**Human Biological Science Stage 2**

**Final Examination 2010**

**Section One: Multiple-choice**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 | A | 11 | A | 21 | C |
| 2 | B | 12 | D | 22 | B |
| 3 | C | 13 | D | 23 | D |
| 4 | C | 14 | C | 24 | D |
| 5 | A | 15 | A | 25 | A |
| 6 | A | 16 | A | 26 | D |
| 7 | D | 17 | C | 27 | C |
| 8 | C | 18 | B | 28 | D |
| 9 | A | 19 | C | 29 | C |
| 10 | D | 20 | B | 30 | D |

**Section Two: Short answer**

**Question 31 (9 marks)**

1. Name = 1 mark, symptoms = 1 mark, treatment = 1 mark

*Bacteria (any one example)*

Syphillis / chancres (open sores), rashes, fevers, in final stage: heart damage, insanity, blindness / antibiotics

Gonnorhoea / in males: burning during urination, pus, sterility / in females: generally no early symptoms, later sterility / antibiotics

Chlamydia / in males: burning during urination, pus, sterility / in females: generally no early symptoms, later sterility / antibiotics

*Viruses (any one example)*

HIV / fatigue, fever, headaches, joint pain, swollen lymph nodes, weight loss, AIDS, compromised immune system / antivirals

Herpes / cold sores, blisters on genitals / antivirals

(b) Safe sex using condoms / abstinence / education / testing of at risk individuals in clinics (Any three points, 1 mark each)

**Question 32 (10 marks)**

1. blastocyst (1)
2. an immature cell that has the potential to become many types of mature, specialized cells (1)
3. embryonic cells / umbilical cord / adult cells in some organs (e.g. bone marrow) (any 2, 1 mark each)
4. mesoderm / ectoderm
5. a substance that causes physical damage to a developing embryo/foetus (1) Any reasonable agent (e.g. alcohol, nicotine, thalidomide) (1)
6. ultrasound – image structure of foetus using high frequency sound waves

Fetoscopy – directly viewing the foetus through a high powered camera

Chorionic villus sampling - taking a sample of foetal tissue from the chorion

Amniocentesis – taking a sample of amniotic fluid

(Any one technique, name = 1 mark, description = 1 mark)

**Question 33 (9 marks)**

1. dissolved in the plasma / combined with haemoglobin (carbaminohaemoglobin) / hydrogen carbonate ions
2. hydrogen carbonate
3. (i) inflammation, (ii) mast cells (1) release of histamine in response to damage (1) blood vessels become more permeable (1) increase in blood flow to the area causing swelling and redness (1)

**Question 34 (10 marks)**

1. Day 12 (1) Surge in LH on this day (1)
2. Maintain endometrium / increase secretions / vascularisation (any point, 1 mark)
3. Corpus luteum (1)
4. The corpus luteum degenerates (1)
5. (i) Human error

(ii) hCG is produced by the blastocyst (or early placenta) (1) therefore a good indication that implantation has occurred (1)

(iii) alcohol passes through the placenta (1) it is a teratogen / causes foetal alcohol syndrome (1)

**Question 35 (9 marks)**

1. 2 = ureter (1), 4 = vas deferens (1), A = scrotum (1)
2. (i) site of sperm maturation (1), (ii) produce fructose rich component of semen (1), (iii) deposits semen in vagina (1)
3. Must have device name and explanation for one mark

Condom – stops sperm from being deposited in the vagina

Diaphragm / cervical cap / female condom – stop sperm from passing beyond the cervix

Spermicides – immobilize sperm preventing them from reaching the egg

Hormonal contraceptives – prevent ovulation

Sterilisation – prevent sperm from being ejaculated or egg from entering uterus

(No marks for IUD or morning after pill as these do not prevent fertlisation)

**Question 36 (10 marks)**

1. Mutation (1)
2. Dominant (1)
3. Autosomal (1)
4. In an X-linked dominant disorder, affected fathers would always pass the disease to their daughter. (1) Specific example – II.4 should have an affected daughter, III.2. (1)
5. aa (1)
6. Working (1) 50% (1)
7. Involuntary movements in the body and limbs / personality changes such as being easily irritated, having poor insight, depression, withdrawal, euphoria and difficulty with organisation (any two symptoms, 1 mark each)

**Question 37 (10 marks)**

1. Type of beverage consumed (1)
2. Performance in endurance trial (1)
3. Repeat experiment / use larger sample size / test female cyclists / test activities other than cycling (any one point for 1 mark)
4. Trained cyclists / male cyclists / glycogen depletion workout / four-hour recovery period / endurance capacity trial / calorie content of beverage (any two points, 1 mark each)
5. Time of day / ambient temperature / volume of beverage relative to body weight / time between trials / order of trials (any two reasonable controls, 1 mark each)
6. Each athlete acts as his own control (1)
7. Subjects in an experiment may show improvement because of their belief about the effect of a particular treatment (1) Athletes in this experiment may have preconceived ideas about the effectiveness of a particular beverage and this may have, in turn, affected the results (1)

**Question 38 (9 marks)**

1. The active site begins to change shape / denature (1) this makes it harder for the substrate to bind to the enzyme (1)
2. Labels (1) / graph (1)

pH

Enzyme

activity

1. Box 1: Anabolism / Box 2: ATP / Box 3: Transfer of energy / Box 4: Catabolism
2. Constantly recycled (1)

**Question 39 (8 marks)**

1. Protein molecules are too large (1) to fit through the pores in the filtration membrane (1)
2. Small enough to pass through the pores (1) but actively reabsorbed along the tubule (1)
3. Diabetes / kidney disease or failure (Any appropriate disease 1 mark)
4. Mainly water (1) urea (1) ions (1)

**Question 40 (9 marks)**

1. Top box = facilitated diffusion or active transport (1) / middle box = facilitated diffusion or active transport (1) / bottom box = simple diffusion (1)
2. Molecules at A and B enter the blood directly (1) molecules at C enter a lacteal (1)
3. Hepatic portal vein is relatively high in glucose (1), amino acids (1) and carbon dioxide (1) and relatively low in oxygen (1). The opposite is true in the mesenteric artery.

**Question 41 (7 marks)**

1. Change in the genetic code
2. Name = 1 mark, description = 1 mark

Point – one base is changed to another

Addition – an extra base or codon is added

Duplication / Repetition – a piece of code (or codon) is repeated several times

**Section Three: Extended answer**

Question 42 (a)

|  |  |
| --- | --- |
| Nutrient Groups | Function |
| Proteins | * Structural material for the body * Enzymes |
| Carbohydrates | * Energy |
| Lipid | * Energy * Cell membranes * Steroid hormones |
| Vitamins | * Co-enzymes for reactions |
| Minerals | * Co-enzymes for reactions * Structure for some molecules |

(One each) (One each) (10)

Question 42 (b)

An enzyme is a protein (1) that increases the speed of metabolic reactions in the body or cells (1)

|  |  |  |
| --- | --- | --- |
| Nutrient Group | Location/Enzymes | Products |
| Protein | * (Stomach) Pepsin * Pancreatic protease * Intestinal Peptidases | * Protein to polypeptides * Proteins and polypeptides into peptides * Peptides to amino acids |
| Carbohydrate | * Salivary Amylase * Pancreatic Amylase * Intestinal amylase | * Starch into disaccharides * Starch into disaccharides * Disaccharides into simple sugars (monosaccharides) |
| Lipid | * Pancreatic Lipase * Intestinal lipase | * Lipds into fatty acids and glycerol * Lipids into fatty acids and glycerol |

(4 @ 1 each) (4 @1 each) (8)

Question 43 (a)

* Ovum formed in ovary
* Ovulation
* Ovum travels down fallopian tube
* Fertilisation occurs in fallopian tube
* Sperm formed in testes
* Mature in epididymis
* Travel up vas deferens
* To prostrate
* On ejaculation
* Travel along urethra
* Deposited in vagina
* Swim through cervix, uterus and up into the fallopian tube

(12)

Question 43 (b)

Purpose

* Meiosis halves the number of chromosomes
* To ensure maintenance of the correct number of chromosomes from one generation to the next
* Increases variation in the species

Differences when compare to mitosis

* Only occurs in ovaries and testes
* Two divisions
* In metaphase I, chromosomes line up in homologous pairs
* Random assortment
* Crossing over

(8)

Question 44 (a)

* Plasma is about 90% water
* Dissolved substances like glucose and ions
* Plasma proteins
* Erythrocytes are biconcave discs with no nucleus
* Leukocytes larger with a nucleus
* Thrombocytes are very small cell fragments with no nucleus

(6)

Question 44 (b)

* Arteries have thick, muscular (1) and elastic walls (1)
* Veins have thin and relatively inelastic walls (1) but do contain values (1)

(4)

Question 44 (c)

Breathing in

* Diaphragm contracts
* Intercostals contract
* Ribs move up and out
* Increase in volume of thorax
* Decrease in air pressure in the lungs
* Air moves from high (outside) to low pressure (in lungs) (6)

Breathing out

* Diaphragm and intercostals relax
* Decrease in the volume of the thorax
* Increase in pressure and air moves out (3)

Identifies air pathway (1) For example – nasal cavity, pharynx, larynx, trachea, bronchi, bronchioles and alveoli

Question 45 (a)

* Placenta is an organ that supplies nutrients to the developing foetus and removes wastes.
* Produces the hormones oestrogen and progesterone
* These hormones enhance the secondary sex characteristics for pregnancy and
* The progesterone maintains the endometrium.

(4)

Question 45 (b)

* Increased uterus size to accommodate the developing foetus.
* Breasts enlarge for breastfeeding
* Increase heart size and blood volume due to increased blood flow through the placenta.
* Increased frequency of urination due to increase blood flow to the kidneys and pressure placed by the baby.
* Back pain due to weight of baby and fluids increasing lumbar curvature
* Shortness of breath due to lungs being pushed upwards
* Mood changes due to changes in hormonal balance

(any four @ 2 marks) (8)

Question 45 (c)

* Increased blood flow through the liver and lungs tissue occurs (1)
* After birth, blood flow through the ductus arteriosus (1) decreases and this blood vessel closes up (1) becoming fibrous tissue (1)
* Decrease in blood flow through the ductus venosus (1) which also closes up (1)
* Increase pressure in the left hand side of the heart (1) forces the flap of the foramen ovale to close (1)

(8)