**B6 – Inheritance, Variation and Evolution Learning Journey**

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| 1C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | **Sexual reproduction** involves the joining of male and female **gametes** and produces **variety** in **offspring**. **Asexual** reproduction involves no joining of gametes as it only involves one parent- **offspring** are **clones** so are **genetically identical** to the parent. Organisms are produced by **asexually reproducing** organisms by **mitosis**. Give some advantages and disadvantages of **sexual** and **asexual** reproduction. |
| 2C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | **Gametes** are produced by **meiosis**. The main stages of **meiosis**- the **genetic material** is copied and there is a **cell division**. This is followed by a second **cell division** but the genetic material is not copied. The result of **asexual reproduction** is 4 **daughter** cells with half the genetic information to the parent cell- each cell contains a unique set of genetic information because of crossing over of **chromosomes** (where pairs of chromosomes exchange some genetic material), and the random assortment of genes into the 4 **daughter** cells at the second cell division. **Gametes** join at **fertilisation** to restore the normal number of **chromosomes**. The new cell divides by **mitosis**, and as the **embryo** develops cells **differentiate**.  |
| 3C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | Compare advantages and disadvantages of **sexual** and **asexua**l reproduction. Describe some organisms that use both sexual and asexual reproduction- malarial parasites and many plants and fungi. |
| 4C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | Humans contain 23 pairs of **chromosomes**- 22 **homologous** pairs and a pair of **sex chromosomes**. Males have an X and a Y chromosome; females have 2 X chromosomes. Humans have a 50% chance of having male or female offspring. A **Punnett square** can be used to explain this **probability**. |
| 5 C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | **DNA** is a **polymer** made of 2 strands wound around each other to make a **double helix**. **Chromosomes** are made of **DNA** arranged into **genes**- genes contain the instructions to make a **protein**. The **genome** is the entire set of genetic information in an organism. The human genome project has mapped out all human genes and the chromosomes they are found on. |
| 6C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | **DNA** is made up of four different **nucleotides**. Each **nucleotide** consists of a **sugar- phosphate** backbone and one of four different **bases** attached to the sugar. The bases are Adenosine, Cytosine, Guanine and Thymine. The bases on the two strands of DNA always join together in the same pairs: C with G and T with A. |
| 7C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | **Proteins** are made in **ribosomes**. A copy of the gene for the protein is made in the **nucleus**- this is messenger RNA (**mRNA**). This leaves the **nucleus** and goes to the **ribosome** where its instructions are followed to make the protein. Carrier proteins bring the correct **amino acids** to the **ribosome** in the correct order to join them together and make the **protein**. When this is done, the protein folds into a unique shape and this enables it to do its job. |
| 8C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | Mistakes when copying DNA are called **mutations**. Most **mutations** have little effect but a few have more serious effects on the function of the **protein**. Not all parts of DNA code for **proteins**. Non-coding parts of DNA can switch **genes** on and off, so variations in these areas of DNA may affect how genes are **expressed**. |
| 9C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | Define and use the terms: **gametes**, **alleles**, **genotype**, **phenotype**, **dominant recessive**, **homozygous** and **heterozygous**. Use **Punnett squares** to show inheritance of **traits** controlled by a single gene. |
| 10C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | Use genetic cross diagrams and Punnett squares to show **inheritance** of some **genetic disorders**- **cystic fibrosis** and **polydactyl**. Explain why, for some diseases, there are carriers of the disease who carry disease **alleles** but do not show any **symptoms**. |
| 11C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | Describe how **Mendel’s** work led to our understanding of genetic **inheritance**. |
| 12C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | **Genetic engineering** involves modifying the **genome** of an organism to introduce a desired **characteristic**. This is done by cutting a gene for the desired characteristic from one organism’s genome and inserting it into another. Describe examples such as genetically modified bacteria producing human insulin and genetically engineered crops. Give advantages and disadvantages of genetic engineering. |
| 13C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | Describe plant **cloning** techniques to include: taking plant **cuttings** and **tissue culture**. Describe animal cloning techniques such as **embryo** **transplants** and **adult cell cloning**. Describe advantages and disadvantages of cloning. |
| 14C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | **Variation** may be due to genes **inherited** from parents (inherited variation), the **environment** (environmental variation) or an **interaction** between **genes** and the environment. Describe some variations as being inherited or environmental, or caused by a combination of both. |
| 15C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | **Selective breeding** (artificial selection) is the process by which humans breed plants and animals for useful **characteristics**. Explain how this is done and give advantages and disadvantages of selective breeding as well as some examples- eg. disease or **weather resistant** crops, more attractive or better flavoured fruits and crops that are easier to harvest, cows that produce more milk, and animals that produce more, better flavoured or leaner meat. |
| 16C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | Darwin’s theory of **evolution** by **natural selection** states that all **species** **evolved** from simple life forms that first developed more than three billion years ago.Describe the main stages of natural selection. Evolution can happen on a faster timescale if a **random mutation** occurs which results in the appearance of a beneficial **characteristic**. The definition of a **species** is a group of organisms which can **reproduce** to produce **fertile offspring**. |
| 17C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | **Speciation** is the development of a new **species**. Describe how **speciation** happens as a result of **isolation**, **genetic variation**, **natural selection** and **mutation**.  |
| 18C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | Darwin published his theory of **evolution by natural selection** in 1859. Explain why it was only gradually accepted. Describe the work of Alfred Russel Wallace and Jean-Baptiste Lamarck on natural selection.  |
| 19C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | Explain how **antibiotic resistance** arises. Explain how **fossils** form. Describe **antibiotic resistant** bacteria and **fossils** as evidence for **evolution**. Explain why we can never be totally certain about how life began on Earth because many early forms of life were soft-bodied, so few traces remain. What traces there were have been destroyed by **geological activity**. |
| 20C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | **MRSA** is a type of bacteria resistant to antibiotics. Explain how resistance has arisen and the steps we should take to avoid the development of resistance in bacteria. Explain the consequences of **antibacterial resistance.** |
| 21C:\Users\rca\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\542FDEB4.tmp | **Extinction** may be caused by: changes to the environment over time, new **predators**, new diseases, new, more successful **competitors**, a single **catastrophic event**, eg massive volcanic eruptions or collisions with asteroids. Explain why some organisms are **endangered**. Give examples. Give reasons why it is important to prevent species from becoming **extinct**. |