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ST DOMINIC'S SCHOOL FOR GIRLS

 GRADE 12 LIFE SCIENCES
 PRELIMINARY EXAMINATION PAPER 1
 2024

MEMORANDUM

1.1

Question	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	1.1.7	1.1.8	1.1.9	1.1.10
Answer	D✓	I✓	F✓	A✓	C✓	L✓	K✓	B✓	E✓	G✓

1.2

Question	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	1.2.7	1.2.8	1.2.9	1.2.10
Answer	B✓	C✓	D✓	C✓	A✓	B✓	B✓	D✓	C✓	B✓

1.3.1 B ONLY✓

1.3.2 A ONLY✓

1.3.3 BOTH✓

1.3.4 NEITHER✓

1.3.5 B ONLY✓

1.4.1 ✓✓✓✓

Scale bar measurement / value of scale bar = diagram measurement / actual size of animal

$$15 \text{ mm} / 1 \text{ mm} = 7 \text{ mm} / X$$

$$X = 7 \text{ mm} / 15$$

$$X = 0.46 \text{ mm (Range 0,46-0,6 mm)}$$

$$\frac{M}{A} = \frac{I}{A} \quad \text{for scale bar}$$

$$\frac{M}{A} = \frac{I}{A} \quad \text{for drawing}$$

$$\frac{I}{A} = \frac{I}{(A)} = X$$

1.4.2 a) TIME✓

b) 0,4 mm✓

~~*~~ c) AS MOON SHELLS EVOLVED✓ THEY MADE BIGGER HOLES✓ IN BRACHIOPOD CELLS.

→ d) BRACHIOPOD SHELLS BECOME THICKER✓ / HARDER /

e) THEY MEASURED 7000 SHELLS✓✓ / MANY FOSSILS (✓)

f) DRAWING ON GRAPH✓✓

1.5 a) POLYDACTYLY – H NORMAL FINGERS – h✓

b) 1 – hh; ✓ 2 – Hh; ✓ 3 – Hh✓

c) THE MUTATION IS CARRIED SOMEWHERE ON CHROMOSOME 1-22. ✓

IT WILL ALWAYS BE EXPRESSED IF PRESENT✓

d) P1 GENERATION: PHENOTYPE: AFFECTED MALE X NORMAL FEMALE

GENOTYPE: Hh ✓ X hh✓

GAMETES: H OR h X h OR h

PUNNETT DIAGRAM: ✓✓

	H	h
h	Hh	hh
h	Hh	hh

F1 GENERATION: PHENOTYPE: 50% POLYDACTYL✓ : 50% NORMAL✓

GENOTYPE: 50% Hh : 50% hh✓

1.6.1 $P = (M \times C)/R$ ✓

$P = (23 \times 29) ✓ / 11✓$

$P = 60✓$

1.6.2 TAGS MUST NOT MAKE THE RAT VISIBLE TO PREDATORS✓

TAGS MUST NOT AFFECT THE BEHAVIOUR OF THE RAT✓

TAGS MUST REMAIN ON THE ANIMAL FOR THE DURATION OF THE EXPERIMENT✓

1.6.3 a) A – ACCELERATING GROWTH: THE POPULATION IS GROWING EXPONENTIALLY / THERE ARE ENOUGH RESOURCES✓✓

B – DECELERATING GROWTH: POPULATION IS GROWING AT A SLOWER SPEED / AS IT APPROACHES CARRYING CAPACITY✓✓

b) COMPETITION FOR FOOD✓; COMPETITION FOR WATER✓; COMPETITION FOR SPACE✓; PREDATION (any 3 density dependent)

1.7.1 IN THE INLAND HABITAT BROWN MICE ARE ATTACKED FEWER TIMES THAN THE LIGHTER MICE✓

IN THE SAND DUNE HABITAT BROWN MICE WERE ATTACKED MORE TIMES. ✓

THIS SHOWS THAT FUR COLOUR EVOLVED A BROWN COLOUR✓ IN THE INLAND HABITAT DUE TO NATURAL SELECTION ✓FROM PREDATORS.

1.7.2 THE POPULATION OF MICE THAT INHABITED THE COAST HAD VARIABLE COLOURS FROM BROWN TO LIGHT COLOUR✓

PREDATORS IN THE COAST PREYED ON THE MICE. ✓

THE BROWN COLOUR MICE WERE CAUGHT AND EATEN MORE OFTEN, THEIR ALLELES ARE REMOVED FROM THE POPULATION✓

THE LIGHT COLOUR MICE BRED AND PASSED THEIR ALLELES ON TO OFFSPRING✓

THE FUR COLOUR OF THE POPULATION OF MICE CHANGES TO THE LIGHTER COLOUR✓

1.7.3

	Natural selection	Artificial Selection
1. Cause of change	ENVIRONMENT✓	HUMAN✓
2. Rate of change	SLOW✓	FAST✓
3. Variation	INCREASE IN VARIATION✓	DECREASE IN VARIATION✓

QUESTION 2

2.1.1 DROUGHT CAUSED A SELECTION PRESSURE ON THE FINCHES✓

A LACK OF SMALL SEEDS MEANT THE SEEDS FOR FOOD WERE LARGER✓

FINCHES WITH BIGGER BEAKS ATE THE SEEDS✓

BIG BEAK TRAIT WAS PASSED ONTO THE NEXT GENERATION✓

2.1.2 CONTINUOUS VARIATION; THERE IS A RANGE OF BEAK SIZES INSTEAD OF TWO DISTINCT GROUPS. ✓✓

2.1.3 a) 10,5 mm✓✓

b) 50✓✓

2.1.4 DRAWING OF GRAPH. PEAK SKEWED TOWARDS A BIG SIZE✓✓✓

2.2.1 FALSE✓

2.2.2 TRUE✓

2.2.3 FALSE✓

2.2.4 TRUE✓

2.2.5 FALSE✓



2.3.1 ALLOPATRIC SPECIATION✓

2.3.2 SHRIMP NEAR PANAMA WERE ORIGINALLY SINGLE SPECIES✓

THE CENTRAL AMERICAN ISTHMUS SEPARATED THE POPULATION✓

NATURAL SELECTION WAS DIFFERENT ON BOTH SIDES✓

DIFFERENT SPECIES OF SHRIMP EVOLVED✓

FLOW DIAGRAM ✓✓

2.3.3 a) THEY WERE AGGRESSIVE✓

b) DIFFERENT MATING TIME; ✓✓ MATING BEHAVIOUR;

2.4.1 Australopithecus robustus✓

2.4.2 Homo erectus✓

2.4.3 COMPLEX SOCIAL BEHAVIOUR✓; LARGE BRAIN✓; (NOT BIPEDALISM)

2.5.1 HOMOLOGOUS STRUCTURES✓

2.5.2 TRANSITIONAL FOSSILS SHOW INTERMEDIATE FEATURES BETWEEN EXTINCT SPECIES AND MORE MODERN EXTANT SPECIES✓✓ / SHOWED THAT SPECIES CHANGED OVER TIME (✓)

2.5.3 POSITION OF FORAMEN MAGNUM✓✓

S-SHAPED SPINE✓✓

ANGLE OF FEMUR

SHAPE OF PELVIS

QUESTION 3

3.1.1 PROTEIN SYNTHESIS✓

3.1.2 a) C✓

b) B✓

c) A✓

3.1.3 C-E-D-A-B✓✓

3.1.4 UCG✓-GAU✓-UAC✓

3.2 a) THE HUMAN GENOME PROJECT WAS SET UP TO MAP THE ENTIRE HUMAN GENOME✓✓ / TO DETERMINE THE ENTIRE SEQUENCE OF DNA NUCLEOTIDES IN THE HUMAN NUCLEUS

b) IDENTIFY GENETIC DISEASES✓✓

DESIGN SPECIFIC MEDICINES BASED ON HUMAN DNA✓✓

(many answers possible)

3.3.1 TYPE 1 – ADDITION / INSERTION MUTATION✓

TYPE 2 – DELETION MUTATION✓

TYPE 3 – SUBSTITUTION MUTATION✓

3.3.2 A SUBSTITUTION MUTATION ADDS A NUCLEOTIDE WHICH MEANS THAT THE DNA WILL CODE FOR A DIFFERENT AMINO ACID WHICH IS ADDED TO THE PROTEIN STRAND. ✓

3.3.3 BENEFICIAL MUTATIONS✓ THESE MUTATIONS ALLOW FOR A BENEFICIAL TRAIT ✓ TO BENEFIT THE ORGANISM✓ IT WILL THEN BE PASSED ON TO THE NEXT GENERATION✓

3.4.1 YES✓ WE SEE IN 2005 8 OUT 9 INSECT SPECIES WERE KILLED BY THE Bt TOXIN✓ IN 2011 ONLY 4 OUT OF 13 INSECT SPECIES WERE KILLED BY Bt TOXIN✓

3.4.2 THERE WERE DIFFERENT NUMBER OF INSECT SPECIES SURVEYED BETWEEN 2005 AND 2011✓✓

3.4.3 YES, GM CROPS ARE MODIFIED IN A PARTICULAR WAY TO BENEFIT CROPS AND THESE MODIFIED GENES MY "ESCAPE" AND EXIST IN WEEDS OR WILD SPECIES✓✓

THE GM PROTEIN MAY BE HARMFUL TO HUMANS IF CONSUMED✓✓

WE DON'T KNOW THE LONG TERM EFFECTS /

THESE CROPS ARE EXPENSIVE AND SEEDS OFTEN CANNOT REGERMINATE AND MUST BE BOUGHT.

OR

NO, THERE IS GREAT FOOD SHORTAGE AND GM CROPS USUALLY PRODUCE MORE FOOD✓✓

GM CROPS HAVE NOT CAUSED ANY DISEASES✓✓

3.5.1 NO, KEEPING A DNA DATA BASE IS EXPENSIVE✓✓

ONE CANNOT SAMPLE ALL THE CATS✓✓

NOT ALL CRIME SCENES WILL INVOLVE CATS

OR

YES, IT IS AN EASY WAY TO TRACE CRIMINALS✓ / SA HAS A HIGH CRIME RATE✓

SOLVING CRIMES WILL BE QUICKER✓ / CATS HAVE MANY MUTATIONS MAKING TRACKING EVIDENCE EASIER✓

3.5.2 CAT2✓ THE BANDS ✓ OF THE GENETIC FINGERPRINT MATCH THE POSITIONS OF THE BANDS OF THE CAT DNA FOUND ON THE CRIMINALS JACKET✓

3.5.3 TO ENSURE THEY HAVE OTHER SAMPLES TO COMPARE ✓ TO AND TO ELIMINATE OTHER CATS AS CONTRIBUTORS TO THE CAT FUR AT THE CRIME SCENE✓

QUESTION 4

- 4.1.1 A GROUP✓ OF SIMILAR ORGANISMS OF THE SAME SPECIES ✓ THAT OCCUPY THE SAME HABITAT✓
- 4.1.2 a) NATALITY✓ AND IMMIGRATION✓
b) MORTALITY✓ AND EMIGRATION✓
- 4.2.1 DENSITY DEPENDENT PARAMETERS REDUCE THE POPULATION SIZE WHEN THE POPULATION GOES TO LARGE✓✓
DENSITY INDEPENDENT PARAMETERS REDUCE POPULATION SIZE IRRESPECTIVE OF THE POPULATION SIZE✓✓
- 4.2.2 MUTUALISM – BOTH ORGANISMS BENEFIT IN A CLOSE RELATIONSHIP WITH EACH OTHER✓✓
COMMENSALISM – ONE ORGANISM BENEFITS AND THE OTHER ORGANISM IS NOT HARMED OR BENEFITTED FROM THE RELATIONSHIP✓✓
- 4.3.1 a) LIONS/HYAENAS/IMPALA COMPETING FOR FOOD✓
b) LIONS COMPETING WITH HYAENAS✓
c) LIONS FEEDING ON IMPALA✓
d) VEGETATION WHICH IS FOOD FOR IMPALA / PREDATION✓
- 4.3.2 DIAGRAM OF A FOOD CHAIN✓✓✓✓
- 4.3.3 THE VEGETATION HAS NOT RECOVERED AND SO THE IMPALA ARE STILL DYING FROM STARVATION✓✓
- 4.3.4 THE IMPALA POPULATION PREVENTED THE RECOVERY OF THE VEGETATION✓✓
- 4.3.5 THE POPULATION SIZE THAT THE ENVIRONMENT IS ABLE TO SUPPORT✓✓
- 4.4.1 INTERSPECIFIC COMPETITION IS REDUCED BECAUSE OF THE DIFFERENT FEEDING STRATEGIES OF THE BIRDS✓✓
- 4.4.2 THE OUTCOME IS NICHE PARTITIONING / COMPETITIVE EXCLUSION✓ EACH SPECIES WILL FEED IN A UNIQUE WAY AND SHARE RESOURCES ✓ AND ALLOW FOR MULTIPLE SPECIES TO SURVIVE✓
- 4.5.1 THE LARVAE REQUIRE THE SAME HABITAT AS THE ADULTS. ✓ ADULTS WILL COMPETE WITH THE LARVAE AND PREVENT THEM FROM SETTLING ON THE ROCKS✓
- 4.5.2 NO✓, CHTHALAMUS CANNOT SURVIVE HIGHER UP ON THE SHORELINE✓
- 4.5.3 COMPETITIVE EXCLUSION✓ THE BALANUS SPECIES OUTCOMPETES THE CHTHALAMUS WHICH BECAME EXTINCT ON THE SHORELINE✓