**JETS PREPARATORY MEEETING HELD AT MPIKA DAY FROM 13 TO 17 MARCH 2014.03.14**

**BIOLOGY OLYMPIADS**

**SENIOR BIOLOGY**

**QUESTION 1**

Explain why smoking is no longer regarded as

(a)advisable for the maintenance of good health [8]

(b)socially acceptable [2]

**Solutions**

(a)Cigarette smoke contains nicotine which causes addiction. Person feels craving for cigarette. Nicotine causes clotting of RBCs in blood and raises blood pressure. It causes vasoconstriction of arteries due to which heart rate is also increased.Artherosclerosis also occurs due to deposition of fat. Smoker mother also affect foetus and it leads to miscarriages or under-weight babies are born by such mothers.

Cigarette smoke also contains tar which decreases oxygen uptake. Tar contains many carcinogen chemicals which may cause lung cancer.Carbonmonoxide is also found in cigarette smoke which binds with haemoglobin,permanently.Thus haemoglobin is not able to bind with oxygen, causing oxygen shortage.

(b)Smoking is not socially accepted as its smell produces feeling of discomfort. It is also irritant to eyes. Due to passive smoking, the people in the company of smokers have greater risk to their health, and some of them may develop lung cancer.

**QUESTION 2**

(a)Define the following genetic terms:

(i)gene pool [1]

(ii)genetic counselling [1]

(iii)genetic drift [1]

(iv)gene splicing [1]

(b)Mr and Mrs Chanda had an haemophiliac child despite them appearing normal in the eyes of commonas.Using suitable symbols;

(i)Draw a well-labelled genetic diagram to show how this is possible. [5]

(ii)If the couple are to have 12 children,how many would be haemophiliac? [1]

**SOLUTIONS**

(a)(i)gene pool refers to all of the allels in a population’s genes

(ii)genetic counselling is counselling by trained professsionls about the probability of genetic or hereditary disorders.

(iii)genetic drift is the alteration of allelic frequencies in na population by chance events which result in disruption of genetic equilibrium.

(iv)gene splicing refers to the rejoining of DNA fragments by vectors and other enzymes.

(b)symbols; --- male XY, female XX

 --- alleic symbols; h,H

**Parents ; Male Female**

Parental phenotype; Normal Normal

Parental genotype; Xh Y X XH Xh

Meiosis stage

Gamate formation; Xh Y XH Xh

Random fertilization;

First filial generation; XhxH XhXh XHY XhY

Genotype

F1 phenotype carrier Haemophiliac Normal Haemophiliac

(c) $\frac{2}{4}$ x 12 = 6 children

**QUESTION 3**

Fig 1.1 shows a food web in an ecosystem.

 leopard

 baboon

 scorpion impala

 locust

 grass

(a)Define the following terms:

(i)ecosystem [1]

(ii)food web [1]

(b)(i)name the herbivore/s shown in the food web [1]

(ii)suggest why it is difficult to state the trophic level to which the leopard belongs to in this food web. [1]

(c)In some years,there are plaques of locusts.State and explain the effect such a plaque might have on the numbers of

(i)impala [1]

(ii)scorpions [1]

(d)During one locust plaque,although the baboons had more food,their numbers subsequently dropped.

(i)in terms of the food web,explain how this happened. [2]

(ii)Suggest another reason ,not related to the food web or hunting,for the drop in the number of baboons. [1]

**SOLUTIONS**

(a)(i)A community/group of organisms and their environments/habitats/surrounds.[1]

(ii)-A number of food chains linked together [1]

 -all food chains in a community

 - animals in a food chain with more than one source of food [1]

(b)(i)locusts or impalas [1]

 (ii)the leopard can be considered to be the 2nd consumer or 4th consumer. [1]

(c)(i)Numbers will drop due to lack of grass [1]

 (ii) scorpions will increase since there will be more locustus for scorpions to feed on. [1]

(d)- less impala for leorpards to eat so leopards will eat more baboons [2]

 -locusts migrate and the locust levels drop and scorpion levels drop and less food for baboons.

 -grass was spread with insecticide and the number of locust dropped and so were scorpions and baboons. [2]

**ACCEPT ANY OF THE ABOVE ANSWERS ALL RELATED.**

**QUESTION 4**

(a)(i)what is the process by which sperms are made in the tests. [1]

 (ii)how is the function of the urethra in males different from that of females. [1]

Fig 2.2 shows the menstrual cycle and the associated hormones.

Hormones Y and Z

HormoneX

 Menstration

 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5

**Days**

(i) What is ovulation [1]

(ii) what hormones are represented by letters X,Y and Z. [3]

(iii)From fig 2.2, when is copulation likely to result into fertilization.

(iv)From the figure above, when is this woman likely to start her next periods (menstrual cycle). [1]

(c) Explain why female mammals like dogs never menstruate. [3]

**SOLUTIONS**

(a)(i) Spermatogenesis [1]

(ii)the urethra in males transport both urine and sperms whihe the urethra in female transport urine only. [1]

(b)(i)Ovulation is the release of the egg(ovum)/eggs/ovules from the ovary/ovaries.[1]

(ii) X- Oestrogen

 Y- FSH –Follicle Stimulating Hormone [1]

 Z – LH – Luteinising hormone [1]

(iii) Day 21 and 25 [1]

(iv) Day 4 of the next month. [1]

(c)Mammals like dogs do not menstruate because copulation takes place just after ovulation has taken place and these mammals are said to be on heat(oestrous cycle). [3]

**QUESTION 5**

(a)The common broomrape, orobranhes minor, is an unusual flowering plant. It is a parasite; it has no leaves and does not contain chlorophyll.

(i) Give one feature of the common broomrape which it shares with all other plants but does not share with organisms from other kingdoms. [1]

(ii) Complete the table to show the classification of the common broom rape.

|  |  |
| --- | --- |
| **Kingdom** | **Plant** |
|  | Angiospermmaphyta |
|  | Dicotyledonae |
|  | Scrophylarales |
| Genes |  |
| Species |  |

(iii)The common poppy and the long headed-poppy are similar plants. Under natural conditions they sometimes cross to form hybrids between the two. Suggest how you could find out whether the common poppy and the long-headed poppy are different species. [2]

(b)explain how geographical isolation can lead to the formation of new species. [4]

**SOLUTION**

(a)(i) It has cellulose cell walls. Large/permanent vacuole. [1]

 (ii)

|  |  |
| --- | --- |
| **KINGDOM** | **PLANT** |
| Phylum | Angiospermaphyta |
| Class | Dicotyledonae |
| Family | Scrophylarales |
| Oder | Orobranchaceae |
| Genus | Orobranhes |
| Species | Minor |

(iii) I would cross two of the hybrid plants. If they crossed and produced seeds that geminated, they would be the same species, if they did not produce seeds or their seeds failed to germinate, they would be different species of poppy.

(b)populations separated by physical barrier/named barrier; no mixing of gene pools;(populations)become adapted to local environment; by natural selection;(separated populations)accumulate different mutant alleles/diverge genetically; allele frequencies change rapidly in small populations; eventually the two populations cannot interbreed(even if together). [4]

**QUESTION 6**

Study the diagrams below that show stages in cell division.

i ii

v iv iii

(a)identify stages (i)………………………………………………………………

 (ii)……………………………………………………………..

 (iii)………………………………………………………………

 (iv)………………………………………………………………

 V………………………………………………………………..

(b)Why is the interphase referred to as a busy time? [3]

(c)what difference is between animal mitosis and plant mitosis? [1]

(d)what term describes final separation of cells in (v). [1]

**SOLUTION**

1. (i) interphase (ii) Prophase (iii) Metaphase

(iv) Anophase (v) Telophase

(b)interphase is the busiest phase.It is divided into three parts

* High protein production and cell grows
* Copying of chromosomes/DNA synthesis/chromosome duplication
* Formation of mitochondria and other organelles.

(c)Animal mitosis involves formation of asters while plant mitosis does not.Asters are not critical to animal mitosis.

(d)Cytokinesis

**JUNIOR BIOLOGY OLYMPIADS**

**QUESTION 1**

(a)(i)what is the chemical equation for photosynthesis [3]

(ii)what are the two stages of photosynthesis [2]

(b)(i)why is glucose produced during photosynthesis stored in plants in form of starch. [1]

(ii)what is meant by destarching a leaf. [1]

(iii)why is it necessary to destarch leaves before setting up some photosynthesis experiments. [1]

(c)name two parts of plant apart from the leaves where starch is stored after photosynthesis. [2]

**SOLUTIONS**

(a)(i) 6CO2 + 6H2O C6H12O6 + 6O2 [3]

(ii) – light stage

* Dark stage [2]

(b)(i)starch is more stable than glucose or starch does not easily dissolve in liquids[1]

 (ii)destarching is the removing of starch without damaging the leaf. [2]

 (iii)it is important to remove all the starch from the leaf before the photosynthesis experiments so that all the starch that would be present after the photosynthesis would have come from photosynthesis. [1]

1. – roots,stems and seeds [2]

**QUESTION 2**

(a)(i)what is the other name of aerobic respiration. [1]

 (ii)in what structures of the body does gaseous exchange take place. [1]

(b)what do the letters ATP stand for? [2]

(c)Give the chemical equation for aerobic respiration. [3]

(d)(i)name the other type of respiration apart from the aerobic respiration. [1]

(ii) Give two uses of energy in the human body. [2]

**SOLUTIONS**

(a)(i)Tissue respiration [1]

 (ii)Air sacs (Alveolus) [1]

(b)Adenosine Triphosphate [2]

(c) C6H12O6 + 6O2 6CO2 + 6H2O + 2880kj(energy)(2800kj) [3]

(d)(i)Anaerobic respiration [1]

 (ii) –walking, - running , -talking, other metabolic reactions [any one] [1]

**QUESTION3**

(i)Study the two organelles shown below which can be found in plant cells.

 X Y

(a)identify organellel X and Y. [2]

(b)what is the relationship between between X and Y. [2]

(c) name the process that links X and Y. [1]

(d)state two differences between X and Y [2]

(ii)Water is very important to a plant .

(a)State the process by which water is uptaken from the soil and by which it is lost to the environment.

Water uptake……………………………………………………………………… [1]

Water loss…………………………………………………………………………. [1]

(b)What instrument is used to study the uptake of water by a plant? [1]

**SOLUTIONS**

(i)(a) X – chloroplast Y—Mitochondrion

 (b) Chloroplast is site for photosynthesis which result in production of glucose.Mitochondrion is site for respiration which make use of glucose.

(c) Photosynthesis Accept—Respiration

(d) X has chlorophyll while Y does not .

 X has single membrane while Y has double bond membrane.

(ii)(a)Water uptake ------------- Osmosis

 Water loss ……………….. Transpiration

(b)photometer

**QUESTION 4**

Solid food is complex and usually insoluble for direct use.

(a)Name the process in humans that make solid food ready for use by the body. [1]

(b)Where does change of proteins in the alimentary canal,

 Physical change [1]

 Chemical change [1]

(c)The pancrease has many functions in the regulation of the body sugar and preparation of food for direct use.State

(i)two(2) chemicals produced that regulate blood sugar [2]

(ii)three (3) enzymes produced by the stated organ. [3]

(d)(i)Define an enzyme [1]

 (ii) State one property of all enzymes. [1]

**SOLUTION**

(a)Digestion

(b)-Mouth for physical change

 -Stomach for chemical change

(c)(i)-insulin

 -glucagon

 (ii) –Trypsin

* Pancreatic lipase
* Pancreatic amylase

(d)(i) Enzyme is a biological catalyst that is protein in nature.

 (ii) -Protein in nature

-affected by temperature/PH/concentration

**QUESTION 5**

The figure below shows two blood vessels in cross section.

 X Y

(a)Name blood vessel X and Y. [2]

(b) State any two differences between blood vessels X and Y. [2]

(c) Name the structure that joins blood vessels X and Y.

(d)Describe the route taken by the blood as it moves from vessels Y until it joins the first vessel similar to X.

**SOLUTIONS**

1. X= artery Y = Vein [2]
2. Any two from;

1. X has thicker wall while Y has thinner wall

2. X has no valves along its stretch while y has valves along its stretch

3. X transports blood away from the heart under high pressure while Y transports blood towards the heart under low pressure. [2]

(c) Capillaries [1]

(d) Blood vessels Y is a vein; blood moves from the venacava; and enters the right atrium; of the heart; the blood is pumped from the right atrium to the right ventricle. The blood is then pumped out of the heart to the lungs; via pulmonary artery. From the lungs, the blood returns to the heart via the pulmonary vein into the left atrium. It then enters the left ventricle where it becomes pumped out into the aorta, the first vessel similar to X.

**QUESTION 6**

The figure below shows a cell observed under a light microscope.

 D A

 B

 Nucleus C (green)

(a)Where would this cell be found? [1]

(b)Label A,B and C. [3]

(c) What is A made up of ? [2]

(d) What pigment is found in C? [2]

(e)State the name of solution found in B. [2]

**SOLUTIONS**

(a)Plant cell

(b) A=cell wall B= cell vacuole C= chloroplast

(c)Cell wall is made up of cellulose

(d)Chlorophyll

(e)Cell sap

**QUESTION 7**

(a)Soil is made up of different components which include rock particles,soil water,humus,mineral slts ,living organism,air etc.

(i)Give two reasons why humus is important to the soil. [2]

(ii)State three conditions needed for plant decay to take place. [3]

(iii)State three ways by which you can improve soil fertility on your form. [3]

**SOLUTION**

(a)(i)-It adds plant nutrients to the soil

 - it improves soil texture

(ii)-plants moisture

 -enough warmth

 -presence of oxygen

(iii)-evaporation

 -plants manure

(i)-Adding manure

 -adding chemical fertilizers

 -crop rotation

**QUIZ**

**PRIMARY SCIENCE QUIZ**

1.What name is gfiven to the wrong use of adrug.

 Ans:Drug abuse

2.What does the term malnutrition stand for?

 Ans:Bad feeding

3.True or false;the heart is used to purify blood.(one attempt).

 Ans:False

4.What name is given to a condition when the body loses too much water.

 Ans:Dehydration

5.Which process in the body is responsible for the removal of waste products.

 Ans:Excretion

6.What kind of air does fish breathe?

 Ans:Dissolved air

7.What disease will a child likely suffer from due to lack of vitamin A?

 Ans:Night blindness

8.State two chief sources of heart energy in the body.

 Ans:Carbohydrates and fats

9.Name the process in which yeasts are useful………

 Ans:Fermentation

10.What name is given to the smell of a dirty skin?

 Ans:Ordour

11.What do we call a clear,colourless jelly-like protein which becomes hard and white when the egg is boiled?

 Ans:Albumen/egg white

12.What do we call a horny mouth on the head of a bird,mainly used for feeding?

 Ans:Beak

13.The process of taking air in and out of the lungs in animals is called..

 Ans:Breathing

14.A drink in which carbondioxid is dissolved under pressure is called

 Ans:Carbonated drink

15.What do we call the smallest basic unit of a living thing?

 Ans:Cell

16.The increase in volume of a substance when heated is called..

 Ans:Expansion

17.A male sex cell is called……….

 Ans:Sperm

18.How much is the composition of oxygen is in the air?

 Ans:21%

19.Which part of the body does the cameleon use to catch its prey?

 Ans:Skin

20.One of the lonf,broad and stiff feathers found on the tail or wings of abird is known as ..

 Ans:Flight feathers

21.A device that is placed in aplug sothat it cuts off extra electricity in a circuit is called.

 Ans:Fuse

22.What do we call the circulation of water in the atmosphere.

 Ans:Water cycle

23.What do we call the inner parts of the skin.

 Ans:Dermis

24.Any material that allows heat to pass is said to be..

 Ans:A good conductor

25.The joining of the male cell and the female cell to form a zygote is called

 Ans:Fertilization

26.The process of removing solid particles and materials such as plant matter is called

 Ans:Filtration

27.What part of the flower turns into a fruit after fertilization.

 Ans:Ovary

28.A person with severe diarrhoea and vomiting suffers from a disease called.

 Ans:Cholera

29.What is the other name for eclipse of the moon?

 Ans:Lunar eclipse

30.Name the carbohydrate that is formed during photosynthesis.

 Ans:Glucose

31.Name the process by which a dye can be separated into its colours.

 Ans:Chromatography

32.What is the name of a device that can be used to observe an HIV Virus .

 Ans:Electronic Microscope

33.The growing of crops together with trees is called.

 Ans:Agroforestry

34.The system of growing flowers is called.

 Ans:Holticulture

35.The name given to the system of growing one crop only is called.

 Ans:Monoculture

36.What do the letters ART in HIV and AIDS stand for.

 Ans:Anti-Retro Viral Therapy

37.What do we call the process of producing magnets from magnetic materials?

 Ans:Magnetisation

38.Where does fertilization in humans take place?

 Ans: Fallopian tube/oviduct

39.What is the name of the naturally occurring oil that consist of different fuels with different boiling points.

 Ans:Petroleum/Crude oil

40.A separation technique used to separate a mixture of two or more liquids which boil at different temperatures is known as

 Ans: Fractional Distillation

41.The bringing together of two organisms of different animal breeds or plants intentionally to produce new breeds or varieties is known as.

 Ans:Crossing/cross breed

42.When it is too hot animals such as dogs pants and sweat.Where are the sweat glands found in dogs?

 Ans:In the pads of its paws

43.Define a carnivore.

 Ans: A mammal which feeds on flesh and bones of other animals.

44.What bis the name of the young dog.

 Ans:Puppy

**JUNIOR PHYSICS QUIZ**

1.Give one example of a longitudinal wave?one attempt)

 Ans: Sound waves/spring waves.

2.What si the name of an apparatus that can be used to reflect light into its components.

 Ans:Glass prism

3.A person rides a bicycle 2km east then 2km north.The trip takes 2hours,what is his average speed?

 Ans:2km/hr

4.A boy is standing 2m in front of the mirror.How far is the boy from his image?

 Ans:4m

5.The highness or lowness of sound is called ..

 Ans:pitch

6.Give the unit for electric charge?

 Ans:Coulomb

7.What do the letters UHF stands for on a TV(television)set?

 Ans:Ultral High Frequency

8.How many kilowatts make 1 megawatts?

 Ans:1000kw

9.What name is given to a ray of light that leaves the refracting material?

 Ans:Emergent or emerging ray

10.What is the name of the type of radiation with the longest range in air.

 Ans:Gamma

11.Name the particle emitted from a hot cathode in a cathode ray oscilloscope(C.R.O)

 Ans:Electron

12.A stone of mass 2000kg and volume 2000m3 .What is its density in kg/m3 .

 Ans;1kg/m3

13.What type of image is produced by a converging lens on the screen?

 Ans:Real (inverted/upside)

14.State the test for magnetism.

 Ans: Repulsion

15.Carbodioxide and iodine are said to exist in two states only.What name is given to such substances?

 Ans:Sublimates

16.What is the name of physical quantities that require both magnitude and direction to specify them?

 Ans:vector quantities

17.The rate of change of velocity is known as ..

 Ans:Accelleration

18.What law of motion is also known as law of inertia?

 Ans:Newtons first law of motion

19.The commercial unit used for selling electricity by zesco is…

 Ans:Kilowatt-hour (kwh)

20.An electric kettle is rated 250V,100w.What is the resistance of the kettle in ohms?

 Ans:62.5 ohms

21.When brakes are used to stop the car,name the type of energy into which most of kinetic energy is converted?

 Ans:Heat energy

22.When you look into the mirror your left hand appears to be the right hand while the right hand appears to be the left hand.This property is reffered to as…

 Ans:Lateral inversion

23.A man walks 7km east stops and then walks 5km west .What is his displacement.

 Ans:2km east

24.Which theory assumes that matter is in a constant random motion?

 Ans:Kinetic theory of matter

25.A girl wants to measure the thickness of a plain paper .What instrument should she use.(one attempt)

 Ans:Micrometer screwgauge

26.What do we call the radiation that comes fromspace?

 Ans:Cosmic Radiation

27.What is reffered to as the ratio of mass of any substance to the mass of an equal volume of water?

 Ans:Relative density

28.A tank 3m long,1m wide and 0.5m deep is filled with oil which weighs 12000N.What is the pressure of the base of the tank due the oil?

 Ans:400pa

29.What do we call a pair of equal but opposite forces that are not acting through the same point?

 Ans:Couple

30.The energy contained by a bag due to its position above the ground is called?

 Ans:Gravitational potential energy

31.What is the acceleration of a car of mass 1000kg moving at a constant velocity of 40m/s?

 Ans:Zero

32.What is reduced by the step down transformer?

 Ans:Voltage

33.What name is given to the rate of flow of charge?

 Ans:Current

34.An irregular solid is also called…

 Ans:An Amorphous solid

35.What do we call the plates that defelect a beam of electrons up and down in a cathode –ray oscilloscope?

 Ans:Y-plates