

BIOLOGY - BY4

No.	Answer	Mark
1. (a) (i)	phosphate; pentose/ribose; adenine (all correct for 2; 1 error = 1) (not: adenosine/nitrogenous base)	2
(ii)	adenosine triphosphate (not: triose phosphate/ATP)	1
(b) (i)	ATP <u>drawn</u> as in part a in upper box; ADP two Ps attached + <u>1P</u> not attached in lower box.	1
(ii)	protein synthesis/biosynthesis/active transport/nerve conduction/cell division/avp (not: metabolism/growth/movement)	1
(c) (i)		2

Stage	Precise location in cell	Number of molecules of ATP	Number of molecules of NADH ₂	Number of molecules of FADH ₂
Glycolysis	cytoplasm	2 (net)	2	0
Link reaction	matrix of mitochondrion	0	2	0
Krebs cycle	matrix of mitochondrion	2	6	2

(1 mark for each correct row) (if only 'matrix' penalise once only)

(ii)	name of stage - electron transfer/transport chain/oxidative phosphorylation + location-inner membrane/cristae of mitochondrion (not: ETC)	1
(iii)	NADH ₂ -3 FADH ₂ -2	1
(d)	NAD, ethanol + carbon dioxide in correct places (not: alcohol)	1

Total 10 marks

2. (a)	they have increasing numbers of spots (not: the number of spots)	1
(b)	A - GP, B-malic acid, C-glycine (all 3 for 1 mark)	1
(c)	First - GP; second-Triose phosphate	2
(d)	Nitrogen (not: nitrate)	1
(e) (i)	Y - ATP to ADP (+P); X-NADPH ₂ to NADP	1 1
(ii)	light dependent reactions/(non cyclic) photophosphorylation; (not: Z scheme/cyclic photophosphorylation)	1
(iii)	grana/thylakoids	1
(f)	6	1
		Total 10 marks

3. (a) (i) general shape of spike including overshoot dip.
accurate values -70 to +40 or +50 mV (width c.3ms)
(allow: 68-80 + 30-60) 2
- (ii) correct labelling of depolarisation on upward and
repolarisation on downward side of graph 1
- (b) (i) I proteins 1
II phospholipids 1
- (ii) Ref. to pumps e.g. resting potential – Na⁺/K⁺ pump pumps
Na⁺ out and K⁺ in; 1
Ref. why difference between two sides e.g. organic anions
inside create pd/K⁺ channels open; 1
less permeable to Na⁺ (not: ref. concentration gradient)
depolarisation - impulse opens Na⁺ channel/voltage gated
channel; 1
Na ions rush in/sudden increase in permeability to Na⁺ 1
- (c) transmitter substances synthesised in synaptic knob;
impulse causes secretory vesicle to migrate to
(presynaptic) membrane/Ca ions to rush in;
vesicle fuses with membrane discharges transmitter
substance/exocytosis;
diffusion of transmitter substance across cleft;
transmitter binds to post-synaptic membrane/stimulates
depolarisation/reference to receptors.
(Any 3 in correct sequence; no mention of transmitter
substance=2 max) 3

Total 12 marks

4. (a) (i) rod shaped; 1
- (ii) retains (red) counter stain/stains red/pink in Gram test/do not retain crystal violet; 1
because of complex nature of cell wall/reference to lipopolysaccharide/does not contain as much merein/peptidoglycan. 1
- (iii) grow best with oxygen; (not: prefer/like oxygen) 1
but can grow with or without oxygen 1
(not: ref. aerobic/anaerobic)
- (b) (i) viable only counts living cells/cells which are reproducing/total count includes living and dead cells 1
- (ii) 9 cm³ of sterile distilled water in each tube; (not: tap water) 1
1 cm³ of sample transferred to tube 1; 1
mixed well or ref. 1 cm³ transferred next tube in sequence; 1
any reference to aseptic technique. (Any 3) 3
(labelled diagram=2max e.g. 9cm³ sterile distilled water + 1 cm³ sample)
- (iii) 4 1
- (iv) take/prepare 4 sterile nutrient agar plates; (idea of each dilution on a different plate needed) 1
transfer 0.5 cm³ /other specified volume of each to a separate plate; (allow: 0.1-1 cm³) 1
spread with sterile spreader; 1
incubate plates at suitable temp./25°C; (allow: 25-40°C) 1
count colonies; 1
1 colony=1 cell. 1
(any 4 in correct sequence) 4

Total 14 marks

5. (a)	W - lag, X-exponential/log, Y-stationary, Z-death (allow: decline) (all correct for 2, 1 error = 1)	2
(b) (i)	(arrow labelled D) pointing to or drawn on the down slope.	1
(ii)	the maximum size of population; (not: optimum size) that can be maintained/supported indefinitely/can be sustained (owtte)	2
(iii)	availability of/competition for food/living space/mates/light; predation; disease/parasitism; accumulation of toxins. (any 2; 1 only from competition; not: competition unequal.)	2
(iv)	temperature/weather (extremes)/flood/fire/natural disasters e.g. tsunami avp	1
(v)	dashed line continued in steep downward gradient (down to at least halfway between line and axis, no lag, no upward turn, down before dip in plotted line i.e. second cross over dotted line)	1
		Total 9 marks
6. (a)	nephron	1
(b) (i)	A-glomerulus, B-bowman's capsule, C-proximal convoluted tubule, D-loop of Henle, E-distal convoluted tubule, F-collecting duct. (all correct for 3, 1 error 2, 2 errors 1) (not: letters/ref. first and second convoluted tubule)	3
(ii)	create concentration gradient/low water potential in medulla owtte. (not: reabsorption of water)	1
(iii)	longer	1
(c) (i)	ADH/antidiuretic hormone	1
(ii)	pituitary	1
(iii)	I detector - hypothalamus Effector wall of collecting duct	1

- (iv) Effector:
left dotted line- makes more permeable
right dotted line- makes less permeable 1
- Concentration:
left dotted line- increase/ hypertonic
right dotted line- decrease/ hypotonic 1
- volume :
left dotted line- decrease
right dotted line- increase 1
- (d) (i) (I) freshwater fish release ammonia; 1
(II) insects release uric acid. 1
- (ii) requires less water for its disposal to allow them to survive
in dry places. /avp e.g. less toxic/less mass to allow flight 1

Total 15 marks

7. (a)	A	Nitrogen gas in air/atmosphere	1
	B	amino acids/protein in plants and or animals	1
	C	urea in urine/ammonia/nitrite/nitrate in soil	1
	D	Decomposition/putrefaction qualified	1
	E	Nitrifying bacteria/nitrification qual – produces nitrates in context	1
	F	<i>Nitrobacter</i> and <i>Nitrosomonas</i> , correctly linked to process	1
	G	ammonium compounds to nitrites	1
	H	nitrites to nitrates (G+H not: just arrows on diagram)	1
	I	denitrifying by <i>Pseudomonas</i>	1
	J	in anaerobic conditions	1
	K	Nitrogen fixing bacteria/nitrogen fixation	1
	L	convert nitrogen gas into soluble/organic nitrogen containing compounds. e.g. amino acids	1
	M	<i>Azotobacter</i> are free living	1
	N	<i>Rhizobium</i> in root nodules (of legumes)/symbiotic	1
	O	Decay bacteria release nitrogen compounds /ammonia from dead bodies faeces and urine (any 10 from 15)	1
		Total 10 marks (max)	

7. (b)	A	all materials are present at start/not added during the process	1
	B	sterile apparatus;	1
	C	pure (culture) of <i>Penicillium (notatum)</i> ;(not: if ref. bacteria)	1
	D	sterile nutrient medium;	1
	E	aeration method/oxygen for respiration;	1
	F	pH adjustment/buffer;	1
	G	filters for introducing sterile air/oxygen;	1
	H	method of mixing qualified e.g. to stop sedimentation/clumping;	1
	I	water jacket to control temperature/qualified	1
	J	allow growth phase to take place/glucose is depleted during growth phase;	1
	K	penicillin is secondary metabolite;	1
	L	penicillin is produced/harvested <u>after</u> growth phase/during stationary phase/after nutrient depletion;	1
	M	filter culture fluid/separate fungus;	1
	N	concentrate or extract penicillin/chemically modify antibiotic;	1
	O	AVP e.g. penicillin production in nature possibly to reduce competition/comparison with continuous culture;	1
		(any 10 from 15)	
			Total 10 marks (max)