1995 HIGHER SCHOOL CERTIFICATE EXAMINATION

GENERAL SCIENCE

2 UNIT

In 1995, 2317 candidates presented for the 2 Unit General Science examination.

SECTION I - Core

Part A

MULTIPLE CHOICE QUESTIONS

The answers considered to be the most suitable for each of these questions were as follows:

1.	C	6.	B	11.	B
2.	A	7.	A	12.	D
3.	C	8.	D	13.	D
4.	B	9.	B	14.	C
5.	C	10.	D	15.	A

Part B

General Comments

There were fewer non-attempts than last year.

Students are advised to consider carefully the key words in the questions before responding.

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Comments on Questions

Question 16

(a)   Candidates were asked to recognise a galaxy. Many confused it with a planet or nebula.

(b)   Most candidates failed to recognise the obvious method of locating a planet or star, i.e. using star charts or newspapers, or referring to marker stars.

(c)   There was little knowledge of the appearance of individual planets. When asked to distinguish between the appearance of a planet and a star, many simply stated *stars twinkle*.

Question 17

(a)   Most candidates knew that there are no stars in front of the moon, and that the moon is not transparent, but had difficulty in expressing their ideas in words. Those who recognised the fact that the star in the diagram was the wrong shape or size relative to the moon scored best in this question.

(b)   The reasons why optical telescopes are often placed on high mountains in remote areas were not clearly explained. Many candidates failed to explain why the view is clearer. Some had the misconception that such places are *closer to the sky*.

(c)   The variations on *radio telescope* were very diverse.

Question 18

When asked to describe the evolutionary trends and their significance as illustrated by the three primate skulls, candidates had difficulty with the terminology. They tended to state a feature of each skull, rather than to describe them. Those who described trends in cranium and teeth size explained them well.

Question 19

There was little evidence of candidates' having carried out a practical investigation of a single inherited human characteristic. Many scored reasonable marks although they based their responses on general knowledge.

Question 20

(a)   Most candidates understood that the most active metals require the most energy to extract them from their ores.

(b)   Candidates had no difficulty in naming a common metal, and the majority were able to describe the method of its extraction from its ore. There was, however, a lack of knowledge of the chemistry involved.

Question 21

(a)   This part was generally well answered, although some candidates described only one property of synthetic blankets.

(b)   Answers to this part were generally good. The more able candidates had no difficulty in relating one property of rubber that makes it suitable for use in surgical gloves.

(c)   This part was answered poorly. It was apparent that many candidates had not performed an experiment that involved making a plastic. The more able candidates presented a logical description of how to make a plastic. In the poorer answers there was confusion between plastics and non-plastic materials and evidence of some undesirable laboratory practice.

Question 22

This question was well answered, with candidates clearly showing their understanding of the biological effects of pesticides.

Question 23

(a)   The responses to this part indicated a lack of understanding of Lamarck's Theory of Evolution. The essence of Darwin's theory was often confused with that of Lamarck.

(b)   This part was answered poorly since most candidates showed little understanding of the meaning or purpose of an experimental control. Those indicating a control often did not relate their response to the experiment stated in the question.

(c)   Frequently, candidates presented arguments **in favour** of Darwin's theory, rather than **against** his theory as required in the question.

Question 24

The response to this question was poor, and there were many non-attempts. The more able candidates clearly showed all working to the problem, including the use of appropriate formulae. Those who responded to part (b) of the question often showed little understanding of the concept of efficiency.

Question 25

(a)   In general, candidates were able to justify their choice of scientist or manager with a valid reason. The word *responsible* was interpreted by some as meaning *to blame*.

(b)   A pleasing aspect of responses here was the wide variety of examples of recent research presented. Able candidates noted the key word *outline*, while less able students presented a name or made a vague statement. Able candidates explained *a **benefit** to people*, while less able candidates emphasised only negative or emotive aspects of the research.

Part C

Question 26

(a)   (i)   Most candidates were able to describe two problems which have prevented people from travelling to other planets.

        (ii)   Little difficulty was encountered by candidates in identifying one method of overcoming one of the problems that have prevented people from travelling to other planets. Some, however, did not relate their solution to one of the problems identified in (i).

(b)   One disadvantage of sending a remote-controlled space probe to explore the solar system was identified by the majority of students.

(c)   Although most candidates were able to name a recent space venture, many had difficulty in giving precise details of the purpose of the venture. Many cited a space venture which was not recent.

Question 27

(a)   Many candidates appeared unfamiliar with star trails and generally interpreted the apparent motion of the objects in Photograph I to be due to the actual movement of stars across the night sky.

(b)   The different uses of a camera to track the stars and produce a photograph of stars was poorly understood.

(c)   Most candidates could not list two observations that led Galileo to believe that the Sun was at the centre of our solar system. Some correctly cited Galileo's observation of the moons of Jupiter. Fewer candidates, however, mentioned the phases of Venus.

(d)   Most candidates were able to refer to Newton's theory about the significance of gravity in maintaining planets in orbits. Fewer candidates explained the significance of the sun's gravitational attraction to the planets.

Question 28

(a)   The existence of tools at site Z was frequently cited as evidence of human occupation of this site. Many students, however, failed to mention that the tools were made by humans. A significant number of candidates incorrectly assumed that the jawbone was that of a human.

(b)   Candidates had trouble in interpreting the diagrams. Many incorrectly chose site Y despite the presence of the engraved bone showing artwork commonly associated with Cro-Magnon Man rather than Neanderthal Man.

(c)   (i)   The significance of the engraved bone at site Y was not well understood, with candidates often resorting to jargon or generalities in their answers.

         (ii)   Most candidates associated the flint pieces at site X with the use of fire or the use of flint to make weapons.

Question 29

This question was well answered by many candidates.

(a)   The scientific term, alleles, was not used by most candidates.

(b)   The majority of candidates could supply the genotypes for Ruth's mother.

(c)   (i)   Most could also explain how Ruth could have brown eyes.

         (ii)   The probability of Ruth's unborn baby sister or brother having the recessive gene for blue eyes, was well explained by some candidates. Others appeared to experience difficulty with the word *probability*.

Question 30

This question was not well answered by most candidates.

(a)   The word *germ* was generally satisfactorily explained.

(b)   The action of antibiotics on bacteria or fungi was not understood and many candidates believed that viruses are susceptible to antibiotics.

(c)   Darwin's Theory of Evolution in relation to germs' becoming antibiotic resistant, was poorly described and, again, not well understood.

(d)   The concept of limiting antibiotic use to minimise the development of resistance to antibiotics, was generally well understood.

Question 31

The statement "Scientific discoveries often bring unforeseen social problems" was the basis of this question.

Many candidates made no attempt to answer it, and the answers of those who did so were not good.

(a)   Most candidates could give two examples of scientific discoveries, but had difficulty in describing a social problem caused by each discovery.

(b)   A lack of experience in conducting an opinion poll on scientific issues and discoveries was evident. The concept of the reliability of an opinion poll also proved a problem for some candidates.

2 UNIT

SECTION II - Electives

It was apparent that, in general, students demonstrated an improved grasp and use of scientific terminology in this year's paper. The more able students read the questions carefully and structured their answers accordingly. Some did not attempt all parts of the question, especially (d), where there were a number of non-attempts in some of the electives.

Question 32 - Colour (193 candidates)

(a)   This was well answered. Candidates who were awarded the higher marks were able to answer in detail all parts of the question for ONE experiment. They were also able to relate their experiment to the physics of colour or to colour and living things.

Many chose to answer this question by using an experiment with chlorophyll. Others had difficulty in relating their conclusion to colour and living things, as asked by the question. Instead, they related their conclusion to photosynthesis and, consequently, gained lower marks.

Some candidates attempted an answer based on library research or a video and they, also, were awarded low marks.

(b)   This was quite a well answered question.

Wavelength

Although few candidates could give a clear explanation of its meaning (few clearly labelled diagrams were used), they were able to relate wavelength to colour.

Refraction

This was poorly answered. Few candidates clearly understood the concept of refraction and, as a result, a wide range of answers was presented.

Absorption

This was well answered. Most candidates used the colour of an object as an example to explain absorption.

Primary Colour

This was also well answered. An explanation of primary colour plus examples was provided.

(c)   The majority of candidates answered this question well.

Diagrams used by candidates were especially suitable to relating items of information to the concept being described.

The best answers related behaviour to mating colour, and hot and cold colours which were mentioned in the question. In other answers candidates related behaviour to camouflage, warning colours and emotions. Those gaining lower marks did not relate behavioural reactions to colour as asked by the question.

(d)   This was, generally, a well answered question. Those who showed an understanding of the trichromatic theory of colour perception, and who were able to contrast this with the opposing theory of colour perception were awarded the highest marks.

Candidates who apparently did not understand the word *perception* wrote about concepts such as *reception*, *reflection* and *emotional colours* and were awarded low marks.

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Question 33 - Metals in the Service of People (119 candidates)

(a)   Explanations and literacy were generally good, while diagrams were fair to good. Most candidates could describe their specific experiment, although many had difficulty in relating it to the question.

Part (iv) was poorly answered.

The descriptions of placing sodium metal into hot water and hydrochloric acid, and the number of students describing impossible experiments such as smelting iron oxide and melting aluminium were a source of concern.

(b)   Ores
This was generally well answered, although some confusion between minerals and ores was apparent.

Smelting
Answers here were poor. The basic process was not well understood, although most candidates were able to give an example.

Electrolysis
This was well answered, and many candidates described copper purification or aluminium refining.

Lustre
Candidates did not answer this well since the concept was not well understood. As a result a wide range of answers was provided.

(c)   Answers ranged from poor to reasonably good, although few diagrams and tables were used.

Extraction methods used by early civilisations were poorly understood and few candidates could relate them to the chemical activity of metals.

Many uses of metals presented were everyday 20th century uses and were non-specific. Bronze was commonly thought to be a metal.

(d)   This was poorly answered and many candidates repeated earlier information about extraction of metals rather than discussing their uses in relation to their particular properties.

Those who discussed properties did so by listing them. They failed to answer the second part of the question on overcoming difficulties associated with the use of metals.

Alloys were well understood, and uses and many examples were given.

Question 34 - Optics (234 candidates)

The standard of literacy of the candidates was, on the whole, satisfactory. The use of scientific language as well as the setting out and presentation were of a reasonable standard.

A significant number of candidates, however, wrote answers based on extensive theoretical information and pre-prepared answers with little or no relevance to the question asked.

(a)   In many cases the description of the experiment occupied only a small section of the answer.

(b)   This was well answered.

(c)   The responses here were pleasing, and showed a general understanding of the term *multi-component optical systems*.

(d)   The answers to this part were closely related to the question, and the better candidates justified their answers with diagrams.

Question 35 - Petroleum and its Compounds (98 candidates)

(a)   Answers to this question were generally average. Many candidates gained low marks because they described *contrived experiments* such as obtaining oil, kerosene and petrol from petroleum.

The better marks in the question on the extraction of fuels were awarded to those who provided specific details in their answers. For example, if the experiment described dealt with the distillation of petroleum, answers were specific in regard to the temperatures and products obtained.

In the question on properties and uses of distillation products from petroleum, the highest marks were awarded to those who described an experiment on the properties of distillation products, e.g. viscosity, flammability, and then related these properties to the uses of the product.

(b)   This was a poorly answered section.

 Hydrocarbon
Few candidates could explain clearly what a hydrocarbon is. Instead, they related hydrocarbons to petroleum products.

Catalytic cracking
A large number of candidates described the separation of petroleum into its fractions instead of explaining what catalytic cracking is.

Plastic
Most candidates attempted to describe *properties* and *uses* of plastics rather than to explain *what* a plastic is.

Impervious
Only a few candidates answered this question. Those who did so usually obtained full marks, however.

(c)   The general standard here was not high. The better answers included information on the production of chemicals from petroleum, e.g. gas, petrol, kerosene, which could be related to the new substances made from them, e.g. plastics, paints, solvents.

Candidates lost marks when they described only the use of products, e.g. petrol used in cars, rather than their use in making new substances.

(d)   Generally, the standard of answers here was good. The best answers covered all three parts of the question   formation, location and extraction of petroleum.

Those gaining the higher marks discussed the location of petroleum in terms of surface exploration and rock structures that trap the oil. Diagrams used were helpful in explaining concepts.

Question 36 - Physiology of the Senses (222 candidates)

(a)   Most candidates attempting this question were able to express themselves well. Many, however, did not realise that the answer to the question was the description of an experiment they had carried out, and simply tacked the experiment onto their account of the sense organs. Nevertheless, the majority of candidates had obviously done the practical work. The diagrams included in most answers were relevant.

(b)   Approximately 10% of the candidates did not attempt this question and many explanations were not brief, as directed. Most terms were explained reasonably well, but that of a reflex arc indicated that it was not well understood by the majority of candidates.

(c) The transmission of impulses was well understood, but many students could not identify particular regions of the brain where the impulses are received.

(d) The standard was generally very satisfactory, with some excellent answers being given. A number of students were obviously confused about the conditions of being short-sighted and long-sighted. This part of the question was, on the whole, the best answered, with many candidates successfully describing various malfunctions. Some, however, simply listed malfunctions, while others discussed malfunctions of the nervous system rather than of the sense organs.

Question 37 - Reproduction of Animals and Plants (245 candidates)

(a) In general, the answers were mediocre. Many candidates referred to notes made, or details of reproductive methods rather than describing, as required by the question, an important experiment they had carried out.

(b) Fertilisation and pollination were generally well understood. Embryo was less well understood while spore was not well explained.

(c) The better candidates referred to a diverse range of reproductive methods in both animal and plant groups. Many referred simply to one reproductive method or one specific plant or animal group, thus losing marks.

(d) Answers to this question were disappointing since candidates showed little knowledge of evolutionary trends in methods of reproduction; approximately a third of them failed to attempt the question.

Many candidates discussed evolution in a general sense rather than addressing the issue of reproductive trends in evolution.

Several candidates referred to modern developments in reproductive technology instead of answering the question.

Question 38 - The Insects (122 candidates)

(a) Experiments were generally described well, the use of diagrams was good and most candidates appeared to possess a reasonable scientific knowledge. The best answers gave detailed classification of the characteristics of insects, mostly with correct order names. Candidates lost marks when they related their experiment to the general topic *insects*, and not to one of the two topics offered them for choice in the question.

A small number of candidates described experiments involving cruelty to insects, such as starving them to death. This is of great concern. **Such experiments are expressly forbidden by law**.

(b)   This was generally well answered. Most candidates were able to explain each term, but answers were sometimes vague.

Thorax
Many candidates confused the position of the thorax with that of the abdomen.

Arthropod
Some candidates gave examples of arthropods, e.g. insects are arthropods, rather than giving the meaning of the term *arthropod*.

Classification
The concept of grouping into categories was mentioned, but few candidates explained the basis for the groupings, i.e. common features.

Adaptation
Some confusion between *adaptation* and *evolution* was evident.

(c)   Some excellent answers were presented. Ants and bees were the most common examples of communal insects discussed.

Most candidates described at least one level of communication and gave examples of social behaviour. Many explained bee dancing in great depth, often to the detriment of the rest of the answer, while others discussed insects in general, thus losing marks.

(d)   On the whole the standard was high. Most candidates gave good examples of how insects survive and how they affect people.

Some candidates described *biological success* in terms of *successful metamorphosis*, while others described the history of insects back to the Jurassic Period, but failed to explain how they have successfully survived to the present day.

Question 39 - The Science of Food Technology (294 candidates)

The general literacy and scientific quality of the candidates' responses were well above the average of previous years and most answers directly related to the questions asked.

(a)   Answers here included evidence of thorough practical investigations, with good use of labelled diagrams and structured tables.

(b)   Most candidates clearly explained the three required terms in this part, using appropriate scientific language.

(c)   This was answered comprehensively and clearly.

(d)   Here most candidates described the various methods of food packaging enthusiastically and competently. The better responses made good use of scientific terminology.

Question 40 - The Scientific Basis of Photography (245 candidates)

(a)   Most candidates clearly explained their knowledge of photography and its processes, showing sound understanding of the relevant terminology and concepts. Experimental work had obviously been carried out and many interesting variations on traditional basic photography were described. Students should be aware that the *scientific basis of photography* needs greater emphasis than the artistic effects achieved.

(b)   The majority of candidates had a good understanding of

> *fixer*,
> *negative*, and
> *film*.

f-stop was poorly understood and often confused with *stop-bath*.

Some candidates attempted all four terms instead of three.

(c)   Candidates showed a good knowledge of the structure and workings of a simple camera. Some candidates attempted to describe the structure of more complex cameras and often found it difficult to explain the working of such structures. Answers included good use of diagrams and tables.

(d)   Only a few candidates appeared to possess a detailed knowledge of the chemical basis of the photographic process and many confused it with the technique of developing and printing.

Question 41 - Water (479 candidates)

(a)   The scientific quality of the responses here was generally good. Although there was evidence that some schools are using Streamwatch Kits, the candidates involved showed little understanding of the reactions involved. Only a few used a control in the experiments they outlined, while only 75% of the candidates attempted part (vi).

(b)   Explanation of the meaning of three of the given terms was done well by the majority of candidates. *Diffusion* was the term least attempted but those who did attempt it, described it well. Many candidates confused *transpiration* with *perspiration*, *solute* with *solvent* and *weathering* with *erosion*. Good answers to the latter mentioned the carrying away of the weathered material by a specific agent. A significant number of candidates, however, attempted all four terms.

(c)   Many candidates confused *storage* with *shortage* and wrote only about *storage*. Many listed items gave **NO** information while others gave paragraphs on each. The water table and water cycle were frequently used diagrams but were often not related to the shortage of water described. Tables were rarely used. Some good answers listed items with related information in a table format.

(d)   The majority of candidates made little use of scientific terminology. When terms were used, many candidates were unable to explain them or to indicate their importance in living systems. There was little evidence of wider research and a number of candidates were content to write answers concerned largely with the percentage of water contained in the human body and the fact that dehydration is a result of too little water in the system.