

### **A Level**

### Biology

Session: 2000 June

Type: Mark scheme

Code: 9264

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### Oxford Cambridge and RSA Examinations



A LEVEL (former Cambridge linear syllabus)

A 9264

### **BIOLOGY**

## Archives & Heritage

### MARK SCHEME FOR COMPONENTS TAKEN IN JUNE 2000



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### Linear A Level Biology 9264 June 2000 Assessment Session

### **Component Threshold Marks**

Maximum Mark	Α	В	С	D	E	N
100	64	57	50	43	37	31
40	32	29	<del> </del> -			<del> </del>
75	54	49		<del></del>	<del> </del>	15
36	33			<del> </del>		25
60	40		<del></del>	<del>                                     </del>		16
12	10			7		20
36				24		5 18
	100 40 75 36 60 12	100     64       40     32       75     54       36     33       60     40       12     10	100     64     57       40     32     29       75     54     49       36     33     30       60     40     32       12     10     9	100     64     57     50       40     32     29     25       75     54     49     43       36     33     30     26       60     40     32     29       12     10     9     8	100     64     57     50     43       40     32     29     25     21       75     54     49     43     37       36     33     30     26     22       60     40     32     29     26       12     10     9     8     7	100     64     57     50     43     37       40     32     29     25     21     18       75     54     49     43     37     31       36     33     30     26     22     19       60     40     32     29     26     23       12     10     9     8     7     6

### The cumulative percentage of candidates achieving each grade was as follows:

A	В	С	D	E	N	Total Number of
25.82	41.98	56.87	70.60	81.17	88 34	Candidates 1657
23.08	38.28	59.90			<del> </del>	1657
18.41	33.37	49.61			<del> </del>	
50.06	71.80	86.96			<del> </del>	1657
17.73	56.36	68.18		·	<del> </del>	807
63.80	78.73			<del> </del>		221
44.70	68.49		<del></del>	<del>                                     </del>		622
	25.82 23.08 18.41 50.06 17.73 63.80	25.82 41.98 23.08 38.28 18.41 33.37 50.06 71.80 17.73 56.36 63.80 78.73	25.82     41.98     56.87       23.08     38.28     59.90       18.41     33.37     49.61       50.06     71.80     86.96       17.73     56.36     68.18       63.80     78.73     86.43	25.82     41.98     56.87     70.60       23.08     38.28     59.90     78.62       18.41     33.37     49.61     65.84       50.06     71.80     86.96     94.04       17.73     56.36     68.18     81.36       63.80     78.73     86.43     94.12	25.82     41.98     56.87     70.60     81.17       23.08     38.28     59.90     78.62     87.95       18.41     33.37     49.61     65.84     78.38       50.06     71.80     86.96     94.04     97.39       17.73     56.36     68.18     81.36     88.18       63.80     78.73     86.43     94.12     97.29	25.82     41.98     56.87     70.60     81.17     88.34       23.08     38.28     59.90     78.62     87.95     94.91       18.41     33.37     49.61     65.84     78.38     88.07       50.06     71.80     86.96     94.04     97.39     98.63       17.73     56.36     68.18     81.36     88.18     94.55       63.80     78.73     86.43     94.12     97.29     99.10



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Markscheme 9264/1 June 2000

Total: 15

### **OPTION 1 - BIODIVERSITY**

1	(a)		low oxygen concentration; varying oxygen solubility with temperature; problem of ventilation; difficulty moving due to high, density/viscosity, of water; no surface to push against; currents; poor light penetration (at depth/in turbid water); faster conduction of heat; ref. pressure/vibration; ref. osmotic problem;	max 3
	(b)		X is a nucleus; macronucleus/meganucleus; polyploid/contains, copies of genes/amplified genes; ref. staining;	
			Y is a food vacuole; ( R 'store') contains (semi-digested) food particles; hydrolytic/digestive, enzymes present;	
			Z is a contractile vacuole; contains, water/salt solution (about to be expelled); surrounded by, accessory vacuoles/canals;	max 6
	(c)		195/200 mm (no mark) 750 0.26mm/0.267 mm/260μm /267μm;	1
	(d)	(i)	protoctista;	1
		(ii)	Chiorella/other alga/Amoeba/other protozoan;	1
		(iii)	eukaryotes; organisms that, are not plants, animals or fungi/cannot be fitted in organisms that do not develop an embryo;	
			unicells (or aggregations of similar cells);	max 3

2	(a)	absorption of carbon dioxide/reduction of greenhouse effect/reduction of global warming/maintenance of oxygen;
		source of timber; source of, drugs/medicine; source of foods;
		gene bank; ethical reasons for conserving, all species/range of species/maintaining, biodiversity/habitats;
		prevention of, landslides/flooding/erosion;
		A.V.P.; max
	(b)	estimated volume dropped considerably; significant decrease since 1981;
		ref. figures (years and volumes of timber); max 2
	(c)	(i) volume in virgin X 100; (= 0.3 X 100 volume in total 0.73
		41%; (A 38 - 41%)
		(ii) virgin forests contain more timbers that are, valuable/useful;
		the best timber from non-virgin forests has already been removed; max 1
	(d)	fewer, accessible/available, (suitable) logs/trees, remaining;
		less demand for, sawn timbers/veneers/wood; government/international, controls;
		valid economic reason;
		( R no timber remaining) max 2
	(e)	mining;
		rail/road, construction/housing; hydroelectric schemes/reservoirs/dams;
		ecotourism;
		industrial development; max 2
	<b>(f)</b>	farmed trees can be used for timber (instead of virgin forest trees); if trees from virgin forests are felled then species relying on them disappear; only the most desirable tree, species/varieties, are grown; small area tree farm produces as much useful timber as large area of virgin forest; alternative source of income for local population (so less need to exploit forest); max 3
		Total: 15

3 (i) Outline the features which can be used to distinguish between platyhelminths and (a) [6] annelids. (ii) Describe the feeding method of a named endoparasitic platyhelminth. [6] (iii) Explain the locomotion of earthworms. [8] ..... (i) P flat and A, cylindrical/rounded, (in T.S.); A are segmented and P unsegmented; A have a coelom but P, do not/are acoelomate; A have an anus (but P do not); P have flame cells (but A do not); A have nephridia (but P do not); A have blood system (but P do not); (most) A have chaetae (but P do not); max 6 (ii) liver fluke/tapeworm/Schistosoma/other example; soluble foods absorbed through the, cuticle/outside surface; e.g. soluble food; by active transport; ref. large surface area; (e.g. cestode microtriches) ref. tolerance to defence mechanisms of host; ref. how position in gut is maintained; Trematoda blood/host cells/mucus/other fluid, ingested; via, mouth/pharynx; digestion in, alimentary canal/gut; undigested remains egested via, mouth/pharynx; Cestoda no gut/foods not ingested; digestion carried out by host; some digestive enzymes in membrane forming body's outer surface; max 6 (iii) body wall contains circular and longitudinal muscle (fibres); ref. antagonistic action: contraction of circular muscles causes a segment to lengthen and narrow; contraction of longitudinal muscles causes a segment to shorten and widen; ref. hydrostatic skeleton; coelomic fluid, transmits force/incompressible, so non-contracting muscles lengthen; septa separate coelomic fluid in adjacent segments; intersegmental reflex/mechanical stimulation; anterior segments of worm lengthen so anterior end moves forwards; chaetae protruded; to provide grip: anterior segments then shorten; posterior part of worm therefore pulled forward; waves pass from anterior to posterior; mucus lubrication; ( A appropriate points off labelled diagram) max 8 Total: 20

3	(b)		Outline the features which can be used to distinguish between the alga Chlorella and bryophytes.	
		(ii)	Discuss the ways in which humans use alone	[6]
••••	•••••	(iii)	EXPIRING the extent to which havenhades are adopted to life and lead	7
		(i)	Chlorella is a protoctist but bryophytes are plants;	•••
			Chlorella is unicellular but bryophytes are multicellular;	
			Critorella is, microscopic/2 - 25μm in diameter, but bryonhytes are larger:	
			(A microscopic v. macroscopic)	
			Chlorella has an, ovoid/rounded/coccoid, shape but bryophytes do not;	
			bryophytes have, a thallus/leaves, which Chlorella does not;	
			bryophytes have rhizoids which Chlorella does not;	
			bryophytes develop archegonia and antheridia which Chlorella does not;	
			bryophytes develop, sporophytes/capsules/sporangia, which Chlorelia does not;	
		4-55	bryophytes develop from embryos which Chlorella does not; max	6
		(H)	(Mark as uses + 1 detail mark per use, including those given below.)	
			used as a food for, humans/farm animals:	
			detail; (e.g. high protein content)	
			releases mineral nutrients as it decomposes;	
		i	detail; (e.g. acceptable to, organic farmers/gardeners) helps with sewage treatment;	
			detail: (e.g. releases outgon which off a service of a se	
		:	detail: (e.g. releases oxygen which other organisms use in aerobic respiration) source of, iodine/other named mineral;	
		,	detail; (e.g. mineral obtained from ash of burned seaweed)	
		9	source of agar;	
			detail; (e.g. used as, gelling agent/growth medium for hacteria/microgramisms as an	:
			cosmeac dse)	
		•	source β carotene/glycol/other chemical; detail;	
		4	A.V.P.;	
		•	detail;	
			max 7	,
	(	iii) 🗡	Adaptations	
		S	pore dispersal by drying of capsule;	
		d	etail spore dispersal; (elators/splash mechanism/teeth)	
		п	nizolds for, water absorption/anchorage:	
		to	plerant of desiccation/able to rehydrate after drying:	
		L	<i>Imitations</i>	
		b	ryophytes are (mainly) confined to, wet/damp, habitats;	
		W	rater needed for, male gametes/fertilisation·	
		n	o, xylem/vascular tissue, so little support;	
		D	ryophytes cannot grow tall;	
		п	nizoids not as efficient as roots;	
		n(	o/little, cuticle so easily desiccated;	
		m	ot as well adapted as, filicinophytes/coniferophytes/angiospermophytes/other plants;	
			max 7	
			Total: 20	
			***************************************	

### **OPTION 2 - APPLIED PLANT & ANIMAL SCIENCE**

1 (a) (i) 26 - 30°C; (ii) light-independent stage of photosynthesis; ( A 'dark stage') enzymes; Calvin cycle; Rubisco: determines rate of carbon dioxide fixation; limiting factor up to optimum temperature; limiting factor above optimum temperature; denaturation of enzymes at high temperatures; ref to Q<sub>10</sub>; ref. to figures; max 4 (iii) tropics/equatorial regions; optimum, range 25 - 35°C/around 30°C; can maintain high rates of photosynthesis at 40+°C; max 2 ref. to figures; (i) within optimum range for each crop; 1 (b) (ii) ( A converse arguments for rice/barley as C<sub>3</sub> plants) no photorespiration in C<sub>4</sub>; detail photorespiration; efficient use of carbon dioxide: use very low concentrations of carbon dioxide; C<sub>4</sub> pathway concentrates carbon dioxide in bundle sheath cells; no competition between carbon dioxide and oxygen for active site of Rubisco; PEP carboxylase has high affinity for carbon dioxide; use of figures from Fig. 1.2; max 4 cut leaf, discs/other similar sized shape; (N.B. question refers to 'a leaf'.) (c) sample, throughout day/beginning and end of day/at least two occasions between sunrise and sunset; several samples/replicates/take averages; dry, discs/etc., to constant mass; max 3 (net) production = difference over the day; Total: 15

2 (	(a)	growing cash crops; still not enough investment; land unsuitable for improvement; poorly educated workforce; land holdings too small; large scale agriculture not possible; not suitable for widescale cultivation of high yielding varieties; poor rainfall/drought; natural disasters; A.V.P.;; (e.g. choice not to grow crops/cheap imports)	max
(1	<b>b</b> ) (	(i) fertilisers/herbicides/pesticides/crop protection chemicals, bought from outsi	off farm/brought in
	<b>(</b> i	ii) no/less, reliance on external inputs; recycling/composting/manuring/crop rotation/interplanting, used; continued long-term without external inputs;	max 2
(0	<b>:</b> )	limited variety of foodstuffs; nutritional status decreases; more, vitamin/mineral, deficiencies; example;; (two marks) imported food less, fresh/nutritious;	max 3
(d	I)	reduce soil erosion; conserve water; conserve organic matter; allow nutrient recycling/stop excessive leaching; maintain/improve, soil texture by returning organic matter;	max 3
(е	)	Rhizobium; nitrogen fixation; root nodules; roots left in ground to decompose; increase nitrogen content of soil; reduce application of fertilisers; any beneficial effect on the soil;	
		avoid eutrophication;	max 4
			Total: 15

3 (a) (i) Explain what the diets of either intensively reared pigs or cattle must provide in order to allow rapid growth. (ii) Explain how animal housing helps to maximise productivity. [6] (iii) Discuss the probelms posed by the disposal of farmyard manure. [7](i) feed ad libitum; provide feed that is easily, digestible/taken up; dry matter intake must provide enough energy; (the ration to give this energy) must be consumed in a day; ref. digestible energy; ref. metabolisable energy/described; enough energy for, maintenance/keeping body temperature constant; energy for growth: ref. cellulose and ruminant digestion; sufficient protein to support growth; all essential amino acids: idea of limiting amino acids in some feeds; different feeds complement each other with respect to amino acids; use of protein concentrates; ref. use of supplements/example given; ref. different, nutrient/energy, intakes at different stages of growth; vitamins/e.g. vitamin: minerals/e.g. mineral; max 7 (ii) temperature so that metabolic heat production is at minimum; so energy not used for keeping warm; restricted movement conserves energy: temperature not so hot that animals reduce food intake: ventilation; heating when necessary: insulation: protection from extremes of climate: helps to maintain hygienic conditions: less chance of disease: effective disposal of effluent (reduces chance of disease); ref. control of day length; max 6 (iii) large quantities/bulky; smell: high BOD if washed into water/ref. eutrophication; may contain weed seeds: expensive to, spread/dispose; difficult to store; requires heavy machinery to distribute on land; need large area for effluent ponds; concentration of heavy metals in soil: low concentration of nutrients if used as a fertiliser; nutrients released slowly so not readily available to crops; risk of spreading animal, diseases/pests; example; (e.g. stomach worms) ref. methane: max 7 Total: 20

3	(b)	(i)	Explain the reasons for large applications of nitrogenous fertilisers in interproduction.	_	
		(ii)	Describe how and when fertiliser is applied during the cultivation of either	r maize <b>or</b>	7]
		(iii)	wheat.  Discuss the problems posed by the widespread cultivation of one crop.		6] 7]
			crop removed at harvest so loss of N; continued cropping exhausts soil; ref. monoculture; soil may be naturally deficient; N not returned by, manuring/ploughing in crop residues; nitrates readily leached; mobile ion; soil erosion; ammonium salts/nitrates, absorbed in large quantities; (A macronutrient) no decomposition and recycling; little provided by decay of organic matter; low yields without fertiliser; ensures near maximum growth rates; ref. protein for grain yield; A.V.P.; (e.g. one role of N in plant)	max 7	 7
			timing: at seed bed preparation/before, sowing/drilling; sowing; just after emergence; early growth; tillering; flowering; A.V.P. (e.g. not during, wet weather/autumn) method: mixed with soil in seedbed when cultivated; pelleted with the seed; drilled into the soil; slow release; broadcast over the soil surface; top dressing - broadcast onto growing crop; (liquid) sprayed onto leaves;	max 6	
		l f r c ia la c n	pests/diseases, spread very easily; arge quantity of the same food available; pests/diseases, overwinter and spread onto next year's crop; iew natural predators; ref. to large scale destruction of a monoculture; ref. to depletion of nutrients; decrease in humus content of the soil; arge areas of land devoted to agriculture; poss of wildlife habitats; compaction of soil; no benefits from crop rotation; single commodity price;		
		r	esources required all at one time;	max 7	
••••••	·····	******		Total: 20	

### **OPTION 3 - APPLICATIONS OF GENETICS**

1	(a)		random/chance/spontaneous/pre-exisisting; mutation (for resistance);	
			herbicide is selective agent;	
			resistants survive to pass on, mutation/resistance, to offspring; natural selection;	max 3
	(b)	(i)	code for one a. acid changed to that for another; ref. mRNA;	
			by, substitution/inversion/change of one base for another;	max 2
		(ii)	change in, shape/3° structure;	
			herbicide no longer, binds to/prevents normal function of, protein;	2
	(c)		meristematic/undifferentiated/totipotent, cells; placed in sterile nutrient medium;	
			p.g. substances/hormones, to stimulate cell division;	
			ref. mitosis/cytokinins;	max 3
	(d)	(i)	N - to show that adding the normal tubulin gene did not produce re to show that genetic engineering itself did not, produce resista	·
			C - to show that 'normal' maize cells did not show resistance;	
			[ A 'both are controls' for max. 1 mark]	max 2
		(ii)	mutated tubulin gene gives resistance;	
			two copies of mutant gene (M2) gives resistance at all concentration one copy of mutant gene (M1) gives same resistance as two copies	s at 0.05mg dm <sup>-3</sup> ;
			but decreasing resistance to higher concentrations/ref. suitable fig same growth as, N/C, at 1.0 mg dm <sup>-3</sup> ;	ures; max 3
				T_4 46
				Total: 15

[Turn over

2	(a)		autosomal/not sex-linked/chromosome 7; recessive allele; sufferers homozygous recessive; heterozygotes, carriers/ unaffected; appropriate statement inheritance (e.g. 1 in 4 chance from two carrier parents	): max 3
	(b)	(i)	Q lacks, C-T-T triplet/3 bases; ( A triplet reversed: T-T-C)	,, <b></b>
		(ii)	(protein) minus, one a. acid/glutamic acid;	1
		(iii)	test is for a particular, mutation/deletion; many different mutations result in CF; P may have a (different) mutation in another part of the gene;	max 2
	(c)		frequency increased; because of, selective advantage/heterozygote advantage;	
	(d)		mutant allele reduces uptake of all three strains; comment re not reduced to 0; ref. comparative figures;; ref. large difference/log scale;	2 max 3
į	(e)		ref. CFTR/transmembrane protein/ion channel/ion pore; membrane less easily penetrated than normal by bacteria; excess mucus hinders bacterial uptake; A.V.P. (e.g. binding to c-s-membrane encourages uptake)	max 3
				otal: 15

3 (a) Explain the roles in selective breeding of (i) progeny testing; (ii) artificial insemination (AI); (iii) embryo transplantation: (i) PT is test of value of genotype from performance of offspring; measure of breeding value of parent; especially when trait is polygenic; ref. reason needed for polygenic trait: used in both plants and animals: of most use in animals: particularly males: used for sex-limited (NB not sex-linked) traits; ( R sex-linked) e.g. of such a trait; (milk production/egg laying) parent mated with range of partners; trait measured in offspring; allows selection for, banking/keeping at stud; max 6 (ii) saves, cost/problems, of keeping male; saves, cost/problems, of animals travelling for mating; less stressful than mating; quickly available; sperm from one superior male can be used for many females; reduces inbreeding if different sperm used: one ejaculate can be divided between several females: sperm genetically tested; sperm sexed; speeds up progeny testing; speeds up, selective breeding/artificial selection; allows international mating; max 7 (iii) reproductive rate of superior female increased; large number of, oocytes/embryos, can be harvested: desirable, herd/flock/etc., quicker; superior female not put at risk by pregnancy; by use of surrogates; surrogates can be, inferior quality/even different species; (e.g. guanaco/goat) cloning embryos further increases number of desirable offspring; embryos can be sexed; embryos can be genetically tested: embryos can be inserted in intermediate portmanteau animal; smaller so easier to transport; embryos can be frozen for storage; max 7 Total: 20

3	{	Explain  (i) what is meant by the terms linkage and crossing over;  ii) the effect of crossing over on the inheritance of two linked genes;  ii) the effect of linkage in the major histocompatibility (HLA) system on the availability transplants.	[7] [6] [7]
	(	do not assort independently/are inherited together; number of linkage groups = number of haploid chromosomes; reduces the number of phenotypic classes resulting from a cross/reduces variation; linkage is broken by crossing over; crossing over occurs in prophase I of meiosis; during synapsis/when homologues pair; chromatids of a bivalent break and join to non-sister chromatids (A/W); exchange of alleles between, maternal and paternal chromosomes/homologues; visible as a chiasma;	
	(ii	in total linkage parental phenotypes only are produced; dihybrid cross behaves as monohybrid cross; 3:1 instead of 9:3:3:1 in F <sub>2</sub> /1:1 instead of 1:1:1:1 in test cross; e.g. total linkage; ( <i>HLA</i> , banded snails, etc.) recombinant offspring produced by crossing over; smaller numbers than parental phenotypes; 1:1 large numbers parentals and 1:1 small numbers recombinants in test cross; e.g. showing this; chance of a cross over between two loci is proportional to their distance apart; percentage of recombinants gives cross over value; measure of distance apart of loci;	
		4 (6) loci/A, B, C and D (P, Q, R); on chromosome 6; tightly linked/no crossing over; detail (A,B,C very close D further away) inherited as a unit; haplotype; must inherit one haplotype from each parent; loci code for tissue typing antigens; donor tissue rejected if not matched; probability of finding a matching donor in general population very small; ref. large number of alleles at each locus; probability of finding matching donor in family much greater; 1 in 4 chance of two siblings having same haplotypes; 1 in 2 chance of two siblings sharing one haplotype; identical twins have same haplotypes; not all loci of same importance in rejection:	
		matching only those that matter most improves chance of match; max	7
		Total: 2	0

### **OPTION 4 - GROWTH, DEVELOPMENT & REPRODUCTION**

1	(a)	(i)	A germinal epithelium ] B stroma/cortex ] Half marks rounded up C corona radiata/cumulus ]	
			D zona pellucida ]	2
		(ii)	0.1mm/100μm → 0.15mm/150μm ( <i>A any figur</i> e <i>in this range</i> )	1
		(iii)	oocyte haploid v. A diploid; as a result of, meiosis I/prophase I; oocyte has 23 chromosomes v. A 46 chromosomes; oocyte has new combinations of alleles; as a result of, crossing over/independent assortment;	max 2
	(b)		acts with FSH to cause follicle growth; stimulates, steroid/oestrogen, production; by the theca; causes ovulation (on day 14); causes, development/maintenance, of corpus luteum; stimulates progesterone production;	max 3
	(c)	(i)	0.27μg;	1
		(ii)	both rise initially; hCG peaks in early pregnancy, progesterone peaks in late pregnancy small initial peak of progesterone; low level/small peak, of hCG in late pregnancy; supporting figures; (blood concentration and time figure for both hormones)	max 3
	(d)		sites of production hCG fertilised egg/zygote/blastocyst/chorion/embryo; progesterone corpus luteum/placenta; functions hCG maintains corpus luteum; up to three months;	
			progesterone maintains uterus, lining/complexity; relaxes uterine muscle; inhibits FSH; inhibits prolactin; stimulates milk gland development;	max 3
			outside Hills Glerie develophiers,	
				Total: 15

2	(a)		vegetative propagation asexual reproduction involving a piece of, tissue/leaf/stem/root/plant;					
			<i>axillary bud</i> lateral bu	id/bud between stem and leaf/bud between stem and petiole;	2			
	(b)	(i)	warm summers	reserves formed in bulb;				
		(ii)	cold winters	ref. to bulb triggered to flower in right season;	2			
	(c)	(i)	0.6 - 0.73 g per v	veek;	1			
		(ii)	synthesis of leaf	rolysed/digested/mobilised; owing leaf;	max 2			
			increase in mass	in mass as reserves used; related to photosynthesis:				
				otosynthesis greater than respiration;	max 4			
	(d)		mass of new bulb	ases with density increase; s decreases with density increase; ted by density; ( <i>A not significant/trivial</i> )				
				ht; ater; utrients;				
			leaves overlap;					
		ł	more energy used	in growing taller (stems);	max 4			
				То	tal: 15			

3 (a) (i) Describe the structures of a stamen and a pollen grain, including reference to their microscopic organisation. (ii) Describe the development of pollen grains and the male gametes of the flowering [6] (iii) Suggest the benefits of knowing when pollen release occurs from plants. [4] ..... (i) stamen consists of anther and filament; vascular strand/connective/xylem and phloem; epidermis and fibrous layer; tapetum/nutritive layer: four, pollen sacs/microsporangia; detail of structure related to wind pollination; detail of structure related to insect pollination; pollen exine with detail; intine with detail; vegetative nucleus/tube nucleus; two, gamete nuclei/male nuclei/sperm cells, or generative nucleus; pits/pores; detail of wind pollen; detail of insect pollen; max 10 (ii) pollen mother cell undergoes meiosis; ref. independent assortment; detail independent assortment: ref. crossing over; detail crossing over: tetrad/four, pollen grains produced; nucleus divides to produce generative and vegetative nuclei: by mitosis; generative nucleus divides; by mitosis: haploid, nuclei/sperm cells/gametes, produced; max 6 (iii) pollination of crops; example of an important crop: timing of insecticide sprays; greenhouse pollination; ref. to, allergies/asthma/hay fever: taking precautionary drugs; avoiding exposure to atmospheres with high pollen counts; A.V.P. (e.g. ref. to hybridisation) max 4

3	(b)	(i)	Describe how the passage of sperms from the testes to the oviduct in humans.	
		(ii)	Explain how fertilisation occurs in humans.	[8]
		(iii)	Discuss the biological reasons for the use of in vitro fertilisation (IVF).	[8] [4]
•••••		(i)	sperm in epididymis;	••••••
			sexual arousal/nervous control of release,	
			contractions of, vas deferens/urethra;	
			addition of seminal fluid from named gland;	
			sugar/fructose, nourishes sperm/for respiration;	
			tail propels sperm;	
			sperm deposited, at top of vagina/at cervix;	
			ref. cervical mucus; (plug/channels)	
			capacitation of sperm/removal of glycoproteins or plasma proteins;	
			cooperative action of sperm;	
			ref. to alkaline secretions protecting sperm;	
			from, low pH/acidity, of vagina;	
			muscular contractions of female tract aiding sperm;	
			action of cilia in oviduct;	
			ref. prostaglandins;	
			chemotaxis/chemical attractant released by, oocyte/egg;	max 8
		(ii)	acrosome fuses with sperm membrane;	
			digestive/hydrolytic, enzymes released;	
		1	ref. protease/acrosin/hyaluronidase;	
		1	path through, surrounding cells/corona/zona, made (by enzymes);	
			sperm binds to receptors;	
			on zona pellucida;	
			membranes of sperm and, oocyte/egg, fuse;	
		(	cortical reaction occurs/lysosomes released;	
		ſ	male nucleus swells:	
			ref. contents;	
			polyspermy prevented/zona pellucida impermeable;	
			second meiosis occurs:	
			polar body extruded;	
			usion of haploid, (pro)nuclei/gametes, to form diploid zygote;	
		r	ef. to calcium release;	D
				max 8
	(	iii) o	lamaged/blocked, oviducts;	
	•		ailure ovulate regularly/polycystic ovaries;	
		С	ervical mucus inhibits sperm;	
			ow sperm count;	
			oor sperm motility;	
			terilised women:	
			mmunity between female and sperm;	
		а	Itows screening of embryo for defects:	
		d	onated oocytes;	·
		_	··· ···	max 4
				Total: 20

### **OPTION 5 - HUMAN HEALTH & DISEASE**

1 (a) (i) similarity rise in number of cases of AIDS: S-shaped curve: both peak in 1990; max 1 difference earlier rise for homosexuals/bisexuals; earlier levelling off in number of new cases for homo/bisexuals; fewer cases in drug users: max 1 (ii) (earlier rise for homosexuals/bisexuals) because gay community first infected; (earlier levelling off in new cases for homo/bisexuals) because more aware of need for/more able to take preventative measures; ( A converse trends for injecting drug users) (fewer cases in drug users) because A.V.P.; max 1 (iii) use of <u>clean</u>, needles/syringes/reduced sharing of <u>contaminated</u>, needles/syringes; provided free (by, local authorities/Government); availability of more effective drug treatments: education/advertising campaigns; (R'safe sex') max 3 (b) component surface glycoprotein: reason glycoproteins often, antigenic/epitopic; stimulate response from immune system; proteins exposed on surface of, virus/infected cell, easy to attack for antibodies: max 1 (c) prevents conversion of RNA of virus into DNA in host: DNA enters host cell nucleus and integrates with host DNA: this necessary before virus can replicate; max 2 (d) antibiotics interfere with metabolic processes; e.g. metabolic process; (e.g. cell wall synthesis/protein synthesis/cell membrane function/enzyme action) viruses do not have, metabolism/relevant metabolic process; max 2 (e) HIV destroys, T helper cells/lymphocytes; T helper cells needed for correct functioning of, immune system/T & B cells; T cells eliminate viral infection/B cells make antibodies; opportunistic infections therefore occur/no resistance to common pathogens; cancers not recognised and eliminated: example; (e.g. TB, fungal pathogens such as candidiasis/oral thrush, secondary cancers, Kaposi's sarcoma, skin cancer, herpes, Pneumocytis/rare form of, pneumonia, food poisoning, toxoplasmosis, brain lesions, cryptosporidiosis, diarrhoea.) max 3

Total: 15

rtions; <i>nly</i> )	literally 'bad nutrition'/not having correct food in correct proportion applied to both under- and over-nutrition; ( R undernutrition only	(a)
max 2	A.V.P.;	
of calculation)	BMI = $m/h^2$ = $70/1.7^2$ = $70/2.89$ ; (one mark for correct method of = $24.22$ ; (kgm <sup>-2</sup> ) (units not needed for BMI)	(b)
max 2	<ul> <li>(i) age ranges variable (between countries);</li> <li>years variable (between countries);</li> <li>sample size unknown;</li> <li>do not know whether equal numbers of men and women;</li> <li>A.V.P.; (e.g. occupations/life styles)</li> </ul>	(c)
al factors important; max 2	<ul> <li>(ii) obesity is a bigger problem in the USA (than in Europe);</li> <li>(slightly) more among women (than men);</li> <li>more in Germany than England;</li> <li>difference between USA and Europe not genetic/environmental A.V.P.;</li> </ul>	
max 1	(iii) working: (One mark only) 7% increase in 14 years; 0.5% increase per year; 5% increase in 10 years;	
1	answer: 17%/18%;	
nan lean people:	mean energy expenditure of obese women greater than lean wo suggests obesity due to obese people taking in more energy that not due to obese people, using less energy/having lower metabolic due to obese people, using less energy/having lower metabolic due to obese people, using less energy/having lower metabolic due to obese people, using less energy/having lower metabolic due to obese people.	(d)
nerav <sup>.</sup>	obese people find it difficult to do enough exercise to lose significant energy of excess food intake far exceeds energy lost in exercise basic problem is eating too much;	(e)
max 2	exercise makes one hungry;	
ion assumes the obese	( R arguments about not wanting to do exercise since question person takes the advice to do exercise)	
Total: 15		

3	(	ii)	Describe the possible effects of alcohol on the liver.	[6] [8] [6]
	٠,	,	Explain from sincing tobacco can lead to damage of blood vessels.	۱۷]
	l		alcohol and tobacco cause both physical and psychological dependence; (statement) both become involved in metabolism and body comes to depend on their presence; = physical dependence; (N.B. linked to previous point) nicotine is active ingredient in tobacco; nicotine, causes physical dependence/is addictive; nicotine mimics acetylcholine; both cause, drug tolerance/progressive decrease in body's response to drug/need	)
			more to get same effect;	
			tolerance leads to dependence because effects of withdrawal heighten, desire/need	
			for drug; both stimulate, pleasure/dopamine, pathways in brain/both alter, mood/emotions/ both reduce, anxiety/stress/brain activity;	
			this leads to psychological dependence; (N.B. linked to previous point) A.V.P.; (e.g. alcohol makes neurones more sensitive to GABA which is sedative)max	6
	(i		fat/plasma protein, builds up in liver (cells); liver becomes swollen (as a result); can disrupt normal functioning of cells; liver adapts to presence of aclohol by increasing production of enzymes that	
			metabolise it;	
			microsome ethanol oxidising system/MEOS, stimulated; ethanol → ethanal;	
			(ethanal) toxic/affects proteins;	
			example; (interferes with, enzyme/membrane protein/other protein, activity)	
			changed proteins often attacked by antibodies;	
			cells cannot excrete bile pigments so leads to jaundice;	
			hepatitis;	
			cirrhosis/cells die and replaced by fibrous tissue; hardens;	
			blood flow into liver obstructed; max	8
	24	••		
	(11)	-	increases atherosclerosis;	
			cholesteroi/fatty streaks, in walls of arteries; other constituent of plaque; (e.g. fibrous tissue/platelets/extra smooth muscle	
			fibres/phagocytes/foam cells)	
		(	damages endothelium of blood vessels;	
			ref. coronary artery;	
			nicotine, increases blood pressure/causes hypertension;	
	٠	•	decreases, antioxidants/vit. C/vit. E, in blood leading to increased damage of artery walls by free radicals;	
		,	A.V.P.; (e.g. Peripheral vascular disease) max	6
			( R thrombosis and strokes, changes to blood)	_
			Total: 2	<b>O</b>

```
3
          (i) Explain why, on average, the death rate from cholera is higher in developing countries
             than developed countries.
          (ii) Describe the response that would be mounted by the B cells (B lymphocytes) of the
             body on their first exposure to cholera bacteria.
                                                                                                   \square
         (iii) Explain with examples, the advantages of using monoclonal antibodies.
          (i) cholera spread by faecal contamination;
             in water;
             untreated sewage;
             no purification of water used for, drinking/washing:
             cannot afford the treatment plants;
             cannot afford vaccination programmes:
             cannot afford, treatment of disease/oral rehydration therapy;
             malnutrition reduces resistance;
             more flies to spread disease:
             unhygienic handling of food;
             low levels of education re, hygiene/etc.;
             many symptomless carriers;
             A.V.P.;
                                                                                               max 7
         (ii) cholera, bacterium/vibrio, has antigens on its surface:
             immune response triggered;
             B cells responsible for humoral immunity;
             B cells with receptor which matches antigen are activated;
             clone themselves/divide by mitosis:
             become, plasma cells/effector cells/memory cells;
             (plasma/effector, cells) produce antibody molecules;
             in blood, tissue fluid and lymph;
             live only a few days;
             memory cells long-lived and enable rapid, response to subsequent infection/2°
                                                                              response;
                                                                                              max 7
        (iii) MCAs are, pure antibodies/specific to one antigen:
             allergic response minimised;
             suitable examples of diagnosis:
             diagnosis of Chlamydia;
              results in 15 - 20 minutes;
             diagnosis of gonorrhoea;
              results in 15 - 20 minutes;
             immediate/rapid, diagnosis of streptococcal throat infections;
              allows immediate treatment;
             distinguish between herpes viruses;
              important to distinguish because treatments different;
             early detection and treatment of cancers;
              example; (e.g.leukaemia/lymphoma)
             pregnancy testing:
              detects hCG in mother's urine:
            blood typing;
               detail;
            suitable examples of treatment (few available)
            use as 'magic bullets'/seek out and attach to specific targets;
            example; (e.g. cancer cells/bacteria/viruses)
            attach, toxic drug/radioactive isotope, to destroy target;
                                                                                              max 6
                                                                                           Total: 20
```



### Archives & Heritage

Markscheme 9264/2 June 2000

### **Multiple Choice**

Question No.	Correct Answer	]	
1	В	4	
	D	-	
3	A	1	
4	В	-	
5	c	1	
6	С	1	
7	В	†	
8	A		
9	В		
10	A		
11	Α		
12	В		
13	D		
14	В		
15	В		
16	D		
17	В	1000	
18	D	$ves \sim$	
19	D		
20	С		
21	С		
22	С		
23	D		
24	Α		
25	В		
26	Α		
27	В		
28	С		
29	В		
30	В		
31	Α		
32	D		
33	В		
34	A		
35	D		
36	Ċ		
37	A		
38	С		
39	A C		
40	C		



### Archives & Heritage

Markscheme 9264/3 June 2000

### MARK SCHEME Question 1

S	E(		Γl	O	٨	Ĺ	4
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(a)	Α	capillary / glomerulus ;	
	В	Bowman's capsule / corpuscle / Malpighian body / corpuscle	
	C	PCT;	3
(b)	X in	area of glomerulus ;	1
(c)		h border / microvilli ; surface area (for reabsorption) ;	
		ny) mitochondria ; ctive transport ;	
		junctions (between cells) ; o polarity of cells / prevent leakage between cells ;	
		er / channel proteins ; ansport / facilitated diffusion / active transport ;	
		mity of (peritubular) capillaries ; ent transfer to blood ;	4
d)	<b>(i)</b>	only waste products / urea / excess salts pass dialysis membrano reabsorption in dialysis; ref. to composition of dialysing fluid / same as plasma no ure ref to (hydrostatic) pressure differences in kidney vs. diffusio ref. to periodic vs. all the time in kidney;	aa ·
	(ii)	permanent / long term; reduce time spent for treatment; allow better lifestyle qualified eg. eat and drink normally; ref. to less chance of infection; ref. to long term cost; ref. to hepatitis / HIV; ref. to damage to blood vessels;	· 2 max
			Total: 13

Question 2

fluid - phospholipids free to move / not laterally bonded / proteins free to move; (a) mosaic - ref. to pattern / arrangement of proteins;

2

(b) hydrophilic / polar channel; hydrophobic / non polar outer surface; ref. to distribution of hydrophilic / hydrophobic R groups;

2 max

(c) ions / carry charge; ref. hydration shell; only soluble in water / not lipid soluble; hydrophobic / non polar region within membrane;

glycolipids

2 max

ref. regulates membrane fluidity / permeability / stability; (d) cholesterol

> cell (to cell) interactions / adhesion / binding / recognition; 2

Question 3

(a) (i)

H-C-O-C-(CH2) 
$$-$$
 CH3 correct molecular Structure shown; Structure shown; deduct one mark for H-C-O-C-(CH2)  $-$  CH3 each mistake

H  $-$  C-O- $-$  C-(CH2)  $-$  CH3 each mistake

H  $-$  C-O- $-$  C-(CH2)  $-$  CH3 each mistake

2

See above. (ii)

1

triglyceride non polar / insoluble (in water) / lipid soluble ; (b) products / fatty acids and glycerol water soluble / polar / insoluble in lipid; penalise once only if no mention of water

ref. to -OH / hydroxyl / -COOH / carboxyl groups ;

groups responsible for solubility(in water) become exposed;

3 max

(c) more hydrogen to oxidise; more carbon - hydrogen bonds; less oxygen; ref. to greater ratio of H to O;

2 max

### **JUNE 2000**

### MARK SCHEME

Question 4

(a) transcription in nucleus

DNA to RNA / ref. synthesis of RNA

RNA polymerase

phosphodiester bonds formed

nucleotides joined

translation

in cytoplasm / ribosome ;

mRNA to protein / ref. synthesis of protein;

ref. to other enzymes / qualified;

peptide bonds formed;

amino acids joined;

must state both points to gain mark

3 max

(b) A large / 50 S subunit;

B  $\underline{m}$ RNA;

C protein / polypeptide;

3

(c) tRNAase / amino acyl tRNA synthetase / description of enzyme joining amino acid to tRNA;

ATP;

amino acids ;

protease / peptidase / description of enzyme forming peptide bond;

2 max

(d) anticodon;

(complimentary) base pairing with codon / triplet of baseson mRNA;

amino acid binding site;

amino acid corresponding / specific (to anticodon);

2 max

Question 5

- (a) (i) levels off at 1500 CO<sub>2</sub> uptake (µmol h<sup>-1</sup> dm<sup>-2</sup>) idea of light no longer a limiting factor; some other factor limiting / qualified / other factor specified eg. carbon dioxide / temp; 2 max
  - compensation point reached at lower light intensity for plants grown in low illumination;
     ref. steeper gradient / faster rate for plants grown in high illumination;
     ref. to initial starting points / quote figures –200 (μmol h<sup>-1</sup> dm<sup>-2</sup>) for high illumination plants compared to –100 (μmol h<sup>-1</sup> dm<sup>-2</sup>) for low illumination plants / lower rate of respiration in low illumination plants;
     2 max
- (b) <u>compensation point</u> reached at a low light intensity; ref. to gain in dry mass (at low light intensities);

  AVP; eg. ref. to greater leaf area

ref. to lower respiratory rate ref. to more chlorophyll

2 max

Question 6

(a) yellow and round are dominant; correct ref. to cross 4 and / or cross 2;

2

(b)	1	YyRr;	y
	2	YvRr:	,

yyrr; YyRR; (Do not (B) in (b)
for incorrect answer
in (a)

or YyRR; YyRR; or

YyRr: YyRR:

if two heterozygous genotypes in 2 only one mark

YyRr;

Yyrr;

3 4 yyRR;

YYrr:

8 max

Question 7

### **SECTION B**

- (a) Describe the main components of mammalian blood.[6]
- (b) Explain how both oxygen and carbon dioxide are transported by the blood.[10]
- (a) 1 plasma ref. water :
  - 2 (dissolved) solutes qualified / named ions / nutrients / hormones;
  - 3 plasma proteins / albumin / fibrinogen / globulin / prothrombin ;
  - 4 red blood cells / erythrocytes;
  - 5 size 7  $8\mu$ m / ref. to shape of rbc;
  - 6 no nucleus:
  - 7 white blood cells / leucocytes / named white blood cell;
  - 8 ref. fewer / larger than rbc;
  - 9 nucleus:
  - 10 platelets / thrombocytes;

6 max

- 11 oxygen carried as oxyhaemoglobin (b)
  - 12 four molecules of oxygen per molecule of haemoglobin / four subunits of Hb;
  - 13 ref. to haem / iron / Fe;
  - 14 ref. allosteric effect / co-operative binding;
  - 15 reversible binding;
  - 16 ref. to dissociation curve / S shaped;

allow on graph with axes labelled

- 17 ref. Bohr effect :
- 18 carbon dioxide dissolves in water to form carbonic acid;
- 19 ref. carbonic anhydrase (in rbc);
- 20 which dissociates into hydrogen ions and hydrogencarbonate ions;
- 21 ref. haemoglobonic acid / HHb and release of oxygen;
- 22 hydrogencarbonate passes out of rbc / in plasma;
- 23 ref. chloride shift;
- 24 some carbon dioxide dissolved in plasma;
- 25 ref. carbamino-haemoglobin;

10 max

Content:

16

Quality:

4

Total:

Question 8

- (a) Describe the behaviour of chromosomes during meiosis.[10]
- (b) Explain the similarities and differences between homologous chromosomes.[6]
- (a) 1 ref. replication of DNA;
  - 2 each chromosome consists of two (identical) chromatids;
  - 3 chromosomes shorten / thicken / coil up / condense;
  - 4 pairing of homologous chromosomes / formation of bivalent / ref. synapsis;
  - 5 chiasmata / crossing over;
  - 6 exchange of, (same) length of chromatid / alleles / genetic material / DNA;
  - 7 orientation of bivalents / homologous chromosomes on equator (at metaphase I);
  - 8 ref. random / independent assortment;
  - 9 ref. to number of possible chromosome combinations / 2";
  - 10 idea of whole chromosomes pulled apart;
  - 11 ref. to role of microtubules / spindle / spindle fibres;
  - 12 chromosome line up separately (in metaphase II);
  - 13 centromeres divide;
  - 14 sister chromatids move to opposite poles;
  - 15 chromatids become chromosomes;

10 max

- (b) similarities
  - 16 have the same genes;
  - 17 code for the same characteristics;
  - 18 same loci / genes in the same position;
  - 19 position of centromeres the same :
  - 20 same length / size;
  - 21 look the same / indistinguishable (under microscope);

### differences

- 22 may have different alleles;
- 23 they have different sequence of bases / nucleotides;
- 24 each has come from different parent;

6 max

Content:

16

Quality:

4

Total:

Question 9

(b) E	Describe the structure and function of a sensory neuron and a mot explain how a nerve impulse is transmitted across a synapse.[8]	or neuron in a	reflex arc.[8]
(a)	sensory  1 (single) long dendron;  2 axon shorter / similar length;  3 cell body not at end of cell / towards centre of the cell;  4 in dorsal root ganglion;  5 impulses / action potentials from receptor / named;  6 impulses / action potentials to CNS / brain / spinal cord;  7 short dendrons / dendrites;  8 long axon;  9 cell body at end of cell  10 cell body in the CNS / brain / spinal cord;  11 impulses / action potentials to muscle / gland / effector;  12 impulses / action potentials from CNS / brain / spinal cord;  13 ref. via intermediate / relay / internuncial neuron;  14 qualified ref.to synapses;  15 ref. to myelin sheath / nodes of Ranvier linked to speed of contents.	allow following on diagram is suitably laber suitably labers on a suitab	f
b)	16 depolarisation of synaptic knob / presynaptic membrane; 17 diffusion / movement in of Ca <sup>2+</sup> / calcium ions into synaptic k 18 vesicles of transmitter / acetylcholine; 19 <u>fuse</u> with presynaptic membrane; 20 empty contents into synaptic cleft; 21 <u>exocytosis</u> ; 22 <u>diffuses</u> ; 23 across synaptic cleft; 24 (transmitter / acetylcholine) <u>binds</u> to receptor; 25 on post synaptic membrane; 26 Na <sup>+</sup> / sodium channels opened; 27 Na <sup>+</sup> / sodium ions diffuse / move <u>in</u> ; 28 depolarises post synaptic membrane; 29 action potential set up / impulse transmitted;	nob;	8 max
		Content: Quality:	16 4

Total:



# Archives & Heritage

Markscheme 9264/5 June 2000

### MARK SCHEME Summer 2000 4815/1, 9264/5

1	(a)		
		opaque; (acc. cloudy, turbid, rej. ppt, milky, murky, dense) Tube B: yellow-green; (if same colours are given in A and B allow once)	
		clear/clearer; (acc translucent)  Tube C and D: both blue;	
		both opaque; (acc less opaque in D, clearer in D)	
	/L.\		6
	(b)	due to production of fatty acids:	
		by action of <u>lipase</u> ;	3
	(c)	more acid produced / lower pH in A; due to greater amount of fat in K1; (acc ref to full fat/ skimmed milk)	
		decrease in opacity in B;	
		due to lower initial fat content in K2;	2
	(d)	C and D act as controls; (rej. fair test)	
		to show that the change in colour in A and B is due to lipase (enzyme) action; allows comparison of fat content:	
1	(e)	K1 rises;	max 2
		HELITAGE	1
	(f)	(i) K2 sinks; drop spreads out less;	2
(	f)	(ii) K1 is less dense than K2; (rej. lighter/heavier)	
		due to greater fat content;	. 2
(9	g)	(i) correct procedure for Benedict's;;(appropriate volumes: boiled) and biuret; (approp. volumes and correct order)	
		two validity points;; (volumes; heating time standardised) (ii) format of table; (separate results and conclusions, headings)	
		accurate results in both for sugar; (ppt/sediment/ cloudy) accurate results in both for for protein;	
	··— ·	correct conclusions: sugar similar, (acc slight differences either way)	
		more protein in K2;	max 7
			Total: 25

2	(a)		Drawing: accurate representation of zone behind cap; two regions shown behind that;	
			Annotations (in appropriate regions/positions):	
			Behind tip:small cells;	
			square;	
			non-vacuolated:	
			most frequent mitoses;	
			Next: square cells;	•
			vacuolated:	
			bigger than those at tip;	
			few mitoses:	
			Furthest from tip:	
			rectangular cells;	
			vacuolated;	
			largest/longest present;	
			no mitoses;	
			Drawing 2, plus any 5 annotations	7
	(b)	(i)	Drawing:	1
	(~)	117	four cells, square outlines;	•
			same scale;	
			two accurate features in each drawing;;;;;;;	
			(see examples provided)	9 max
			(555 SALITIPIOS PIOTIZOS)	J IIIQA
		(ii)	correct sequence;;	2
		(,	33.7.3.3.3.4.3.7.3.3,	-
	(c)	(i)	cells contain chromosomes;	
	` '	` '	at different stages of meiosis/cell division;	
			presence of diads or tetrads;	max 2
				-
		(ii)	arrow in correct position;	1
		` '		
		(iii)	genetically identical in K3, different in K4;	
		• •	diploid in K3, haploid in K4;	2
				Total: 23
		•		

.

.

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### Question 2 [50 minutes]

K3 is a stained longitudinal section of a young root tip.

Examine K3 carefully using low and high power objectives of your microscope. Note the occurrence and distribution of different kinds of cells in this section.

(a) Make a plan drawing of the entire section, within the outline drawn in Fig. 2.1, to show the different regions. These regions result from differences in the shapes, sizes and structure of the cells as well as in the frequency with which stages of mitosis are visible.

Do not draw individual cells. Ignore the cells that make up the root cap region.

Annotate your drawing as fully as possible to describe the features of the cells in each region that you map.

Drawing: zone (1)shown at apex with some backward extension from it, area (2) indicated by a line; Annotations (in appropriate regions/positions): rectangular cells; vacuolated; largest present; no mitoses: square cells; vacuolated: bigger than those at tip; few mitoses:

Drawing 2. plus any 5 annotations

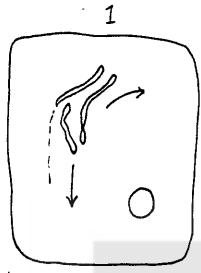
root cap

small cells; square;

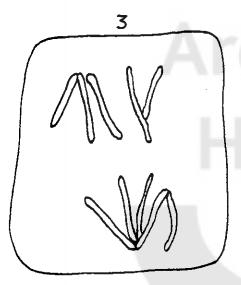
non-vacuotated; most frequent mitoses;

Fig. 2.1

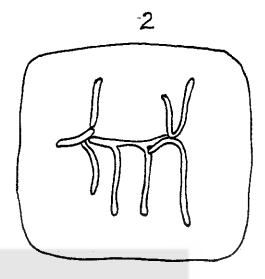
Q2(b)(i) Drawing points: any 2 on each of the following:



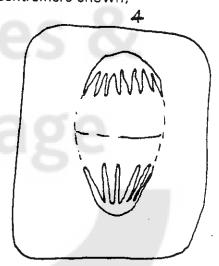
circular group <u>not enclosed by membrane;</u> random arrangement of threads; presence of one or two nucleoli;



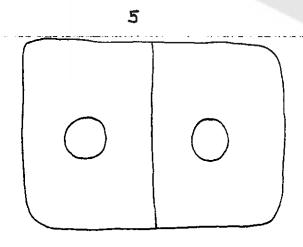
fan-like arrangement; symmetry between groups; variation in chromosome length;



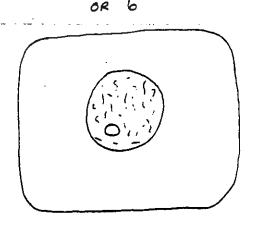
some chromosomes shown as V's or U's; points towards centre; connected as a mass; centromere shown;



solid mass with arms; some evidence of a spindle; and middle lamella;



two small nuclei widely separated; new cell wall;



presence of nuclear membrane and nucleolus nucleus detail; (granular/thread appearance);

3 (a) Drawing: presence of a substantial airway;

shown as a solid structure;

from which a branch (branches) anses:

at an acute angle;

and which is much finer than the main branch (1/2 to 1/4);

blobs shown as a group from a fine branch;

blobs shown to be solid rather than sections: Any 6

Labels: alveoli (air sacs);

bronchiole;

 (b) <u>extensive (acc many, network)</u> system of blood capillaries (vessels); <u>thin</u> alveolar walls; (*rej.* one cell thick)

2

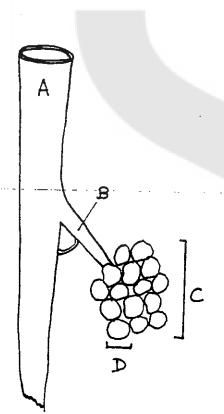
8

(c) three dimensional structure/shape of the alveoli; number of alveoli connected to a bronchiole: branching pattern of bronchioles; aggregation of alveoli into clusters;

max 2

Total: 12

Q3(a)



A - airway shown as drawing;

branch; acute angle;

B - finer than A (1:3); biobs shown (C) as group; each as solid (D)

Any 6