Marking scheme_ HKDSE mock examination 2019-2020_paper 2

1. (a) Rate of respiration of skeletal muscle increases (1)
Heat is produced by the skeletal muscle cells to increase the core temperature. (1)

(b) (i) The change of core temperature by warm water bath (2.0) is higher than that of the core- warming after 60 minutes (1.36). (1) OR
The rate of changing of core temperature by warm water bath is higher than that by core-warming from 10 to 30 minutes. (1) OR
The core temperature of the patient drops from 0 – 6th minute using warm bath for rewarming but that increases when using core- rewarming. (1)

(ii) Thermoreceptor in the thermoregulatory centre of hypothalamus can be stimulated by the heat transfer from the warm air. (1)
More nerve impulse can be sent to the medulla oblongata (structure X) for generating nerve impulse to respiratory muscles for contraction (1) to restore the breathing rate. (1)

(c) (i) Since the hydrostatic pressure of the afferent arteriole is higher than that of the efferent arteriole in the glomerulus. (1)
Water and small molecules including rhEPO is filtrated out as glomerular filtrate in the Bowman's capsule. (1)
rhEPO cannot be reabsorbed by the kidney tubule
without the suitable carrier/ channel protein OR excreted out in the urine which can be detected. (1)

(ii) More oxygen can be supplied to the skeletal muscle for aerobic respiration (1) to provide energy for muscle contraction. (1)
10000m run has a higher percentage of energy contributed by aerobic respiration and 100m run mainly relies on stored ATP in skeletal muscle and anaerobic respiration. (1)
In which the effect of increase of oxygen supply to muscular contraction is more significant in 10000m race than 100m race. (1)

(d) (i) Sample A (1)

(ii) The plasma water potential decreases during the test due to urination without replenishment from drinking. (1)
Osmoreceptors in the hypothalamus is stimulated to pituitary gland to release more ADH. (1)
However, the cells in the collecting duct cannot response to the increase of ADH and hence less/ no channel protein for water is available for increasing the permeability of the wall of the collecting duct to water. (1)
Water is retained in the collecting duct and hence the solute potential remains unchanged regardless the drop of water potential in blood. (1)

(iii) To minimize the loss of water through sweating during the test. (1)
Which may increase the solute concentration of urine and interfere the result. (1)

2. (a) Shortened mRNA contains less codons (1)
Shorter polypeptide fold to a different shape and lose its function (1)

(b) Recessive. (1)
For SMA to develop, the individual must have two chromosome 5 / SMN1- OR
deletion of SMN1 on both chromosomes (1)
so there is no (functional) SMN protein being produced and causes SMA (1)

(c) (i) Denature DNA molecules at high temperature to form single-stranded DNA (1)

At a lower temperature, allow annealing of suitable primers that flank SMN genes (1)
Increase temperature again, with complementary free nucleotides, DNA molecule is extended by Taq polymerase (1)

(ii) PCR product of SMN1 and SMN2 are of the same size and will be in the same band if run on gel together / gel electrophoresis cannot separate SMN1 from SMN 2 (1)
As only SMN2 contains the restriction site, adding the restriction enzyme can help distinguish SMN1 and SMN2 during gel electrophoresis. (1)

(iii) (1) A (1)

(2) Thinner band indicates there is less PCR products (1)
Because individual C is heterozygous for / just have one copy of SMN1 gene. (1)

(d) (i) A viral vector is used to carry the working SMN / SMN1 / normal gene (1)
The viral vector delivers and inserts the normal gene into the patient's genome / cell (1)
This inserted gene is expressed to produce functional SMN protein which should overcome the defect (1)

(ii) Antibodies / immune reaction develop against the viruses if exposed before. (1)
Will destroy /attack the viral vector and corrective gene cannot be delivered to target cells (1)

(iii) Treatment 1 is long-term treatment because once the working SMN gene is inserted into motor neurones the normal SMN proteins can be produced by the cells (1)
Treatment 2 is not as it does not alter the SMN2 gene, the individual could not produce 0functional SMN protein as long as the drug is administered. (1)