DAPTO HIGH SCHOOL

2008

School Certificate Trial Examination

Science

General Instructions

Total Marks - 100

- Reading time: 10 minutes
- Working time: 2 hours
- You may use a pencil to draw or complete diagrams
- Attempt ALL questions
- Calculators may be used
- Write using black or blue pen
- Write your student number/name on every page
- A **Stimulus Booklet** is provided separately

Section I – Pages 2 – 23
Total marks (60)
This section has two parts, Part A and Part B

Part A
Attempt Questions 1 – 50
Allow about 50 minutes for this part

Part B
Attempt Questions 51 – 60
Allow about 20 minutes for this part

Section II – Pages 24 – 31
Total marks (40)
Attempt Questions 61 – 67
Allow about 50 minutes for this section

This paper MUST NOT be removed from the examination room

STUDENT NUMBER/NAME: ……..

STUDENT NUMBER/NAME: ……..

Section I

Part A
Total marks (50)
Attempt Questions 1 – 50
Allow about 50 minutes for this part

Select the alternative A, B, C or D that best answers the question and indicate your choice with a cross (X) in the appropriate space on the grid below.

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				

	A	B	C	D
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				

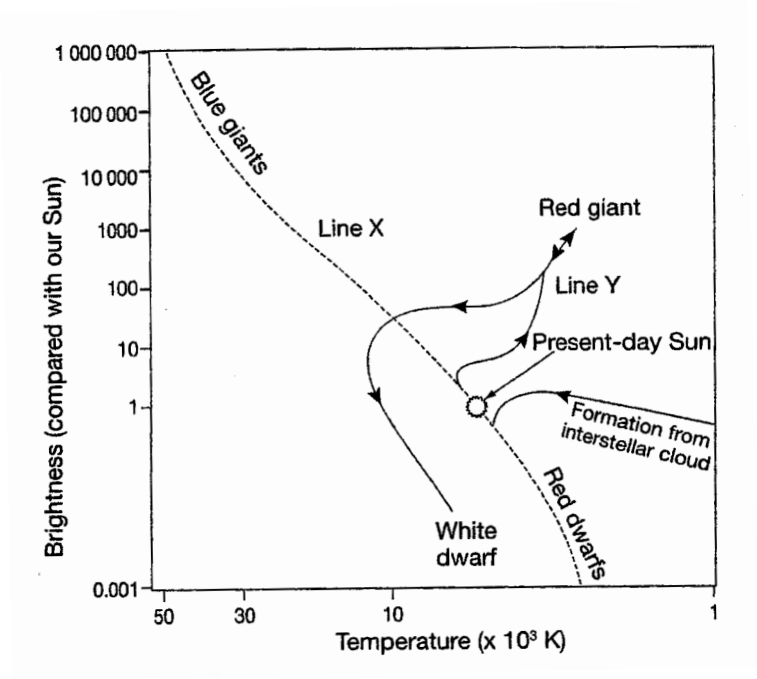
	A	B	C	D
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				

1 Two colourless liquids are mixed together; the resulting clear solution is red.

Which of the following is a possible explanation?

(A) A new chemical compound was formed.
(B) A red precipitate formed.
(C) The colourless liquids were dilute.
(D) A third solution must have been added.

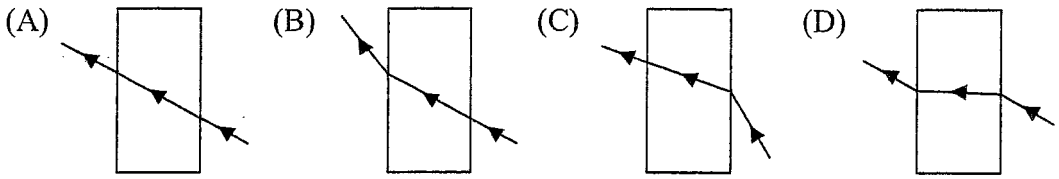
2 The diagram indicates the *evolutionary path* taken by our Sun, it present position, and the path it is predicted to take over the remainder of its "life".



According to this information, which statement is correct?

(A) The Sun is about half way through its "life".
(B) In the next stage of its evolution the Sun may be a red giant.
(C) The Sun commenced its "life" as a white dwarf.
(D) Red Dwarfs are formed from interstellar cloud.

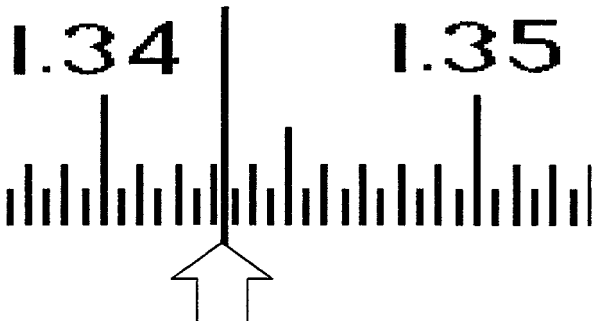
3 Which diagram shows a possible path of a ray of light through a glass slab?



4 In which organ of the female body does an *embryo* usually develop?

(A) Ovary
(B) Fallopian tubes
(C) Oviduct
(D) Uterus

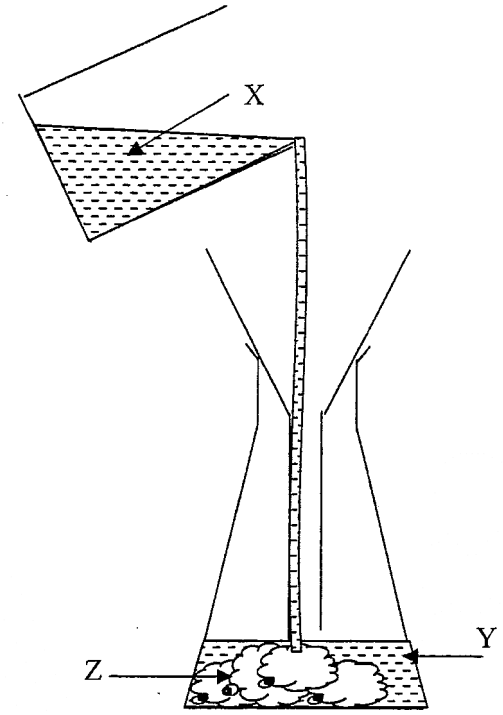
5 The diagram shows part of the scale on a meter.



What is the reading on the scale where the arrow is pointing?

(A) 1.3343
(B) 1.3430
(C) 1.3433
(D) 1.3463

Use the following information to answer Questions 6 – 8.



6 The diagram shows a *precipitation* reaction.

Which statement about this reaction is correct?

(A) X and Y are both insoluble chemicals.
(B) X and Y react to form Z.
(C) Y and Z are both reactants of the reaction.
(D) X contains a chemical indicator.

7 What statement about chemical Z is correct?

(A) It will be composed of atoms rather than molecules.
(B) It will contain equal numbers of atoms from X and Y.
(C) It will composed of atoms from both X and Y.
(D) It will be more soluble in X than in Y.

8 Which piece of *apparatus* is shown in the diagram?

(A) Beaker
(B) Filter paper
(C) Pipette
(D) Stirring rod

9 Which of the following involves *coordination* between the *endocrine* and *nervous* systems of the human body?

(A) Knee jerk reaction
(B) Cell division by mitosis
(C) Bodily response to stress
(D) Kicking a football

10 Which of the following methods of producing electricity is the LEAST *environmentally friendly*?

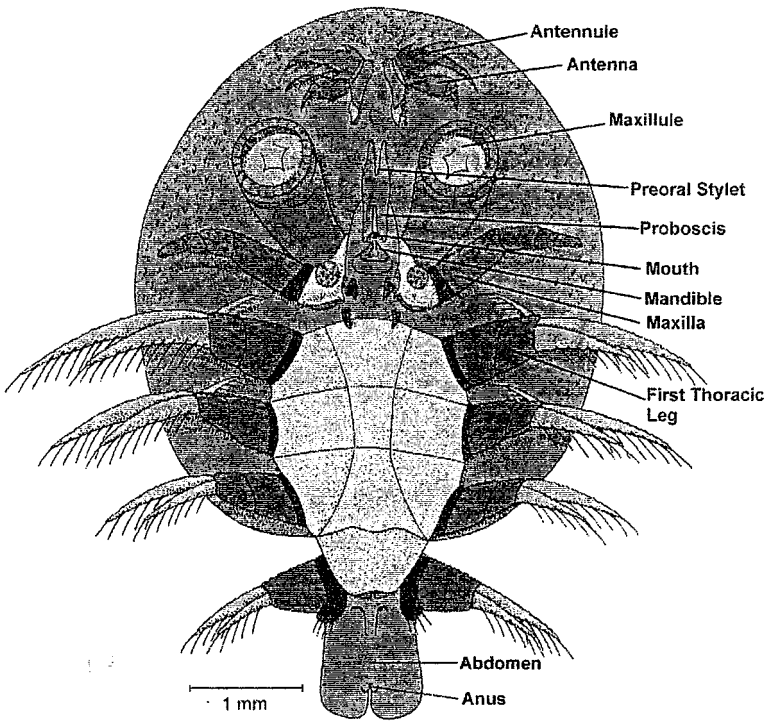
(A) Burning coal to produce steam to turn generator turbines
(B) Using tidal flow in rivers and oceans to turn generator turbines
(C) Using wind to turn generator turbines
(D) Using solar cells to convert light energy into electricity directly

11 In New South Wales, the main source of electricity is from coal-fired power stations.

What is the main reason for this?

(A) Oil fuelled power stations produce too much pollution.
(B) Alternate sources of energy are not as economical.
(C) Uranium is only found in the Northern Territory.
(D) New South Wales does not get sufficient wind or sun light to use these as energy sources.

12 The following diagram of a parasitic tick is *drawn to scale*.

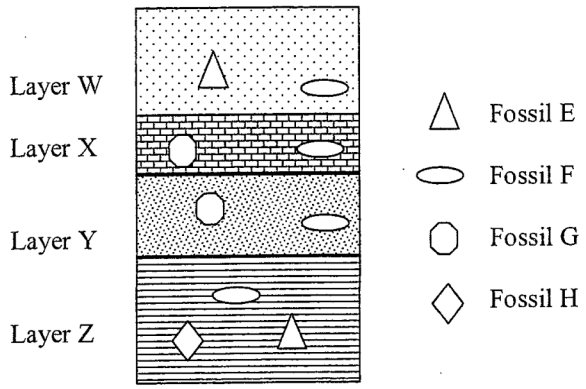


What is the approximate maximum width of the body of the tick?

(A) 1.0 mm
(B) 4.1 mm
(C) 6.2 mm
(D) 9.3 mm

Use the following information to answer Questions 13 and 14.

The diagram represents a series of vertical rock layers found in a cliff face. The geometric shapes represent different types of fossils found in the layer of rock.



13 Which statement regarding this sequence of rock layers and the fossils is correct?

(A) Rock layer Y is younger than rock layer W.
(B) Fossil F is older than fossil E.
(C) Rock layer X is older than fossil F.
(D) Fossil H is older than rock layer Y.

14 What is the main use for geological records like this?

(A) To find evidence for presence of economical mineral deposits
(B) To determine the age of rocks and to study the evolution of life on earth
(C) To prove Darwin's theory of evolution correct
(D) To provide evidence for the theory of plate tectonics

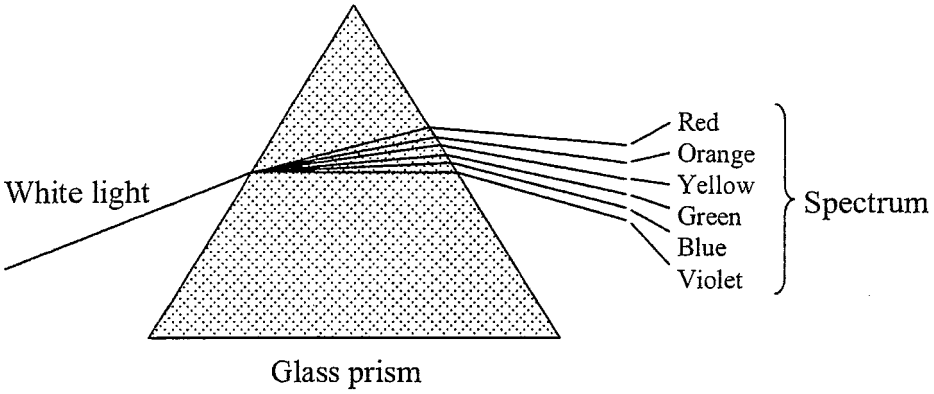
15 The table shows the levels of pollution in the atmosphere at two different locations (X and Y).

Pollutant	**Concentration of pollutant at location X (ppm)**	**Concentration of pollutant at location Y (ppm)**
Coarse dust particles (>0.1 mm)	225	4
Fine dust particles (<0.1 mm)	157	8
Oxides of nitrogen	2	0
Carbon monoxide	4	1
Sulfur dioxide	2	0

Which of the following is a possible reason for the difference in these results?

(A) Both X and Y are city locations.
(B) Both X and Y are isolated country locations.
(C) X is in the city, Y is an isolated country location.
(D) X is an isolated country location, Y is in the city.

16 The diagram shows the behaviour of white light as it passes through a glass prism.



Which statement explains the phenomenon shown in the diagram?

(A) Prisms disperse white light.
(B) White light is made up of all the colours of the rainbow.
(C) The amount of refraction of light depends on its wavelength.
(D) White light cannot pass through glass.

17 Assume that an astronaut travels from the Earth into outer space.

Which of the following is correct about her weight and mass as she travels?

	Mass	Weight
(A)	constant	constant
(B)	constant	decreases
(C)	decreases	constant
(D)	decreases	decreases

18 A spaceship is travelling in deep space where the *gravitational force* is zero.

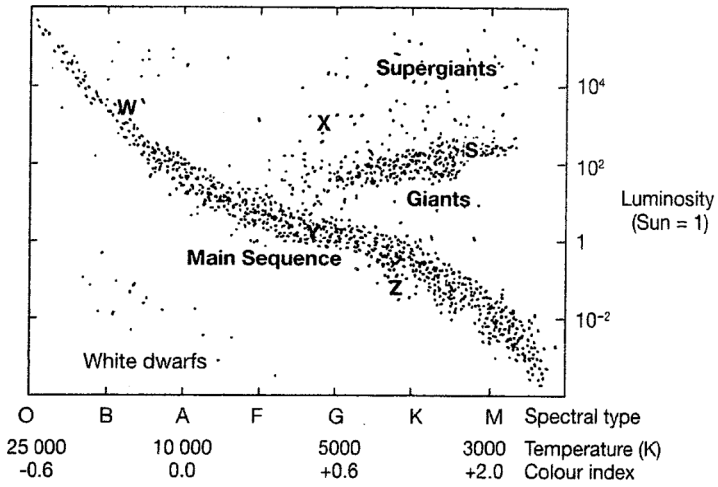
How will the spaceship move if the rockets are switched off?

(A) Toward the nearest planet
(B) Decelerate
(C) Accelerate
(D) At constant speed

19 Who is credited with describing the *structure* of DNA?

(A) Watson and Crick
(B) Hertzsprung and Russell
(C) Darwin
(D) Einstein

20 The diagram shows a common classification of *star types*. In general, for stars plotted on the diagonal Main Sequence, the closer a particular star is to the top left hand corner of this diagram, the larger, hotter and brighter it is.



From this information, which of the following is correct?

(A) Star X is cooler, larger and brighter than star Z.
(B) Star X is hotter, smaller and brighter than star W.
(C) Star W is hotter, larger and brighter than star Z.
(D) Star Z is cooler, larger and duller than star X.

21 What is the advantage of *DNA mutation*?

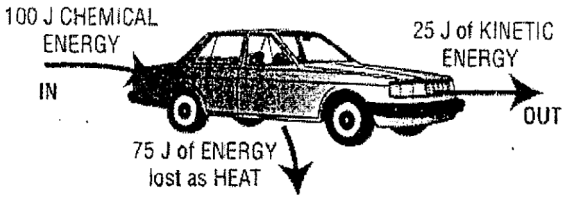
(A) The cloning of organisms to maintain population numbers
(B) The possible appearance of a new characteristic useful for survival
(C) The development of a healthy organism that may survive to reproduce
(D) The exact replication of chromosomes to ensure no error is passed on

22 The *plate tectonic model* involves the concept of zones of weakness within the Earth.

Where are these zones of weakness located?

(A) At all boundaries between crustal plates
(B) Where one crustal plate rises on top of another crustal plate
(C) In regions where mountain ranges are forming
(D) In deep oceanic trenches

23 Cars convert the chemical energy in fuels into other energy forms. The car in the diagram produces 25 joules of kinetic energy and 75 joules of heat energy from every 100 joules of chemical energy.



The efficiency of a machine is calculated using the formula:

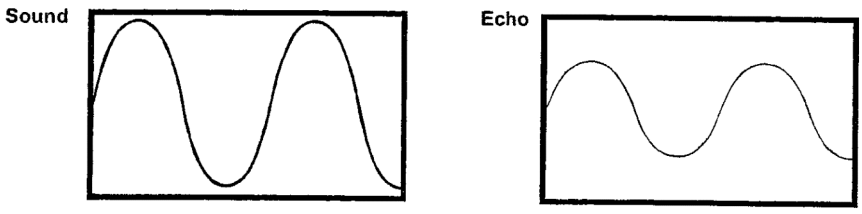
$$\text{Efficiency} = \frac{\text{Useful energy}}{\text{Total energy input}}$$

What is the *efficiency* of the car shown?

(A) 0.25
(B) 0.33
(C) 0.75
(D) 100

Use the following information to answer Questions 24 and 25.

When bats fly, they emit high frequency sounds. The echoes produced give bats information about their surroundings. The diagram shows the oscilloscope traces of the original sound by a bat and the echo.



24 Which property of waves is being used by bats?

(A) Reflection
(B) Refraction
(C) Dispersion
(D) Absorption

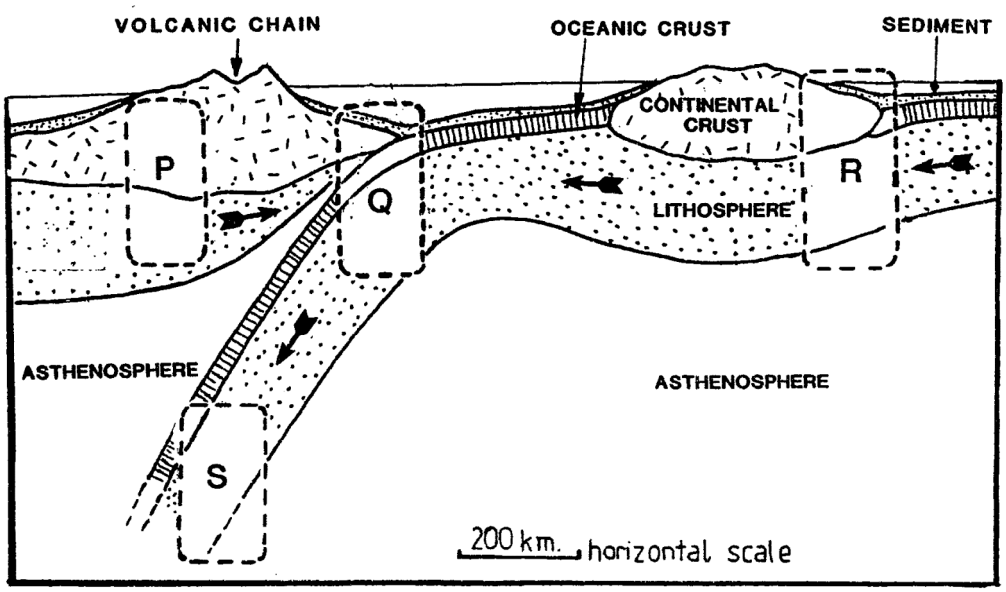
25 Comparing the traces, which *wave characteristic* has changed?

(A) Frequency
(B) Speed
(C) Wavelength
(D) Amplitude

26 Which list contains only *abiotic features* of an environment?

(A) Temperature, flora, fauna
(B) Wind speed, temperature, humidity
(C) Living organisms, food sources, temperature
(D) Oxygen concentration, degree of acidity, green plants

27 The diagram shows a section of the Earth.



Where on this diagram would earthquakes be most likely to occur?

(A) In the region marked P
(B) In the region marked Q
(C) In the region marked R
(D) In the region marked S

28 Which list only contains forms of *electromagnetic radiation*?

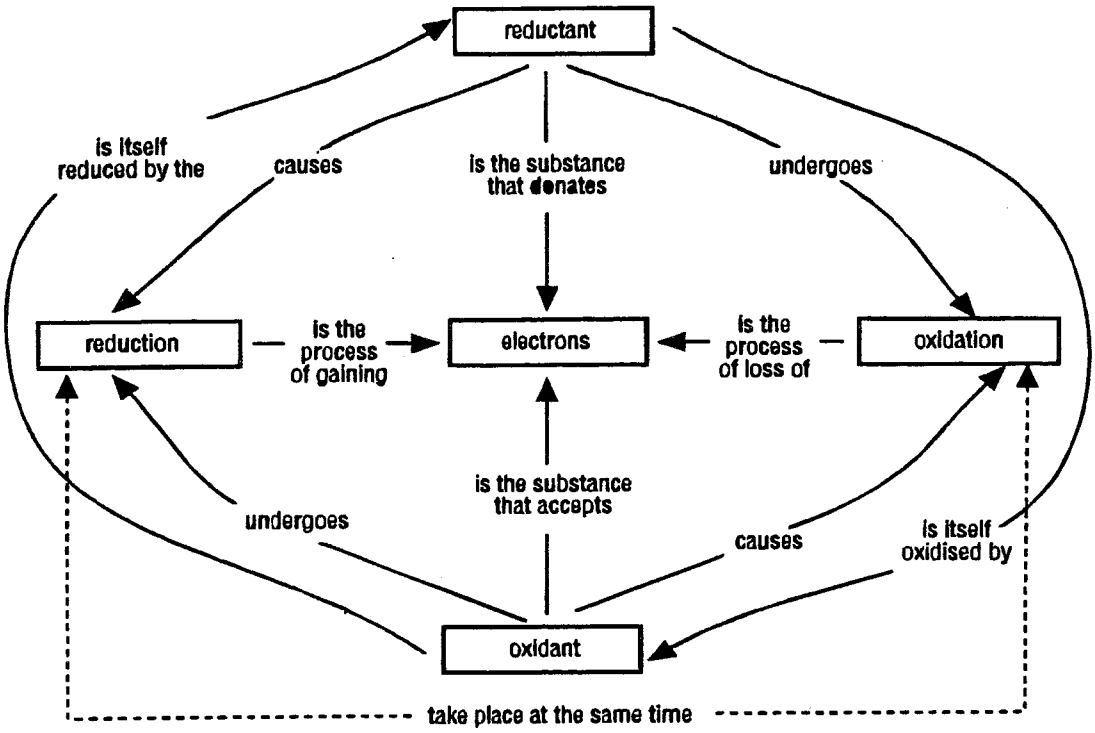
(A) X-rays, microwaves, earthquake waves
(B) Radio waves, gamma rays, infra-red heat
(C) Alpha, beta and gamma radiation
(D) Light, ultraviolet light, sound

29 Which of the following types of electromagnetic radiation is LEAST useful for communication information across long distances?

(A) Microwaves
(B) Radio waves
(C) TV waves
(D) Visible light

Use the following information to answer Questions 30 and 31.

The drawing shows the relationship between an oxidant and the reductant in a chemical reaction involving oxidation and reduction, called a *redox reaction*.



30 Which term describes this kind of drawing?

(A) Graph
(B) Flow chart
(C) Spreadsheet
(D) Diagram

31 A substance that *accepts electrons* during a chemical reaction describes which of the following?

(A) Oxidant
(B) Oxidation
(C) Reductant
(D) Reduction

Use the following information to answer Questions 32 to 34.

The diagram to the right represents a section of the Periodic Table.

3 **Li** 7
11 **Na** 23
19 **K** 39
37 **Rb** 85

32 Potassium is element number 19 on the Periodic Table.
Its atomic number is K and it is often represented as $^{19}K_{39}$.

What does this additional information tell us about potassium atoms?

(A) A potassium nucleus has 39 neutrons.
(B) A potassium nucleus has 20 protons.
(C) A potassium nucleus has 20 neutrons.
(D) A potassium nucleus has 39 protons.

33 Which of the four elements shown would be the *least chemically active*?

(A) Li
(B) Na
(C) K
(D) Rb

34 When these four elements react with chlorine, the chemical compounds formed (lithium chloride, sodium chloride, potassium chloride and rubidium chloride) are all classified as salts.

Why are they classified in the same group?

(A) All these compounds have the same type of name.
(B) All four compounds have the same physical properties.
(C) All four compounds have similar chemical properties.
(D) All four compounds have constant physical properties.

35 According to the theory of plate tectonics, plates move over the mantle.

What causes this movement to happen?

(A) Different density of rocks in the crust
(B) The presence of molten rock in deep ocean trenches
(C) Convection currents in the mantle
(D) Fault lines which exist between the crustal plates

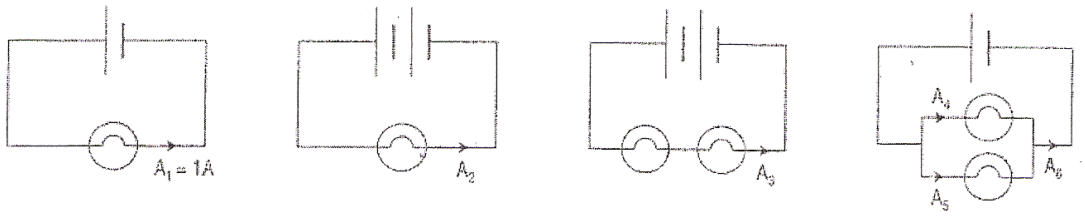
36 At different stages in the history of aeroplanes, various materials have been used in their construction. The table lists some of the relevant properties of a number of these materials.

Material	**Density g/cm^3**	**Strength GPa**	**Stiffness GPa**	**Relative cost**
Aluminium alloy	2.8	0.6	90	low
Steel	7.8	1.0	210	low
Wood	0.6	0.1	20	low
Glass reinforced plastic	1.9	1.5	21	medium
Kevlar plastic	1.5	3.0	190	high

Why is glass reinforced plastic a suitable material for the wings of a small aeroplane?

(A) It is relatively stiff and fairly strong.
(B) It is relatively light, strong and not too expensive for small wings.
(C) The wings must be transparent and flexible.
(D) It is not as dense as aluminium and cheaper.

37 Observe the following image.



The *light globes* and *batteries* used in each of the four circuits are *identical*.

Which statement describes how the *currents* compare?

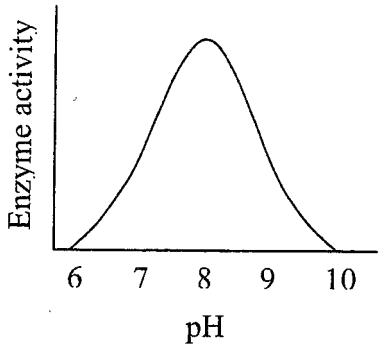
(A) Current A_1 = current A_2
(B) Current A_2 = current A_3
(C) Current A_1 = current A_4 = current A_5
(D) Current A_3 = current A_6

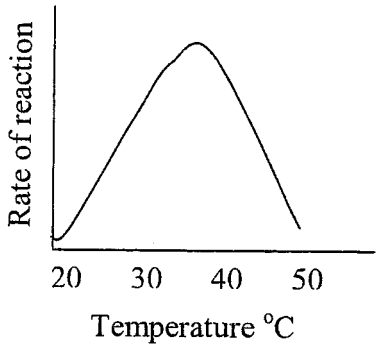
38 Earth-based telescopes such as the radio telescope at Parkes in NSW, are usually very large.

Which of the following is the reason for the large size of such telescopes?

(A) The wavelengths of the electromagnetic radiation reaching Earth from distant objects are very long.
(B) To collect electromagnetic radiation from near stars.
(C) To collect a lot of electromagnetic radiation in a short time.
(D) To collect as much as possible of the very low intensity electromagnetic radiation reaching Earth from distant objects.

39 Enzymes are important because they alter the rate of chemical reaction in organisms. The effect of an enzyme depends on the reaction conditions, such as temperature and the acidity (pH) of the solution.
Below are graphs showing some information about a reaction that is sped up using an enzyme.



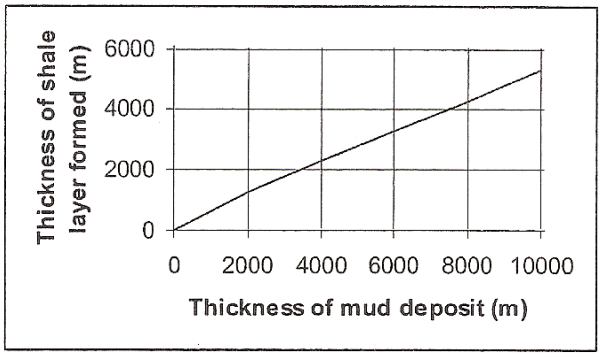


From the graphs, what are the best conditions for *maximum* rate of reaction?

	pH	Temperature
(A)	10	50°
(B)	6	20°
(C)	6	20°
(D)	8	37°

Use the graph below to answer Questions 40 and 41.

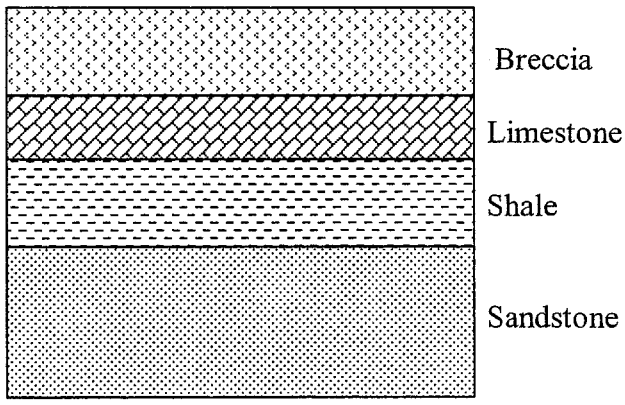
The graph below shows the relationship between thickness of mud deposited in a region and the thickness of shale rock formed when the mud dries out and compresses.



40 According to this information, what is the thickness of the *shale layer* formed by a 4 500m thick mud deposit.

(A) About 2 200m
(B) About 3 000m
(C) About 3 200m
(D) About 8 500m

41 The diagram shows a vertical sequence of rocks in a cliff face. The diagram is drawn to a scale where 1 cm = 1 500m.



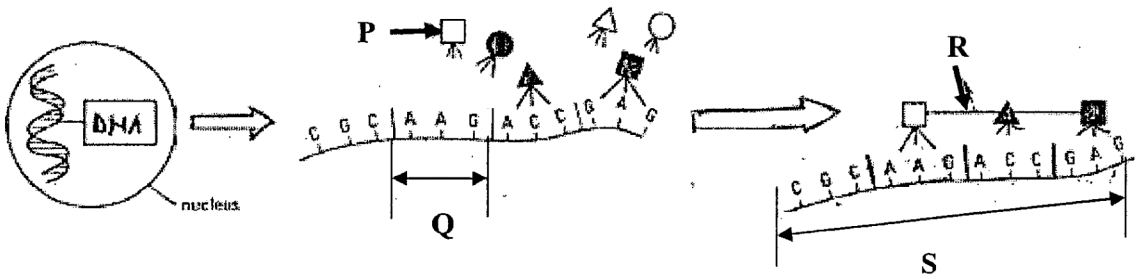
Using the graph, approximately how thick was the *mud deposit* that resulted in the formation of the shale in this cliff face?

(A) 1 000m
(B) 1 650m
(C) 2 000m
(D) 2 500m

Use the following information to answer Questions 42 and 43.

DNA codes for the production of chemicals needed for life. Protein synthesis takes place in the cytoplasm surrounding the cell nucleus. A messenger molecule takes the genetic code from the nucleus to the cytoplasm.

The messenger code is read in groups of three bases called triplets. Each triplet codes for a particular amino acid. The protein is built up, amino acid by amino acid. The order of the different amino acids depends on the order of triplets on the DNA. When the complete message has been read, the protein is complete and can carry out its function.



42 A messenger molecule has 30 bases.

What is the composition of the *protein* produced?

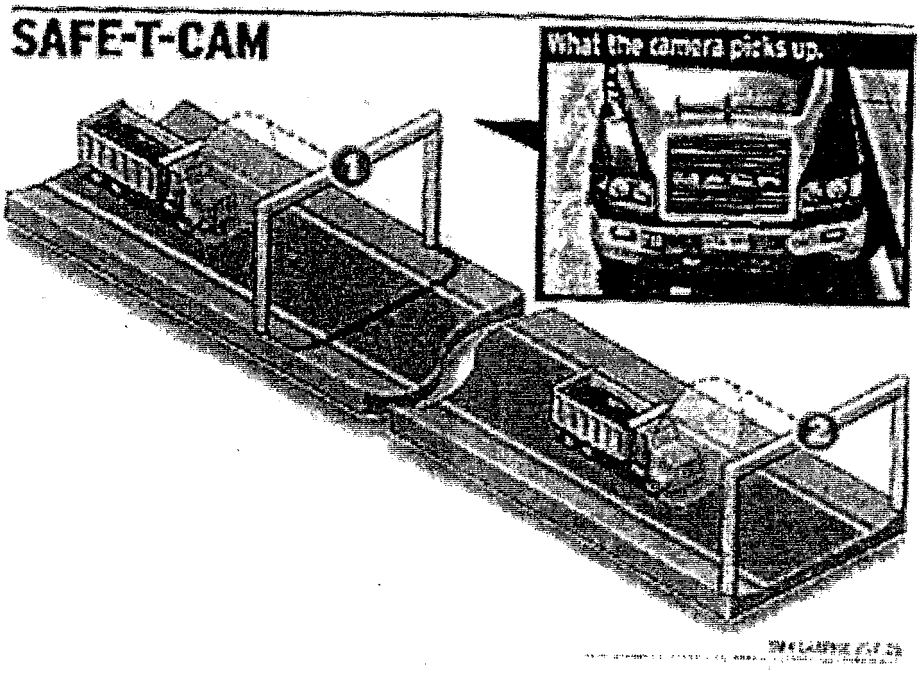
(A) Ten DNA triplets
(B) Ten amino acids
(C) Ten bases
(D) Thirty amino acids

43 Which alternative correctly labels the parts of the diagram?

	P	Q	R	S
(A)	messenger molecule	triplets	amino acid	Protein
(B)	triplets	messenger molecule	protein	amino acid
(C)	amino acid	triplets	protein	messenger molecule
(D)	amino acid	messenger molecule	protein	triplets

44 'Safe-T-Cam' is a point-to-point speed camera which takes an image showing the number plate of the passing vehicle.

A second 'Safe-T-Cam' many kilometres away recognises the same vehicle from the number plate and takes a second image.



Which information is needed by the 'Safe-T-Cam' system to determine if a motorist is speeding?

(A) Only the time taken between being photographed by the two cameras
(B) The speed recorded by the second 'Safe-T-Cam'
(C) The average speed recorded at each 'Safe-T-Cam'
(D) The distance between the two cameras taking the images, as well as the time taken between being photographed at the two cameras.

Questions 45 to 50 refer to the **Stimulus Booklet**.

Questions 45 and 46 refer to **Source A.**

45 What does the *reliability* of experimental results refer to?

(A) Whether or not all the variables in the experiment have been controlled
(B) Whether or not the results of the experiment are consistent when the experiment is repeated
(C) Whether or not the experiment measures the variables accurately
(D) Whether or not the experiment has been designed properly

46 According to the information in the passage, when is it appropriate to make a conclusion for an experiment?

(A) After all tests and observations have been made
(B) When a hypothesis that answers the question has been found
(C) When a result supports the hypothesis
(D) When repeated experiments show the same results

Questions 47 and 48 refer to **Source B**.

47 What would be an appropriate *hypothesis* for this experiment?

(A) Radioactivity can be stopped by lead sheets.
(B) The stronger the radiation, the more counts per minute we will get on the Geiger Counter.
(C) The further the lead sheeting is from the radioactive source, the less the count will be.
(D) Thicker sheets of lead will stop more radiation than thinner sheets of lead.

48 Which *conclusion* is most appropriate for this experiment?

(A) Thick lead sheets stop more radioactivity than thin lead sheets.
(B) Thick lead sheets are more efficient in stopping radioactivity than thin lead sheets.
(C) Radioactivity penetrates thick lead sheets better than thin lead sheets.
(D) The radiation absorbed by a lead sheet is directly proportional to its thickness.

Questions 49 and 50 refer to **Source C**.

49 What is the symbol for the *unknown* element in the graph?

(A) Na 24
(B) Zn 72
(C) As 71
(D) I 124

50 From the data on radioactive isotopes used in medicine, which of the following is the most likely *half life* of *molybdenum-99*?

(A) 66 minutes
(B) 6 hours
(C) 66 hours
(D) 6 months

Section I – continued

Part B
Total marks (10)
Attempt Questions 51 – 60
Allow about 20 minutes for this part

Answer the questions in the spaces provided.

Question 51 **Marks**

What name do we give to a group of millions of stars held together by gravity? **1**

…….

Question 52

What is the term used to describe a group of organs in our body that have related functions? **1**

…….

Question 53

When hydrochloric acid is reacted with zinc metal, one product is a salt. What is the other product? **1**

…….

Question 54

What term describes diseases that are easily passed from one person to another? **1**

…….

Question 55

Which activity of cells allows growth and repair in multicellular organisms? **1**

…….

Question 56

What is the name of the particle orbiting the nucleus of an atom? **1**

…….

Question 57 **Marks**

What word describes particles that are made up of two or more atoms joined together? **1**

…….

Question 58

What is the name of the scientist who developed the idea of natural selection to explain the variety of organisms on Earth? **1**

…….

Question 59

As well as an earthquake, what other natural event can occur when crustal plates move over each other? **1**

…….

Question 60

What is the unit of force? **1**

…….

End of Section I

Section II

Total marks (40)
Attempt Questions 61 – 67
Allow about 50 minutes for this part

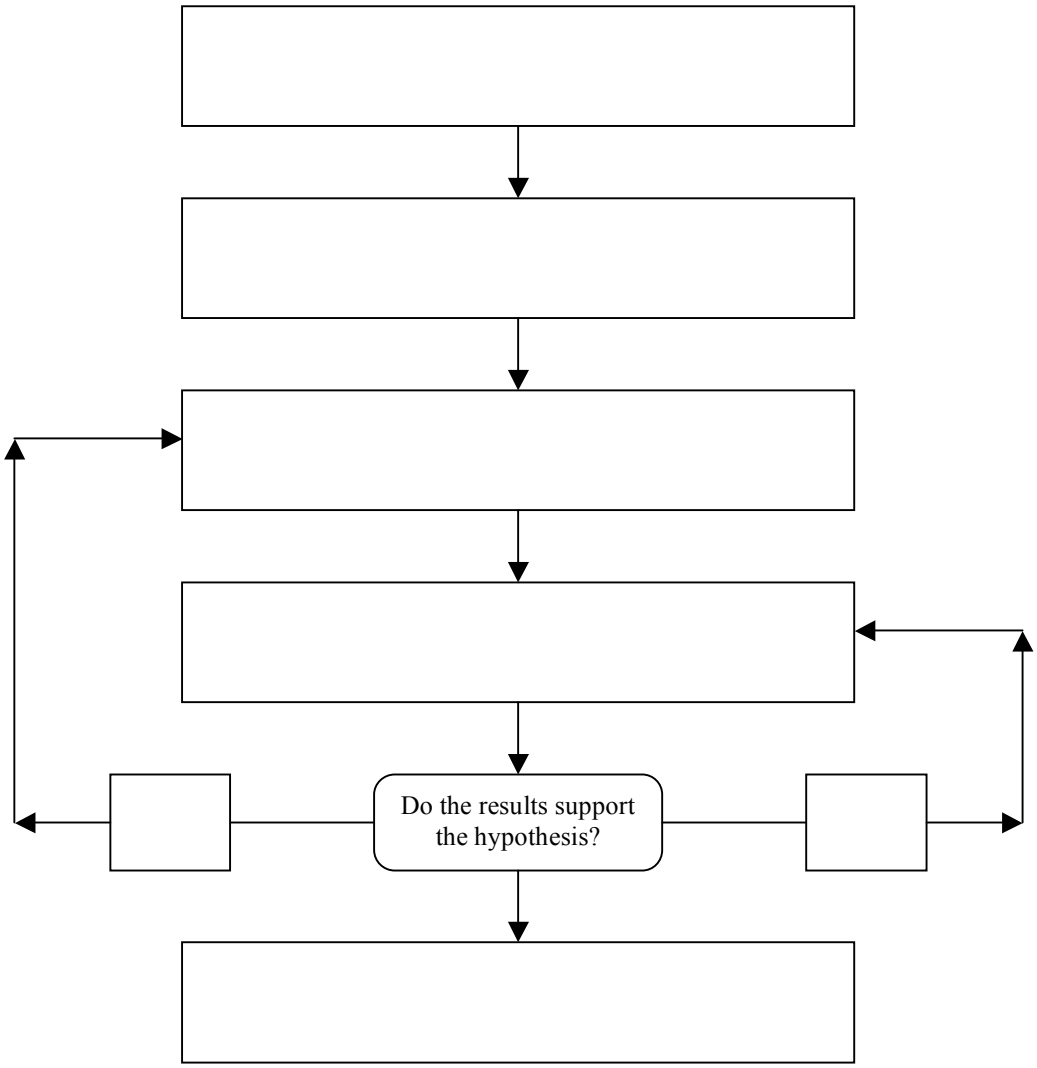
Answer the questions in the spaces provided.

Question 61 (6 marks) **Marks**

Refer to **Source A** in the **Stimulus Booklet** to assist you in answering this question.

The ideas about the 'Scientific Method of Discovery' in the passage can be summarised in a diagram like the blank shown below.

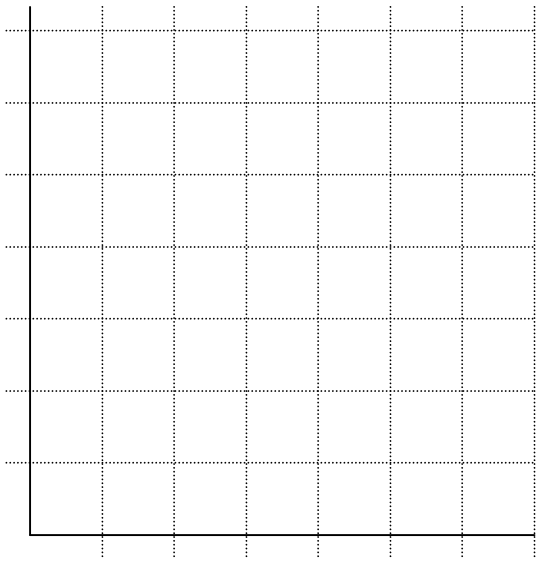
Complete this diagram using information from Source A. **6**



Question 62 (5 marks) **Marks**

Refer to **Source B** in the Stimulus Booklet to assist you in answering this question.

(a) Complete the graph to show the results of this experiment. **4**



(b) Estimate the *thickness* of the *lead* required to provide protection from this source of radiation so that the radiation count is no greater than 20 counts per minute. **1**

Thickness to reduce count to 20 counts per minute = …….

Question 63 (5 marks) **Marks**

Refer to **Source D** in the Stimulus Booklet to assist you in answering this question.

With reference to specific examples, evaluate TWO claims by the writer of the source about technology AND our ability to use it. **5**

…….

…….

…….

…….

…….

…….

…….

…….

…….

…….

…….

…….

…….

Question 64 (5 marks) **Marks**

In recent years, a number of scientific discoveries have been made that raise ethical issues.

(a) Identify ONE area of *scientific discovery* that has caused *controversy* in Australia. **1**

……

……

(b) Outline ONE argument that could be used to *support* the view that scientists should research in this area. **1**

……

……

(c) Outline ONE argument that could be used to support the view that scientists should NOT research in this area. **1**

……

……

(d) Discuss reasons why various groups might have different views in relation to the application of scientific discoveries within our society. **2**

……

……

……

……

……

……

Question 65 (5 marks) **Marks**

Heinrich Geissler was born in 1814 in Germany. Educated by his father, he was a gifted glassblower and engineer. He earned his living as a travelling instrument maker before settling and establishing in 1854 a workshop in Bonn, a young university town with a demand for laboratory apparatus. Here Geissler worked closely with chemists, physicists, medical doctors, physiologists and mineralogists and built up an international client list. In 1855 he devised his famous mercury pump which was able to remove air from glass tubes and result in lower gas pressures than previous pumps. His vacuum pump later contributed to the success of Thomas Edison's first incandescent lamps in 1879.

Geissler began experimenting with what was later to become known as the 'Geissler Tube' in 1857 and full-scale production of these was well underway in the 1880s. An electrical discharge through a partially evacuated tube glows with a colour depending on the type of glass in the tube and the gas inside. Such tubes are still commonly used in advertising displays and known as neon signs. Studies of discharges in these tubes later led to the development of atomic physics. The tubes, as modified by Sir William Crookes, became the first to produce cathode rays, leading eventually to the discovery of the electron. Much later cathode ray tubes were used as one of the main component in television sets.

(a) What improvement in *technology* was made by Geissler? **1**

……

……

(b) Identify a scientific discovery AND a technological development that were consequences of Geissler's work. **2**

……

……

(c) Outline a different *historic example* where developments or improvements in technology have transformed science. **2**

……

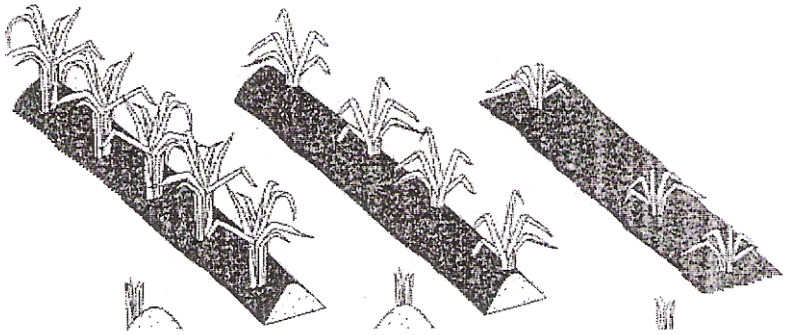
……

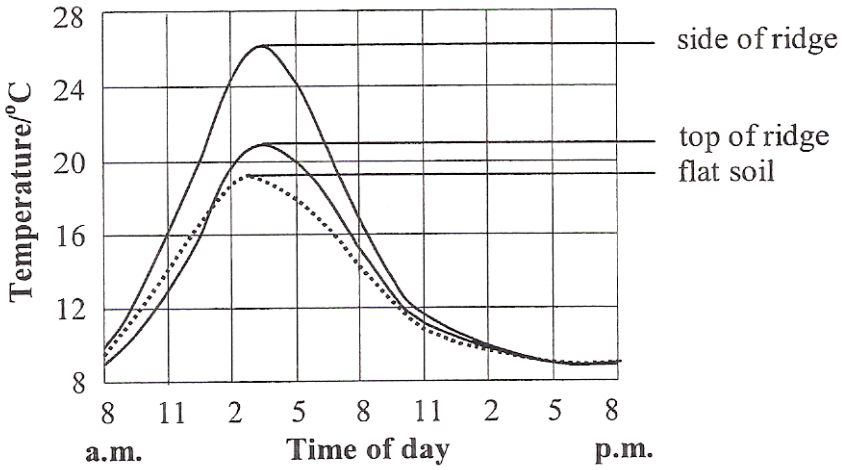
……

……

Question 66 (7 marks) **Marks**

Assume a farmer wanted to find the best place to grow corn. He planted corn seeds in three different positions: one on the side of a ridge, one at the top of a ridge and one on flat soil as shown. He planted the same number of seeds in each position in early spring. He took the temperature of the soil around the corn in three places.





(a) State the *independent variable* in the farmer's experiment. **1**

……

(b) Which position stayed *above* 12º for the longest time? **1**

……

Question 66 continues on the next page

Question 66 (continued) **Marks**

(c) Describe an appropriate *strategy* that the farmer could have used to collect the results shown in the graph. **2**

……

……

……

……

(d) What *other variable* could the farmer have used? **1**

……

(e) Identify TWO of the factors that the farmer would try to keep *constant* for each position. **2**

……

……

End of Question 66

Question 67 (7 marks) **Marks**

The table shows a number of greenhouse gases, their abundance in the troposphere and *greenhouse effect factors* relative to carbon dioxide. The greenhouse factor compares the contribution to the greenhouse effect of equal volumes of the gas versus carbon dioxide.

Greenhouse gas	Percentage abundance in the troposphere	Greenhouse gas factor
Carbon dioxide	0.035	1.0
Nitrous oxide	0.000 03	160.0
Methane	0.000 17	30.0
Chlorofluorocarbons	0.000 000 04	23 000.0
Water vapour	1.0	0.1
Ozone	0.000.0004	2000.0
Oxygen	20.0	negligible

(a) The burning of fossil fuels produces carbon dioxide. Identify an *alternate energy* source that could replace fossil fuels AND present an argument *for and against* its use by society. **3**

……

……

……

……

……

……

(b) Outline ONE possible sequence of events that could be caused by an *increased* greenhouse effect. **2**

……

……

……

……

(c) Compare the contribution of *nitrous oxide* and *chlorofluorocarbons* to the greenhouse effect, based on the information in the table. Explain your reasoning. **2**

……

……

……

……

End of paper