**MARKING SCHEME BIOLOGY \_SENIOR FOUR**

**SECTION A**

**1)**

**(i)**

|  |  |  |
| --- | --- | --- |
| Numbers  (n) | n/N | (n/N)2 |
| 56 | 0.448 | 0.2007 |
| 48 | 0.384 | 0.147 |
| 12 | 0.096 | 0.0092 |
| 6 | 0.048 | 0.0023 |
| 3 | 0.024 | 0.0005 |

∑n=N (125) ∑(n/N)2 = 0.36

D= 1-∑(n/N)2 =1-0.36=0.64

**2 marks**

(ii) With a high diversity, there is greater species richness. More species means that each species relies on a number of others. If one species is affected by change, the others may be less affected.

**2 marks**

(iii) For ecological importance.

For example:

-The recycling of nutrients

-The formation of and protection of Soil.

-Maintenance of ecosystem

- Production of food, fibres of clothing, medicine and timber

- Considerable potential for tourism etc,………

2 a) Taxonomy is the study of principles behind classification, the study of

differences between species while classification is the process of sorting

things into groups. **(2 marks)**

b) It helps us to understand our own evolution. Studying those organisms

that are not closely related to ourselves can help us understand our own

biology and behavior.

**(2 marks)**

3) a) –Have similar genes and therefore resemble one another.

- They have common ancestry

- They occupy the same ecological niche.

**Any two**: **2 marks**

b) It is based on evolutionary relationships between organisms and their ancestors.

It classifies species into groups using shared characteristics derived from their

ancestors.

It is arranged in a hierarchy in which groups are contained within larger

composite groups with no overlap.

**3 marks**

4 a) **Magnification** is how many times bigger the image is compared to the original object whereas **resolution** is the minimum distance apart that two objects can be in order for them to appear separate items. **2 marks**

b)

|  |  |
| --- | --- |
| **Advantages of light microscope** | **Advantages of electron microscope** |
| It is easier to move and use | It has higher resolution |
| It is less expensive | It has higher magnification because it uses beams of electrons that have a short wavelength |
| It can be used without killing specimen |  |

**3 marks**

5 a)

|  |  |  |  |
| --- | --- | --- | --- |
| Structure | Plant cell | Animal cell | Prokaryotic cell |
| Nucleus | √ | √ | x |
| Plasmid | x | x | √ |
| Mitochondrion | √ | √ | x |
| Cellulose wall | √ | x | x |

**4 marks**

b) Muscle contraction requires a lot of energy in the form of ATP, whereas fast storage cells have very low energy requirements **(2 marks)**

6 a) Add ethanol, then add water. White emulsion shows presence of lipids.

Reject: Ethanal or ethonal

Accept - alcohol

- milky

Ignore: Cloudy

**(3 marks)**

**7**) **Starch**

- Helical/spiral shape so compact

-Large Molecule insoluble so osmotically inactive

-Branched to glucose is easily released for respiration

-Large molecule so can not leave cell/cross cell membrane

**Cellulose**

-Long/straight chain of beta glucose

-Joined by hydrogen bonding

-Provide rigidity/strength

**8** a) Similarities

-Both are less soluble in water: None of them is lost in solution

-Both are less chemically reactive: can be stored over a long time without alteration.

-Both are compactly arranged : very much can be packaged in a small space.

Differences between Fat and Glycogen

|  |  |
| --- | --- |
| **Fat** | **Glycogen** |
| Yield more energy per gram | Yield less energy per gram |
| Has less weight while storing more energy | Has more weight and may lead to overweight |
| Yield more metabolic water | Yield less metabolic water |

**4 marks**

b) Fat yields more metabolic water upon oxidation

Fat yields more energy per gram upon oxidation

Fat is completely insoluble in water, none is lost in solution

Fat is lighter than glycogen and helps to keep body weight to minimum

**3 marks**

c) –Breakdown of Fat to Fatty acid which can then be utilized is a slow process

because it is induced by hormones

- Conversion of glycogen to glucose is fast because it involves enzymes which

are readily available in muscles.

- Glucose from glycogen enters directly into glycosis to produce energy.

Fatty acids have to first undergo beta oxidation

- Oxidation of fats produces more heat, which would lead to burning out of

the muscles cells.

**3 marks**

**9** a) COOH/Carboxyl group **1 mark**

b) 6 molecules of water **1 mark**

c) Difference between globular and fibrous proteins

|  |  |
| --- | --- |
| **Fibrous protein** | **Globular protein** |
| Regular sequence of amino acids | Irregular amino acid sequence |
| Actual sequence may vary slightly between two examples of the same protein | Sequence highly specific |
| Polypeptide chains form long parallel strands | Polypeptide chains folded into spherical shape |
| Stable structure | Unstable structure |
| Insoluble | Water soluble |
| Support and structural function | Metabolic functions |

**2 marks**

**10** a) (i) Alveoli, Lung, Skin **1 mark**

(ii) Stomata, Cuticle, lenticels, Epidermis, Mesophyll  **1 mark**

(iii) Lamella, Lung, Gills  **1 mark**

b) Large leaves, thin leaves, flat leaves, number of stomata **2 marks**

**11** (i) The respiratory surface areas have rich supply in blood to quickly

transport gases to and from the cells **1 mark**

(ii) Respiratory surfaces should have thin walls or thin surface area to

maximize the diffusion **1 mark**

(iii) To enable respiratory gases to diffuse into solution **1 mark**

**12** a) Vibriocholera

b) Faecal-oral route-contaminating drinking water; poor hygiene;

eating contaminated food

**13** a)–Visible growth of microbes on food;

- Microbes use an external digestion process

- Bacteria produce a toxin called botulin that can be hazardous;

- Presence of microorganisms in food cause infection.

**3 marks**

b) –Cooking where heat destroys bacteria

-Pasteurising

-Drying, Salting

-Smoking

-Pickling that is Use an acid PH to kill microbes.

**4 marks**

**14)** –Escape danger such as fire or predators

- Look for food, water and shelter

- For reproduction

- Avoid competition

- Avoid overcrowding

- Avoid unfavourable conditions

**5 marks**

**SECTION B**

**15)** Lungs contain numerous alveoli which present a large surface area for gas exchange. The alveoli membrane is thin which provides a short distance across which gases diffuse`

A steep diffusion gradient is maintained by ventilation, a rich blood supply and presence of an oxygen –carrying pigment, Haemoglobin.

The alveolar surface is moist, allowing quick dissolution and subsequent diffusion of gases across the alveolar membrane.

The lung tissue is elastic. This allows it to expand and contract easily during breathing.

16) Any two of the following groups

**Bread**: made with the help of yeast; saccharomyces cerevisiae; converts sugar to carbondioxide which raises bread.

**Beer:** made with the help of yeast which converts sugar into alcohol

**Yoghurt:** with the help of Lactobacillus bacteria which converts lactose from milk into lactic acid which thickens milk

**Cheese:** made with the help of lactobacillus/penicillium which converts lactose from milk into lactic acid which makes curds

**Vinegar:** made by Acetobacter (bacteria) which converts alcohol into lactic acid aerobically.

**10 marks**

**17) For plants**:

-Osmosis and turgidity

-Reagent in Photosynthesis

-Germination of seeds

-Transpiration and Translocation

-Mineral ion absorption

-Fruit and seed dispersal

**5 marks**

**For animals**

-Transport

-Osmoregulation

-Cooling by evaporation

-Lubrication as in joints

- Support

-Protection eg lachrymal fluid and mucus.

**5 marks**

**18** a) Many cases of AID are not diagnosed or reported **2 marks**

b) Condom may split when in use or may not be put correctly **2 marks**

c) - Practice safer sex

- Do not use unsterile needles

- Have one sexual partner

- Do not donate blood if at risk of HIV infection

- Have blood test

- Encourage sexual abstinence

- Public awareness

**6 marks**