BY4

1. (a) A = Coccus

B = Bacillus

C = Spirillum [3]

(b) Gram +ve violet/purple (not:blue)

Gram –ve red [1]

(c) Facultative anaerobes, grow better in presence of <u>oxygen</u> but can survive without it; [1]

Obligate anaerobes, cannot survive in presence of oxygen. [1]

(d) (i) do not put culture bottle cap onto bench;

flame mouth of tube;

flame (inoculating) loop;

lift Petri dish lid at an angle;
(not: in context of pouring plate)
use a pressure cabinet / sterile cabinet / near Bunsen for updraft;
(not: use sterilised Petri dishes/autoclave/equipment)

[Max 4]

(ii) Sealed: anaerobic conditions encourage pathogenic bacteria; [1]

Body temperature: encourages (human) pathogenic bacteria. [1]

(e) (i) B, clear distinct colonies which can be counted / A too many colonies / merged, to count accurately, C not enough; [1]

(ii) Plate B 200 bacteria per cm^3,

B was diluted by hundredfold twice dilution factor of <u>10000</u>;

200 x 100 = 2 million/ $2x10^6$;

1 mark for method look for 200 and 10000,

Give 2 marks for 2 million [2]

2. (a) P = phosphate (not: phosphoric acid)

Q = nitrogenous base / organic base / adenine;

R = Ribose / pentose (sugar). [3]

(b) (i) Supplies energy; <u>all</u> reactions; in <u>all</u> cells; [Max 2]
(not: produces)

(ii) Soluble; easily transported across membranes; easily hydrolysed; energy released in useable amounts; several methods of regeneration; link between energy production and energy use; only one enzyme needed [Max 3]

(c) Glycolysis; glucose to pyruvic acid/ pyruvate; (ATP produced) substrate level phosphorylation; pyruvic acid converted into lactic acid (accept ethanol); from reduced NAD; so that NAD regenerated; allows glycolysis to continue.
(not: NADP/glucose to lactic acid/ref. number ATP produced) [Max 4]

3. (a) A = Grana / thylakoid membranes;

B = Stroma;

A = Grana / thylakoid membranes;

B = Stroma;

C = Starch grain, clear area in chloroplasts; [5]

(b) (i) P = light energy / photons of light;

(ii) Electron acceptors/carriers;

(iii) Electrons flowing along an electron transport chain / cytochromes;
(not: chemiosmosis)

(iv) Oxygen

(v) NADP / $NADPH^+$ / reduced NADP / NADPH2;

(vi) Electrons from photolysis replacing electrons in chlorophyll of PS II [6]

(c) a. Light dependent reactions do not take place – in correct context;

b. ATP;

c. reduced NADP not produced;

d. Calvin cycle stops; (not: dark reactions)

e. GP not converted into TP/GALP;

f. no hexose sugar made;

g. no respiratory substrate / respiration stops [Max 5]

4. (a) Transmit impulses between neurones / from neurone to muscle;
(not: signal)
One direction only / polarity;

Filter out low level stimuli/background;

Protect from over stimulation;

(Act as junctions) / additive effect of stimuli from different neurones/ Spatial summation;

Accept reference to inhibitory synapses;

Temporal summation; [Max 3]

(b) Nerve net, neurones shorter; branched; can transmit in both directions; facilitation; slower transmission; Stimuli pass in all directions from point of stimulation; non-myelinated; one type of cell. Converse vertebrate. Matched points [Max 2]

(c) (i) As fibre diameter increases speed of conduction increases;

Much more rapid response in myelinated;

Below a certain diameter (1.1 um) non myelinated faster;
(not: Below a certain diameter no conduction)
Myelinated linear, non-myelinated rapid at start then plateau; [Max 3]

(ii) Conduct slower than non myelinated. [1]

(iii) Increase diameter; myelination, higher (body) temperature; longer distance between nodes / fewer nodes.
Saltatory conduction [3]

5. (a) (i) cortex [1]

(ii) Water has been absorbed / less volume of water; [1]

(iii) C

B, A

E acc C

F or G [4]

(iv) A = decrease

C = decrease

D = decrease

E = increase [4]

(b) (i) Loop of Henle longer;

Counter current multiplier; (not: description)

Creates region of (very) low water potential around loop;

More water reabsorbed from collecting duct;

Reference to low filtration rate; [Max 2]

(ii) Metabolic water / water from metabolism;

Respiration;

Fats / oils. [2]

6. (a)

A. Lag phase, Log phase / exponential- term in correct context;

B. Induction DNA / gene switching / DNA unzipping;

C. Enzyme production/protein synthesis;

D. Substrate breakdown / getting used to growth medium;

E. Slow population growth;

F. <u>Rapid</u> cell division;

G. Abundance of nutrients / oxygen / low levels of waste products / no environmental resistance;

H. Cell production exceeds cell death;
(not: ref. birth/immigration/emigration)

I. Population doubles per unit time;

J. Population increases then begins to slow;

K. Lack of nutrients / accumulation waste products / environmental resistance; (not: ref space)

L. Stationary phase;

M. Cell production = cell death; (not: ref birth, penalise once only)

N carrying capacity;

O. lack of nutrients / accumulation of waste products if not given as K;

P Death phase;

Q Cell death exceeds cell production;

(b)

A. Decomposition / putrefaction;

B. Recycling nutrients;

C. Breakdown of organic materials into inorganic / suitable e.g.;

D. Nitrifying bacteria;

E. Nitrosomonas, Nitrobacter;

F. ammonium compounds to nitrites;

G. nitrites to nitrates;

H. ammonium compounds to nitrates if no F/G;

I. Nitrogen fixing bacteria;

J. atmospheric nitrogen converted into organic nitrogen / e.g.;

K. free living azotobacter;

L. rhizobium;

M. root <u>nodules</u> of (legumes);

N denitrification [Max 8]

O. encourage aerobic conditions (to stop denitrifyers) / ploughing;

P drainage for aerobic conditions to stop denitrifyers;

Q grow leguminous crops / add organic waste products / manure / urea etc;

[Max 2]