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EXAM PREPARATION: PAPER 1

SECTION A: TYPICAL EXAM QUESTIONS

Question 1: 8 marks 7 minutes (Taken from IEB November 2009 Paper 1)

The following table shows the effectiveness of some contraceptive measures.

Method of contraception	Number of pregnancies (per 100 women per year)
None	115
Condom, used incorrectly	56
Condom, used correctly	14
The Pill used correctly	0
Vasectomy (male sterilisation)	0

- 1.1 Account for the number of pregnancies where a vasectomy was used as the method of contraception. (2)
 - 1.2 Give one way in which a condom might be 'used incorrectly'. (1)
 - 1.3 Calculate the percentage of all pregnancies that occurred in the year where a condom was used correctly as the method of contraception. (2)
 - 1.4 Give **three** reasons why condom use is encouraged by the South African government even though condoms are not the most effective method of contraception. (3)
- [8]**

Question 2: 12 marks 10 minutes (Taken from DoE November 2009 Paper 1)

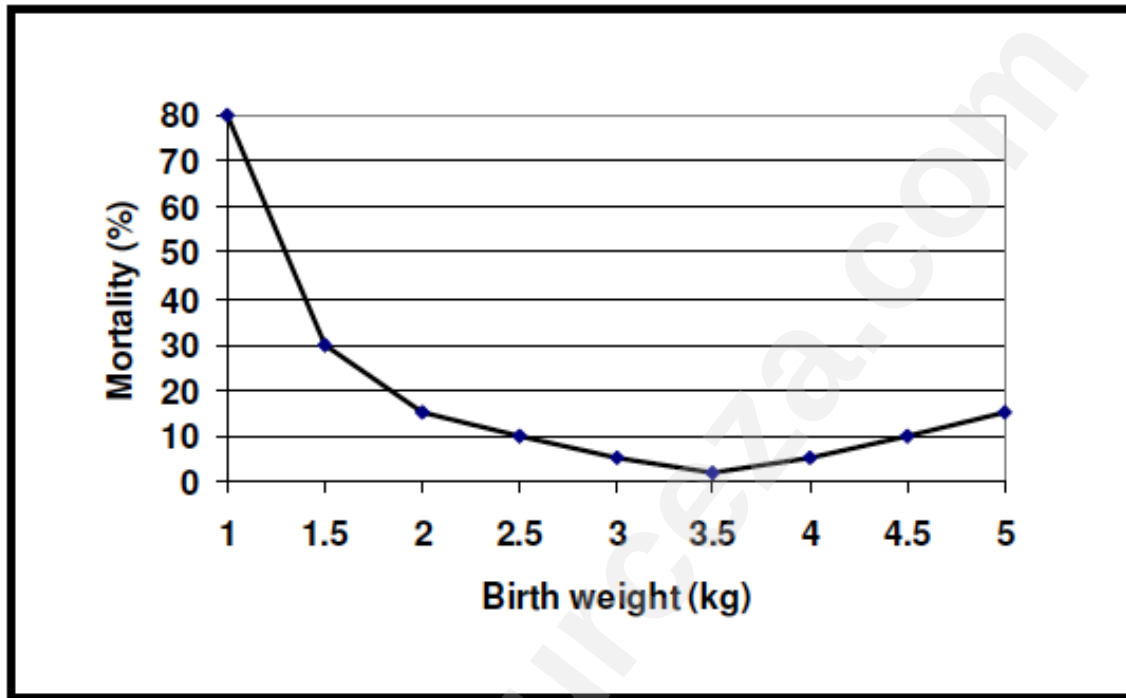
In an experiment to show co-dominance, cows with white fur (W) were crossed with bulls with red fur (R). All the offspring of the F₁-generation have roan fur (RW). A roan fur consists of patches of white and patches of red fur. Roan cows and roan bulls were crossed and the results are given below.

Genotype	RR	RW	WW
Number of offspring	120	240	120

- 2.1. Give the ratio of the different phenotypes shown in the above table. (2)
 - 2.2. Use the information in the table above to draw a pie-chart showing the proportions of the different genotypes. (7)
 - 2.3. Explain why the cows and bulls with genotype RW have roan fur and not only red or only white fur. (3)
- [12]**

Question 3: 15 marks 10 minutes*(Taken from Free State DoE September 2009 Paper 1)*

A group of Grade 12 learners visited a hospital in a city to investigate the relationship between birth weight and mortality rate in new born babies. Their results are shown in the graph below. Study the graph and answer the questions that follow.



- 3.1. What is the optimum birth weight in terms of the lowest newborn mortality rate? (2)
- 3.2. State a hypothesis for this investigation. (2)
- 3.3. Use the data in the graph to draw a table that shows the results they have obtained. (6)
- 3.4. State ONE way how the learners could improve the validity of their results? (1)
- 3.5. Explain the possible relationship between the birth weight and the newborn mortality rate. (4)

[15]**Question 4: 18 marks 13 minutes***(Taken from Free State DoE September 2009 Paper 1)*

The Human Research Council conducted a study of HIV/AIDS prevalence and tested 8 428 people of different ages for HIV/AIDS in 2002. The results are shown in the table below.

AGE	NUMBER	HIV POSITIVE (%)	
		Male	Female
Children (2 – 14)	2 348	5.9	5.2
Youth (15 – 24)	2 099	6.1	12.0
Adults (25+)	3 981	14.1	16.2
TOTAL	8 428	9.5	12.8

- 4.1. Which age group has the highest incidence of HIV+ ? (1)
- 4.2. State a reason for your answer in QUESTION 4.1. (1)
- 4.3. On the same system of axes, draw TWO sets of bar graphs to compare the percentages of HIV+ males with HIV+ females for the THREE different age groups (11)
- 4.4. When the survey was conducted, 13 512 people were asked if they would allow themselves to be tested for HIV but only 8 428 people agreed to be tested. State a possible reason why many people refused to be tested. (1)
- 4.5. The following proposal was made to control the spread of HIV:
All sexually active people should be compelled by law to get a HIV test and to make the results available to any body that needs this information.
- (a) State TWO advantages of this proposal. (2)
- (b) State TWO disadvantages of this proposal. (2)
- [18]

SECTION B: SOLUTIONS AND HINTS – SESSION 36

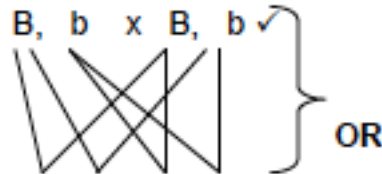
Question 1

[Hint: Homozygous dominant (BB) you will see black in the phenotype; heterozygous (Bb) you will see black in the phenotype because black is the dominant gene for this trait of fur colour; homozygous recessive (bb) you will see white. So, there must be TWO recessive genes for the trait to be seen in the phenotype. Whenever there is a cross between homozygous dominant and homozygous recessive (BB x bb), the offspring will **ALL** only be Bb – B from the one parent (BB) and b from the other parent (bb). B is dominant, so for **complete dominance**, only the dominant trait/characteristic will be seen in the phenotype = all offspring will be black. When there is a heterozygous cross of parents = Bb x Bb, the result of the offspring will be BB, Bb, Bb, bb, so 1:2:1. Remember – you are only working on the possible result of the gene cross. Take note of the layout when you are asked to do a genetic cross. Use a punnett square because you cannot get confused. Remember to show the P₁ and the F₁ – 2 marks for each, so don't leave it out.]

- 1.1 2 – Black ✓ 4 – White ✓ (2)
- 1.2 1BB: 2Bb: 1bb ✓ / 1:2:1 (1)
- 1.3 12 ✓ (1)
- 1.4 P₁ phenotype Black x Black ✓
genotype Bb x Bb ✓

Meiosis

G



Fertilisation

F₁ genotype BB Bb Bb bb ✓
phenotype Black and White ✓

gametes	B	b
B	BB	Bb
b	Bb	bb

1 mark for correct gametes
1 mark for correct genotypes

Parents and offspring ✓ / P₁ & F₁ Meiosis and fertilisation ✓ **any** (6) for Q1.4.

[10]

Question 2

- 2.1 As age of mother increases ✓ chances of having a Down's syndrome baby increases ✓
(2)
- 2.2 8 ✓ (1)
- 2.3 47 ✓ (1)
- 2.4 During gamete formation ✓ / Anaphase I/ meiosis I the chromosome pair 21 does not separate ✓
Could also occur during meiosis II non-disjunction ✓
Failure of chromatids to separate ✓
One gamete will have an extra chromosome ✓ / 24 chromosome
If this gamete fuses with a normal gamete with 23 chromosomes ✓ the resulting zygote will have 47 chromosomes ✓ **any** (4)

[8]

Question 3

- 3.1 A – Nuclear membrane ✓
B – mRNA/RNA ✓
D – DNA ✓ (3)
- 3.2 - Carrying hereditary characteristics from parents to their offspring ✓
- Controls the synthesis (manufacturing) of proteins ✓
- Controls the structure and functioning of cells (**Mark first ONE only**) (1)

- 3.3 Transcription ✓ (1)
[Hint: you must learn the definitions for **Transcription** and **Translation**. You must learn when each of the processes takes place. Remember it like this: **trans** = to move or transfer and **script** = to write, so the process is the writing/copying of the one side of a DNA strand so that it can be taken or transferred to another location. For translation – see the answer to question 3.6.]
- 3.4 Enzymes ✓ (1)
- 3.5 Ribosome ✓ (1)
- 3.6 Translation ✓ (1)
- The mRNA strand from the nucleus becomes attached ✓ to a ribosome with its codons exposed ✓
 - each tRNA molecule carrying a specific amino acid ✓ according to its anticodon ✓
 - matches up with/complements the codon of the mRNA ✓
 - so that the amino acids are placed in the correct sequence ✓
 - adjacent amino acids are linked ✓ - to form a protein ✓ **any** (5) **[13]**

Question 4

- 4.1 To allow air to pass in and out ✓ / oxygen and carbon dioxide / gaseous exchange
 To prevent the fruit flies from escaping ✓ **(Mark first TWO only)** (2)
- 4.2 Repeat the investigation ✓
 Use a bigger sample ✓ / more flasks
 Use other organisms ✓ **(Mark first ONE only)** (1)

[Hint: in questions about experiments, you will most often be asked how you would improve the reliability of your results. The same answers will apply as those in question 4.2. The more times you repeat the investigation, the more accurate your results will be. The larger the sample that you use (more samples), the better the percentage of your results. Think about this: if there are only 10 people in the class and everyone passes – it means only 10 people passed so the 100% pass rate is expected. But if there are 100 people in the class, the chances are that not all will pass so the result average will be different. If you are trying to prove a characteristic that is special to one species of organism, then you will try to use individuals from the same species. For reliable results, you need to think about what variable you can remove from the investigation to make sure that only the variables that you select will impact the results. Example: if I am investigating the growth of seed and the rate of germination, then I would use seeds from the same parent plant so that I remove the variable of different genetics. This will remove a variable that may impact my results. So, repeat investigation a number of times; use more samples; ensure readings/results are accurate; and then depending on the question/investigation – consider time, genetic make-up, variety etc.]

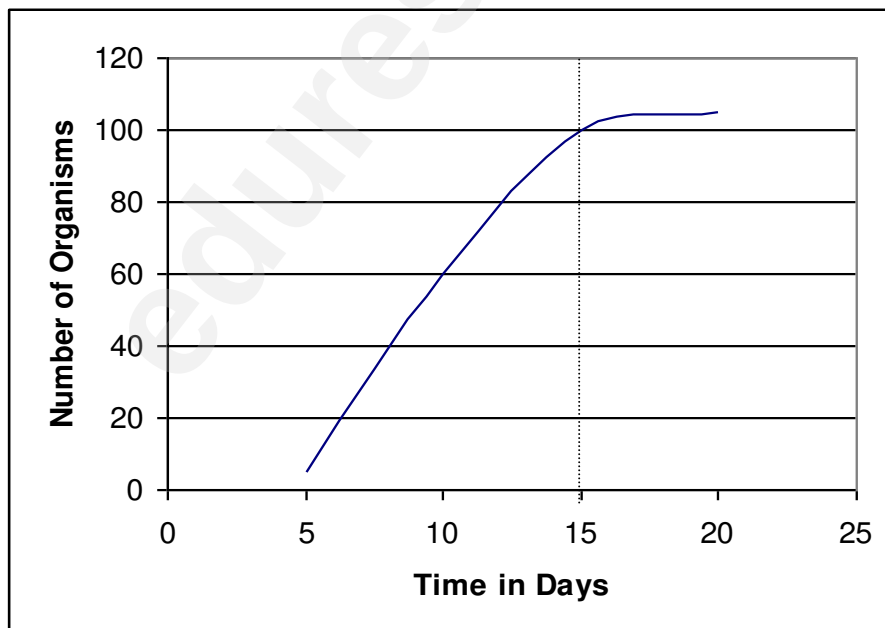
- 4.3 (a) RR ✓ Rr ✓
 (b) rr ✓ (3)
[Hint: Refer to question 1 for explanation of ratios for genotypes] **[6]**

GENERAL INFORMATION ABOUT GRAPHS: PLEASE LEARN WELL

In Life Sciences, **research** is conducted. The **data** is collected and **recorded** in the form of a table. The information may then be presented in **graph form**.

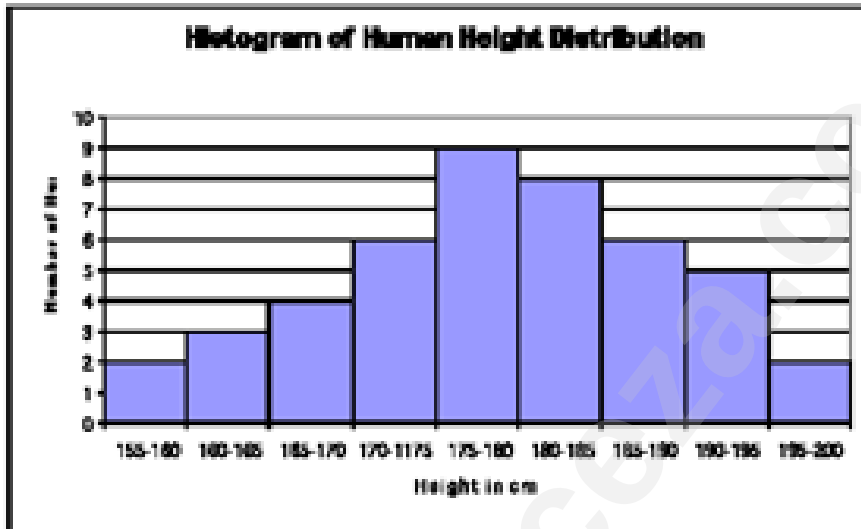
Line graphs:

- **Heading:** Remember to always give the graph a title or heading. It tells the reader what the graph represents.
- **Axes:** The X axis is drawn across the page. The Y-axis is drawn vertically to the X-axis. The point where the two axes meet is called the **origin**. The value of the origin is usually 0 (zero).
- Line graphs show the **relationship** between the dependant and independent variables. **Independent variables are graphed on the X-axis.** The researcher can control these variables e.g., time, temperature, pH. **The dependant variable** “depends” on the independent variable. It reflects the changes, results or outcomes of the experiment. It is **graphed on the Y-axis.** The y-axis indicates the result/ number of organisms/ rate of reactions etc.
- **Label the x and y-axes:** Indicate what the x-axis and what the y-axis represents. Always include the measurements using SI units, e.g., Temperature ($^{\circ}\text{C}$), Length of growth (mm).
- **Scale:** Choosing the correct scale is important. Study the results. Always look at the lowest and highest values to decide on the scale e.g., Lowest = 0 and the highest = 50. In this case, the axis values will be from 0 to 50.
- **Spacing:** When numbering the X and Y axis, use $\frac{1}{2}$ cm, 1cm or 2cm spacing. The spacing must be the **same** for both axes, irrespective of the units used.
- **Co-ordinates:** When joining the points, draw a smooth, free hand line. Always use a pencil to join the co-ordinates.
- **Reading information:** Use a ruler and pencil. Draw a straight line through the graphed line from the X-axis and again from the information required on the Y-axis. The pencil lines should **cross** on the graphed line. As an example, from the graph determine the number of organisms after 15 days. Number of organisms = 100.



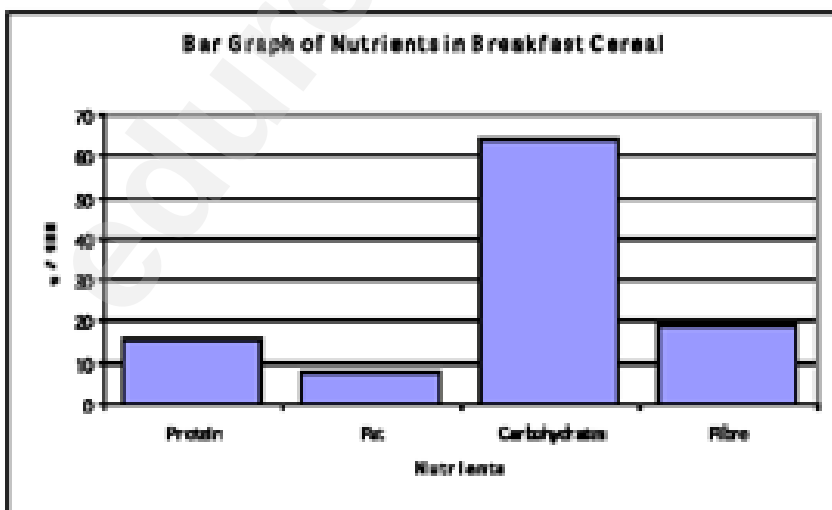
Histograms:

- These graphs look **similar to bar graphs**.
- A histogram is used, when the values represented on the x-axis are **separate groups** or categories of **similar** data.
- Each column must be the **same width**.
- A histogram shows a trend clearly.



Bar Graphs:

- Bar graphs are used when the **independent variable** is **not** a number, but has a certain quality, e.g.: blood group of type, animal type or food type.
- The values are represented in columns.
- There is **no size** and the categories are **not continuous**, yet they are **different** from one another. There are always **spaces** in between the bars, to show that they are not continuous.
- Bar graphs look like histograms **with spaces**.



Pie Charts:

- Pie charts illustrate the **proportions** of an identifiable whole. The **data** is a proportion of the **total**, draw as a circle.
- The complete circle represents the **total or 100%**.
- The circle is divided into **sectors** (like the pieces of a pie). The sector (piece) of this circle represents the **percentage** of the total for each series.
- It shows the **relative portion** of each of the parts.
- Pie charts are normally arranged in a **clockwise** direction, from smallest sector to the largest sector, starting at 12 o'clock. The angles of each sector can be determined using the following formula:

$$D = \frac{V \times 360}{T}$$

Where:

D = the angle of the sector in degrees

V = the actual amount of the variable

T = the grand total (100%)

If you have to find the angle of the sector for 35%:

$$\frac{35}{100} \times 360^\circ = \frac{12\ 600}{100} = 126^\circ$$

If you have to determine the percentage represented by 94° :

$$\frac{94^\circ}{360^\circ} = 0.26 \times 100 = 26\%$$

