**YEAR 10 SCIENCE**

**2017**



Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Science Class: 10.

# TIME ALLOWED FOR THIS PAPER

## Reading time before commencing work: five minutes

Working time for the paper: fifty five minutes

# MATERIALS REQUIRED/RECOMMENDED FOR THIS PAPER

**To be provided by the supervisor:**

Multiple-choice Question Booklet

Question/Answer Booklet

Data Sheet

**Students to provide:**

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener,

eraser, ruler, highlighters

Special items: non-programmable calculator

# IMPORTANT NOTE TO STUDENTS

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

**Structure of this paper**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Section | Number of questions available | Number of questions to be answered | Suggested working time  (minutes) | Marks available |
| Section One:  Multiple-choice | 15 | 15 | 15 | /15 |
| Section Two:  Short answer | 16 | 8 | 20 | /29 |
| Section Three:  Extended answer | 5 | 2 | 20 | /20 |
|  | | | | /64 |

**Instructions to candidates**

1. Answer the questions according to the following instructions.

Section One: Answer all questions on the front of the separate Answer Booklet provided. For each questions put a cross (X) in the box to indicate your answer. Use only a blue or black pen to mark the boxes. If you make a mistake, shade that square then put a cross on your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

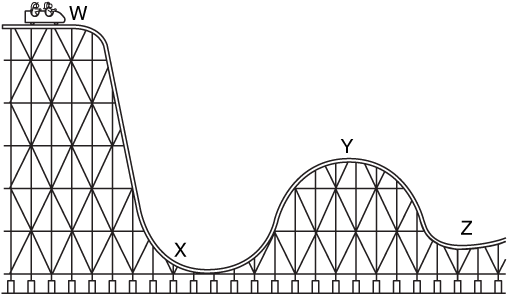
Sections Two and Three: Write your answers in the Question/Answer Booklet.

2. When calculating numerical answers, show your working or reasoning clearly. Express numerical answers to the appropriate number of significant figures and include appropriate units where applicable.

3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.

4. Remember to use pencil and ruler for all diagrams. Include clear labels and titles where appropriate.

1. An element is a:
2. Substance that contains molecules
3. Pure substance made up of only one type of atom
4. Pure substance made up of two types of atoms
5. Substance that contains no bonded atoms
6. An atom has a mass number of 27. It therefore has:
7. 13 protons, 14 neutrons and 14 electrons
8. 13 protons, 14 neutrons and 13 electrons
9. 14 protons, 14 neutrons and 14 electrons
10. 13 protons, 13 neutrons and 13 electrons
11. Which of the following shows the correct conjugate base pairs?
12. thymine and guanine
13. adenine and guanine
14. cytosine and adenine
15. cytosine and guanine
16. Which of the following statements about the number of daughter cells produced is CORRECT?
17. mitosis = 4 daughter cells, meiosis = 2 daughter cells
18. mitosis = 1 daughter cell, meiosis = 2 daughter cells
19. mitosis = 1 daughter cell, meiosis = 4 daughter cells
20. mitosis = 2 daughter cells, meiosis = 4 daughter cells
21. What is the name given to an individual whose alleles are the **same** for a characteristic?
22. heterozygous
23. homozygous
24. monohybrid
25. homologous
26. Which of the following best describes the energy changes occurring when an apple falls from a tree branch to the ground below?
27. gravitational potential→kinetic→sound
28. gravitational potential→elastic potential→sound
29. kinetic→sound→gravitational potential
30. elastic potential→sound→kinetic

Questions **7 and 8** refer to the diagram of a rollercoaster below.

1. At which point on the rollercoaster does the cart have the **most** gravitational potential energy?
2. W
3. X
4. Y
5. Z
6. At which point on the rollercoaster does the cart have the **most** kinetic energy?
7. W
8. X
9. Y
10. Z
11. Which of the following is TRUE regarding kinetic energy?
12. The greater an object’s mass, the greater its kinetic energy
13. The greater an object’s speed, the greater its kinetic energy
14. An object at rest has no kinetic energy
15. All of the above
16. The kinetic energy of a ball rolling down along a table can be calculated using the formula Ek=½mv2. ,if the mass of the ball is 1kg and the velocity is 2ms-1: What kinetic energy does the ball have?
17. 2 ms-1
18. 1 ms-1
19. 0.5 ms-1
20. 3. ms-1
21. What is the difference between displacement and distance?
22. distance is the meters travelled plus the direction.
23. there is no difference.
24. displacement must include the direction travelled.
25. displacement is only the meters travelled.
26. Speed is measured using
27. seconds.
28. kmh-1 only.
29. ms-1.
30. Newtons

**Use the example given to answer question 13 and 14.**

A tiger runs 500m east, then turns and runs 200m west. If the total journey took 100s:

1. His distance travelled was
2. 700m.
3. 500m.
4. 200m.
5. 100
6. His displacement was:
7. 300m.
8. 300m east.
9. 2 ms-1.
10. 500m.
11. To convert 12 minutes to seconds you would:
12. divide by 60
13. divide by 36.
14. times by 3.6.
15. times by 60

**End of Section One**

****

**SEMESTER 2 2017**

**YEAR 10 SCIENCE EXAM:**

**ANSWER BOOKLET**

**NAME:**

**FORM: DATE:**

**Multiple Choice Short Answer Extended Answer Total**

**/29**

**/15**

**/20**

**/64**

**SECTION ONE: Multiple choice answers**

**Cross (X) through the correct answer.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1** | **a** | **XXX** | **c** | **d** |
| **2** | **a** | **XXX** | **c** | **d** |
| **3** | **a** | **b** | **c** | **XXX** |
| **4** | **a** | **b** | **c** | **XXX** |
| **5** | **a** | **XXX** | **c** | **d** |
| **6** | **XXX** | **b** | **c** | **d** |
| **7** | **XXX** | **b** | **c** | **d** |
| **8** | **a** | **XXX** | **c** | **d** |
| **9** | **a** | **b** | **c** | **XXX** |
| **10** | **XXX** | **b** | **c** | **d** |
| **11** | **a** | **b** | **XXX** | **d** |
| **12** | **a** | **b** | **XXX** | **d** |
| **13** | **XXX** | **b** | **c** | **d** |
| **14** | **a** | **XXX** | **c** | **d** |
| **15** | **a** | **b** | **c** | **XXX** |

**Section Two: Short answer (64 marks)**

**Question 16**

Classify the following as situations in which forces are **balanced** or **unbalanced**.

a. A motor bike accelerating away from traffic lights. (1 mark)

***UNBALANCED***

b. A car travelling at a constant 100 kmh-1 straight down a freeway. (1 mark)

***BALANCED***

**Question 17**

A short form of Newton’s First Law is ***inertia***. Explain what inertia is and how it relates to the mass of an object. (2 marks)

***Inertia is a property of an object which makes it keep doing what it is already doing – that is, when moving it wants to stay moving and when still it wants to stay still (1 mark)***

***Mass is a measure of inertia – more mass will lead to more inertia, less mass will lead to less inertia (1 mark)***

**Question 18**

Mr Miles was doing time-trials on his bike around a 400 metre horizontal track.

(i) He took 32 seconds to travel 400 m. What was his average speed? (4 marks)

|  |  |
| --- | --- |
|  | 1 mark |
|  | 1 mark |
|  | 1 mark |
| units: ms-1 or m/s | 1 mark |

(ii) Compare the forward force on the bike with the backward force on the bike when Mr Miles was travelling at a constant velocity. (1 mark)

***They are equal***

**Question 19**

You are sliding down a hill after falling off your bike. The road is applying of force of -90 N (due to friction). If you have a mass of 50 kg, what was your acceleration?

(4 marks)

|  |  |
| --- | --- |
|  | 1 mark |
|  | 1 mark |
|  | 1 mark |
| units: ms-2 or m/s2 | 1 mark |

**STOP: Read the following instructions carefully.**

* Identify which module you completed at the beginning of Term 3 (not the one you are currently working through)
* If you completed Module 1 SPORT SCIENCE, answer questions 20 – 23 ONLY.
* If you completed Module 1 FORENSIC SCIENCE, answer questions 24 – 27 ONLY.
* If you completed Module 1 EVOLUTION, answer questions 28 – 31 ONLY.

Identify the module you completed:

*I completed Module 1:*

*I am answering questions to ONLY.*

**SPORTS SCIENCE**

**Question 20**

Describe the three main functions of the cardiovascular system **.** (3 marks)

1. ***Carry oxygen and nutrients to the cells of the body***
2. ***Remove carbon dioxide and waste***
3. ***Transport chemicals required for body functions***

**Question 21**

What are the main constituents of blood? (4 marks)

1. ***Red blood cells***
2. ***White blood cells***
3. ***Platelets***
4. ***Plasma***

**Question 22**

List 3 major functions of the skeleton**.** (3 marks)

***Any 3 from:***

* ***Support***
* ***Protection***
* ***Movement***
* ***Storage of minerals***
* ***Productions of red blood cells***

**Question 23**

Compare and contrast the three main types of joints in humans. (6 marks)

* + **Fibrous** = No movement (Skull)
  + **Cartilaginous** = Slightly moveable (Ribs and sternum)
  + **Synovial** = Freely moveable (Shoulder)

***(1 mark for name, 1 mark for movement)***

**FORENSIC SCIENCE**

**Question 24**

Explain the principle of Locard’s Exchange Theory. (2 marks)

When a person comes into contact with an object or another person, there is always some exchange of material (Proper defn – 2 marks)

OR a criminal always leaves something at the scene of the crime, or takes something away (1 mark)

**Question 25**

Define the term “contact trace” and provide three examples of this type of evidence. (5 marks)

Contact trace- exchanged materials (1 mark) from coming into contact with person, object or crime scene location etc (1 mark)

eg fingerprints, clothes fibres, hair, saliva, blood , glass paint fragments, pollen

any 3 or other suitable , 1 mark each max 3 marks for examples

**Question 26**

Identify three ways that blood can be used to help solve a crime. (3 marks)

Blood – can give us blood group, DNA, approximate age, sex identification, blood of human or other animal, bloody fingerprints, footprints left in blood trail etc

**Question 27**

Identify and describe some important characteristics of a good eye witness. (6 marks)

Alert – notice and take note of any suspicious activity or useful information that may help solve a crime

Accurate memory – not forget details that might be pertinent eg car rego number

Accurate eyewitness account -Able to give a detailed decription of the events they observed, or the people involved

Observant – detect small differences objects out of place etc

Identification – 1 mark each

Description – 1 mark each

**EVOLUTION**

**Question 28**

Write the vocabulary terms which match the following definitions (4 marks)

|  |  |
| --- | --- |
| **Term** | **Definition** |
| **Punctuated Equilibrium** | Burst of evolutionary change followed by periods of stability. |
| **Gradualism** | Slow evolutionary changes over a long period of time. |
| **Coevolution** | When two organisms evolve in response to the other. |
| **Speciation** | Formation of a new species from a pre-existing species. |

**Question 29**

Compare and contrast the processes of convergent evolution and divergent evolution, giving examples of each where appropriate. (4 marks)

***Convergent evolution occurs when unrelated species evolve similar characteristics because they live in similar environments (1 mark).***

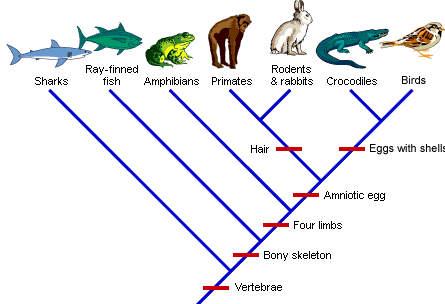
***For example, birds, bats and butterflies have all evolved to have wings despite being unrelated because their being able to fly is useful in their environment (1 mark).***

***Divergent evolution is when a number of different species evolve from one common ancestor due to new environments causing them to evolve differently (1 mark).***

***For example, bears, elephants and primates all share a common mammal ancestor but they are all very different species due to their different environments (1 mark).***

**Question 30**  (3 marks)

Use the phylogenetic tree below to answer questionsa) – c):



1. Which organism diverged first? ***sharks***
2. Who is most closely related to the primate? ***Rodents and rabbits***
3. What do all of these organisms share? ***A common ancestor***

**Question 31**

|  |  |
| --- | --- |
| Field of Study | Evidence for Evolution |
| Paleontology | **fossils help to find the link between extinct species and current species, evidence that species have evolved** |
| **Biogeography** | The locations of living things with similar characteristics points to divergent evolution. |
| Biochemistry | **similarities in DNA between different species indicate similarities in ancestry** |
| Embryology | **similarities in embryo development of different species indicates that they have a common ancestor** |
| **Anatomy** | Similar structures in unrelated organisms points to a common ancestor. |

Complete the table by filling in the missing information: (5 marks)

**End of Section Two**

**SECTION THREE: EXTENDED ANSWER SECTION**  **(20 marks)**

**Question 32** The table below shows the speed of a cheetah starting at rest and then at 5 second intervals as it chases its prey.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time in s | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| Speed in ms-1 | 6 | 14 | 27 | 27 | 27 | 20 | 12 | 3 | 0 |

1. Draw a graph to represent the data in the table. (3 marks)



***Cheetah chasing its prey***

**Title – ½ mark**

**Axis title – ½ mark**

**Axis units – ½ mark**

**Scale – ½ mark**

**Plots – ½ mark**

**Pencil – ½ mark**

***28***

***24***

***20***

***16***

***12***

***8***

***4***

***0***

***Speed***

***(ms-1)***

***5 10 15 20 25 30 35 40 45 50***

***Time (s)***

Use the information in the table and the graph to;

b) Write down the time intervals in which the acceleration of the cheetah was: (3 marks)

i. zero. ***15 – 25 s***

ii. positive. ***0 – 15 s***

iii. negative. ***25 – 45 s***

c) Calculate the acceleration of the cheetah between 25 and 40 seconds. (4 marks)

|  |  |
| --- | --- |
|  | 1 mark |
|  | 1 mark |
|  | 1 mark |
| units: ms-2 or m/s2 | 1 mark |

**Question 33 (10 marks)**

Select **one (1)** of the following questions to write your extended answer. Complete your answer in the spaces provided, including labelled diagrams where appropriate.

**OPTION 1: Sport Science**

The cardiovascular system plays a major role in transporting blood and essential components around the body. Compare and contrast the structure and function of the three types of blood vessels in the human body. Give detailed examples and labelled diagrams where appropriate.

|  |  |  |
| --- | --- | --- |
| **Name of vessel** | **Function** | **Difference** |
| **Artery (1 mark)** | **Takes blood away from heart (1 mark)** | **Thickest muscular wall of all vessels (1 mark)** |
| **Vein (1 mark)** | **Take blood to the heart (1 mark)** | **Any of: valves, thinner wall than artery (1 mark)** |
| **Capillary (1 mark)** | **Any of: join artery to vein, deliver blood to all of body (1 mark)** | **Wall only one cell thick (1 mark)** |

**Plus 1 mark for labelled diagrams if included.**

**OPTION 2: Forensic Science**

It is your first day on the job as a Police Forensic Investigator and you are determined to impress your new boss. You are called to the scene of a robbery in a busy city mall.

Describe in detail the actions you would take from the moment you arrive at the scene.

ANSWER :

**Securing the scene of the crime** (1 mark)

– avoid any accidental destruction or contamination of potential evidence

**\_** ensure the safety of any injured people and the site itself, call ambulance and back up next

\_ turn off gas,water, electricity

\_ secure site with a physical barrier

\_ if dead body present ensure it is not touched or moved until it has been carefully examined and photographed

\_ record names and addresses of any eyewitnesses to the crime

**Examining the scene** ( 1 mark)

\_ specialist persons arrive on the scene eg senior detective, pathologist CSI’s and SOCO’s who are experts at looking for evidence

\_ police photographer will take pictures of the victim and the positions of the body, wounds or medical features may also be photographed, location of evidence recorded

\_ Photos or videos of the crime scene will be taken, with oral description of the crime scene

\_ police draughtsmen may sketch a picture of the site

\_ thorough search of the crime scene takes place, usually immediate area first

\_ CsI’s wear special overalls and overshoes to prevent contamination, approach site from same route as the first police officer, use duck boards to minimise interference to the crime scene

\_location of point of entry if crime scene in a building

**Collection/ Removing the evidence** (1 Mark)

\_ all items of possible evidence are labelled and sealed in bags where possible

\_ bodies are removed to the morgue

\_ Laboratory registration numbers are assigned to the evidence

\_ other locations searched are conducted by different CSI’s to avoid contamination

\_ eye witness statements

**1 mark x 3 for the main ideas, then any 7 processes or descriptions within each category…..**

**OPTION 3: Evolution**

Charles Darwin promoted the theory of natural selection in his studies of evolution.

Provide a definition for the term ‘natural selection’ and describe its principles by referring to how it would impact on a real species.

Natural Selection occurs when there is a variation/mutation within a gene pool of a population that puts an individual at a survival advantage. (1 mark)

The principles involved are:

1 There are often variations within a population of a species. (1 mark)

2..There are more offspring produced than there are parents. (1 mark)

3. There is competition for resources. (1 mark)

4. Those with a favourable variation are likely to survive. (1 mark)

5. They are more likely to reproduce (1 mark)

6. and pass that characteristic onto their offspring. (1 mark)

7. The trait becomes more characteristic becomes more common in the population. (1 mark)

**The other 2 marks are giving an example of a real species that has under gone natural selection applying the above principles in nature. Not artificial selection by humans.**

Eg. Peppered moth

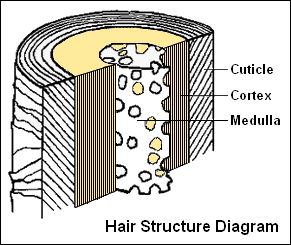
**OPTION 4: Cosmetic Science**

Australians spend over $100 billion a year on looking good, including treatments and products to make their hair look healthy and shiny. Name and describe the 3 layers of hair, including a clearly labelled diagram. Describe the cleaning process of shampoo and what effect the pH of your chosen product has on your hair.

Structure – 3 layers, 1 mark each for name and 1 for description (6 marks)

* In the hair structure diagram above, you can see that the shaft has three layers: the cuticle (outer layer), cortex (middle layer) and medulla (inner layer).
* The **medulla** is a honeycomb(1/2mark) keratin(1/2mark) structure with air spaces inside.
* The **cortex** gives flexibility and tensile (stretching) strength to hair and contains melanin granules, which give hair its color (blond in the diagram above). The cortex is made from tiny fibers of keratin running parallel to each other along the length of the hair shaft (as shown in the photo of the split hair end above). (1/2 mark each for any relevant points of description)
* The **cuticle** is made from overlapping semi-transparent keratin scales (1/2 mark), which make the hair waterproof and allow it to be stretched (1/2 mark).

Diagram- labelled (1 mark)



Explanation of how shampoo works (1 mark)

### HOW SHAMPOO WORKS – ½ mark for detergent, ½ mark for hydrophilic nature

Shampoo contains [detergent](https://www.thoughtco.com/how-do-detergents-clean-607866), much like you would find in dishwashing or laundry detergent or bath gel. Detergents work as [surfactants](https://www.thoughtco.com/definition-of-surfactant-605928). They lower the surface tension of water, making it less likely to stick to itself and able to bind with oils and soiling particles. Part of a detergent molecule is hydrophobic. This hydrocarbon portion of the molecule binds to the sebum coating hair, as well as to any oily styling products.

Detergent molecules also have a hydrophilic portion, so when you rinse your hair, the detergent is swept away by the water, carrying sebum away with it.

**pH of shampoos:**

Better to have - Low pH(1 mark) – increases strength of hair(1 mark)

**END OF EXAM**