**1.** D

[1]

**2.** A

[1]

**3.** A

[1]

**4.** C

[1]

**5.** C

[1]

**6.** C

[1]

**7.** D

[1]

**8.** (a) (i) BMI = 74.0 kg / (1.80 m)2;  
= 22.8 kg m–2; *(unit required)*  1 max

(ii) normal weight *(allow ECF)* 1

(b) diet rich in carbohydrate/fat;  
too much food intake / unbalanced diet / food cheap and readily available;  
sedentary lifestyle / lack of training/exercise;  
genetic disposition/disorder;  
malfunction of hunger centre; 3 max

[5]

**9.** (a) cardiac output/stroke volume increases more rapidly during exercise;  
heart rate increases more gradually during exercise;  
recovery to normal cardiac output after exercise is faster;  
resting pulse rate is lower; 2 max

(b) lactate can be converted to pyruvate in liver;  
pyruvate can then be converted into glucose (Cori cycle);  
glucose/pyruvate can then be used for aerobic respiration;  
additional oxygen is supplied during deep/fast ventilations after exercise; 2 max

(c) increase blood flow to muscles;  
stretch tendons and ligaments;  
improve flexibility of joints;  
little scientific evidence for the need to warm up / strong belief  
amongst athletes in the effectiveness of warm up / placebo effect  
during scientific trials / mental preparation for intense exercise; 2 max

[6]

**10.** (a) *Both name and function required to achieve* ***[1]****.*

*A*: *name*: flagella/flagellum

*function*: used for locomotion / beats in whip-like action to propel cell;

*B*: *name*: pili/pilus

*function*: used for adhesion (to another cell/surface) / transfer  
of genetic material (between cells);

*ECF, for one mark, can be applied if both parts of the pair are reversed.* 2

(b) *Award* ***[1]*** *for a similarity.*both have a plasma/cell membrane/ribosomes/cytoplasm/genetic material;

*Award up to* ***[2]*** *for differences. Candidate must make a valid  
comparison, not simply describe each. Award* ***[2 max]*** *if features  
of prokaryotic and eukaryotic cells are not compared directly,  
item by item, although a table is not necessary.*

|  |  |
| --- | --- |
| **Prokaryote** | **Eukaryote** |
| naked DNA | DNA associated with proteins; |
| DNA in cytoplasm/no nucleus | DNA enclosed in nuclear envelope/membrane / nucleus; |
| 70S ribosomes | 80S ribosomes; |
| no membrane-bound organelles | internal membranes that form membrane-bound organelles; |
| circular chromosome | linear chromosomes; |
| fission | mitosis; |
| no introns or exons | introns and exons; |
| Smaller in size(approximately) 10 microns | larger in size up to (approximately) 100 microns; |
| cell wall present | cell wall only present in plants/fungi; *Do not accept cell wall sometimes present.* |

3 max

[5]

**11.** (a) (i) phosphate 1

(ii) covalent / phosphodiester 1

(b) only the antisense strand is transcribed / the antisense strand is  
transcribed to mRNA and the sense strand is not transcribed/has  
the same base sequence as mRNA (with uracil instead of thymine) 1  
*To award* ***[1]****, reference must be made to both strands and transcription.*

(c)

|  |  |
| --- | --- |
| **prokaryotic DNA** | **eukaryotic DNA** |
| circular | linear; |
| in cytoplasm/nucleoid region | enclosed in nuclear membrane / in nucleus; |
| naked | associated with proteins/histones; |
| plasmids | no plasmids; |
| both prokaryotic and eukaryotic DNA consist of a double helix of (deoxy)nucleotides / phosphate, deoxyribose and base/ATC and G; | |

2 max

*Award marks for paired statements only. Answers do not need to  
be shown in a table format.*

[5]

**12.** (a) enzymes/biological catalyst —amylase/protease/lipase/catalase;  
defence/immunity — immunoglobin/antibody;  
structure—collagen;  
movement — actin/myosin;  
transport—hemoglobin;  
synthesis — ligase/DNA polymerase;  
hormonal communication — insulin/luteinizing hormone; *MUST be  
proteinaceous*food stores — casein in milk;  
pigments—opsin;  
*Accept any other valid responses.* 2 max

(b) polar amino acids have hydrophilic R groups, non-polar have hydrophobic  
R groups;  
non-polar amino acids in centre of water-soluble proteins stabilise their  
structure;  
non-polar amino acids cause proteins to remain embedded in membrane;  
polar amino acids on surface of proteins make them water-soluble;  
polar amino acids create hydrophilic channels/protein pores in membranes;  
enzyme active site specificity depends on amino acids present/polar and  
non-polar amino acids can play a role in substrate interactions at the  
active site; 3 max

[5]

**13.** during exercise the rate of tissue respiration increases/more carbon dioxide produced;  
carbon dioxide production in the tissues exceeds the rate of breathing it out;  
increase in carbonic acid / increase in H+ ions / pH drops in the blood plasma;  
lactic acid (in strenuous exercise) reduces pH;  
chemoreceptors/chemosensors detect change in pH/increase in carbon dioxide/  
decrease in oxygen;  
receptors in the carotid/aortic bodies;  
nerve impulses sent to the breathing centres of the brain;  
nerve impulses then sent to diaphragm/intercostal muscles;  
negative feedback control; 6 max

[6]

**14.** (a) HIV/human immunodeficiency virus;  
reduces the effectiveness of the immune system / reduction in  
the number of active lymphocytes / infects T-(helper) cells/  
lymphocytes;  
loss of the ability to produce antibodies;  
leaving the infected person susceptible to other infectious  
diseases / AIDS is an accumulation of opportunistic diseases;  
can be transmitted by sexual intercourse/exchange of body  
fluids with an infected person;  
can be transmitted by blood transfusion/blood products from  
infected person;  
mothers can transmit to children while breast feeding/  
during pregnancy/birth;  
sharing hypodermic needles that have not been sterilized; 5 max

(b) phagocytic leucocyte occurs in blood and body tissue fluids;  
phagocytic leucocyte detects pathogen/foreign material;  
leucocyte surrounds/engulfs pathogen / endocytosis / phagocytosis;  
membrane forms around pathogen to form a vacuole;  
lysosomes digest contents of vacuoles; 4 max

(c) homeostasis involves maintaining a constant internal environment;  
involves the concept of negative feedback;  
a deviation from the norm is the stimulus to trigger the mechanisms  
to restore the norm / *OWTTE*;  
body temperature in mammals must be maintained at a constant  
level for enzymes;  
controlled by the hypothalamus / hypothalamus as a thermostat;  
too hot causes vasodilation so more heat is lost from skin;  
too hot causes sweating as evaporation of sweat leads to cooling;  
too cold causes shivering/muscle contraction as (increased  
metabolic rate) generates heat;  
too cold causes vasoconstriction so less heat lost from skin;  
liver/muscles can generate heat which is distributed around the  
body by blood;  
hair can trap air which insulates against heat loss (goose bumps);  
behavioural example of heat retention;  
*(e.g. adding layers of clothes, jumping up and down,  
huddling in groups)* 9 max

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

[20]