M: Zoology

Q. 1 – Q. 6 carry one mark each.

Q.1 Sickle-cell anemia is caused by mutation in

(A) Haemoglobin A (B) Haemoglobin B

(C) Haemoglobin F (D) Haemoglobin S

Q.2 Each individual antigenic determinant of the variable region of the antibody is referred to as

(A) Paratope (B) Epitope

(C) Agretope (D) Idiotope

Q.3 Which of the following non covalent interactions is considered as strongest ?

(A) Hydrophobic interactions (B) Ionic bonds

(C) Hydrogen bonds (D) Van der waals forces

Q.4 Acrosome present on the sperm head is derived from

(A) Golgi apparatus (B) Nucleus

(C) Endoplasmic reticulum (D) Centrosome

Q.5 The first site of hematopoiesis in the mouse embryo is

(A) Liver (B) Bone marrow

(C) Spleen (D) Yolk sac

Q.6 Which of the following fish is considered to be a 'living fossil' ?

(A) *Protopterus* (B) *Lepidosiren*

(C) *Latimeria* (D) *Neoceratodus*

Q. 7 – Q. 24 carry two marks each.

Q.7 Albinism is controlled by a recessive gene (c). From a marriage between a normal pigmented person carrying genotype Cc and albino cc, what is the chance that an albino child will be born ?

(A)1/2 (B)1/4

(C)3/4 (D)3/8

Q.8 Many fishes are able to live outside water with the help of special air chambers above the gills. Which one of the following fish does not have same adaptation?

(A) *Anabas* (B) *Saccobranchus*

(C) *Gobius* (D) *Clarias*

Q.9 The air sac plays an important role in the aerial life of flying birds. Which of the following is not a function of the air sac ?

(A) As a resonator (B) As a balloon

(C) In perching (D) Regulator of moisture content of the body

Q.10 Transgenic mice are produced by

(A) *In vitro* fertilization of ova by sperms from a different strain followed by implantation
(B) Transfer of cloned foreign DNA into blastocyst cells followed by implantation
(C) Implantation of mixed blastocyst cells from two different strains
(D) Selection of a given trait by repeated back-crossing

Q.11 Which of the following proteins binds tightly to DNA in the chromatin structure and influences eukaryotic DNA replication ?

(A) Histones (B) Lamins

(C) Vimentin (D) Proteasome

Q.12 During DNA replication significant proportion of newly synthesized DNA in the lagging strand exists as small Okazaki fragments. The sizes of these units in bacteria are approximately

(A) 100 nucleotides (B) 1000 nucleotides

(C) 100 base pairs (D) 1000 base pairs

Q.13 Which of the following statement is not included in the inductions and deductions of Darwinism ?

(A) The prodigality or reproduction is very important since over crowdedness results in struggle for existence
(B) In the struggle for existence the organisms with variation in structure habits or instincts may be better adapted to new conditions and will have better chance of survival
(C) Natural selection operates amongst the fittest and the new forms are established leading to speciation.
(D) There is no organism without genotype. The genotype should be changed to give an efficient organism.

Q.14 In case of turtles, the temperature at which the eggs are exposed during development is the deciding factor in sex determination. This is because of the temperature sensitivity of

(A) Estrogen
(B) Testosterone
(C) Aromatase enzyme
(D) Progesterone

Q.15 One of the most remarkable features of evolution is the formation of the amnion and the allantoin, which appeared for the first time in

(A) Amphibians
(B) Fishes
(C) Birds
(D) Reptiles

Q.16 For cloning an animal, which of the following somatic cells would not be suitable ?

(A) Lymphocytes
(B) Fibroblasts
(C) Epidermal cell
(D) Neutrophils

Q.17 Differential blood cell counting is carried out routinely not only for assessing the 'general health' of an individual but also for identifying types of infection. Increase in the circulatory eosinophils is likely to be due to infection with

(A) Viruses
(B) Helminths
(C) Fungus
(D) Bacteria

Q.18 Rajesh and Deb while playing in the field got stung by a comparable number of bees. After about 15 minutes, while Rajesh experienced only pain and small swelling, Deb manifested intense swelling, breathlessness and had to be hospitalized. Which of the following reasons would be the most logical explanation for the different reactions ?

(A) Deb was on an empty stomach
(B) Rajesh is several years younger than Deb
(C) Deb had been stung by bees before
(D) Deb is several years younger than Rajesh

Q.19 Normally receptors are cell-membrane bound but with few exceptions. Which of the following receptors is present in the cytoplasm ?

(A)Thyroid stimulating hormone receptor
(B) Epidermal growth factor receptor
(C) Progesterone receptor
(D) Cytokine receptor

Q.20 During development of the red blood cells from the stem cells of most mammals, the phenomenon of enucleation is observed during the last stage of differentiation. However, the red blood cells of some animals are nucleated:
Identify which one of the following ?

(A) Cow

(B) Rhinoceros

(C) Camel

(D) Polar bear

Q.21 Comparison of the genome sequences of any two animals would reveal evolutionary relatedness. In this context, the similarity between man and chimpanzee is

(A) > 95 %

(B) < 75 %

(C) < 25 %

(D) < 50%

Q.22 Certain types of cancers can be correlated with specific changes in chromosome structure. In patients suffering from myelogenous leukemia, the abnormal chromosome detected was termed Philadelphia chromosome. Which of the following chromosome is altered in this disease ?

(A) Chromosome 10

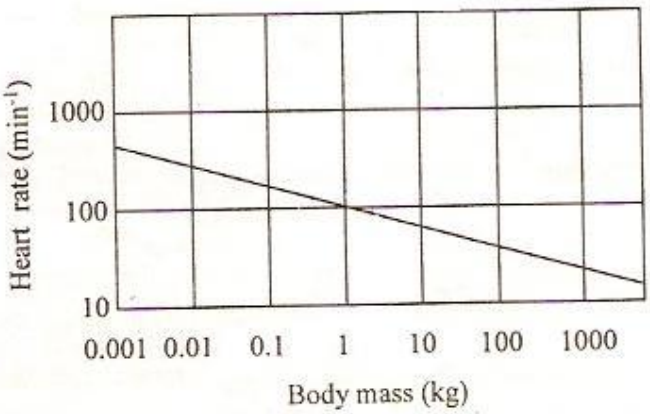
(B) Chromosome 11

(C) Chromosome 20

(D) Chromosome 22

Common Data Questions

Common Data for Questions 23, 24:
The size of mammalian heart is nearly proportional to body size and makes up approximately 0.59 % of the body mass. However the heart rate is inversely related to body size. The following graph represents the relationship between the heart rate and body size of the mammals (data are plotted on logarithmic coordinates).



Q.23 1 kg bird is expected to have a heart of 8.2 g. For a mammal of the same size, the expected size of the heart could be

(A) 11.8 g

(B) 5.9 g

(C) 2.95 g

(D) 23.6 g

Q.24 An elephant that weighs 3000 kg has a resting pulse rate of 25 per minute. What would be the possible range of the pulse rate of 3 g shrew (the smallest living mammal) ?

(A) 25 (B) 125

(C) 250 (D) Above 500

Linked Answer Questions: Q. 25 to Q. 28 carry two marks each.

Statement for Linked Answer Questions 25 & 26:

An experiment was carried out to study the immune response to dust mite allergen in two strains of mice viz., BALB/c (b) and Nude (n). The mice were administered the immunogen on days 0 and 8 and allergen specific circulatory antibodies were monitored in the two groups of mice on days 7 and 18.

Q.25 Which of the following class of antibodies would be detected in these strains of mice on day 7 ?

(A) IgM (b) IgM (n) (B) IgG (b) IgM (n)

(C) IgA (b) IgM (n) (D) IgE (b) IgM (n)

Q.26 Which of the following class of antibodies would be detected in the two strains of mice on day 18 ?

(A) IgG (b) IgM (n) (B) IgE (b) IgE (n)

(C) IgE (b) IgE (n) (D) IgE (b) IgG (n)

Statement for Linked Answer Questions 27 & 28:

A woman has a rare abnormality of the eye that has been found to be dependent on a single dominant gene (P). The woman's father had abnormal eyes but mother had normal eyes.

Q.27 If the woman marries a man with normal eyes, what proportion of her children will have abnormal eyes ?

(A) 25 % (B) 50 %

(C) 75 % (D) 100 %

Q.28 Which of the following representation does not explain the genotype of the woman's father ?

(A) Heterozygous for P (B) Homozygous for P

(C) Dominant for P (D) Recessive for P

END OF THE SECTION