UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2005/2006

April/Mei 2006

BOM 114/4 – Basic Genetics
[Genetik Asas]

Duration : 3 hours

[Masa: 3 jam]

Please ensure that this examination paper contains SIX printed pages and ONE page of Attachment before you begin the examination.

Answer FIVE out of SIX questions, in English or Bahasa Malaysia.

Each question carries 20 marks.

Sila pastikan bahawa kertas peperiksaan ini mengandungi ENAM muka surat yang bercetak dan SATU muka surat Lampiran sebelum anda memulakan peperiksaan ini.

Jawab LIMA daripada ENAM soalan yang diberikan dalam Bahasa Inggeris atau Bahasa Malaysia.

Tiap-tiap soalan bernilai 20 markah.

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1. Heterozygous black cats (Cc) are crossed among themselves.

[a] What is the probability of the first three offsprings being alternately black-white-black or white-black-white?

(5 marks)

[b] Among the three offsprings produced, what is the probability of getting two black and one white in any order?

(5 marks)

[c] Describe briefly factors that change allele frequency in a population.

(5 marks)

[d] Describe briefly the terms epistasis, linked gene, incomplete dominance and sex mosaic.

(5 marks)

1. Kucing hitam heterogizot (Cc) dikacukkan sesama sendiri.

[a] Apakah kebarangkalian tiga anak pertama berselang-seli hitam-putih-hitam atau putih-hitam-putih?

(5 markah)

[b] Antara tiga ekor anak yang dihasilkan, apakah kebarangkalian untuk mendapat dua anak hitam dan satu anak putih dalam mana-mana turutan?

(5 markah)

[c] Terangkan dengan ringkas faktor-faktor yang mengubah frekuensi alel di dalam suatu populasi.

(5 markah)

d] Terangkan dengan ringkas istilah epistasis, gen terangkai, kedominanan tak sepenuh dan mosaik seks.

(5 markah)

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2. In the pea plant, yellow seed is dominant to green, and round seed is dominant to the wrinkled form. When both of these traits were considered jointly in self-fertilised dihybrid, the progeny produced were as follows:

Green, round – 193
Yellow, wrinkled – 184
Yellow, round – 556
Green, wrinkled – 61

Test the data for independent assortment by using the Chi-square test.

(20 marks)

2. *Dalam pokok pea, biji kuning adalah dominan kepada hijau dan biji bulat adalah dominan kepada bentuk kedut. Apabila kedua-dua ciri tersebut bergabung di dalam kacukan dihibrid sesama sendiri, progeni yang dihasilkan adalah seperti berikut:*

Hijau, bulat – 193
Kuning, kedut – 184
Kuning, bulat – 556
Hijau, kedut – 61

Uji data tersebut untuk prinsip pemilihan bebas dengan menggunakan ujian Chi-kuasa dua.

(20 markah)

...4/-

3. [a] With the aid of labeled diagrams, describe gametogenesis in animals.

(10 marks)

[b] Prove the Hardy-Weinberg law by finding the frequencies of all kinds of matings based on gene A and its allele a and then generate the frequencies of genotypes among the progeny using the symbols shown below.

	Alleles		Genotypes		
	A	a	AA	Aa	aa
Frequency:	p	q	p^2	2pq	q^2

(10 marks)

3. *[a] Dengan bantuan gambar rajah berlabel, terangkan gametogenesis di dalam haiwan.*

(10 markah)

[b] Buktikan hukum Hardy-Weinberg dengan mencari semua frekuensi gabungan berasaskan gen A dan alel a, dan seterusnya janakan frekuensi-frekuensi genotip antara progeni dengan menggunakan simbol seperti di bawah.

	Alel		*Genotip*		
	A	*a*	*AA*	*Aa*	*aa*
Frekuensi:	*p*	*q*	p^2	*2pq*	q^2

(10 markah)

4. [a] Differentiate between maternal inheritance and maternal effect.

(4 marks)

[b] Explain the result of a cross between two variegated *Mirabilis jalapa* plants.

(8 marks)

[c] Explain the negative and positive control in lactose operon.

(8 marks)

4. *[a] Bezakan antara perwarisan ibu dan perwarisan kesan ibu.*

(4 markah)

[b] Jelaskan hasil kacukan antara dua pokok Mirabilis jalapa bervariegasi.

(8 markah)

[c] Jelaskan kawalan negatif dan kawalan positif dalam operon laktosa.

(8 markah)

5. Discuss **TWO** of the following:

[a] DNA replication.

(10 marks)

[b] Transcription.

(10 marks)

[c] Translation.

(10 marks)

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5. *Bincangkan **DUA** daripada berikut:*

[a] Pereplikaan DNA.

(10 markah)

[b] Transkripsi.

(10 markah)

[c] Translasi.

(10 markah)

6. [a] Describe the structure of DNA according to Watson and Crick's model.

(10 marks)

[b] How is the DNA organised to form a chromosome?

(10 marks)

6. *[a] Huraikan struktur DNA mengikut model Watson dan Crick.*

(10 markah)

[b] Bagaimanakah DNA diorganisasikan untuk membentuk kromosom?

(10 markah)

Jadual Taburan χ^2.

	Kebarangkalian, p											
$(n-1)^*$	0.99	0.98	0.95	0.90	0.80	0.50	0.20	0.10	0.05	0.02	0.01	0.001
1	0.000	0.001	0.004	0.016	0.064	0.455	1.64	2.71	3.84	5.41	6.64	10.83
2	0.020	0.040	0.103	0.211	0.446	1.386	3.22	4.61	5.99	7.82	9.21	13.82
3	0.115	0.185	0.352	0.584	1.005	2.366	4.64	6.25	7.82	9.84	11.35	16.27
4	0.297	0.429	0.711	1.064	1.649	3.357	5.99	7.78	9.49	11.67	13.28	18.47
5	0.554	0.752	1.145	1.610	2.343	4.351	7.29	9.24	11.07	13.39	15.09	20.52
6	0.872	1.134	1.635	2.240	3.070	5.35	8.56	10.65	12.59	15.03	16.81	22.46
7	1.239	1.564	2.167	2.833	3.822	6.35	9.80	12.02	14.07	16.62	18.48	24.32
8	1.646	2.032	2.733	3.490	4.594	7.34	11.03	13.36	15.51	18.17	20.09	26.13
9	2.088	2.532	3.325	4.168	5.380	8.34	12.24	14.68	16.92	19.68	21.67	27.88
10	2.558	3.059	3.940	4.865	6.179	9.34	13.44	15.99	18.31	21.16	23.21	29.59
11	3.05	3.61	4.58	5.58	6.99	10.34	14.63	17.28	19.68	22.62	24.73	31.26
12	3.57	4.18	5.23	6.30	7.81	11.34	15.81	18.55	21.03	24.05	26.22	32.91
13	4.11	4.77	5.89	7.04	8.63	12.34	16.99	19.81	22.36	25.47	27.69	34.53
14	4.66	5.37	6.57	7.79	9.47	13.34	18.15	21.06	23.69	26.87	29.14	36.12
15	5.23	5.99	7.26	8.55	10.31	14.34	19.31	22.31	25.00	28.26	30.58	37.70
16	5.81	6.61	7.96	9.31	11.15	15.34	20.47	23.54	26.30	29.63	32.00	39.25
17	6.41	7.26	8.67	10.09	12.00	16.34	21.62	24.77	27.59	31.00	33.41	40.79
18	7.02	7.91	9.39	10.87	12.86	17.34	22.76	25.99	28.87	32.35	34.81	42.31
19	7.63	8.57	10.12	11.65	13.72	18.34	23.90	27.20	30.14	33.69	36.19	43.82
20	8.26	9.24	10.85	12.44	14.58	19.34	25.04	28.41	31.41	35.02	37.57	45.32
21	8.90	9.92	11.59	13.24	15.45	20.34	26.17	29.62	32.67	36.34	38.93	46.80
22	9.54	10.60	12.34	14.04	16.31	21.34	27.30	30.81	33.92	37.66	40.29	48.27
23	10.20	11.29	13.09	14.85	17.19	22.34	28.43	32.01	35.17	38.97	41.64	49.73
24	10.86	11.99	13.85	15.66	18.06	23.34	29.55	33.20	36.42	40.27	42.98	51.18
25	11.52	12.70	14.61	16.47	18.94	24.34	30.68	34.38	37.65	41.57	44.31	52.62
26	12.20	13.41	15.38	17.29	19.82	25.34	31.80	35.56	38.89	42.86	45.64	54.05
27	12.88	14.13	16.15	18.11	20.70	26.34	32.91	36.74	40.11	44.14	46.96	55.48
28	13.57	14.85	16.93	18.94	21.59	27.34	34.03	37.92	41.34	45.42	48.28	56.89
29	14.26	15.57	17.71	19.77	22.48	28.34	35.14	39.09	42.56	46.69	49.59	58.30
30	14.95	16.31	18.49	20.60	23.36	29.34	36.25	40.26	43.77	47.96	50.89	59.70

$^*(n-1)$ – Darjah kebebasan

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