

# Answers to exam-style questions

## Option D

- 1 metabolic disorder;  
caused by lack of tyrosine hydroxylase / enzyme that metabolises phenylalanine;  
babies are tested;  
children and babies are treated with a special diet;  
must avoid high protein foods;  
until puberty; [5 max]
- 2 *Protein hormones:*  
do not enter cells / do not pass through plasma membrane;  
bind to receptors on the outside of the plasma membrane;  
cause release of a secondary messenger inside the cell  
*Steroid hormones:*  
pass through plasma membrane;  
form complex with receptors in cytoplasm;  
regulate transcription of one or more genes [2 max]
- 3 pepsin digests proteins;  
pepsin could digest cells that secrete it;  
pepsinogen is the inactive form of pepsin;  
pepsinogen is activated by hydrochloric acid / HCl /  
pepsinogen is converted into pepsin (active form) by HCl;  
different cells in the stomach wall secrete pepsinogen and HCl [3 max]
- 4 enzymes in the stomach work at pH2 / optimum pH;  
acidic conditions provided by the release of hydrochloric acid from gastric glands provide this;  
acid also kills bacteria that may be ingested with food [3 max]
- 5 *Answer must link structure to function*  
surface area of lumen / plasma membrane increased by microvilli;  
facilitated diffusion (protein) channels to absorb digested molecules;  
pinocytotic vesicles at base of microvilli take in fluid / solution from lumen;  
many mitochondria provide ATP / energy for active transport;  
large amount of rER and Golgi apparatus for enzyme synthesis / secretion;  
tight junctions join cells together to form barrier;  
prevent intestinal juices leaking into tissue fluid [5 max]
- 6 hepatic artery from aorta brings blood to liver;  
hepatic portal vein from gut brings blood to the liver;  
these vessels merge and branch into capillaries;  
liver capillaries are called sinusoids;  
sinusoids join to form hepatic vein;  
hepatic vein leaves liver and joins vena cava [4 max]
- 7 a erythrocytes break up at end of life span / after about 120 days;  
taken in to liver / Kupffer cells / hepatocytes by phagocytosis;  
hepatocytes / Kupffer cells form walls of liver capillaries / sinusoids;  
hemoglobin broken into globin and heme;  
iron removed from heme;  
remainder of heme converted to bile pigment / bilirubin;  
bilirubin released into gall bladder / alimentary canal;  
globin broken down / digested / hydrolysed to release amino acids [5 max]
- b excess glucose stored as glycogen in liver;  
iron from breakdown of red blood cells / hemoglobin;  
vitamins A and D [2 max]
- [total 7 marks]
- 8 SAN / sinoatrial node / pacemaker sends out / releases / fires electrical impulse;  
when ventricle 70% / almost full;  
electrical wave spreads across atria;  
atrial systole;  
blood pumped / pushed into ventricles;  
atrial diastole;  
AVN / atrioventricular node receives electrical impulse;  
AVN sends out / releases / fires electrical impulse (after brief delay);  
electrical impulse passes between ventricles / down bundle of His;  
electrical impulse (rapidly) spreads over ventricles in Purkinje fibres;  
ventricular systole;  
rise in pressure closes AV valves;  
further rise in pressure opens semilunar valves;  
blood pumped into arteries / aorta and pulmonary artery;  
ventricular diastole;  
back pressure in arteries closes semilunar valves;

pressure (difference) / lower pressure causes atrioventricular / AV valve to open;  
blood drains into ventricles from atria;  
heart sounds due to valves closing;  
first sound is AV valves closing, second sound is semilunar valves closing **[6 max]**

**9 a** the pressure exerted by a single gas in a mixture of gases **[1]**

**b** increase in ventilation rate;  
increase in number of red blood cells / erythrocytes in blood;  
increase in myoglobin content of muscles;  
increase in capillary networks in muscles;  
increase in lung volume / vital capacity **[3 max]**  
**[total 4 marks]**

**10 a** At 0.3 secs or 1.3 sec **[1]**  
**b** 60 beats per minute **[2]**  
**c** 16 kPA **[1]**  
**d** the left ventricle has thicker muscle walls; which can produce greater pressure; because the left ventricle must pump blood all round the body whereas the right ventricle pumps blood only to the lungs **[3]**

**e** When the ventricle has contracted fully the semi lunar valves in the aorta close to prevent back flow of blood which enters slowly from the atrium; Pressure in the ventricle is low at this time but pressure in aorta is high; and is maintained by the muscle walls of the artery. **[2 max]**  
**[total 9 marks]**