SCIENCE

Paper 5125/01
Multiple Choice

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

Comments on individual questions (Physics)

This year there was only 1 entry for the 5125 paper and individual question comments are, therefore, from the 187 5124 candidates whose scores ranged from 5 to 36 with a mean score of 19.13 and a standard deviation of 6.37. No question was found to be very easy although **Question 18** produced a correct response from more than 70% of the candidates. Some more able candidates found problems with a number of questions, particularly **Questions 9, 11** and **20**. Good discrimination was also shown in a number of questions, particularly **Questions 2, 5** and **14**.

Question 1. Only 50% of candidates were able to read the vernier scale correctly (option B). The remainder were equally divided between the incorrect options with option A attracting some of the more able.

Question 2 showed good discrimination. The incorrect responses were divided, almost wholly, between options B (the reverse axes) and C with the former more popular.

Question 3 also discriminated well with option B the most popular incorrect choice.

Question 4 was not well answered because the majority of candidates considered the original length as part of the extension under the 6N load. This led almost twice as many to choose option A rather than the key, option B.

Question 5 and Question 14 showed very good discrimination with the majority of candidates divided between two options in both. The more able candidates chose the key, option B in **Question 5** and option A in **Question 14**, and the less able an alternative option, C, in both questions. Both questions also had a 'positive distractor', option A in **Question 5** and option D in **Question 14**, indicating that more able candidates chose these.

Question 6 and Question 7. The topics of power and heat transfer were well known and the questions discriminated well with option D in **Question 6** collecting most of the incorrect responses and in **Question 7** they were almost equally divided between options A and D.

Question 8. In choosing options A and, in particular, C a third of candidates showed a lack of understanding that there is no temperature change accompanying a change of state. Most of those who did appreciate this chose correctly, option D.

Question 9 had 73% of candidates divided between options B and C with the latter drawing over twice as many responses as the key, option A. The more able candidates who chose option C were unable to adapt the wave shape to a **bar** as the vibrating source.

Question 10 also had more candidates choosing a distractor, option B, than the key, option D. This should act as a reminder to read the whole question.

Question 11 resulted in answers that showed uncertainty among candidates with all options attracting a significant number of responses. More chose option B over the key, option D, and a substantial number of the more able chose option A.

Question 12 and Question 13. A calculation for the speed of sound and an alternative unit for current were well known and both questions showed good discrimination. In both questions candidates were mainly divided between the key and one other; in **Question 12** it was option B and in **Question 13** it was option C.

Question 15 was well answered with option D the most popular incorrect response.

Question 16. The kilowatt-hour as a unit of energy, option B, was known to only 27% of candidates who were mainly drawn from the more able. Almost twice as many considered it to be a unit of power, option C.

Question 17 is a possible cause for concern in that 41% of candidates, most choosing either option A or B, were unable to correctly work out the most appropriate fuse to be fitted, option D.

Question 18 was very well answered with option A the most popular incorrect choice.

Question 19 differentiated well with less able candidates preferring option A over option D.

Question 20 showed that the concept of *half-life* was not fully understood. 'Positive distractors' (indicating the more able choosing), options A and D both required, as a first step, the correct working out of the **total** number of *half-life* periods.

Comments on individual questions (Biology)

Question 21

Many candidates mistakenly believe that it is the cell wall that controls the entry of substances into the cell.

Question 22

This was not well answered, with many candidates guessing at the answer.

Question 23

This question showed good discrimination.

Question 24

Significant numbers of candidates were confusing respiration and photosynthesis.

Question 25–26

These questions were answered well by most candidates.

Question 27

This question discriminated well.

Question 28

Many candidates need to revise plant water relations.

Question 29

Candidates had difficulty in interpreting this question on blood flow in veins.

Question 30–31

These questions, on gas exchange, caused problems for some of the better candidates.

Question 32

Many candidates need to review nitrogenous excretion.

Question 33

Many candidates had the accommodation mechanism of the eye the wrong way round.

Question 34

Some of the better candidates believe that alcohol is a stimulant.

Question 35

This question discriminated well.

Question 36

This straightforward question on the carbon cycle caused problems for many candidates.

Question 37–38

These questions discriminated well.

Question 39

Most candidates did well on this question.

Question 40

Half of the candidates thought that blood groups show continuous variation.

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Paper 5125/02
Theory (Physics)

Most candidates showed evidence of being well-prepared and performed well. There was the usual range of ability but a much greater number than last year gained higher marks. It was pleasing to see that there were good answers to all questions.

Calculations were well done by many and descriptions of experiments were clear and concise. A large number of candidates, however, lost marks by describing the wrong experiment.

Section A

Question 1

This was answered well by most candidates but a number used the wrong power of 10. A sizeable minority gave an answer of 7000 for both **(a)** and **(b)**. The correct answers were 7000 for **(a)** and 0.007 for **(b)**.

Question 2

(a) (i) The vast majority of candidates gained credit for knowing that they had to use F = ma and the majority of these went on to gain further credit for the correct answer. The most common mistake, made by a few, was to use 10 m/s/s as the acceleration. A small number of candidates converted 5 kg into g before using the formula and so lost credit. The correct answer is 40 N.

(ii) This was answered well by only a minority of candidates who clearly stated that the two forces are friction/drag/air resistance and weight/gravity. Many candidates were satisfied with giving "downward force" and "upward force" which gained no credit. A number stated that the two forces are "friction" and "air resistance" which gained only half the credit since both of these forces act downwards.

(b) Only the most able candidates suggested that the frictional force increased and so gained credit. A common mistake was to state that the weight decreased which is incorrect science. Others stated that the object reached terminal velocity which does not fully answer the question.

Question 3

(a) A majority of candidates were able to interpret the information on the diagram and give the correct answers to both parts of this question. A small number mixed up the two readings or gave values for the volume of 41 cm^3 or 25 cm^3 which does not take into account the volume of the solid. The correct answers were, the mass is 36 g and the volume is 16 cm^3, although any answer in the range 15.5 to 16.5 cm^3 was accepted.

(b) Almost all candidates gained credit for knowing that they needed to use "density is mass divided by volume". The large majority of these went on to use the values that they quoted in **(a)** correctly and so gained full credit. The correct answer is 2.25 g/cm^3 but any answer which properly used incorrect answers to part **(a)** was accepted.

(c) A small majority realised that water cannot be used if the solid is soluble or if it reacts with water or if it floats and so gained credit for this part. Credit was not given for "the water would evaporate", which was the most common mistake, since this is true whenever water is used.

Question 4

(a) The majority of candidates used "acceleration is change of speed divided by time" or used the gradient of the graph. Almost all of these went on to calculate the correct answer which is 1.25 m/s/s.

(b) This was well done by the majority of candidates who successfully calculated the area under the graph to find that the distance of the race is 100 m. Some of those who used "distance = speed x time" had less assured success. Some used the wrong formula, for example "speed divided by time", and gained no credit. Others used the final speed rather than the average speed during the first 8 seconds. These gained some of the credit if they worked out that the distance travelled in the final 6 s is 60 m.

(c) Most candidates gained full credit for dividing the distance that they had calculated in part **(b**) by 14 s. A small minority divided this distance by 8 s and so gained only the credit for knowing that they needed to divide total distance by time. A small number tried to find the arithmetical average of different speeds from different stages in the race and gained no credit. The correct answer is 7 (.143) m/s.

Question 5

(a) This was well done by most candidates who carefully drew the normal and indicated the correct angles, stated that the correct formula is "sin i divided by sin r" and drew a plausible ray which refracted away from the normal. A large minority either did not draw a normal, and so were unable to show the correct angles, or indicated the angles between the normal and the surface. These gained no credit for part **(a)**. A few candidates did not gain credit for part **(c)** either because they drew no ray at all or drew a ray reflecting from the surface or drew a ray that refracted towards the normal.

(b) This question was well done by most candidates who used the formula sin i divided by sin r to calculate the correct answer of 1.4 (or 1.39). The usual minority did not use sines and simply divided angle of incidence by angle of refraction and so gained no credit.

Question 6

(a) Only a very small minority of candidates gained credit for stating that the sun's energy originates as nuclear reactions within the sun. Most candidates, however, correctly stated that the energy reaches Earth by radiation and so gained credit for part **(ii)**. A small minority stated that the energy reaches Earth by solar energy and were not given credit.

(b) Only the most able minority gained credit for stating that the solar cells convert light or solar energy into electrical energy. Many thought that they convert heat energy into mechanical energy. Slightly more candidates gained credit for stating that the motor converts electrical energy into kinetic energy or mechanical energy. The most common error was to state that the motor converts kinetic energy into potential energy.

Question 7

(a) The circuit diagram was well drawn by most candidates with only very few drawing a series circuit or destroying credit by shorting out the resistors.

(b) Most candidates gained full credit for using the correct formula to calculate the effective resistance of the parallel combination of resistors. A small minority simply added up the two resistances and a few others made the mistake of stating and using the formula $R = 1/R_1 + 1/R_2$. This is a common mistake every year. Candidates should be reminded that the formula should be 1/R not R. Perhaps candidates would have more success if they used "R = product of resistances divided by the sum of the resistances". The correct answer is 6 Ω.

(c) (i) Many candidates successfully used I = V/R to find the correct value of the current. The most common mistake was to use 6 Ω as the resistance or to use an incorrect version of the formula. The correct answer is 1.3(3) A.

(ii) This was well done with the majority of candidates correctly using P = IV to calculate the correct answer of 16 W. Many candidates rounded up their answers in part **c(i)** and so did not get exactly 16 W but these were all awarded full credit.

Question 8

(a) This was the least well-done part of ***Section A***. Only a minority knew that they needed to multiply the power in kilowatts by the time in hours to work out the number of units and then to multiply by the cost of one unit to find the total cost. Some candidates changed the power into watts and many failed to convert the time into hours.

(b) Only the most able gained credit for stating that the normal operating current of the heater is more than 10 A and therefore the fuse would melt when the heater operated normally.

Question 9

Only a minority gained credit for stating that the narrow bore or the large bulb are features that improve the sensitivity of the thermometer. Even fewer went on to give a convincing explanation to show that either of these allows a greater movement of mercury along the tube for each degree change in temperature. The majority showed confusion over what is meant by sensitivity by stating that the bulb was made of thin glass to allow a faster response. This answer gained no credit.

Question 10

(a) The majority gained credit for stating that there are 8 neutrons in the nucleus of carbon-14. 6 neutrons and 14 neutrons were both common incorrect answers.

(b) Most candidates gained credit for indentifying the radiation as β-radiation and most of them linked this to the changes in the nucleus to gain further credit.

Question 11

Most candidates gained some credit for this question but only the minority gained full credit for stating that the air near the heating coil expands and becomes less dense so rises and that this process is repeated to set up a convection current.

Section B

Question 12

(a) Almost all candidates gained most of the available credit for describing a suitable experimental arrangement and detailing the readings that need to be taken. Fewer candidates wrote that the experiment should be repeated for different values of force and distance and a small number stopped short of stating what should be done with the readings to verify the principle of moments. Weaker candidates simply drew a seesaw and explained why one side went up or down.

(b) Most candidates gained some credit for showing that they knew how to calculate a moment and that they needed to equate moments about the pivot. The majority of these went on to calculate the correct answer of 37.5 N.

(c) This question was found to be challenging by all but the most able. Only a small minority stated that the wide heavy base means that the centre of gravity is low and that the base is wide. Even fewer went on to gain full credit for explaining why this improves stability.

Question 13

(a) This question was very popular and was well answered by most candidates who scored most of the marks available. Most were able to give a clear account of the experimental arrangement and detailed the readings that needed to be taken. The majority gained further credit by specifying that the distance between the person making the sound and the person measuring the time needs to be at least 500 m to minimise errors and a small number lost some credit for not stating what needs to be done with the readings to work out the speed of sound. Most candidates stated that the experiment should be repeated in the opposite direction to allow for any effect of wind. A minority of candidates attempted to describe a method involving echoes. Whilst this allowed full credit to be gained, most found it difficult to describe the method convincingly.

(b) Most candidates gained full credit for describing that vibrations are passed from particle to particle and that this results in a longitudinal wave or a series of compressions and rarefactions. A small minority stated incorrectly that the wave is a transverse wave.

(c) This was extremely well-answered with most candidates gaining full credit. Almost all showed that they need to use "distance = speed x time" and successfully calculated the total distance travelled by the wave as 66 m. Most of these gained full credit for realising that this is the distance to the object and back, and gave the correct distance between camera and object as 33 m.

Question 14

(a) This question was the least popular in ***Section B*** but was well answered by most of those who attempted it. Most gained credit for describing an arrangement that allowed relative movement between the wire and the magnet and described some way of measuring the induced e.m.f. Many then went on to gain further credit by describing a change in either the speed of movement or the strength of the magnet and described how the readings change as a result. A sizeable minority described only how reversing the direction of movement reverses the e.m.f. As this does not answer the question, these gained no further credit.

(b) This question was well-answered. Most candidates who attempted it calculated the correct answer of 6 V.

(c) Only a minority knew that iron is used since it is easier to magnetise and demagnetise and that it produces a stronger magnet. The most common answer was that iron does not rust. This gained no credit since it is incorrect and irrelevant.

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Paper 5125/04
Theory (Biology)

There were too few candidates for us to be able to produce a meaningful report for this examination.