Baulkham Hills High School

Yearly Examination

2023

Year 10

Science

Time Allowed: 90 minutes
Reading Time: 5 minutes

Directions:

- Attempt ALL questions
- NESA approved calculators may be used
- Write using black or blue pen
- Draw diagrams using a pencil and a ruler
- Show all working
- Write your answers in the spaces provided
- There is a periodic table attached at the end of the booklet. You may detach it.
- There is additional writing paper at the end of the booklet. If used, reference it clearly in the question. Do not detach it.

Total Marks: 85

This paper consists of **TWO** sections

Section I – Multiple Choice
20 marks
Pages 2-8

Section II – Written Response
65 marks
Page 10-22

Section I – Multiple Choice (20 marks)
Select the response which best answers the question by circling A, B, C or D on the Multiple-Choice Answer Sheet

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1. Which of the following best describes Newton's first law?

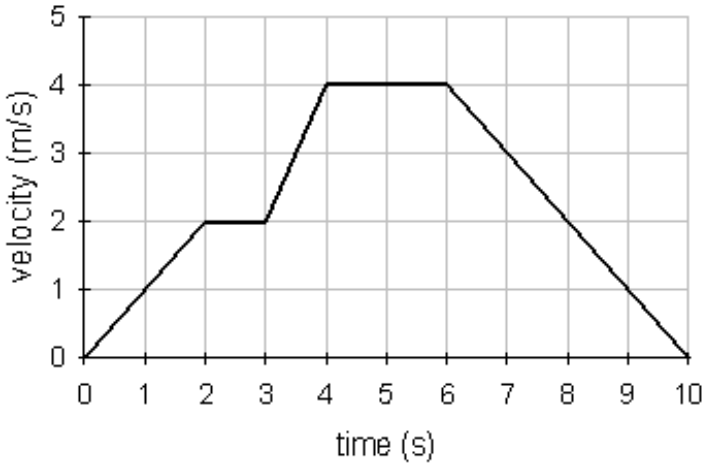
   (A) Every force has an equal and opposite reaction.

   (B) The net force on an object is equal to its mass multiplied by its acceleration.

   (C) An object with a net force of zero will always be at rest.

   (D) An object will continue in its state of motion unless acted upon by a net force.

Refer to the following diagram for questions 2 and 3.



2. What is the speed of the object at 8 s?

   (A) 1 m/s

   (B) 2 m/s

   (C) 3 m/s

   (D) 4 m/s

3. What is the total distance travelled by the object at 4s?

   (A) 0 m

   (B) 2 m

   (C) 4 m

   (D) 7 m

4. A single runaway train engine travelling at 60km/h collides with a stationary carriage (of half its mass) which did not have its brakes applied. The engine and carriage then continue along the track as one.
Which statement best describes the forces during the impact?

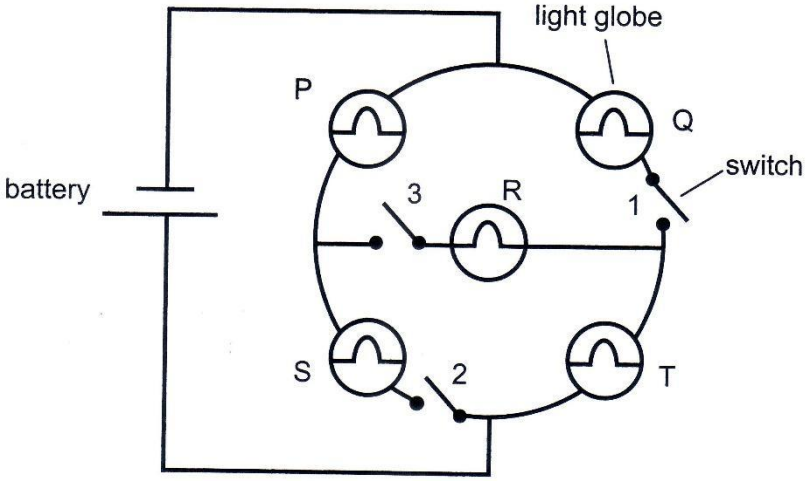
(A) The engine experiences the greatest net force as it is heavier

(B) The carriage experiences the greatest net force as it is lighter

(C) Newton's third law states that there is no net force on either

(D) Both the engine and carriage experience the same magnitude of force

5. The diagram below shows an electric circuit consisting of five identical light globes, (P, Q, R, S and T) and three switches (1, 2 and 3) all connected to a battery.



Which globes will be on when only switch 3 is closed?

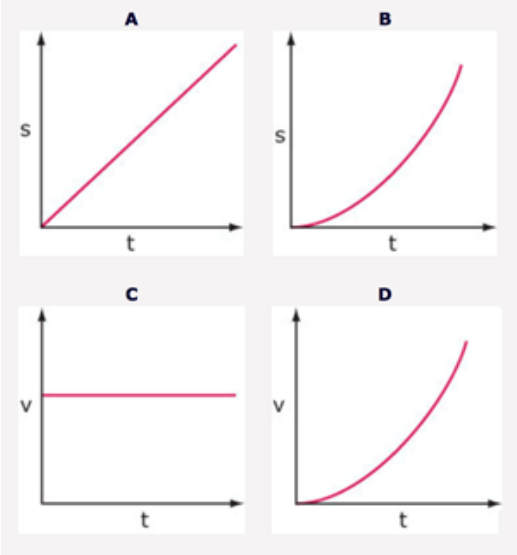
(A) R only

(B) P, R and T only

(C) P, R and S only

(D) P, Q, R and T only

6. Which of the following graphs could represent a vehicle accelerating at a constant, non-zero rate:



7. A strand of DNA has a base sequence ATC GAC CTA. Which of the following would be the complementary DNA strand?

   (A) UAA CUG GAU

   (B) UAG CUG GAU

   (C) TAA CTG GTA

   (D) TAG CTG GAT

8. Which of the following illustrates why the shark and the dolphin are an example of convergent evolution?

   (A) both are vertebrates

   (B) both have a pentadactyl limb

   (C) reproductive methods are similar

   (D) both have streamlined body shape

9. A purebred (homozygous) black-eared dog is crossed with a female white-eared dog. Black ears (B) is dominant over white (b). Which of the following genotypes would a white-eared female have?

   (A) Bb

   (B) bb

   (C) b

   (D) B

10. You are standing on some scales in a stationary lift which read 60 kg. The lift suddenly starts accelerating downwards. The reading on the scales would read:

    (A) 60 kg

    (B) Less than 60 kg

    (C) More than 60 kg

    (D) 60 x 9.8 kg

11. Metals like sodium and calcium are very reactive because they have…

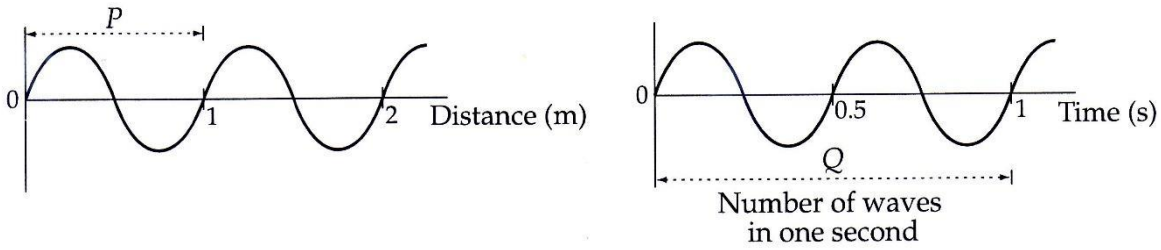
    (A) many outer-shell electrons, and they are readily donated

    (B) a few outer-shell electrons, and they are readily donated

    (C) many outer-shell electrons, and they are not readily donated

    (D) a few outer-shell electrons, and they are not readily donated

12. The diagrams below represent a wave.



What features of the wave are represented by *P* and *Q*?

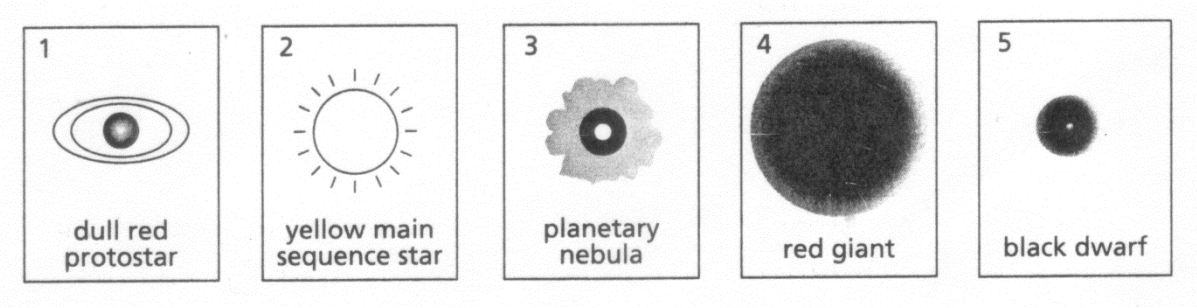
	P	Q
(A)	Wavelength	Frequency
(B)	Frequency	Wavelength
(C)	Speed	Wavelength
(D)	Wavelength	Speed

13. Observe the following chemical reactions:

W: magnesium + oxygen → magnesium oxide solid
X: magnesium carbonate + heat → magnesium oxide solid + carbon dioxide gas
Y: sodium hydroxide + hydrochloric acid → sodium chloride solution + water
Z: sodium chloride + silver nitrate → sodium nitrate solution + silver chloride solid
Which choice correctly classifies these reactions?

	W	X	Y	Z
(A)	combustion	decomposition	neutralisation	precipitation
(B)	decomposition	precipitation	neutralisation	precipitation
(C)	combustion	combustion	decomposition	neutralisation
(D)	precipitation	decomposition	corrosion	decomposition

14. The pictures below show stages in the life of a star. Number the pictures in the correct sequence, from star birth to death.



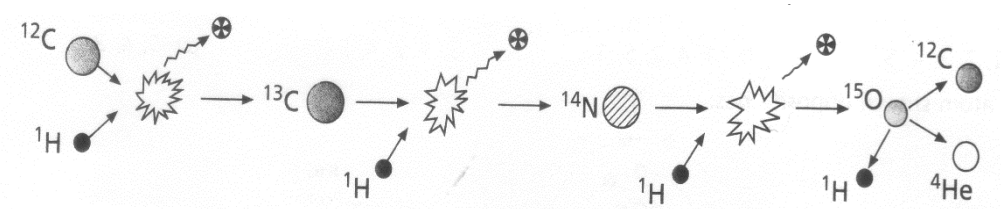
(A) 5, 2, 3, 4, 1

(B) 1, 2, 3, 4, 5

(C) 3, 1, 2, 4, 5

(D) 1, 2, 4, 3, 5

15. In stars with a solar mass greater than 1.0, the core is hotter and energy is produced by the following nuclear process known as the carbon nitrogen oxygen cycle (CNO). In this process…



(A) Carbon -12 is recycled. One hydrogen atom and one helium atom is produced

(B) The overall process involves the fission of hydrogen into helium

(C) No energy in the form of gamma rays are produced

(D) Hydrogen -1 has one proton, one electron, and one neutron

16. Coordination in humans is controlled by the nervous and hormonal systems. Which of the following statements about these systems is correct?

(A) They both act at the same speed

(B) They always act independently

(C) They may interact to produce a response

(D) They both use chemicals carried in the blood

The following information refers to Questions 17 and 18

One test carried out by food technologists is to work out how long it takes different cooking oils to boil. Part of a test is given below:

1. A certain amount of oil is placed into a beaker 2. An electrical element (wire) is placed into the oil 3. The wire is turned on to heat the oil gently 4. The temperature is measured over a period of time until the oil boils 5. Results are plotted on a graph to obtain the boiling point and the time it takes for the oil to boil

17. What should be kept constant throughout the test?

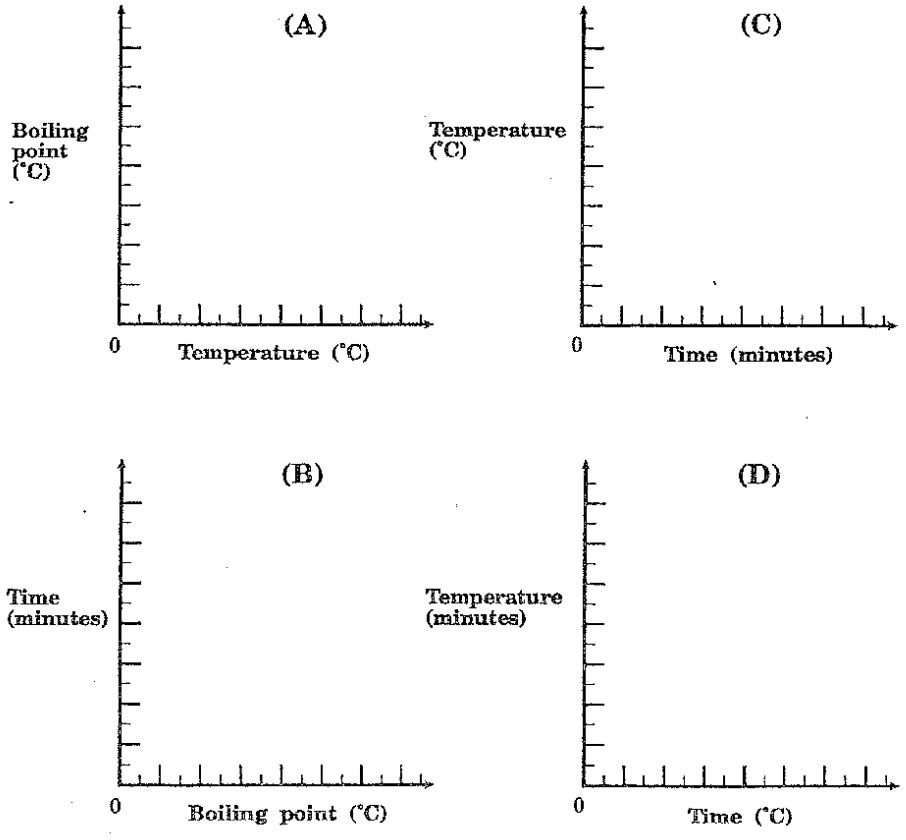
(A) the temperature of the oil

(B) the amount of oil used

(C) the time taken to boil

(D) the type of oil used

18. Which set of axes below would you use to plot the results of the test?



19. In a thermal nuclear reactor, the function of the moderator is to…

(A) increase the speed of the neutrons to produce a greater reaction rate
(B) to reduce the rate of reaction of the neutrons so as to avoid any chain reaction
(C) to absorb neutrons in order to prevent any unwanted explosive reactions
(D) to slow neutrons down and raise the rate of power generation

20. Which of the diseases listed below could be treated with antibiotics?

	Disease	Cause
(A)	Influenza	Virus
(B)	Mad Cow Disease	Prion
(C)	Meningococcal Disease	Bacteria
(D)	Parkinson's Disease	Brain Malfunction

End of Section I

Name: …….. Teacher: ……..

Baulkham Hills High School

Yearly Examination

2023

Year 10 Science

Section I – Multiple Choice Answer Sheet

Select the response which best answers the question by placing an ‘X’ over A, B, C or D on the grid below.

1	**A**	**B**	**C**	**D**
2	**A**	**B**	**C**	**D**
3	**A**	**B**	**C**	**D**
4	**A**	**B**	**C**	**D**
5	**A**	**B**	**C**	**D**
6	**A**	**B**	**C**	**D**
7	**A**	**B**	**C**	**D**
8	**A**	**B**	**C**	**D**
9	**A**	**B**	**C**	**D**
10	**A**	**B**	**C**	**D**

11	**A**	**B**	**C**	**D**
12	**A**	**B**	**C**	**D**
13	**A**	**B**	**C**	**D**
14	**A**	**B**	**C**	**D**
15	**A**	**B**	**C**	**D**
16	**A**	**B**	**C**	**D**
17	**A**	**B**	**C**	**D**
18	**A**	**B**	**C**	**D**
19	**A**	**B**	**C**	**D**
20	**A**	**B**	**C**	**D**

Section II – Extended Response (65 marks)

Write your answers to this section in the spaces provided.

Question 21 (2 marks) **mark**

Use the equation of motion to answer the question below.

v = u + at

A rock falls away from the edge of a high cliff. If the rock was initially at rest, how long did it take the falling rock to reach a velocity of 39.2 metres per second?
Ignore friction and use gravitational acceleration to be 9.8 metres per second, per second.
Show all working.

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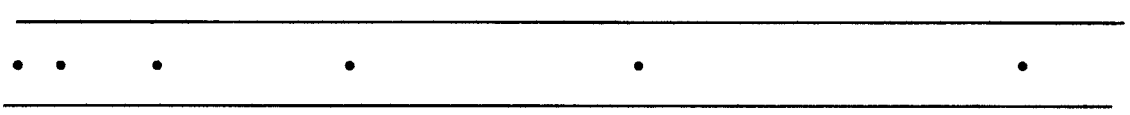
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Question 22 (2 marks) **mark**

A ticker tape recording of an accelerating object is shown below.



Given that one interval on the ticker tape represents 1/50 second, calculate the average speed of the object and give your answer in metres per second. Show all working. **2**

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Question 23 (5 marks) **mark**

Apollo 15 astronaut Scott Irwin dropped a hammer and a feather while standing on the moon's surface.

(a) Both objects hit the surface of the moon at the same time. Explain why this occurred. **1**

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(b) Predict the outcome if Scott Irwin did the same experiment with a hammer and a feather on the surface of the Earth. **1**

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(c) Explain your prediction for part (b). **1**

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(d) You are a crew member of a shuttle mission and make the following observation: inside the orbiting shuttle, you sneeze and move backwards. Explain this observation with reference to Newton's third law. **2**

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Question 24: (5 marks) **mark**

Jacky and his sister Angelina are given two rabbits for Christmas by their Auntie Sarah. The two rabbits are different colours, the male is a dark grey and they name him Shadow, and the female is pure white, and they name her Snowy.

The children keep the rabbits in the same hutch outside in the garage, and several months later, the female rabbit, Snowy, has babies. There are five babies, two grey males, one grey female, and two white females. The baby rabbits grow healthy and strong, but the family does not have room for all these rabbits, so they sell four of the babies and keep only the grey female. They name her Misty. When Misty gets older, she escapes into the yard next door and mates with another grey rabbit. She has 3 babies, two white ones, a male and a female, and one grey male.

(a) Using the information above, draw a pedigree for the rabbit family in the space below. Include a key. **3**

(b) Identify the mode of inheritance for white fur colour in the rabbits that belong to Jacky and his sister. Justify your choice with evidence from the pedigree. **2**

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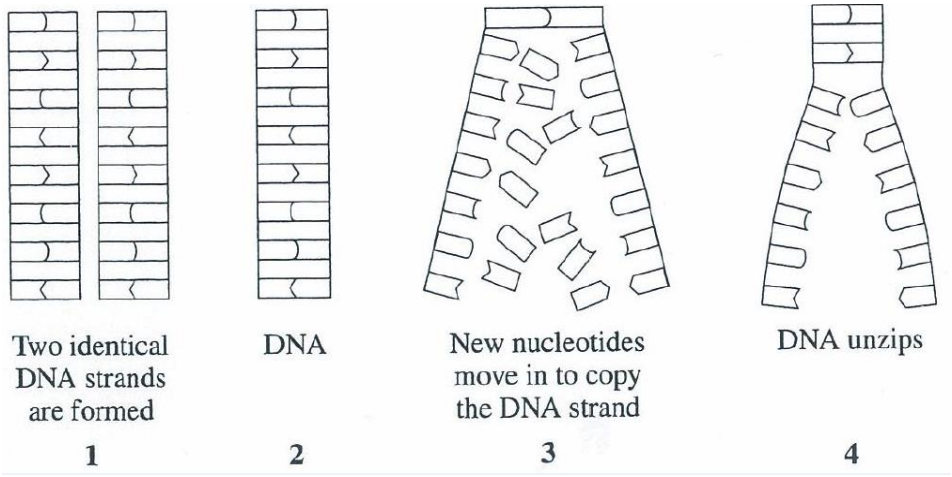
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Question 25 (4 marks) **mark**

The following is a series of diagrams which show the process of DNA replication. The diagrams are NOT in order.



(a) Rewrite the numbers 1, 2, 3 and 4 to identify the correct order of the diagrams. **1**

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(b) Outline the importance of DNA replication in functioning organisms. **2**

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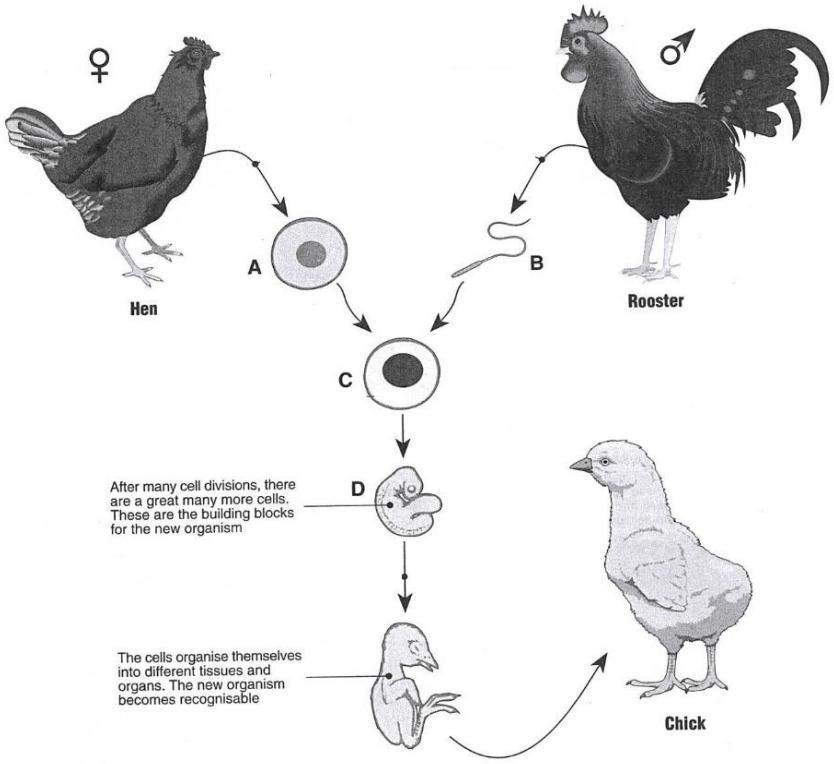
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(c) Identify the two scientists who were responsible for proposing the double-helix model of DNA. **1**

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Question 26 (5 marks) **mark**

The following is a diagram showing sexual reproduction in chickens and roosters.



(a) Name the type of cell division that produces sex cells such as sperm and ova. **1**

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(b) Name the process where sperm and ovum unite to form a zygote (the first cell of a new offspring). **1**

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(c) Name the type of cell division by which the zygote will grow into a new individual made of millions of cells. **1**

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(d) How many chromosomes would be found in the nucleus of the sperm cell of a human. **1**

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(e) How many chromosomes would be found in the nucleus of the human zygote? **1**

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Question 27 (6 marks) **mark**

Rabbits are not native to Australia. They were introduced in the early days of settlement so they could be bred for food. However, the domesticated rabbits escaped into the wild and became a nuisance. They ate the crops planted by farmers and competed with the native marsupials, eventually driving some to extinction in some areas. One marsupial that was affected adversely by competition with rabbits was the bilby. Bilbies are adapted to life in arid grasslands. They dig burrows in which they shelter, they feed on grasses and other vegetation, and they have large, thin ears like a rabbit. Their ears are useful for radiating heat so they can maintain a constant body temperature in the dry, hot inland areas they inhabit.

(a) How would Charles Darwin explain the evolution of bilbies with large, thin ears? **4**

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(b) Identify the key differences between Lamarck's theory of evolution and Darwin's theory of evolution. **2**

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Question 28 (6 marks) **mark**

Evaluate some of the evidence that supports the theory that present day organisms have evolved from organisms in the distant past. In your answer, refer to at least **two** different types of evidence that you have studied.

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Question 29 (2 marks) **mark**

Use the following information to answer Question 30.

Solubility Rules

i)	**All sodium, potassium and ammonium salts are soluble**
ii)	**All silver, lead and mercury salts are insoluble**
iii)	**All carbonates, sulphides and hydroxides are insoluble, except Rule i)**
iv)	**All sulfates are soluble except calcium sulphate and barium sulphate**

(a) Name the precipitate formed when a sodium sulphide solution is added to a copper (II) sulphate solution. **1**

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(b) Write a full, balanced chemical equation to show the formation of the precipitate. **1**

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Question 30 (5 marks) **mark**

Hydrogen gas is produced when a metal and an acid react together. A student placed some magnesium and some hydrochloric acid in a test tube and observed the reaction.

(a) How would the student know that a gas was being produced? **1**

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(b) Describe a test you could use to check that the gas produced was hydrogen. **2**

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(c) Explain why metals such as iron corrode when in contact with air, moisture and acids while other metals such as gold, do not corrode. **2**

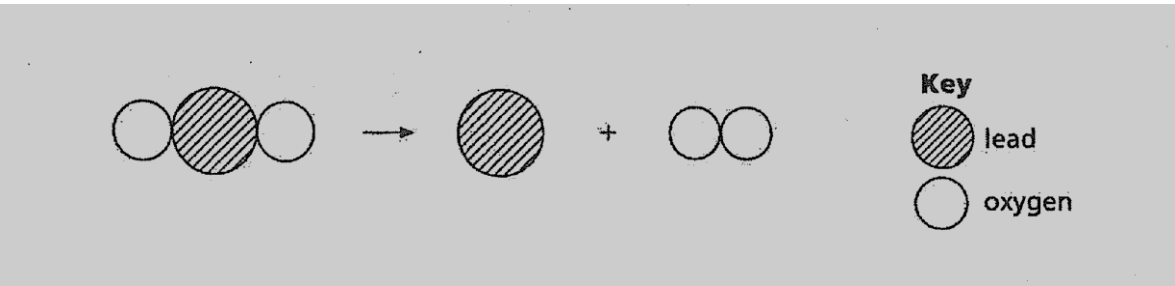
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Question 30 (5 marks) **mark**

The diagram below shows what happens to an oxide of lead when it is strongly heated.



(a) What type of a reaction is this? **1**

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(b) In the example above, what is the valency of the lead ion? **1**

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(c) Write the balanced chemical equation for the above reaction. **1**

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(d) Explain how the balanced chemical equation relates to the law of conservation of mass. **2**

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Question 31 (4 marks) **mark**

Complete the table of properties for alpha (α), beta (β) and gamma (γ) radiation.

(a) **2**

Radiation Type	Mass (amu)	Charge
alpha (α)		
beta (β)		
gamma (γ)		

(b) Nuclear power is used to generate electricity in many parts of the world. In Australia we do not use radioactive substances as an energy source because it is considered to be too much of a risk. **2**

However, we do use radioisotopes for other purposes. Identify **one** such isotope and describe **exactly** what it is used for.

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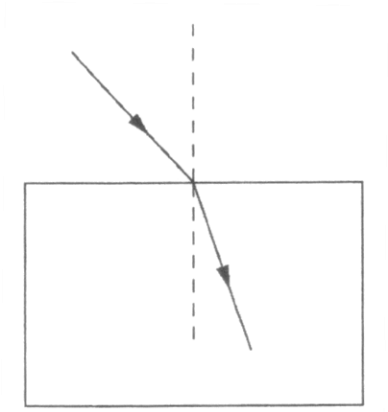
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Question 32 (4 marks) **mark**

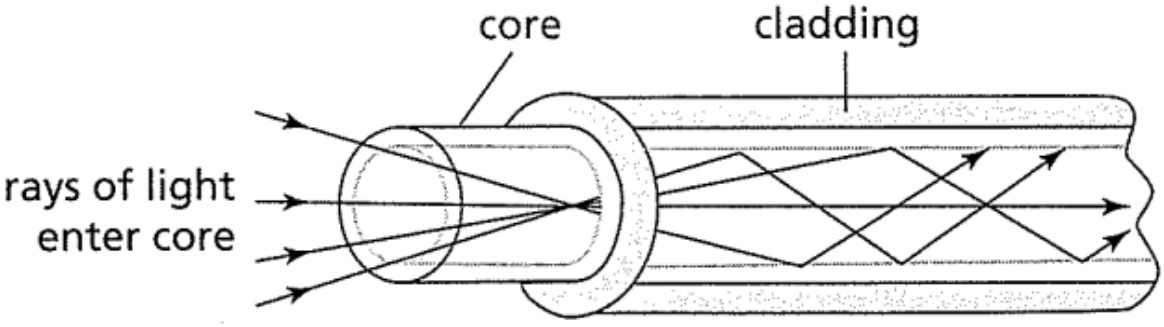
The diagram below shows a beam of light passing from air into a glass block.



(a) What is the term for the behaviour of light being shown in the diagram? **1**

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(b) Study the diagram below. This shows another behaviour of light which can be used to transmit light as signals over long distances inside a fibre optic thread.



(i) What is the name given to the property of light that enables it to remain inside the fibre? **1**

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(ii) Fibre optic cables are used extensively in communications. Why are they used in preference to more conventional technologies such as copper wires? In your answer you may refer to the properties of light that are relevant. **2**

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Question 33 (5 marks) **mark**

(a) Outline the **difference** between the idea of Continental Drift, and the Theory of Plate Tectonics. **2**

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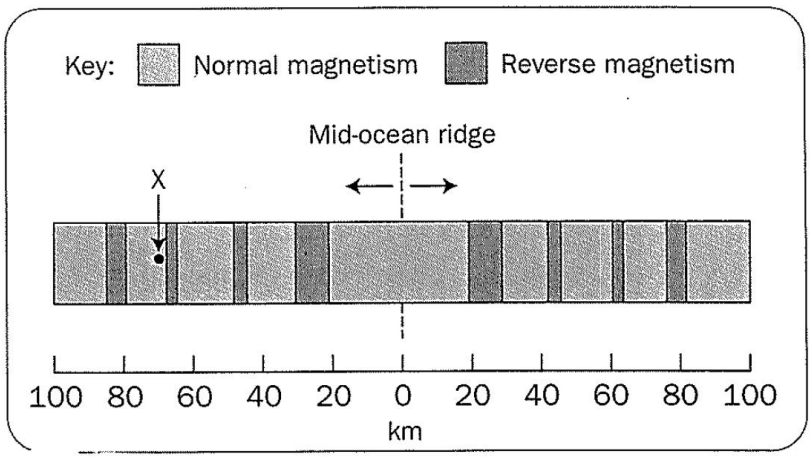
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(b) Geologists have found that the magnetic field of the earth has reversed itself many times over millions of years. These reversals happen at irregular intervals and last for tens of thousands of years. The pattern produced by these reversals can be detected because the rocks that form during this time will have the same magnetic poles as the Earth had during that period.

Below is a diagram of the pattern of sea floor spreading on the ocean floor. The differently shaded bands represent reversals of magnetism on either side of a mid ocean ridge.



Patterns of changes in geomagnetism on either side of a mid-ocean ridge

(i) At what distance from either side of the ridge is the most recent reversal? **1**

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(ii) How do these reversals near the ridges provide evidence for Plate Tectonics? **2**

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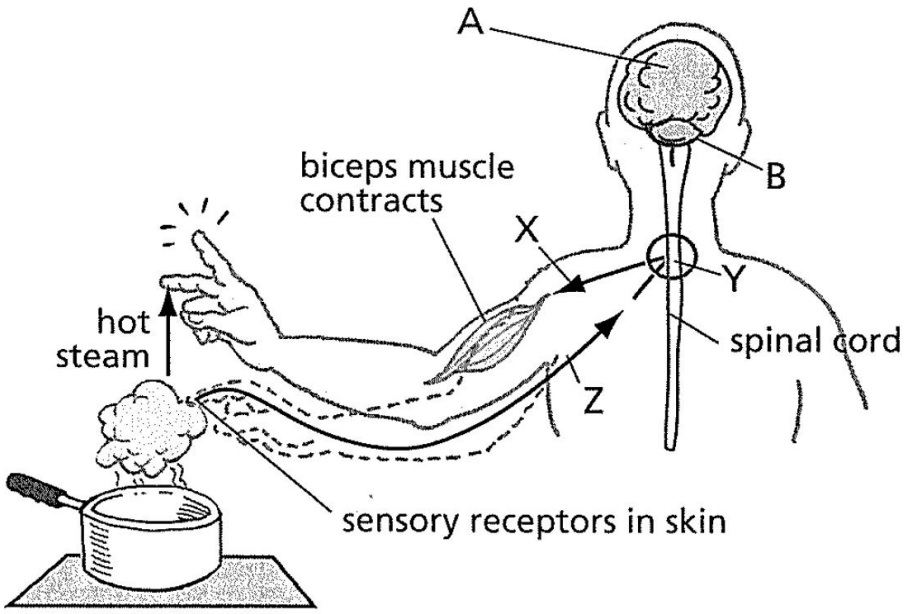
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Question 34 (5 marks) **mark**

The following diagram shows a person responding when they burn their finger in hot steam from a boiling pan of water on the stove.



(a) Name the type of nervous response that is being shown in this diagram. **1**

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(b) Identify the part of the brain labelled A. **1**

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(c) Identify the effector in this diagram. **1**

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(d) This type of response is very fast. Explain why the body can respond quickly when this type of nervous pathway is used. **2**

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End of Section II

End of Examination

Additional Writing Paper

Refer to this page's number in your original answer and include the Question & Part numbers below

Additional Writing Paper

Refer to this page's number in your original answer; and include the Question & Part numbers below

PERIODIC TABLE OF THE ELEMENTS

KEY

Atomic Number	79
Symbol	Au
Standard Atomic Weight	197.0
Name	Gold

1 H 1.008 Hydrogen																	2 He 4.003 Helium
3 Li 6.941 Lithium	4 Be 9.012 Beryllium											5 B 10.81 Boron	6 C 12.01 Carbon	7 N 14.01 Nitrogen	8 O 16.00 Oxygen	9 F 19.00 Fluorine	10 Ne 20.18 Neon
11 Na 22.99 Sodium	12 Mg 24.31 Magnesium											13 Al 26.98 Aluminium	14 Si 28.09 Silicon	15 P 30.97 Phosphorus	16 S 32.07 Sulfur	17 Cl 35.45 Chlorine	18 Ar 39.95 Argon
19 K 39.10 Potassium	20 Ca 40.08 Calcium	21 Sc 44.96 Scandium	22 Ti 47.87 Titanium	23 V 50.94 Vanadium	24 Cr 52.00 Chromium	25 Mn 54.94 Manganese	26 Fe 55.85 Iron	27 Co 58.93 Cobalt	28 Ni 58.69 Nickel	29 Cu 63.55 Copper	30 Zn 65.38 Zinc	31 Ga 69.72 Gallium	32 Ge 72.64 Germanium	33 As 74.92 Arsenic	34 Se 78.96 Selenium	35 Br 79.90 Bromine	36 Kr 83.80 Krypton
37 Rb 85.47 Rubidium	38 Sr 87.61 Strontium	39 Y 88.91 Yttrium	40 Zr 91.22 Zirconium	41 Nb 92.91 Niobium	42 Mo 95.96 Molybdenum	43 Tc Technetium	44 Ru 101.1 Ruthenium	45 Rh 102.9 Rhodium	46 Pd 106.4 Palladium	47 Ag 107.9 Silver	48 Cd 112.4 Cadmium	49 In 114.8 Indium	50 Sn 118.7 Tin	51 Sb 121.8 Antimony	52 Te 127.6 Tellurium	53 I 126.9 Iodine	54 Xe 131.3 Xenon
55 Cs 132.9 Caesium	56 Ba 137.3 Barium	57–71 Lanthanoids	72 Hf 178.5 Hafnium	73 Ta 180.9 Tantalum	74 W 183.9 Tungsten	75 Re 186.2 Rhenium	76 Os 190.2 Osmium	77 Ir 192.2 Iridium	78 Pt 195.1 Platinum	79 Au 197.0 Gold	80 Hg 200.6 Mercury	81 Tl 204.4 Thallium	82 Pb 207.2 Lead	83 Bi 209.0 Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon
87 Fr Francium	88 Ra Radium	89–103 Actinoids	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium	113 Nh Nihonium	114 Fl Flerovium	115 Mc Moscovium	116 Lv Livermorium	117 Ts Tennessine	118 Og Oganesson

Lanthanoids

57 La 138.9 Lanthanum	58 Ce 140.1 Cerium	59 Pr 140.9 Praseodymium	60 Nd 144.2 Neodymium	61 Pm Promethium	62 Sm 150.4 Samarium	63 Eu 152.0 Europium	64 Gd 157.3 Gadolinium	65 Tb 158.9 Terbium	66 Dy 162.5 Dysprosium	67 Ho 164.9 Holmium	68 Er 167.3 Erbium	69 Tm 168.9 Thulium	70 Yb 173.1 Ytterbium	71 Lu 175.0 Lutetium

Actinoids

89 Ac Actinium	90 Th 232.0 Thorium	91 Pa 231.0 Protactinium	92 U 238.0 Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium

Standard atomic weights are abridged to four significant figures.

Elements with no reported values in the table have no stable nuclides.

Information on elements with atomic numbers 113 and above is sourced from the International Union of Pure and Applied Chemistry Periodic Table of the Elements (November 2016 version).

The International Union of Pure and Applied Chemistry Periodic Table of the Elements (February 2010 version) is the principal source of all other data. Some data may have been modified.