Variation

Mark Scheme 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Selection and evolution
Sub Topic	Variation
Booklet	Theory
Paper Type	Mark Scheme 1

Time Allowed : **53 minutes**

Score : **/ 44**

Percentage : **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 **(a)**

nuclear division	letter of stage
meiosis I	B
	E
	J
	H
	F
	D
meiosis II	G
	I
	C
	A

E J H F all in meiosis I ;
E J H F in correct order ;
G I C A all in meiosis II ;
G I C A in correct order ; [4]

(b) 1. chiasma / crossing over ;
2. between <u>non-sister</u> chromatids ;
3. homologous chromosomes / bivalents ; *in correct context of mp1 or mp8*
4. in prophase I ;
5. exchange of genetic material / AW ;
6. linkage groups broken ;
7. new combination of <u>alleles</u> ;
8. <u>independent</u> assortment ; **R** random assortment
9. in metaphase I ;
10. detail of independent assortment ;
11. AVP ; e.g. possible mutation [5 max]

[Total: 9]

2 **(a)** metaphase;
II; (*allow one mark for telophase and two marks for telophase 1*)

2

(b) ref. spindles/microtubules shorten contract/pull/breakdown;
centromeres divide;
choromatids (pulled) apart;
to opposite poles;
chromosomes unwind/AW;
nuclear membrane reforms;
ref. cytokinesis/cleavage;

4 max

(c) independent/random assortment;
of homologous chromosomes;
different combinations of parental chromosomes;
crossing over/chiasmata;
between chromatids of homologous chromosomes/non-sister chromatids;
breaks up linkage groups/mixes alleles from parents; **R** genes
ref. to non-identical/genetically different gametes;

4 max

Total: 10

3 (a) (i) all arrow heads in correct direction (phytoplankton to herring / krill, krill to herring, herring and krill to whale); [1]

(ii) secondary / tertiary, consumer;
A third / fourth (trophic level) [1]

(iii) 1 plenty of food available / AW;
A feeding on more than one trophic level
2 further detail; e.g. phytoplankton efficient at converting light energy
phytoplankton blooms
little / no competition
ref. efficient feeding mechanism
3 short food chains / fewer links of the food chain;
4 less energy lost overall;
A *idea in terms of* percent lost at each level
5 few, indigestible / inedible parts; [max 3]

(b) 1 fat / blubber = triglyceride;
2 fat / blubber / triglyceride, used as <u>energy</u>, store / reserve;

decreases
3 less fat in cells; ora
A fewer fat-filled cells / less adipose tissue
4 mobilised / respired / converted to fatty acids (**A** glucose), to release energy (during non-feeding season);
5 energy (from fat mobilisation) used, qualified; e.g. for movement

increases
6 food eaten / during feeding season, <u>conversion</u> to, fat / AW (for storage);
7 ref. thermal insulation;
A *idea of* prevents heat loss **R** keeps it warm [max 2]

(c) 1 (good) solvent / AW; e.g. (many) ions / minerals dissolve (in water)
A idea of (sufficient) dissolved respiratory gases (to support life)
2 provides, buoyancy / support / AW;
A *idea of floating*
3 (buoyancy / support) enables some to attain a large size / supports large mass / enables phytoplankton to remain, near / at surface;
4 high specific heat (capacity);
5 qualified; aquatic environment, more temperature stable / slow to change temperature / helps whale to maintain constant body temperature
6 ice, floats / less dense than water;
7 acts as insulator / prevents heat loss from water / water is underneath allowing survival in the winter;
8 transparent, for light penetration / for photosynthesis / for visual cues;
9 (density changes causing convection) currents, maintain circulation of nutrients / make nutrients available to support phytoplankton;
10 **AVP**; e.g. ref. to surface tension prevents sinking (small organisms) ref. to gamete movement [max 3]

[Total: 10]

4 **(a)** 1 occur during meiosis I ;
crossing over
2 between non-sister chromatids ;
3 of, (a pair of) homologous chromosomes / a bivalent ;
4 in prophase 1 ;
5 at chiasma(ta) ;
6 exchange of genetic material / AW ;
***R** genes unqualified*
7 linkage groups broken / AW ;
8 new combination of alleles (within each chromosome) ;
independent assortment
9 of homologous chromosomes pairs / bivalents ;
10 each pair lines up independently of others ;
11 line up on equator ;
12 (during) metaphase 1 ;
13 results in gametes that are genetically unique / AW ; [9 max]

(b)

	artificial selection		*natural selection*
14	selection (pressure by) humans	**or**	environmental selection pressure ;
15	genetic diversity lowered	**or**	genetic diversity remains high ;
16	inbreedin common	**or**	outbreeding common ;
17	loss of vigour / inbreeding depression	**or**	increased vigour / less chance of inbreeding depression ;
18	increased homozygosity / decreased heterozygosity	**or**	decreased homozygosity / increased heterozygosity ;
19	no isolation mechanisms operating	**or**	isolation mechanisms do operate ;
20	(usually faster	**or**	(usually) slower ;
21	selected feature for human benefit	**or**	selected feature for organism's benefit ;
22	not for, survival / evolution	**or**	promotes, survival / evolution ;

[6 max]

[Total: 15]