

## BY2

1. One mark for each line:-

Animalia: Fungi: Protoctista: Plantae: Prokaryotae. [5]  
(no mark if extra ticks present)

**[Total 5 marks]**

2. (a) Wings of birds and bats. [1]

(b) (i) Adaptive radiation (**Allow** Speciation / Natural Selection) [1]

(ii) No competition from other birds / vacant niches / subsequent intraspecific competition (Any two) [2]

(c) Unable to interbreed and produce fertile offspring [1]  
(allow: breed together. Not: unable to breed)

(d) DNA profiling/hybridisation (comparing DNA or equivalent e.g. fingerprinting) [1]  
(not: looking at DNA/electrophoresis unqualified)

**[Total 6 marks]**

3. (a) (i) Larger caecum in rabbit. [1]

Longer intestine in rabbit [1]  
(allow: longer rectum in rabbit. Not: ref. pancreas)

(ii) Human is omnivorous / mixture of meat and plant food [1]

(b) Rabbit – premolars and molars with large cusps or for grinding / no carnassials / large incisors / no canines (not: ref. continuous growth)  
Cat – carnassials / loss of back molars / shape of incisors / large canines.

(Three comparisons) [3]

(c) Mammals are unable to digest cellulose / do not possess a cellulase. [1]

Bacteria can break down the (very high proportion of) cellulose in the rabbit diet. [1]

(d) (i) Effectively doubles the exposure to cellulose digestion. Gives more time to absorb nutrients. [1]

(ii) Cows have (four) more than one stomach(s). [1]

Food is regurgitated for further grinding/chew the cud. [1]

Additional stomachs for bacterial fermentation. [1]

**[Total 12 marks]**

4. (a) Large surface area / thin or short diffusion pathway / permeable / good blood supply  
(moist neutral; wrong answer negates right answer; not: ref. contraflow)  
(Any three) [3]
- (b) On diagram B label water (upper plot) and blood (lower plot) with arrows pointing left to right on both [1]  
Water plot starts high on Y axis (90-100%) and blood starts low (20%) [1]  
Convergence point is at 50%. [1]
- (c) X = distance along lamella / gill plate (not gill). [1]
- (d) Blood saturation reaches higher level. [1]  
Uptake continues (water concentration higher than blood) throughout/  
concentration gradient maintained. [1]

**[Total 9 marks]**

- 5 (a) In combination with haemoglobin /as carbamino-haemoglobin. [1]  
Dissolved/in solution in the plasma. [1]
- (b) (i) Carbonic anhydrase. [1]  
(ii) speeds up the reaction. [1]
- (c) (i) They pass (out of the corpuscle) into the plasma. (not: blood) [1]  
(ii) They dissociate oxyhaemoglobin to release oxygen [1]  
To be used in respiration by the muscle. [1]  
(iii) Chloride/ $\text{Cl}^-$  (not: chlorine) [1]  
Enters the corpuscle to replace bicarbonate/ in order to preserve  
electrical neutrality. [1]
- (d) Causes acidification in fresh and seawater. [1]  
Extinction of fish in lakes / death of coral reefs / failure of shell formation in  
shellfish / any sensible suggestion based on aquatic fauna or flora. [1]  
(not: affects organisms in the water)

**[Total 11 marks]**

6. (a) Choice of suitable scale with axes the right way round [1]  
 Correct units on axes (hrs,  $\text{gh}^{-1}$ , or g/h) [1]  
 Accurate plotting of points (+/- half small square). [1]  
 Quality of line, no extrapolation. [1]
- (b) Quantitative comparison e.g. actual values at the two times or value at 1600 is 5 times the value at 0800 [1]  
 Mention of difference in light intensity at the two times. [1]  
 Relate this to photosynthesis of  $\text{K}^+$  pump. [1]  
 Causing opening of stomata / movement apart of guard cells. [1]
- (c) Increasing the temperature / lowering the humidity / air movement. (not: heat) (*ignore light – conference*) (Any two) [2]
- (d) (i) Cohesion is the strong attraction that water molecules exert on one another. (not: stickiness) [1]  
 (ii) Water molecules evaporating through the stomata/transpiration at the top of the column are replaced from below [1]  
 and because of cohesion this creates an upward force (tension) throughout the whole column. [1]  
 (iii) Adhesion between the water molecules and the xylem wall. (allow: ref. cellulose/lignin. Not: friction/capillarity) [1]
- (e) (i) Root Pressure. [1]  
 (ii) Active transport of ions into the root xylem. [1]  
 Creates an osmotic (wp) gradient / water is drawn in by osmosis at the foot of the xylem. [1]

**[Total 17 marks]**

7. (a)
- A. Heart muscle is myogenic. [1]  
(allow: heart is myogenic, conference only)
  - B. It can contract without any nerve stimulation. [1]
  - C. The stimulus to contract originates in the sinoatrial node (SAN). [1]
  - D. Which controls the rate of beating / acts as pacemaker. [1]
  - E. It is situated in the wall of the right auricle / atrium. [1]
  - F. Electrical impulse from the SAN causes the two auricles / atria to contract. [1]
  - G. Thin layer of connective tissue prevents the stimulus spreading to the ventricles. [1]
  - H. At the bottom of the wall separating the two auricles / atria is the atrioventricular node AVN. [1]
  - I. This delays the impulse (about 0.1 sec) before passing it on to the ventricles. [1]
  - J. The impulse is sent to the tip/apex of the ventricles [1]
  - K. Along bundle branches (Bundle of His); [1]
  - L. And is conveyed upwards along the branching Purkinje fibres [1]
  - M. Causing a wave of ventricular contraction starting from the lowermost part of the ventricle; [1]
  - N. The SAN may be stimulated by various factors to change its pacing [1]
  - O. One example – hormones (adrenalin), exercise, body temperature, etc. (allow: ref. autonomic nervous system) [1]

**[Ten marks can be awarded from the fifteen available]**

7. (b)
- A. Gametes are shed in water [1]
  - B. and fertilisation is external. [1]
  - C. Heavy waste of gametes which fail to fuse. [1]
  - D. Embryo is entirely dependent on yolk supply for its development. [1]
  - E. Many hazards – predation etc, - large waste of embryos. [1]
  - F. Finding suitable conditions for development is a completely random process. [1]
  - G. Terrestrial mammals have internal fertilisation. [1]
  - H. Placing of gametes/female gametes not shed. [1]
  - I. Greater certainty of fertilisation. [1]
  - J. Number of eggs has been much reduced. [1]
  - K. Internally developing embryo not dependent solely on yolk / importance of placenta. [1]
  - L. High level of protection from external hazards during development. [1]
  - M. In general more time / energy / resources devoted to fewer offspring. [1]
  - N. Contact between parent and offspring; parental care [1]
  - O. e.g. provision of dens/burrows/herding/ protection from predation etc. [1]

**[Ten marks can be awarded from the fifteen available]**