COMBINED SCIENCE

Paper 5129/11
Multiple Choice

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

Comments on specific questions (Biology)

Question 1

The most common choice after the key was ‘cell wall’, indicating that there is some confusion between the roles of the cell wall and the cell membrane, especially amongst the weaker candidates.

Question 2

Some lower-scoring candidates were confused by the direction of the concentration gradient of water and thought that the water concentration in the root hairs needed to be higher than in the soil in order for the water to enter the plant roots.

Question 6

Many candidates struggled with this question, incorrectly selecting the method of transfer as 'osmosis'. Osmosis refers only to the movement of water molecules. The nutrients mentioned in the stem will move by the process of diffusion.

Question 7

A significant number of candidates incorrectly selected 'carbon dioxide and lactic acid', indicating the common misconception that carbon dioxide is produced during anaerobic respiration in muscle cells.

Question 8

Candidates need to be aware that the kidneys remove urea from the blood.

Question 10

This was a well-answered question, indicating a good understanding of food webs.

Question 11

Candidates found this question challenging. Decomposition releases carbon dioxide into the atmosphere and by leaving the soil bare (and not growing crops) less carbon dioxide is taken out of the atmosphere during photosynthesis.

Question 13

Some weaker candidates incorrectly selected 'surgical'.

Comments on specific questions (Chemistry)

Question 14

Candidates needed to be aware that gases less dense than air need to be collected in inverted or sealed vessels. Candidates also needed to use the information given in the stem to deduce that if the gas was passed through water or acid before collection, it would dissolve or react.

Question 16

Many candidates demonstrated that they had not grasped the idea of transfer of electrons in the formation of ionic bonds.

Question 20

Candidates need to be aware that the reactivity of the halogens increases down the group.

Question 21

The use of copper for electrical wiring was very well known by the candidates but its use for water pipes was less well known, even by higher-scoring candidates.

Question 22

Candidates need to be able to deduce the order of reactivity from a given set of experimental results.

Question 24

The use of hydrogen to make ammonia was well known by the vast majority of the candidates.

Question 26

A majority of the candidates recognised that bromine water is used to distinguish between alkanes and alkenes.

Question 27

The uses of ethanol were well known by the majority of the candidates.

Comments on specific questions (Physics)

Question 28

Candidates answered this question well, indicating a good understanding of speed / time graphs.

Question 30

This question required that candidates understand how mass and a gravitational field combine to create weight, as well as the difference in the units used for mass and weight.

Question 32

Candidates needed to recognise that power is the rate of work done, and calculate the total work done for the situation described before dividing by the time to find the work done in one second.

Question 34

Most candidates are able to correctly deduce the amplitude of a wave; a few needed to be aware that the amplitude of a wave is the displacement from the undisturbed position.

Question 35

Candidates need to be aware that the angle of incidence is the angle between the normal and the incident ray.

Question 36

Candidates needed to first calculate current before substituting this value into $V = IR$ to find the voltage across the resistor. The better candidates performed well on this question.

Question 37

Candidates need to make sure that they are manipulating equations correctly

Question 38

Candidates need to be aware of the difference in the magnetic properties of iron and steel, as well as the need to be able to switch an electromagnet off.

Question 40

Candidates need to be able to estimate a half-life from a decay curve

COMBINED SCIENCE

Paper 5129/12
Multiple Choice

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

Comments on specific questions (Biology)

Question 1

A significant number of candidates incorrectly selected 'cell wall', showing that there is some confusion between the roles of the cell wall and the cell membrane.

Question 2

Some candidates were confused by the direction of the concentration gradient of water and thought that the water concentration in the root hairs needed to be higher than in the soil in order for the water to enter the plant roots.

Question 3

Some candidates incorrectly selected graph B and did not seem to appreciate the denaturing effect of high temperatures on enzymes.

Question 4

Many candidates incorrectly selected 'epidermis' here. Whilst photosynthesis does occur in the epidermis, candidates perhaps failed to note the requirement to identify where the **most** photosynthesis occurs in the leaf.

Question 5

Candidates need to be aware of the main functions of different parts of the alimentary canal, as well as be able to describe the function of a typical amylase.

Question 8

The sequence of events during exercise is an area that candidates find challenging.

Question 9

Candidates know the functions of component parts of the eye well.

Question 10

Many candidates found this a challenging question. Although deforestation will inevitably result in fewer trees, it will not result in increased humidity as transpiration is reduced. The rainfall not absorbed by trees will tend to run over the surface of the ground, washing soil away.

Question 13

This question proved challenging to most candidates, with the correct answer being selected by few. 'Chemical (spermicides)' was the most common incorrect response.

Comments on specific questions (Chemistry)

Question 14

Candidates needed to be aware that gases less dense than air need to be collected in inverted or sealed vessels. Candidates also needed to use the information given in the stem to deduce that if the gas was passed through water or acid before collection, it would dissolve or react.

Question 15

The difference in atomic structure of two isotopes was well known by a majority of the candidates.

Question 16

Candidates needed to recognise the ionic nature of sodium chloride and the fact that ionic substances have high melting points.

Question 17

Candidates need to be able to distinguish between ammonia (NH_3) and ammonium (NH_4^+).

Question 19

Candidates need to be aware of the acidic nature of non-metallic oxides.

Question 20

Candidates need to know the trend in reactivity of Group I elements.

Question 22

The better candidates were able to use the reactivity series to determine which reaction occurs but there was evidence of guesswork amongst the weaker candidates.

Question 23

The majority of the candidates were aware of the processes that increase the global concentration of carbon dioxide in the atmosphere.

Question 24

Candidates need to know that the formula of ammonia is NH_3 and therefore contains two elements, nitrogen and hydrogen.

Question 25

The vast majority of the candidates knew the trend in the boiling points of the alkanes.

Question 27

The use of a catalyst and a temperature of 300^{o}C for the production of ethanol from ethane and steam are well known by many of the candidates; fewer candidates recognised that a pressure of 60 atm is also required in the process.

Comments on specific questions (Physics)

Candidates found **Question 31** to be very easy and **Question 40** to be very difficult.

Question 28

This was well answered with weaker candidates, choosing incorrectly, favouring option C.

Question 30

Candidates correctly deduced the size of the force needed, distance from the pivot and the side to apply the force. Some were uncertain as to its direction although the majority correctly chose option A.

Question 33

Candidates needed to recognise that power is the rate of work done, and calculate the total work done for the situation described before dividing by the time to find the work done in one second. The better candidates generally selected the right answer.

Question 34

Candidates need to be aware that a clinical thermometer is constructed to supply a steady reading in order that the temperature of the patient be easily read when the clinical thermometer is removed from the patient's mouth.

Question 36

Candidates needed first to calculate current before substituting this value into $V = IR$ to find the voltage across the resistor.

Question 37 was well answered.

Question 40 was not well answered and showed guessing among candidates with more choosing options A and C, including some better candidates, than the key, option D. Some better candidates also chose option B.

COMBINED SCIENCE

Paper 5129/21
Theory

Key Message

When answering questions using Physics formulae, candidates should be encouraged to state the equation they are using and use the correct symbols for the quantities.

General Comments

The candidates' responses to calculations in the Physics questions were invariably good and showed a good understanding. In general the candidates' responses to the Chemistry question were not of the same standard.

Comments on Specific Questions

Section A

Question 1

(a) Candidates need to be able to read vernier scales as well as micrometer scales. A large proportion of the candidates were unable to read the vernier scale.

(b) More candidates were familiar with the micrometer scale.

Question 2

(a) (ii) A large number of candidates were able to identify the components of the eye.

(ii) The functions of the components of the eye were not well known by many of the candidates. Candidates were expected to know that the iris focuses the image on the retina, the ciliary muscles change the shape of the lens and the retina converts light into nerve impulses.

(b) (i) Many candidates recognised that the pupil is larger in Fig. 2.3.

(ii) The cause of the change in the size of the pupil was known by a majority of the candidates.

(iii) The candidates only rarely mentioned the circular or radial muscles but answered the question in terms of the ciliary muscles.

Question 3

(a) (i) The two processes were well known by the better candidates but there was some evidence of guesswork amongst the weaker candidates.

(ii) A significant number of candidates stated the names of specific hydrocarbons rather than the type of hydrocarbon.

(b) A large number of candidates were able to calculate the values of x and y.

Question 4

(a) This proved to be an easy question particularly for the better candidates.

(b) This was another easy question for the better candidates.

(c) The calculation was well done by a significant proportion of the candidates.

(d) (i) The vast majority of the candidates were able to read the graph correctly.

(ii) The candidates' responses to this question were disappointing. The majority of the candidates were unaware that all that was required was to add 10 to the answer to part **(d)(i)**.

Question 5

(a) The vast majority of the candidates were able to calculate the proton number whereas the nucleon number was less frequently correct.

(b) (i) The better candidates recognised that the electronic structure given in the question was that of an ion and therefore correctly deduced that the element is in Group 7.

(ii) A significant proportion of the candidates recognised that the ion is negatively charged but then did not state that it was a single negative charge.

Question 6

(a) A significant proportion of the candidates stated the pieces of apparatus the wrong way round. The colours of Universal Indicator in acidic, alkaline and neutral solution are not well known by many of the candidates.

(b) Candidates needed to realise that the experiment is repeated without indicator so that it does not contaminate the solid sodium chloride.

Question 7

(a) (i) The bar chart was well drawn by many of the candidates but some marks were lost by candidates drawing the bars so that they were touching each other.

(ii) This question proved to be easy for the majority of the candidates.

(b) Many candidates correctly identified the palisade mesophyll cell as the one which contained the most chlorophyll and therefore forms the most glucose by photosynthesis.

(c) Only the best candidates recognised that nitrogen is used to make proteins in plants and that the protein is required to help the plant grow.

Question 8

(a) The calculation was well done by the majority of the candidates.

(b) Convection currents in liquids are well understood by many of the candidates.

(c) The majority of the candidates understand that heat is transferred through metals by conduction.

(d) The idea that black surfaces emit heat more effectively than a white surface is not well understood by many of the candidates. A significant proportion of the candidates answered the question in terms of absorption or reflection.

Question 9

(a) (i) Of those candidates who drew the normal to the mirror, most drew the line at 90^{o} to the mirror.

(ii) Candidates should be encouraged to draw reflected rays so that the angle of incidence is equal to the angle of reflection.

(b) Only the best candidates were able to position the image of the pin behind the mirror and directly opposite the pin.

Question 10

(a) (i) The use of a catalyst to speed up a reaction was quite well known by the candidates, however the specific catalyst used in the Haber process was less well known.

(ii) The conditions for the Haber process were well known by the better candidates.

(b) Many candidates were not aware that methane or natural gas is the source of hydrogen for the manufacture of ammonia.

(c) The use of ammonia to manufacture fertilisers is well known by many of the candidates.

(d) Only the best candidates were able to identify the ion which causes a solution to be alkaline as the hydroxide ion.

Question 11

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

Question 12

(a) The symbols for components used in electrical circuits are not known by many of the candidates, however many of the candidates were able to construct a series circuit containing the four components. Only the very best candidates were able to draw the voltmeter in parallel with the lamp in the circuit.

(b) (i) The calculation of the resistance of the lamp was well done by many of the candidates, although some candidates correctly stated the formula for the calculation but then rearranged it incorrectly.

(ii) A majority of the candidates were able to state the current in the resistor.

Question 13

(a) The calculation of relative molecular masses is not well understood by many of the candidates, however some of these candidates were able to score some marks by correctly performing the second part of the calculation using the wrong relative molecular masses calculated in the first part.

(b) The test and result for carbon dioxide is well known by many of the candidates.

Question 14

(a) The differences in the structure of arteries and veins are known by many of the candidates.

(b) The differences in the function of the arteries and veins are well known, particularly by the better candidates.

Question 15

(a) An easy question for the majority of the candidates.

(b) (i) The nature of the beta particle is not well known by the majority of the candidates.

(ii) The effect of emitting a beta particle on the nucleus of an atom is not understood by a majority of the candidates. Candidates are expected to know that the number of protons increases by one and the number of neutrons decreases by one as the emission of an electron from the nucleus arises as a result of a neutron being converted into a proton.

(c) The concept of half-life is not understood by many of the candidates.

Question 16

This question proved difficult even for the better candidates. Candidates are expected to be able to distinguish between representations of elements, compounds and mixtures including alloys, molecules and atoms.

Question 17

(a) The vast majority of the candidates recognise that famine is caused by lack of food.

(b) Most candidates were aware of some of the causes of famine; however, many candidates' explanations were vague and frequently referred simply to the fact that there was a lack of food. Candidates should be encouraged to fully explain how the problem can lead to a famine situation.

COMBINED SCIENCE

Paper 5129/22
Theory

Key Message

Candidates should be encouraged to include their working in the answers to calculations and quote formulae using the accepted symbols for the quantities involved.

General Comments

It is pleasing to note that the quality of the candidates' work in Physics calculations was better than in previous years; however, where the candidates were required to manipulate the formula for the calculation they were less successful. In the Biology section of the paper, the candidates' responses to questions involving experimental work needed more detail. All too often, the candidates simply restated the question and offered no explanation. In the Chemistry section of the paper the candidates' responses to the organic chemistry question would have been improved with a better understanding of the reactions of ethene.

Comments on Specific Questions

Question 1

(a) A small number of the candidates correctly identified that the Sun's energy is converted into chemical energy during photosynthesis. A larger number of candidates identified that the energy is trapped by chlorophyll in the plant and used to combine water and carbon dioxide to make glucose.

(b) The use of ions containing nitrogen to make proteins was not well known by the candidates.

Question 2

(a) The calculation of relative molecular mass is not well understood by many of the candidates; however a significant proportion of the candidates were able to complete the second and third steps correctly and therefore showed their understanding of the relationship between the equation and the reacting masses.

(b) Only the better candidates recognised that an ionic bond is formed between a metal and a non-metal.

(c) The candidates' responses to this question were disappointing. The composition of air is not well known by many of the candidates.

Question 3

(a) Some candidates mistakenly interpreted the size of the small divisions on the measuring cylinder and obtained incorrect answers of 20.3 or 23. For the majority of the candidates this was an easy question.

(b) The equation for calculating the density of the liquid was well known by the majority of the candidates but a significant number had difficulty substituting the correct numbers in the equation. The units of the density were known by many of the candidates who did the calculation incorrectly.

Question 4

(a) A significant number of the candidates confused the speed-time graph with a distance-time graph and therefore thought the runner was at rest when it was maintaining a speed of 6 m/s.

(b) The difference between speed and velocity is not well known by many candidates. The better candidates could not always express their understanding well, but nevertheless did convey the idea that the added information of direction of movement is a factor in differentiating between speed and velocity.

(c) The calculation of acceleration was well done by many of the candidates, although a significant number correctly quoted the formula F=ma but then had difficulty manipulating the formula to make the subject the acceleration.

Question 5

This question was well done by many of the candidates. The most frequently incorrect line was that from glucose production to palisade mesophyll cell.

Question 6

(a) Many candidates recognised the most reactive and least reactive elements but were unable to distinguish the reactivity of **S** and **P**.

(b) (i) The responses to this question were disappointing. A large number of the candidates used a glowing splint for the test instead of a burning splint.

(ii) Only a small number of candidates were able to deduce the correct formula of the chloride of **S**. A number of candidates tried to work out the identity of element **S** represented and then give the formula of the actual compound.

(c) The majority of the candidates were unable to identify that the products of the reaction are zinc oxide and hydrogen.

Question 7

(a) The calculation of the work done was well done by many of the candidates.

(b) Only a small number of candidates recognised that the weight is being lifted and that the weight-lifter uses chemical energy to lift the weight. Candidates should be made aware that heat or sound is rarely useful energy.

Question 8

(a) A large proportion of the candidates made no attempt at this question. Candidates were required to draw a horizontal line on the diagram to show the direction of the sound wave.

(b) (i) Many candidates gave a qualitative description of the frequency but only a small number of candidates explained that frequency is the number of waves in a particular time period.

(ii) The calculation was well done by many of the candidates.

Question 9

(a) The product of digestion of starch in the presence of amylase is not well known by the candidates.

(b) Many candidates tried to make a comparison between test-tubes **A** and **B** in their answer. Candidates were expected to explain why the solution changed from black to brown in **both** test-tubes. The explanation required was that the solution is brown because the starch was not present due to it being digested by the amylase.

(c) (i) The vast majority of the candidates correctly identified test-tube **B** as the solution which turned brown most quickly.

(ii) Many of the candidates simply stated that test-tube **B** changed colour quicker than test-tube **A** rather than explain why it changed colour quicker. Candidates were expected to state that the temperature in test-tube **B** was higher than test-tube **A** and therefore closer to the optimum temperature, and as a consequence the amylase worked more rapidly in test-tube **B**.

(iii) Most candidates recognised that the temperature in test-tube **C** was much higher than in the other test-tubes but they then did not explain why the colour of the solution remained black. Candidates were expected to explain that the solution remained black because starch is not digested by the amylase because the enzyme is denatured by the high temperature.

Question 10

(a) (i) The simple reactions of ethene are not well known by a large proportion of the candidates. Only the very best candidates were able to identify that ethanol is oxidised to ethanoic acid.

(ii) The better candidates were able to identify the combustion products of ethanol as carbon dioxide and water.

(b) (i) This question was very well done by a large number of the candidates.

(ii) Candidates had a number of alternatives for a use of ethanol. Candidates could not gain credit for stating that ethanol is used for making alcohol as ethanol is alcohol. The syllabus states that ethanol is used as a fuel, a solvent and as a constituent of wine and beer. Other acceptable uses are in thermometers or as a hand sanitiser.

Question 11

(a) Candidates need to have an understanding of parallel circuits.

(b) There is a misconception amongst many of the candidates about the meaning of the term fuse rating. Many candidates believe that a fuse controls the amount of current or that the rating shows the current in the circuit rather than limiting the amount of current that can pass through the circuit.

(c) (i) This proved to be an easy question for many of the candidates.

(ii) The calculation was well done by many of the candidates.

Question 12

(a) A majority of the candidates were able to correctly mark the poles on the iron rod.

(b) There was evidence of guesswork particularly amongst the weaker candidates.

Question 13

(a) A large number of candidates were able to state the numbers of the different particles for the atoms oxygen, aluminium and the chloride ion; however the number of electrons in a calcium ion proved difficult for the majority of the candidates.

(b) The electronic structure of oxygen was well known by many of the candidates.

Question 14

(a) (i) A majority of the candidates knew that the function of the petals is to attract insects.

(ii) The function of anthers was less well known. Candidates were expected to state that the anthers produce pollen.

(b) (i) Most candidates were able to identify at least one of the parts of the seed with radical being the most commonly correct answer.

(ii) The function of the cotyledon as a store of food for the seed was not well known by the candidates. Many candidates thought that the cotyledon protected the seed.

(c) (i) Many candidates recognised the dispersal methods of seeds but the weaker candidates answered the question in terms of germination rather than dispersal.

(ii) The reason why it is important for seeds to be dispersed was less well known. Candidates were expected to explain that the dispersal of seeds reduces the competition for nutrients with the parent plant.

(d) A significant proportion of the candidates knew that asexual reproduction involves a single parent and sexual reproduction involves two parents but the differences in the appearance of the offspring were less well known.

Question 15

(a) (i) The candidates' responses indicated that conduction occurred in the metal plates but only rarely did the candidates refer to the air-gap between the plates and the fact that air is a poor conductor of heat.

(ii) A number of candidates made correct statements about convection but only rarely were these statements relevant to the situation in the question or the question asked.

(b) A significant number of candidates knew that the matt black surface is a good absorber of heat. Unfortunately, many candidates spoilt their answer by referring to either conduction or emission in their response.

(c) The components of the electromagnetic spectrum are well known by many of the candidates.

Question 16

(a) This question was well done by a large number of candidates but the metal that forms compounds that pollute the atmosphere known only by a small number of candidates.

(b) (i) The definition of an alloy is not well known. Candidates were expected to state that an alloy is a mixture of metals. Of those candidates who knew that an alloy is mixture many then stated that it is a mixture of metals and compounds.

(ii) Only a small proportion of the candidates recognised that the reason for making metals into alloys is to improve or change the properties of the metal. Candidates who gave a specific change in the properties of a metal were awarded credit for the answer.

Question 17

The application of Lenz's law needs to be understood by candidates. Candidates need to realise that the current in the coil caused by the movement of the permanent magnet itself induces a magnetic field with opposite poles to the magnet, and causes repulsion of the magnet. Candidates' responses frequently related to electromagnets or transformers.

Question 18

(a) The candidates' responses were frequently vague and did not define what a drug is. Candidates were expected to state that a drug is an externally administered substance that modifies the chemical reactions of the body.

(b) (i) Most candidates knew of some of the effects of excessive consumption of alcohol on a person, however some of the responses were very vague and did not refer to a specific effect.

(ii) The vast majority of the candidates were able to name a drug of abuse.

Question 19

This question was answered well by many of the candidates. The fact that potassium nitrate acts as the solute was less well known than the other answers.