SCIENCE

Paper 5126/01
Multiple Choice

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

Chemistry 5126/1 (Questions 1 – 20)

Question 1

This question proved easy for the better candidates, however a significant number of the candidates thought that the mixture of two solids could be separated by filtration alone and chose option **A**.

Question 2

Another easy question for the better candidates.

Question 3

The vast majority of the candidates knew that a solution of sodium chloride in water conducts electricity.

Question 4

Almost a third of the candidates chose options **B** and **D**, both of which offered combinations of a metal and a non-metal, which are combined by ionic bonding.

Question 5

The majority of the candidates were able to balance the equation correctly.

Question 6

Calculations involving concentrations of solutions are not well understood. There was evidence of widespread guesswork even amongst the better candidates

Question 7

The carbon cycle is well known by the majority of the candidates.

Question 8

The majority of the candidates were unable to interpret the results correctly. Candidates should be aware that fine powder reacts quicker than large lumps and that a smaller mass of calcium carbonate produces less carbon dioxide.

Question 9

This question was well answered by the majority of the better candidates but there was evidence of guesswork amongst the weaker candidates.

Question 10

The majority of the candidates know that caesium reacts with water but a significant proportion of the weaker candidates thought that caesium is a non-metal and chose option **A**.

Question 11

The use of aluminium in the manufacture of aircraft is well known by the better candidates, however almost a quarter of the candidates thought that mild steel is used to make cutlery.

Question 12

The reactivity series is not well understood particularly amongst the weaker candidates as there was evidence of guesswork.

Question 13

The source and effect of pollutant gases is not understood by the majority of the candidates. It is disappointing to record that 60% of the candidates think that carbon monoxide is the cause of global warming.

Question 14

This question allowed the vast majority of the candidates to demonstrate their knowledge positively.

Question 15

Many candidates know that methane is the main constituent of natural gas.

Question 16

There was evidence of guesswork particularly amongst the weaker candidates. Candidates should know that bromine adds across the double bond in an alkene.

Question 17

The representation of ethanol was recognised by the majority of the candidates but a significant proportion of the candidates chose ethanoic acid.

Question 18

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

Question 19

There was evidence of widespread guesswork even amongst the better candidates. The reactions of ethanol are not well understood by the majority of the candidates.

Question 20

The majority of the better candidates identified nylon and proteins as having the same linkage.

Biology

Question 21

This question worked well.

Question 22

As in previous years, the question on osmosis caused difficulty for some candidates.

Question 23

Weaker candidates were put off by the unusual format of this question.

Question 24

Candidates tended to focus (wrongly) on the heat of the underwater springs, and so chose option A.

Question 25

Most candidates could recognise a leaf cell, but were not sure which one.

Question 26

This was an easy question.

Question 27

There was some guessing here.

Question 28

This was a straightforward question.

Question 29

This question (on blood circulation) proved to be difficult.

Questions 30 – 31

These questions discriminated well

Question 32 – 33

These were straightforward questions, but caused some problems.

Question 34

It was surprising that candidates had difficulty in identifying the liver as the organ affected by alcohol.

Question 35

This question, about food webs, proved to be difficult.

Question 36

This question worked well.

Question 37

Candidates confused cause and effect, sometimes believing that decreased nitrogen content causes soil erosion (rather than the other way round).

Question 38

This question proved difficult.

Question 39

This was an easy question.

Question 40

This question discriminated well.

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Paper 5126/03
Theory (Chemistry)

Section A

Question 1

Uses of five different substances. Well answered.

(a) 'Zinc' was usually correctly given

(b) 'Sulfur dioxide' or 'oxides of nitrogen' are the gases which cause acid rain. 'Sulfuric acid' was often given and earned zero marks.

(c) 'Acetylene (ethyne)' was the expected answer, as described in the syllabus, but 'hydrogen', though rarely given, also gained the mark available.

(d) 'Diamond'. Several candidates realised that an allotrope of carbon was needed but incorrectly gave 'graphite'.

(e) 'Yeast', 'zymase' and, even, the general term 'enzymes' were all accepted as organisms that ferment sugars.

Question 2

The particles present in hydrogen gas and molten potassium chloride. Poorly answered. It was not clear whether candidates realised that molten potassium chloride is a liquid, with all the associated properties.

(a) Movement – 'fast moving' gas particles and 'slower' moving liquid particles were the responses required. Candidates often used the term 'moving freely' in distinguishing between the particles in solids and liquids. This failed to earn any marks. 'Random' / 'non random' movement of particles to describe the movement in gases/liquids was not accepted

Arrangement - 'far apart' and whatever could be interpreted as 'closer together than in gases' were the responses sought.

Attraction for one another – either 'slight attraction' or 'no attraction' were both accepted as descriptions of the particles in a gas and 'strong' attraction between the particles was the description required for the ionically bonded sodium chloride. 'Ions' did not need to be included.

(b) 'Moving/mobile' 'ions' is of course the basis for electrical conduction in the melt of an ionic compound such as potassium chloride. Answers based upon 'clouds/streams of electrons' earned zero marks, as did answers that used the conductivity of the metal, potassium, within the compound, to explain conduction. These latter descriptions were commonplace.

(c) Many candidates believed that breaking covalent bonds is easily completed and this results in hydrogen having a low boiling point. The ease with which the intermolecular forces between hydrogen molecules is the basis of the response required. This was given - but not often.

Question 3

The electronic structure of covalently bonded methane, its relative molecular mass and derived structures.

(a) Very well answered. Imperfect answers were awarded a mark for any of the following three factors in the structure drawn: a shared pair of electrons; seemingly eight electrons in the outer shell of a carbon atom; seemingly two electrons in each of four hydrogen shells.

(b) The elements, compounds and mixtures illustrated by this series of diagrams were extremely well identified by most candidates.

Question 4

The alkali metals

(a) (i) The various ways of describing the fact that the element has one electron in its outer shell earned the mark available. 'Needs seven more electron for a stable structure' was also accepted, at this level of understanding.

(ii) Well answered with 'eleven protons' and 'twelve neutrons', though 'twelve nucleons' often, erroneously, appeared,

(iii) Most candidates realised that different isotopes of the same element differ by the numbers of neutrons in their respective nuclei.

(b) The meaning of 'property' was interpreted liberally by Examiners and so such 'properties' as 'most reactive of the Group', 'displaces from a solution the ions of metals above francium in the Group' and any property of a metal were all individually accepted for each of the three marks available.

(c) Candidates could choose any element from Group VI and Group VII in writing these two formulae. Both, for example, FrO_2 and O_2Fr were accepted as being correct for the compound formed between francium and oxygen.

Question 5

Properties of acids and bases. Very well answered.

The source of the acidity of hydrochloric acid was accepted as being either H^+ or H_3O^+. The range of pH acceptable for this acid was 0-3 and the range of pH acceptable for sodium hydroxide solution was 10-14. The product of neutralisation was identified correctly by most candidates - though, as a 'name' was required, the formula was not accepted.

Question 6

Definition and uses of 'relative molecular mass'.

(a) Using 'total number of protons and neutrons' to define 'relative molecular mass' earned zero marks. Such standards as $1/12^{th}$ of a carbon-12 atom, one hydrogen-1 atom and $1/16^{th}$ of an oxygen-16 atom were all equally acceptable.

(b) The reason for not obtaining this mark was not, as expected, that candidates could not write the correct formula for potassium hydroxide but, more usually, for incorrect addition.

(c) A simple calculation that was not always answered correctly of the mass of hydrogen chloride present in 250 cm^3 of a solution of 2.0 mol/dm^3 hydrochloric acid. In this instance the relative molecular mass of hydrochloric acid was given.

Question 7

Reactivity series of metals. Evidently the style of this rather unusual and difficult question did not deter candidates as they produced exceedingly good answers, showing excellent chemical understanding.

(a) Only the metal with the code name 'epsilon' is below hydrogen in this reactivity series and so is the only one of these metals that will not corrode in moist air.

(b) Only 'alpha' is more reactive than 'beta' and so is the only metal present in this series that will displace 'beta' from its oxide.

(c) The least reactive of the metals positioned above hydrogen in this series of metals is 'delta'. Hence 'delta' will react most slowly with hydrochloric acid to produce hydrogen gas.

(d) Copper will appear below hydrogen in a reactivity series. So, copper could be represented by the code name 'epsilon'.

Section B

Question 8

Manufacture of iron and calculating mass and volume of carbon dioxide so produced.

(a) Three suitable equations, balanced and with fully correct formulae, would have earned the full six marks for this section. The most difficult of these, that which involved the production of calcium silicate, caused the greatest problem to candidates. However, mention of the word 'slag' earned a single mark. Very well answered.

(b) F - Barium sulphate – of these four compounds, this was identified with greatest difficulty.
G - Iron(II) hydroxide – usually correctly identified.
H - Iron(III) hydroxide – usually correctly identified.
I - Iron(II) sulphate – usually correctly identified. Candidates not recognising the sulphate but correctly given the formula of the iron(II) salt they had, incorrectly, identified, still earned the mark available for the formula. In other words they were not penalised twice for a single error. This technique of marking is commonly applied when marking all of these questions.

Question 9

Determining and explaining speed/rate of reactions..

(a) A very simple description of how particle size and temperature affect the rate of a reaction was enough to earn full marks.

(b) Some candidates described how to <u>compare</u> rates of reaction rather than to <u>determine</u> the rate of reaction, going down the route e.g. 'use two forms of calcium carbonate, add acid, observe the bubbles, fastest bubbles, fastest reaction', rather than the route e.g. 'use calcium carbonate chips, add acid, measure the total volume of gas produced over time, using a gas syringe and stop clock and calculate rate from a volume against time graph'. In doing so they were penalised in that two marks of the mark scheme, those given for plotting and interpreting a graph of volume of gas produced against time, were not available to them.

Of course, the rate of a reaction varies according to when the rate is measured – sometimes being slow and sometimes being fast. Better answers, and there were many, determined the rate by explaining that the gradient of a graph that displayed 'volume of gas produced' against 'time' was the rate at any one point in time. Less good answers did not contain a graph but determined a mean rate by dividing the overall volume of gas produced by the time for the reaction to reach completion.

(c) A simple control, the reaction used for either answers to 'b', and a change in temperature needed to be described in deciding whether the a rate of reaction will or will not depend upon temperature, either bubbles being produced faster or a steeper graph at a higher temperature, was considered sufficient for full marks to be awarded.

Question 10

Separating petroleum into its fractions and the basis of polymerisation.

(a) Only a very simple description of the means whereby petroleum is separated into its various fractions was required. 'Heating, passing into the lower part of the fractionating tower, and collecting the fractions at different levels' was enough. This was less well answered than any other part of this paper and yet required no more than factual recall. Names of the fractions so obtained were well remembered, as were their uses.

(b) A structural formula for ethene was enough and so displayed hydrogen atoms were not essential though, of course, were not penalised in any way.

An explanation of the reason why ethene can be polymerised had to centre upon the existence of a double carbon-to-carbon bond and that many molecules are needed to form a polymer. Many candidates gave the chemical formula of poly(ethene). The 'n' that appears in a correct formula was sufficient to earn the mark available for 'many molecules'.

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Paper 5126/04
Theory (Biology)

Too few candidates to provide a meaningful report.