Markscheme

TutorChase Prediction Paper

Biology

Higher level

Paper 1B

5 Pages

Question	Answers	Notes	Total
1 a	Central America **C1** and **C2** share the most recent common ancestor;	—	**1**
1 b	**Node** = hypothetical common ancestor/point of divergence; **Clade** = group including an ancestor and **all** its descendants;	Either wording accepted; order not required.	**2**
1 c	Europe **E1** is closer to **C2** than to **A1**; because the E1–C2 path meets at a more recent node/shorter branch distance than E1–A1;	Both parts required for full credit.	**2**
1 d	Molecular clock converts sequence difference (genes/proteins) to time using an assumed mutation rate; requires calibration with at least one known divergence; **limitation**: mutation rates can vary among lineages/genes or with selection/generation time so estimates are uncertain;	Award any **3** valid points; OWTTE allowed.	**3**
1 e	Duffy-negative phenotype common in Africa prevents *P. vivax* invasion; non-African populations lacked this resistance allowing diversification elsewhere;	Accept any plausible, selection-based mechanism.	**1**

2 a	~50–55% saturation at **5.0 kPa**;	Accept **48–58%** for tolerance in graph reading.	**1**
2 b	Change in saturation from ~30% (4 kPa) to ~75% (8 kPa) ≈ **+45 percentage points**;	Credit **+40 to +50** with working shown.	**2**
2 c	**Haem** / heme (iron-containing group);	—	**1**
2 d	Cooperative binding: binding of first O_2 increases affinity at remaining sites (T → R conformational change) giving shallow–steep–plateau sigmoidal curve;	Award **2** clear points.	**2**
2 e	Foetal Hb has **higher O_2 affinity** (left-shifted curve); at the same placental pO_2, foetal blood is more saturated while maternal Hb releases O_2; facilitates transfer across placental villi;	All three ideas for full credit.	**3**

3 a	**A** = synaptic vesicles; **B** = synaptic cleft; **C** = postsynaptic membrane/postsynaptic density;	**Marking:** 0 correct = 0; **1–2 correct = 1**; **all 3 correct = 2**. Accept “vesicles” for A; accept “motor end plate” for C.	**2**
3 b	Vesicles bud from trans-Golgi/endosomal pool; clathrin-mediated endocytosis replenishes vesicles after release; vesicles traffic along cytoskeleton (e.g. kinesin on microtubules) to active zone and **dock/prime via SNAREs** for Ca^{2+}-triggered fusion;	Any **3** distinct steps; award once only for each process.	**3**
3 c	ACh persists in cleft → prolonged receptor activation → sustained depolarization/end-plate potential; voltage-gated Na^{+} channels inactivate / failure to repolarize properly; abnormal muscle control (spasms or paralysis, dose-dependent);	Award **1** each; physiological consequence must be stated.	**3**
4 a	**Meiosis II** (sister chromatids of chromosome **N** fail to separate);	—	**1**
4 b	Gametes for chromosome **N**: **n+1, n−1, n, n**;	Order not required.	**2**

4 c	Fusion of **n+1** with normal gamete → **trisomy (2n+1)**; fusion of **n−1** with normal gamete → **monosomy (2n−1)**; either may reduce viability;	Any **2** correct outcomes.	**2**
4 d	**Expected** = 40 : 40; **χ^2** = $\Sigma((O-E)^2/E)$ = $(58-40)^2/40 + (22-40)^2/40$ = 324/40 + 324/40 = **16.2**; **df** = 1, critical χ^2 = **3.84** ⇒ **reject** null hypothesis; deviation **significant**, not consistent with 1:1 ratio;	Calculation (**2**); decision with comparison (**1**); conclusion stated (**1**). Allow correctly set-out table. ECF for arithmetic applied consistently.	**4**