**HUMAN BIOLOGY YEAR 12 ATAR**

**Task 1 UNIT 3**

**ASSESSMENT: SCIENCE INVESTIGATION TASK WEIGHTING 3%**

***Receptors and our ability to respond to our environment.***

**Responding to a stimulus**

A stimulus is a change in the environment of an organism. Human respond to a stimulus in order to keep themselves in favourable conditions. *Example -* *Moving to somewhere warmer if they are too cold*.

Receptors respond to a stimulus and send impulses along sensory neurons to the CNS which figures out the correct response. Some receptors are found in the skin. Other receptors can form part of complex organs, such as:

* Light receptor cells in the retina of the eye
* Hormone-secreting cells in a gland
* Muscle cells
* Position receptors in the inner ear
* Sound receptors in the ear
* Touch, pressure, temperature and pain receptors in skin
* Chemical receptors in the nose and tongue

Effector organs carry out the body's responses to stimuli. Effectors in humans are either glands or muscles. Stimuli will bring about a response from a muscle or gland. A nerve impulse may cause a muscle to contract. This is a rapid, brief response.

Reaction time is a measure of how quickly an organism can respond to a particular stimulus. Reaction time has been widely studied, as its practical implications may be of great consequence, e.g. a slower than normal reaction time while driving can have grave results. Many factors have been shown to affect reaction times, including age, gender, physical fitness, fatigue, distraction, alcohol, personality type, and whether the stimulus is auditory or visual. The model for information flow within an organism can be represented in this way:

Stimulus - Receptor - Sensory Neuron- Spinal Cord or Brain- Motor Neuron – Effector – Response/Effect

**TASK**

Your task is to design, plan, conduct and evaluate an investigation based on the way receptors enable the body to respond to changes in the internal or external environment.

The investigation should be based on the following concept:

* receptors can be affected by external or internal factors which can affect their ability to respond appropriately to a stimulus.

Receptors that could be studied, but not limited to, are:

Pain, touch, pressure, temperature, visual, auditory, chemoreceptors (taste, smell, gas).

**Plan the investigation – one week** (page limit 2 sides of A4, Calibri Font 12) (15 marks)

Things to consider when planning your investigation:

* research and provide background information on the receptor, its purpose, factors that affect it etc
* devise a hypothesis
* describe dependent and independent variables for your investigation
* identify variables to control and variables that are beyond control
* decide upon the appropriate sample size, trials and data collection methods (what would be optimum)
* describe the experimental method you will use during your investigation
* describe how data will be collected and analysed.

**Conduct the investigation – one hour**

* set up times and places for the measurements to be taken,
* carry out data collection from test subjects

**Scientific report** (9 marks)

* include the introduction/research, hypothesis, variables and method.
* include design features of the investigation that ensured reliability and validity
* include any safety and/or ethical considerations
* table of results (show processing of raw data by identifying any outliers and working out averages)
* plot appropriate graphs by hand to show results

**Analysis and evaluation** (17 marks)

* describe the trend and/or pattern in your data
* state how your data relates to your hypothesis
* use your knowledge and understanding to explain the trend and/or pattern of your results
* comment on the accuracy of the data collected
* state one limitations in the data collection strategy that may have affected the reliability of your data and comment on how they would have affected it
* state one improvements you could make to the data collection strategy to improve your investigation

**Conclusion** (4 marks)

* summarise your findings and comment on the reliability and validity of the outcome of the investigation

# Marking key for investigation assessment task — Unit 3

|  |  |
| --- | --- |
| **Description** | **Mark** |
| * *A - Describes complex relationships between data and concepts using appropriate terminology and conventions. -* Provides background information on the receptor, what stimulus will cause a response and the response, include what factors will affect the response. **OR** * *B - Describes relationships between data and concepts using appropriate terminology and conventions. -* Provides background information on the receptor, what stimulus will cause a response and the response, include what factors will affect the response but responses are brief and lack full detail. **OR** * *C - Describes simple relationships between data and concepts using appropriate terminology and conventions. -* Provides background information on the receptor, what stimulus will cause a response and the response, include what factors will affect the response but information simplistic stating fact rather than linking. | 3  2  1 |
| * *Includes a testable hypothesis that clearly states the relationship between dependent and independent variables.* **OR** * *Includes a testable hypothesis that links the dependent and independent variables.* | 2  1 |
| * States the independent and dependent variables with details *eg change the strength of the stimulus – strong, medium and low.* **OR** * States the independent and dependent variables *eg the strength of the stimulus* | 2  1 |
| * Three control variables stated and how they will be controlled eg age of subject – all 16-17. **OR** * Controlled variables stated but not how controlled | 2  1 |
| * States variables that cannot be controlled but indicates how their effect can be minimalised to increase validity. **OR** * States variables that cannot be controlled | 2  1 |
| * A - Method is detailed and easy to follow and repeat, adequate number of trials and sampler size. **OR** * B - Method enables experiment to be carried out be lacks some specifics. **OR** * C - Method is brief but still enables experiment to be done but not easily repeated accurately. | 3  2  1 |
| * Safety considerations and or ethics considered in design | 1 |
| **Total** | **Max 15** |

**Results**

* show processing of raw data by identifying any outliers and working out averages
* plot appropriate graphs by hand to show results

|  |  |
| --- | --- |
| **Description** | **Mark** |
| A *- Organises data logically and accurately processes data. Presents data in a range of forms, including graphs, tables and charts to show patterns and relationships.*  *B - Organises data logically and usually processes data accurately. Presents data in a range of forms, including graphs, tables and charts to show patterns and relationships.*  *C - Organises and processes data with some errors or omissions. Presents data using basic tables and appropriate graphs.* | |
| Records raw data in an appropriate format:   * uses headings , groups relevant data, records repeat trials. **OR** * table contained details but simplistic eg may lack appropriate headings, units | 2  1 |
| Carries out simple processing of raw data:   * calculates mean values * identifies outliers and acts on them appropriately | 1  1 |
| Plots a/an appropriate graph/s of the processed data using correct conventions   * uses appropriate title, stating independent and dependent variables * correctly labels axes with names * labels axes with units * uses correct type of graph * plotted graph correctly | 1  1  1  1  1 |
| **Total** | **Max 9** |

**Analysis and evaluation**

* describe the trend and/or pattern in your data
* state how your data relates to your hypothesis
* use your knowledge and understanding to explain the trend and/or pattern of your results
* comment on the reliability and validity of the data collected
* list **two** limitations in the data collection strategy that may have affected the reliability of your data and comment on how they would have affected it
* list **two** improvements you could make to the data collection strategy to improve your investigation

| **Description** | **Mark** |
| --- | --- |
| *A - Comprehensively explains trends using numerical data, where appropriate,*  *B - Explains trends using some numerical data, where appropriate,*  *C - Describes trends in the data* | |
| Describes the trends and patterns in the processed data:   * Links evidence to the trends shown (2 marks, 1 for each piece of evidence, max 2) * Describes the trend(s) shown in the data | 1 - 2  1 |
| * States how the data relates to the hypothesis | 1 |
| A - *Communicates detailed information and concepts logically and clearly, using appropriate scientific language and conventions.*  B *- Communicates information and concepts clearly, using appropriate scientific language and conventions.*  C *- Communicates information and concepts, without detail, using some appropriate terminology and conventions.* | |
| * Explains two physiological responses made by the body during the experiment * Links the physiological responses to the effect on the nerve impulse pathway or the receptors | 1 -2  1 |
| A - Evaluates the experimental method and provides specific relevant suggestions to improve the validity and reliability of the data collected. *Eg Comments on the reliability of the raw data collected, using correct terminology, such as repeat trials or greater number of test subjects, changes that could be made and why they would provide improvement.*  *B - Evaluates the experimental method and provides relevant suggestions to improve the validity and reliability of the data collected but no explanation why.*  *C - Provides general suggestions to improve the investigation or what was wrong.* | |
| * Comments on the reliability of the outcome of the investigation with reasoning * Comments on the validity of the outcomes of the investigation and gives reasoning | 1 - 2  1 - 2 |
| * State a limitations in the data collection strategy that may have affected the accuracy or precision of the raw data collected * Explain in detail, using correct terminology, how the limitation would have affected the results | 1  1 - 2 |
| * Suggests one improvements to the data collection strategy * Evaluates how the strategy would improve the reliability or validity of the experiment using correct terminology | 1  1 - 2 |
| **Total** | **Max 17** |

Conclusion

* summarise your findings and comment on the reliability and validity of the outcome of the investigation

|  |  |
| --- | --- |
| **Description** | **Mark** |
| *A - uses evidence to draw conclusions that support or refute the hypothesis.*  *B - uses evidence to draw conclusions that support or refute the hypothesis.*  *C - draws simple conclusions that may not be linked back to the hypothesis.* | |
| * Uses evidence to support or refute the hypothesis **OR** * States if the hypothesis is supported or not but no real link to evidence | 2  1 |
| * Comments on the validity of the experiment * Links the validity to the hypothesis to explain whether the results have any value | 1  1 |
| **Total** | **Max 4** |