**1.** A

[1]

**2.** C

[1]

**3.** A

[1]

**4.** A

[1]

**5.** C

[1]

**6.** C

[1]

**7.** B

[1]

**8.** C

[1]

**9.** B

[1]

**10.** C

[1]

**11.** C

[1]

**12.** B

[1]

**13.** D

[1]

**14.** B

[1]

**15.** C

[1]

**16.** C

[1]

**17.** B

[1]

**18.** C

[1]

**19.** (a) active transport: against concentration gradient and requires ATP and  
protein pumps/transport proteins;  
facilitated diffusion: along concentration gradient, is passive/no ATP  
required and requires carrier/transport proteins;  
simple diffusion: passive/no ATP required and along concentration  
gradient and through protein channels;  
endocytosis: invagination of the cell membrane making a vesicle; 2 max

(b) *Two of the following needed for* ***[1]****.*cellulose/fibres  
lignin  
bile pigment  
bacteria  
intestinal cells 1 max

[3]

**20.** (a) for both men and women a decrease is seen at the lowest alcohol intake  
followed by an increase;  
the level of CRP is higher in women than in men over the range of  
alcohol consumption / as the intake increases the difference between  
men and women increases, the CRP increase being greater in women; 1 max

(b) drinking small amounts of alcohol seems to reduce the level of all  
markers / drinking none and/or high amounts of alcohol has higher  
levels of markers than moderate amount;  
the effect of small amounts of alcohol is less in women than in men /  
the effect of large amounts of alcohol is greater in women than in men /  
women should consume less than men;  
other effects of alcohol consumption are not measured;  
other factors increasing risk of CVD are not measured;  
the type of alcohol is not stated / the active factor in the drink is not seen; 3 max

(c) CRP shows the decrease in risk for low amounts of alcohol then increases  
above the baseline for higher amounts 1

(d) high blood pressure damages endothelial wall;  
WBC/macrophages build up cholesterol;  
plaque hardens arterial wall / blocks lumen / artery blocked by  
depositions in wall;  
wall rough;  
clots form; 2 max

[7]

**21.** (a) atheroma/fatty deposits in arteries;  
hardening of arteries/atherosclerosis/arteriosclerosis;  
rough surface causes rupture of platelets;  
clots form in coronary artery; 2 max

(b) (i) increase in CO2 concentration;  
decrease in pH; 1 max

(ii) graph drawn to left of A;  
curve not sigmoid; 2  
*As shown below.*



(c) hemoglobin absorbed by phagocytes/Kupffer cells;  
split into heme and globins;  
globin hydrolysed/broken down to amino acids;  
iron removed from heme group / heme broken down to form bilirubin/  
bile pigment; 2 max

[7]

**22.** (a) (i) standing position 1

(ii) leg muscles are not pumping/contracting to help return  
of blood to the heart;  
gravity pulls the blood back towards feet / circulation  
must overcome gravity to return blood to heart; 1 max

(b) 340 (arbitrary units) 1

(c) better oxygenation enhances muscle metabolism;  
better blood flow/cardiovascular fitness prevents pooling/swelling  
of ankles and feet/varicose veins;  
prevention of thrombosis;  
maintenance of muscle strength from better circulation;  
maintenance of muscle strength from use of muscles; 3 max

[6]

**23.** (a) (i) microvilli/microvillus 1

(ii) epithelial cell/enterocyte 1

(b) chemical (messengers) secreted by (endocrine) glands;  
into the blood / transported by the blood;  
act on target organs/cells; 2 max

(c) hepatic artery carries oxygenated blood;  
hepatic portal vein carries blood from gut/deoxygenated blood;  
blood from hepatic portal vein and hepatic artery mix;  
flows through sinusoids;  
hepatic vein carries blood away from liver; 3 max

[7]

**24.** (a) I. hepatic cells / hepatocytes / liver cells / liver tissue;

II. hepatic vein / blood cells;

III. sinusoids; 3

(b) storage of nutrients;  
detoxification of poisons;  
breakdown of hemoglobin;  
production of bile pigments;  
synthesis of plasma proteins;  
synthesis of cholesterol; 2 max

(c) *Award* ***[1]*** *for two of the following.*cellulose / lignin / bile pigments / bacteria / intestinal cells  
*Do not accept fibre.* 1

(d) insulin / glucagon / prolactin / somatotrophin  
*Award other suitable examples.* 1

[7]

**25.** (a) *Award* ***[1]*** *for every two correct.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Enzyme*** | ***Source*** | ***Optimum pH*** | ***Substrate*** | ***Products*** |
| Amylase | Salivary gland | 7 | starch/amylose/ glycogen; | maltose/short polysaccharides /disaccharides /dextrin; |
| Lipase | Pancreas; | *Allow any pH in range 7–9* | Lipids | Fatty acids and glycerol |

2 max

(b) rate of digestion at body temperature would be too slow / enzymes  
increase the rate of digestion;  
enzymes break large molecules down into small/soluble molecules;  
for absorption/diffusion into blood; 2 max

(c) labelled sac-shaped gall bladder with a duct;  
tubule/(bile) duct shown connecting gall bladder directly to small  
intestine/duodenum / tubule/(bile) duct merging with the pancreatic  
duct before entering small intestine; *Alternative answers are  
accepted because of variations in human anatomy.*pancreas drawn with pancreatic duct connected to small intestine  
and pancreas labelled; 3*A duct is preferred to a line, but since this is a diagram, both are acceptable.*

[7]

**26.** (a) 0.13 (pH min–1) *(Allow values between 0.125 and 0.135)* 1

(b) (DIDS) reduces the rate of decrease of (extracellular) pH;  
rate of decrease reduced less than control cells / some SCL26A9  
are not inhibited; 1 max

(c) (hypothesis supported as) SCL26A9 in excess means more  
transport of ions;  
(hypothesis supported as) when inhibited there is less transport  
of ions (needed to maintain neutral pH); 2

(d) host cells increase transcription/protein synthesis to make more carriers 1

(e) pH will fall;  
SLC26A9 transports less chloride/hydrogen carbonate ions; 2

[7]

**27.** (a) *Award* ***[1]*** *for each structure clearly drawn and correctly labelled.  
Schematic diagrams are acceptable.*right and left ventricles — not connected shown larger than atria;  
right and left atrium — not connected, thinner walls than ventricles;  
right ventricle has thinner walls than left ventricle / *vice versa*;  
atrio-ventricular valves / tricuspid and bicuspid valves — shown between  
atria and ventricles;  
aorta and pulmonary artery — shown leaving the appropriate ventricle  
with semilunar valves shown;  
pulmonary vein and vena cava — shown entering appropriate atrium;  
*Vessels must join unambiguously to correct chamber.* 4 max

(b) cells/tissue is damaged/cut/bruised;  
damaged cells/platelets release clotting factors;  
(clotting factors cause the) production of thrombin;  
blood plasma contains soluble fibrinogen;  
fibrinogen converted into fibrin;  
by thrombin;  
forms a net of fibres trapping blood cells;  
forming a clot / prevents blood loss / entry of bacteria/pathogens;  
cascade of reactions/series of stages prevent accidental clotting/  
speed up clotting; 6 max

(c) *benefits:* ***[6 max]***immunity results  
can limit pandemics/epidemics/spread of (infectious) diseases;  
diseases can be eradicated/smallpox eliminated;  
reduces mortality/deaths due to disease;  
can protect vulnerable groups/young/old/with other conditions;  
decreases crippling effects of diseases (such as polio);  
decreased health care costs;

*risks:* ***[6 max]***  
may produce (mild) symptoms of the disease;  
human error in preparation/storage/administration of vaccine;  
individual may react badly to vaccine / defective immune system /  
hypersensitive/allergic reaction;  
immunity may not be life-long / booster required;  
possible toxic effects of mercury-based preservatives/thimerosal; 8 max

*(Plus up to* ***[2]*** *for quality)*

[20]