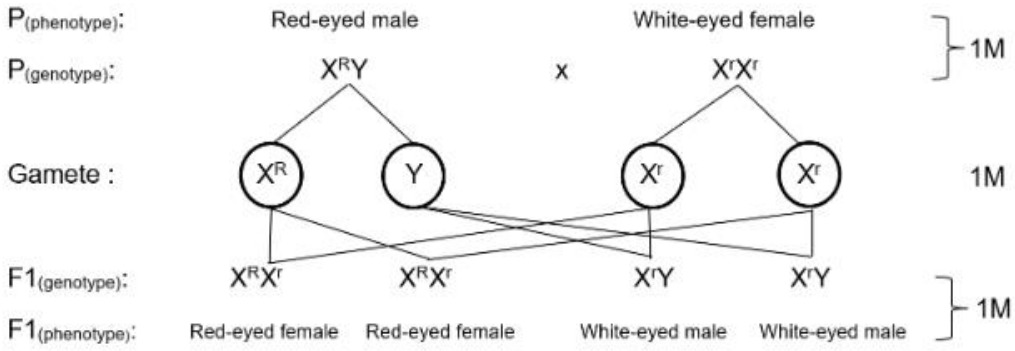
SKEMA JAWAPAN TRIAL PSPM SET A 20232024

NO	ANSWER	MARKS
1(a)	1. There are 4 stages in mitosis, that is **prophase, metaphase, anaphase and telophase** 2. During prophase, chromatin / chromosome shortens, thicken and condense 3. Each chromosome consists of 2 / a pair of sister chromatids attached together at centromere 4. During metaphase, chromosomes align at equatorial / metaphase plate 5. During Anaphase, sister chromatids separate and move to the opposite poles 6. During Telophase, chromosomes reach at the opposite poles 7. Chromosome uncoil and lengthen / less dense / decondense Sequence must be correct. Otherwise minus 1 mark	Any 5
(b)	(i) Anaphase I	1
	(ii) In anaphase I, homologous chromosome / bivalent / tetrad separate and move to opposite poles while in anaphase sister chromatid separate and move to opposite poles.	1
	TOTAL	**7**
2(a)	(i) Tall: TT Dwarfness: tt	1 1
	(ii) Tt	1
	(iii) 3 tall : 1 dwarf	1
(b)	(i) Linked gene with crossing over	1
	(ii) 1 wild type/grey normal : 1 Black normal : 1 Black vestigial :1 Grey vestigial	1
	(iii) Because the gene encoding for the body colour and wing type are linked / the two genes are located on the same chromosome and crossing over occur.	1
(c)	Let R, dominant allele for red eye and r, recessive allele for white eye  	1 1 1
(d)	(i) Incomplete dominance	1
	(ii) C^RC^R x C^WC^W C^RC^R x C^RC^R / self cross of C^RC^R C^RC^W x C^RC^R	1 1
	TOTAL	**13**

3(a)	• Allele frequencies & genotype frequencies in a population does not change / remain constant from generation to generation under certain condition • Such as large population / No net mutation / Random mating / No migration / No natural selection	**1** (Any 1)
(b)	• Frequency of Rh- individuals, q^2 = 98/600 = 0.163 • Frequency of recessive allele, q = $\sqrt{}$ 0.163 = 0.404 • Frequency of domimant allele, p = 1 – q = 1 – 0.404 = 0.596 • Frenquency Rh+ individuals with r allele, 2pq = 2(0.596)(0.404) = 0.482	1 1 1 1
	TOTAL	**6**
4(a)	(i)B : 3'- CTA TGT ACC TTAAGG TAC GACT -5' C : 5'- GAU ACA UGGAAUUCC AUGCUGA-3'	1 1
	(ii)mRNA Function: (carry genetic information copied from DNA which) act as a template for translation during protein synthesis	1 1
(b)	1. It is an <u>elongation</u> process. Involves 3 steps. **1. <u>Codon recognition</u>** 2. During <u>codon recognition</u>, aminoacyl-tRNA / tRNA with specific amino acid enters the empty A site 3. This tRNA's anticodon is complementary to the mRNA's codon / by complementary base pairings between the tRNA's anticodon & the mRNAs codon **4. *<u>Formation of peptide bond</u>** 5. Condensation / reaction occurs / peptide bond is formed between carboxyl group of amino acid in P site and amino group of amino acid in A site 6. Catalysed by peptidyl transferase 7. This step removes the amino acid / growing polypeptide chain attached to the tRNA in the P site and linked/join/binds it to the amino acid attached to the tRNA in the A site **7. <u>Translocation</u>** 8. Ribosome moves a codon ahead 9. from 5' to 3' direction 10. tRNA in the A site is translocated / shifted to the P site 11. the free tRNA (in P site) is translocated to the E site 12. tRNA in E site is released 13. A new aminoacyl-tRNA enters the empty A site to translate the next codon 14. The process is repeated until complete polypeptide chain is formed / it reach stop codon 15. Energy is supplied by hydrolysis of GTP (in codon recognition and translocation).	**1** **P1, 4 & 7 wajib**
	Max	**10**
	TOTAL	**14**

5(a)	(i) Base substitution	1
	(ii) 1. It occurs when one nucleotide is replaced/substitutes with another nucleotide 2. It causes missense mutation 3. results in the change of one amino acid in the polypeptide 4. Activity of protein/enzyme/hormone may decrease	 1 1 1 1 (any 2)
	(iii) 1. One or more nucleotides is removed from the genetic material/DNA 2. Result in frame shift mutation 3. Triplet code / codon / reading frame of mRNA codon is shifted / changed 4. That changes all amino acid sequence at & after the point of deletion 5. Cause a serious effect 6. Different proteins are produced	 1 1 1 1 1 1 Any 4
	Max	7
(b)	(i) Allopolyploidy (ii) 19	1 1
	(iii) ● When chromosome doubling occurs, homologous chromosomes is present ● able to undergo synapsis / meiosis, thus able to produce gamete	 1 1
	Max	4
	TOTAL	**11**
6(a)	● Cloning vector is DNA molecule/agent that carry the DNA fragment/target DNA into a host cell ● It has multiple cloning sites so that various restriction enzyme can be used to cut the restriction site//to insert target gene into cloning vector ● It has origin of replication that enables the vector to replicate independently in the host cell//to amplify target gene in host cell ● It has selectable marker gene that useful in screening process	1 1 1 1
	Max	4
(b)	(i) 5' GAATTC 3'	1
	(ii)The base sequence on both/each DNA strands are identical in 5' to 3' direction / the base sequence of one strand reads the same as its complement in the 5' to 3' direction	1
	(iii) ● EcoRI ● Identify specific sequence & cut within the (palindromic) sequence ● It makes a staggered cut on both DNA strands // produces sticky ends ● by cutting (the phosphodiester bond) between the nucleotide / base guanine and adenine	 **1** 1 1 1 (any 2)
	(iv)  	1
	(v) ● It will be inserted into the plasmid/cloning vector (cut with the same RE) ● DNA ligase is used to join both target gene and plasmid ● To form recombinant DNA ● By catalyzing the formation of phosphodiester bond between sugar phosphate backbone	 1 1 1 1 (any 3)
	Max	9
	TOTAL	**13**

7(a)	(i) granulosa cell	1
	(ii) alter / inactivate the sperm receptors on zona pellucida / secondary oocyte's membrane // structure F will become impenetrable to other sperm	1
	(iii) metaphase II	1
	(iv) The primary oocyte is diploid (2n) while the secondary oocyte is haploid (n). The primary oocyte contains full sets of chromosomes while secondary oocyte has half the number of chromosomes.	1/0
	Max	4
(b)	1. There are 4 stages in fertilization, capacitation, acrosomal reaction, fusion of sperm head membrane & secondary oocyte and cortical reaction 2. During capacitation, sperm undergoes maturation/glycoprotein coat/ plasma protein in the head of sperm cell is removed 3. Sperms bind to receptor ZP3 on zona pellucida 4. Which triggers acrosomal reaction 5. Acrosome releases acrosin / hydrolytic enzymes / hyaluronidase by exocytosis to digest zona pellucida 6. Sperm binds to receptor on secondary oocyte's membrane 7. and fuse with it 8. Lastly, cortical reaction occurs 9. Cortical granules releases enzymes by exocytosis to alter the receptor on zona pellucida / secondary oocyte's membrane 10. To block other sperms from entering secondary oocyte / polyspermy 11. Secondary oocyte completes its second meiotic division to form ovum and second polar body 12. Male and female pronuclei fuse to form diploid zygote	
	Max	8
(c)	(i) ● The first leaf emerges ● and start photosynthesis to synthesize organic substance	 1 1
	(ii) ● Maize plant growth pattern consists of one sigmoid curve while Meranti tree growth pattern consists of series of sigmoid curves. ● Maize plant growth pattern is limited / definite until reach maturity while Meranti tree growth pattern is unlimited growth / grow continuously throughout life.	 1 1
	Max	4
	TOTAL	**16**