most candidates gained at least 2 marks for drawing two correct rays. A minority of candidates failed to gain the third mark by not being careful to show the object at a great distance from the lens and so did not make clear that the image was diminished.

Question 12

- (a) This question was very popular and was well answered by most candidates who scored most of the marks available. Most candidates gained a mark for describing two appropriate absorbers and for describing a sensible method of detecting any difference in radiant heat absorbed. They then went on to gain a further mark for stating the observation they would expect in order to show that dull black surfaces are better absorbers of radiation. Only a few candidates failed to gain 2 further marks for suggesting a suitable heater and for a method of ensuring that each absorber had the

same amount of radiation incident upon it. The most common reason for losing marks was for describing an experiment to show that black surfaces are better emitters of radiation.

- (b) This question was quite well done by most candidates but few gained all 3 marks. Few realised that conduction, convection and radiation all play their part in the transfer of heat in this context. While most gained marks for stating and explaining how one or two of these processes is involved, only the most able gained all three marks for a comprehensive answer.
- (c) This application is not well known and few gained marks for stating that air is a bad conductor or that the gap is too small to allow convection. This was intended to be a demanding question and it proved to be so.

Question 13

- (a) Most candidates who attempted this question gained 2 marks for a diagram that showed a coil in the magnetic field of a magnet and for labelling slip rings that allow continuous movement. The majority went on to gain further marks for stating that the magnet is rotated and that this cuts the magnetic field and so an e.m.f. is induced. Few chose a method that involved rotation of the magnet but those who did were given full credit. The most common error was to draw a transformer and explain how this worked. These answers gained very little credit.
- (b) This question was reasonably well answered by most candidates. Almost all were able to gain two marks for identifying two methods of increasing the e.m.f induced but few went on to gain the other two marks for explaining why these methods did so.
- (c) Almost all candidates gained a mark for stating that earthing prevents electrocution. Marks would have been awarded for describing how earthing works but very few mentioned this.

SCIENCE

Paper 5124/03
Theory (Chemistry)

General comments

Section A

Question 1

The constituents of air. Uses of nitrogen and oxygen. Poorly answered.

Many candidates gave two inert gases. Many candidates believed there to be more oxygen by volume in the air than there is nitrogen. Uses were well remembered, though some candidates incorrectly described nitrogen gas as being a fertiliser.

Question 2

Test for hydrochloric acid. Neutralisation. Fairly well answered.

- (a) Tests for acids using some type of indicator or even a pH meter were well described. Tests for a chloride rarely given correctly. Many candidates described a test for chlorine, by bleaching, rather than a chloride, using silver nitrate solution.
- (b) The dangers of adding large and excessive amounts of alkali to neutralise spilt acid were well understood.
- (c) Naming and giving the formula for any one of the products of the reaction of hydrochloric acid with calcium carbonate earned these marks. So 'water' and 'H₂O' would have been sufficient.

Question 3

Nuclear structure and a calculation. Well answered.

- (a) Most candidates could determine the number of neutrons present in a nucleus when provided with the nucleon number and atomic number. Most could then proceed to determine the number of electrons that would, as a result, be in orbit around this neutral atom.

No problems were found in balancing the equation provided but few candidates could then proceed, using a supplied equation, to determine the mass of materials needed to manufacture 10 tonnes of uranium.

Question 4

Homologous series, organic names, structures and types of reaction. Very well answered.

- (a) A general formula was expected though many candidates gave 'identical chemical formula' and earned zero marks. Specific trends in physical properties, such as increasing boiling point with increasing relative molecular mass, were accepted for one mark when describing features of all members of the same homologous series.
- (b) Several names were accepted for an 'ethene to ethane' type of reaction, including reduction, hydrogenation and addition. Hydration was often given and earned zero marks. Chemical structures were well known.

Question 5

Periodic Table and members of Group I. Well answered.

- (a) 'Alkali metals' was correctly given as the collective name for the elements in Group I.
- (b) Most candidates could use the Periodic Table supplied on the examination paper to identify correctly the members of Group I, and excluded copper. Any description of the reaction of water with rubidium as being anything implying more than just 'very fast', the description of the reaction of potassium with water, was accepted for the mark available.

Question 6

Identifying the drawings of various particles as any combination of mixtures, elements, compounds, solids, liquids and gases. Extremely well answered.

Candidates were asked to identify the drawing that 'best' represented a particular combination of the above. The particle-spacings of F and E indicated both to be liquids but only E contained a mixture of substances and so could, from these drawings, be a liquid mixture.

Question 7

Reaction rate and interpretation of a graph (metal with acid).

- (a) Many candidates interpreted the reaction represented by the graph as one which was increasing in rate.
- (b) Most candidates realised that with a fixed mass of metal – the concentration of acid used does not vary the amount of gas produced as long as the acid is in excess, and using a more dilute acid will affect the rate of gas production, and hence the gradient of the curve.
- (c) This section was not well answered. There was some confusion between the results from changes in temperature and from changes in concentration: candidates often wrongly attributed the change in the shape of the curve to be the result of increases/decreases in the speed at which the particles move – which is a temperature effect. An answer involving 'particles' was required for full marks to be obtained.

Question 8

Non-biodegradable materials and recycling.

- (a) Many candidates understood the term 'non-biodegradable', particularly with reference to plastics.
- (b) Many candidates believed that all metals are non-biodegradable and so used this as a reason why metals should be recycled. There are at least four basis reasons why metals are recycled. These include: shortage of natural resources; the economics of manufacture and recycling; the potential for pollution; the conservation of energy. A response had to contain some form of 'reason' before the mark available could be earned, for example, just writing 'pollution', 'cost', 'saving the Earth', 'being environmentally friendly' were not enough.

Section B**Question 9**

Covalent and ionic bonding. Well answered.

- (a) Good accurate drawings of both covalent and ionic substances, containing chlorine, were commonplace. Charges were usually included correctly in drawings of the structures of ionic substances. Chlorine was, of course, accepted as a covalent substance containing chlorine atoms.
- (b) Good knowledge was shown of the differences between the substances chose. However, the electrical conduction of molten ionic substances continues to be wrongly attributed to 'mobile electrons'.

Question 10

Ethanol by fermentation. Calculation. Fairly well completed.

- (a) Most candidates could give an adequate description of how to ferment glucose to produce ethanol. Many underlined the importance of not allowing the temperature to rise above a certain point and so not 'killing' the yeast.
- (b) Few candidates failed to determine the relative molecular mass of glucose and most could proceed to determine the percentage by mass of oxygen in each molecule.

Question 11

The reactions of gases. Well answered.

- (a) The properties of common gases were well known and the gases correctly identified. An acidic liquid that produces a white precipitate with acidified barium nitrate solution was not often recognised as probably being dilute sulphuric acid.
- (b) Equations for changes were rarely supplied with correct formulae for reactants and products, and even fewer were balanced.
- (c) The uses of hydrogen and ammonium sulphate were well remembered.