

1. Answer all the questions in the question paper
2. Answer ALL of the questions in the test book.
3. Work neatly.
4. Read your questions carefully.
5. Good Luck

Please read the following instructions carefully

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DEPARTMENT OF BOTANY AND PLANT BIOTECHNOLOGY

BIO2EA1

BIOLOGY 1A EXTENDED

APK CAMPUS

JUNE EXAM MEMO

25 MAY 2019

FACULTY OF SCIENCE



BIO12EA1 - JUNE EXAM 2019

[21]

QUESTION 1

Choose the best answer to complete the statement or answers the question. Only write down the correct letter next to the appropriate question number.

1.1 Which of the following most closely represents the male gametophyte of seed-bearing plants?

- A. Ovule
- B. Microspore mother cell

C. Pollen grain interior

- D. Embryo sac
- E. Fertilized egg

1.2 The cycads, a mostly tropical phylum of gymnosperms, evolved about 300 million years ago and were dominant forms during the Age of the Dinosaurs. Though their sperm are flagellated, their ovules are pollinated by beetles. These beetles get nutrition (they eat pollen) and shelter from the microsporophylls. Upon visiting megasporophylls, the beetles transfer pollen to the exposed ovules. In cycads, pollen cones and seed cones are borne on different plants. Cycads synthesize neurotoxins, especially in the seeds, that are effective against most animals, including humans.

Which feature of cycads distinguishes them from most other gymnosperms?

- 1. They have exposed ovules.
- 2. They have flagellated sperm.
- 3. They are pollinated by animals.

A. 1 only

B. 2 only

C. 3 only

D. 2 and 3

- 1.9 A young farmer purchases some land in a relatively arid area and is interested in earning a reasonable profit for many years. Which of the following strategies would best allow such a goal to be achieved?
- D. Active transport by sieve-tube members.
 - E. Active transport by tracheid and vessel elements.

- A. Establishing an extensive irrigation system.
- B. Using plenty of the best fertilizers.
- C. Finding a way to sell all parts of crop plants.

D. Selecting crops adapted to arid areas.

- E. Converting hillsides into fields.

- 1.10 You are given the task of designing an aerobic, mixotrophic protist that can perform photosynthesis in fairly deep water (e.g. 250 m deep), and can also crawl about and engulf small particles. With which two (2) of these structures would you provide your protist?

1. hydrogonosome

2. apicoplast

3. pseudopods

4. chloroplast from red alga

5. chloroplast from green alga

A. 1 and 2

B. 2 and 3

C. 2 and 4

D. 3 and 4

E. 4 and 5

1.11 Which of the following is not characteristic of ciliates?

- A. They use cilia as locomotory structures or as feeding structures.
- B. They are relatively complex cells.

C. They can exchange genetic material with other ciliates by the process of mitosis.

- D. Most live as solitary cells in fresh water.
- E. They have two (2) or more nuclei.

1.12 The strongest evidence for the endosymbiotic origin of eukaryotic organelles is the similarity between extant prokaryotes and which of the following?

- A. Nuclei and chloroplasts

B. Mitochondria and chloroplasts

- C. Cilia and mitochondria

- D. Mitochondria and nuclei

- E. Mitochondria and cilia

1.13 The clownfish and parrotfish died on the same day. Autopsies revealed the presence of many small, flat worms using tiny suckers to attach to the fish gills. If the worms discovered during the autopsies have all features characteristic of their phylum, dissection of the worms should reveal the presence of _____

- 1. nephridia.

- 2. chaetae.

- 3. segmentation.

- 4. a gastrovascular cavity.

- 5. the acoelomate condition.

- A. 5 only

B. 1 and 2

C. 4 and 5

D. 1, 2, and 3

E. 3, 4, and 5

1.14 Of the annelid classes below, which make castings that are agriculturally important?

A. Oligochaeta

B. Polychaeta

C. Hirudinea

D. all three (3) of these

E. two (2) of these

1.15 In terms of food capture, which sponge cell is most similar to the cnidocyte of a Cnidarian?

A. Zygote

B. Choanocyte

C. Gamete

D. Epidermal cell

E. Pore cell

1.16 All types of muscle tissue have _____

A. intercalated discs that allow cells to communicate.

B. striated banding pattern seen under the microscope.

C. cells that lengthen when appropriately stimulated.

D. a response that can be consciously controlled.

E. interactions between actin and myosin.

- 1.17 Compared with a smaller cell, a larger cell of the same shape has _____
- A. less surface area.
- B. less surface area per unit of volume.
- C. the same surface-to-volume ratio.
- D. a smaller average distance between its mitochondria and the external source of oxygen.
- E. a smaller cytoplasm-to-nucleus ratio.
- 1.18 The epithelium best adapted for a body surface subject to abrasion is _____
- A. simple squamous.
- B. simple cuboidal.
- C. simple columnar.
- D. stratified columnar.
- E. stratified squamous.
- 1.19 The vegetal pole of the zygote differs from the animal pole in that _____
- A. the vegetal pole has a higher concentration of yolk.
- B. the blastomeres originate only in the vegetal pole.
- C. the posterior end of the embryo forms at the vegetal pole.
- D. the vegetal pole cells undergo mitosis but not cytokinesis.
- E. the polar bodies bud from this region.
- 1.20 All individuals of a particular species of whiptail lizards are females. Their reproductive efforts depend on _____
- A. fertilization of their eggs by males of other lizard species.
- B. gonadal structures that only undergo mitosis.

C. meiosis followed by a doubling of the chromosomes in eggs.

D. budding prior to the development of a sexual phenotype.

E. fragmentation via autolysis.

1.21 As an embryo develops, new cells are produced as the result of _____

A. differentiation.

B. preformation.

C. cell division.

D. morphogenesis.

E. epigenesis.

QUESTION 2

[21]

Give the correct biological term for each of the following definitions. Only write down the correct term next to the appropriate question number.

2.1 Fungi which absorb phosphorus and other essential materials from the soil and make them available to the plant. Mycorrhizae

2.2 The male reproductive organ of an Angiosperm. Stamen

2.3 The site of embryonic development of a seed plant. Ovule

2.4 The points at which leaves are attached on a plant. Nodes

2.5 Plant cells which usually have a thin and flexible primary cell wall and perform most of the metabolic functions of a plant. Parenchyma cells

2.6 A lateral meristem that lies at the outer edge of the stem cortex. Cork cambium

2.7 Plants that grow anchored on other plants and absorb water and minerals from rain. Epiphytes

2.8 Bacteria converting ammonium to nitrates in the soil. Nitrifying bacteria

2.9 Compounds given to plants to promote growth. Fertilizer

2.10 The mobile zygote in the life cycle of *Plasmodium*. Ookinete

2.11 The feeding stage in the life cycle of *Plasmodium*. Trophozoite

2.12 The unique feature visible in all organisms of the sub-phyllum Sarcodina. Pseudopodia

2.13 The largest class of molluscs. Gastropoda

2.14 The class which includes sea urchins. Echinoidea

2.15 Term used to describe animals with three (3) embryonic layers. Triploblastic

2.16 The spleen is part of this organ system. Lymphatic and immune system

2.17 Cell found in bone tissue. Osteocytes

2.18 Study of structure. Anatomy

2.19 The fertilization process that takes place as soon as the sperm makes contact with the egg. Acrosome reaction

2.20 Two (2) membranes surrounding the egg of a human. Zona pellucida, Plasma membrane and vitelline layer (Any 2)

QUESTION 3

[16]

3.1 What are the most likely pollination agents of the following plants shown in the diagrams below? Give a suitable reason for your answer in each case. (6 x ½ = 3)

A.



B.



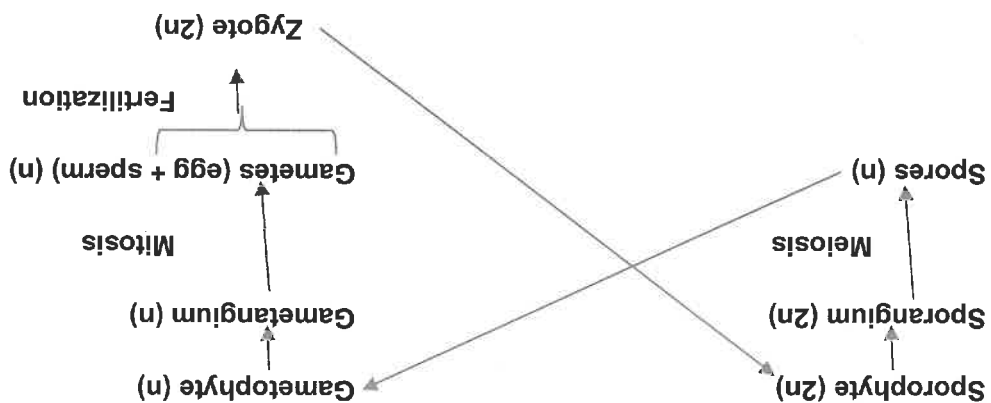
C.



○ A – Wind – light pollen – no brightly coloured flower

- B – insect – shape – easy access – scented – bright colour
- C – bird – bright red – no scent – narrow tube shaped flower to allow only beak of bird to enter.

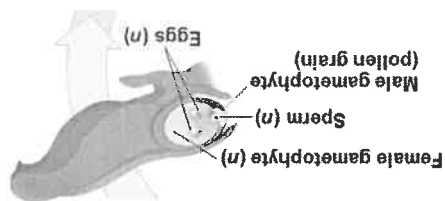
3.2 Draw a general flow diagram to explain alternation of generations in plants. ($10 \times \frac{1}{2} = 5$)



3.3 Plant diversity reflects the evolutionary history of the plant kingdom. Name the four (4) key adaptations for life on land which distinguish the main lineages of the plant kingdom from one another.

- Dependent embryos are present in all plants.
- Lignified vascular tissues mark a lineage that gave rise to most living plants.
- Seeds are found in a lineage that includes all living gymnosperms and angiosperms.
- Flowers mark the angiosperm lineage.

3.4 Draw and label one (1) diagram which form part of the life cycle of the pine tree after meiosis has occurred in the female gametophyte.



QUESTION 4

[15]

4.1 Distinguish between seed germination of the two (2) groups of Angiosperms.

(7 x ½ = 3½)

○ In eudicot seedlings

- the embryonic root of a bean emerges first and grows downward,
- and

- shoots emerge from the soil with the
- apical meristem "hooked" downward to protect it.

○ In monocot seedlings,

- the shoots are covered by a protective sheath
- and emerge straight from the soil.

4.2 Give suitable definitions or descriptions of the following terminology.

4.2.1 Apical dominance: (2 x ½ = 1)

- When the terminal bud produces hormones that
- inhibit growth of the axillary buds.

4.2.2 Cuticle (2 x ½ = 1)

- A waxy layer,
- which reduces water loss.

4.2.3 Mesophyll (½)

Leaf ground tissue.

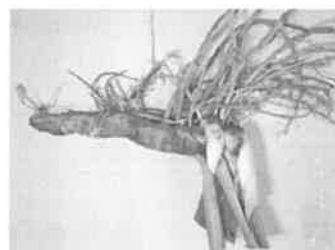
4.3 Which modified organs are found in the following plants (Include specific name of modified organ where applicable)? What modified function does this organ have?

(14 x ½ = 7)



4.3.1

Root – storage



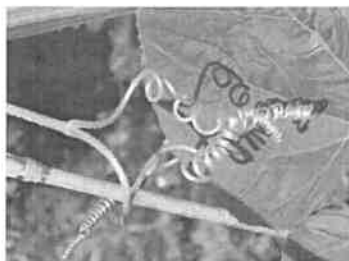
4.3.3

Stem – Rhizome – storage



4.3.2

Stem – tuber – storage



4.3.4

Leaf – tendril – climbing



4.3.5

Leaf – thorn – protection and prevent excess water loss

4.4 Briefly name and explain the type of fertilization portrayed by Angiosperms. (4 x ½ = 2)

At fertilization,

- one sperm fertilizes the haploid egg to produce a diploid zygote, and
 - another sperm fuses with the diploid central cell nucleus
 - to produce a triploid (3n) cell that will give rise to the endosperm,
- which nourishes the developing embryo.

- This formation of a diploid zygote and a triploid nucleus is called double fertilization.

QUESTION 5 [15]

- 5.1 Discuss the feeding methods of the plant in the photograph below. Why do plants like these feed in this manner? (4)



- The venus fly trap feeds on insects, they are Carnivores. They
 - capture and digest small animals such as insects,
 - absorb inorganic elements from prey, and
 - are found in nutrient-poor environments.

- 5.2 Distinguish between the nutrition methods of the following two (2) plants. (6 x ½ = 3)

Plant A



Holo parasite

Plant B



Semi-parasite

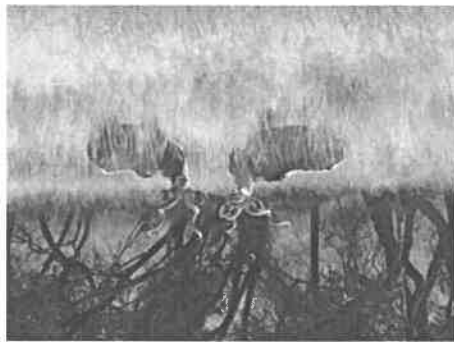
Use all plants resources

Photosynthesize self

Do not photosynthesize itself (no chlorophyll) Absorb water and minerals

Absorb sugar and minerals from plant

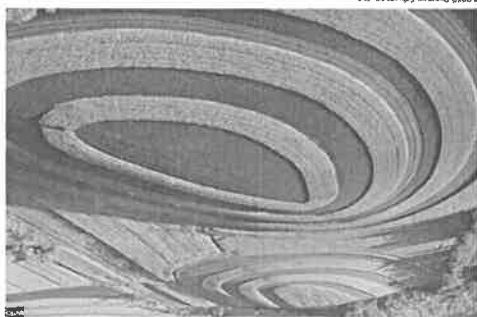
5.3 Identify the agricultural practices responsible for the degradation of soil. Choose the correct diagrams (only write down the letters of the diagram) and briefly discuss why it is responsible for the degradation of the soil. (4)



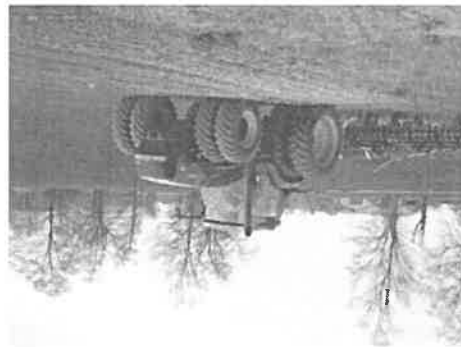
A



B



C



D

- A - Irrigation can gradually make soil salty.
- C - Ploughed lands are subject to erosion by wind and rain, which removes topsoil.

5.4 Describe the factors which play a role in guard cell activity. (4)

- Sunlight signals guard cells to accumulate K⁺ and open stomata.

- Low CO₂ concentration in leaves also signals guard cells to open stomata.
- Plants have natural rhythms that help them close stomata at night to conserve water.
- Plants may also close stomata during the day to conserve water when necessary.

QUESTION 6

[15]

6.1 Protista is a vastly diverse kingdom which constitute a polyphyletic group with several characteristics unique to this kingdom. Discuss these characteristics under the following headings and give examples of specific organisms with these characteristics.

6.1.1 Locomotion (8 x ½ = 4)

- Protists move by means of

- flagella (*Trypanosoma*),
- cilia (*Paramecium*),
- spores (*Plasmodium*) and
- pseudopodia (*Amoeba*)

6.1.2 Nutrition

(8 x ½ = 4)

- Autotrophs – *Euglena/Volvox*
- Heterotrophs

- Phagotrophs / holozoic feeders which ingest visible whole particles (*Amoeba*)
- Osmotrophs / saprozoic feeders which ingest soluble food (*Paramecium*)

6.1.3 Asexual Reproduction

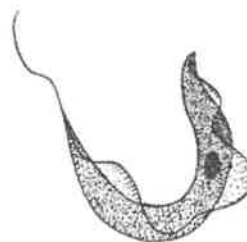
(10 x ½ = 5)

- Binary fission = division (transverse or longitudinal) of the parent body into two exact halves. Mitoses is part of the process e.g *Paramecium* / *Vorticella*
- Budding = outgrowths from the parent form and pinch off to live independently or remain attach to form a colony
- Multiple fission through:

- Schizogony – multiple fission into many cells (*Plasmodium*)
- Sporogony – the formation of spores

6.2 Study the following diagrams and photos and identify the required taxa. (4 x ½ = 2)

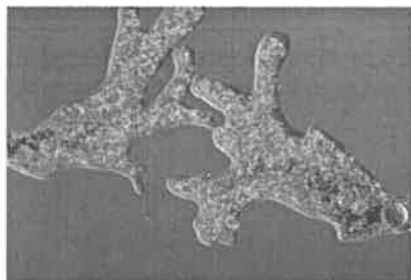
A



Genus name: *Trypanosoma*

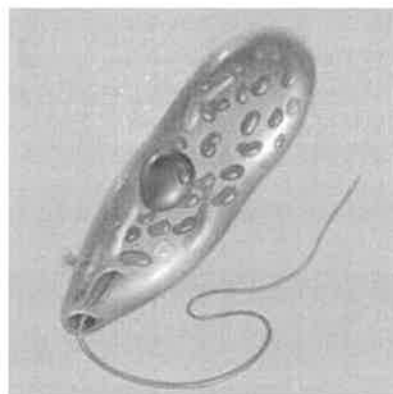
Phylum: Sarcomastigophora

B



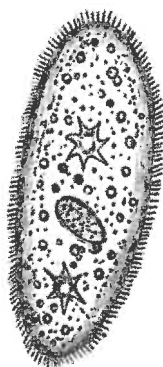
Phylum: Ciliophora

C



Class: Phlebobranchia

D



7.1 The simplest chordates are tunicates and lancelets. Why is this statement true? (2)

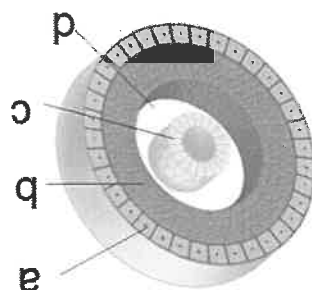
- Both do not have a backbone and

- Both use their pharyngeal slits for suspension feeding.

QUESTION 7

[16]

7.2 Study the following diagram and answer the questions that follow.



7.2.1 Label a – d and stipulate what each layer will become. (4)

- a - Ectoderm – become epidermis
- b – Mesoderm – become muscle layer
- c – Endoderm – become lining of digestive tract
- d - pseudocoelome

7.2.2 In what group will organisms be categorized who have the type of body cavity depicted in the diagram above. Give a reason for your answer. (2)

Pseudocoelomata – the body cavity is derived from the mesoderm and endoderm.

7.2.3 To which phylum will an organism belong with a body cavity as shown in the diagram? (1)

Nematoda

7.2.4 Organisms in the phylum answered in question 7.2.3 can prevent their bodies from drying out. What structure is used to accomplish this? (1)

Cuticle

7.2.5 What are the functions of the body cavity shown in the diagram? ($2 \times \frac{1}{2} = 1$)

- distribute nutrients
- and act as a hydroskeleton

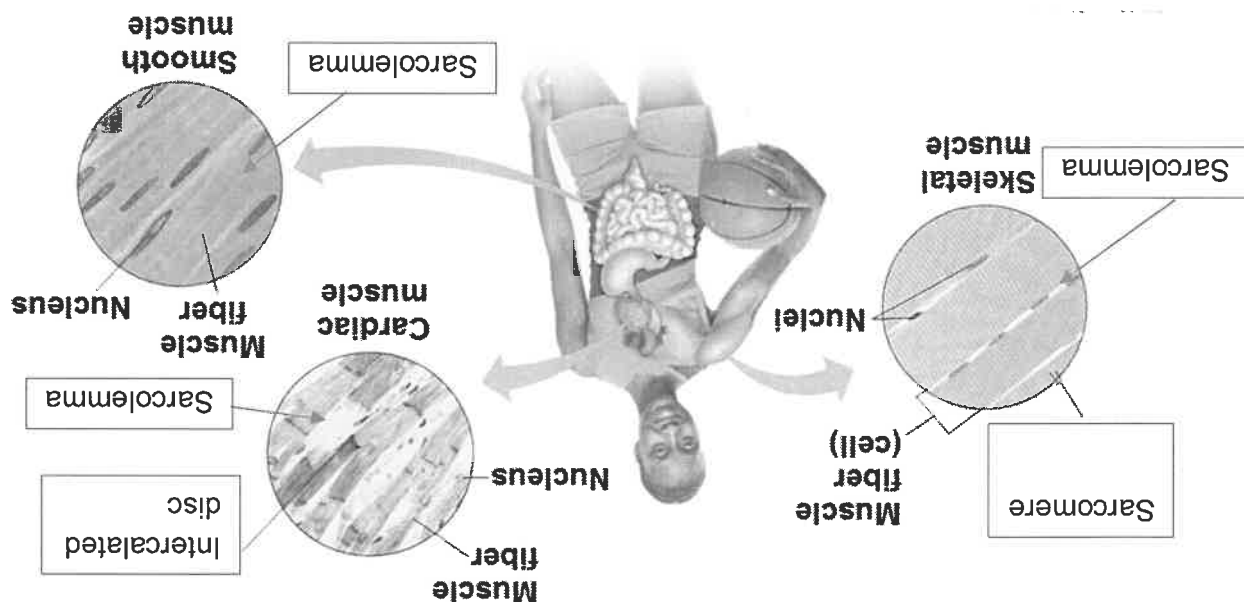
7.3 Why are Arthropods so diverse and successful? (3)

- 7.4 Distinguish between the two (2) types of Myriapoda. (2)
- Segmentation = tagmatisation,
 - a hard exoskeleton - molting, and
 - jointed appendages, for which the phylum is named.
 - Millipedes are herbivores that have two pairs of short legs per body segment.
 - Centipedes are carnivores that have one pair of legs per body segment.

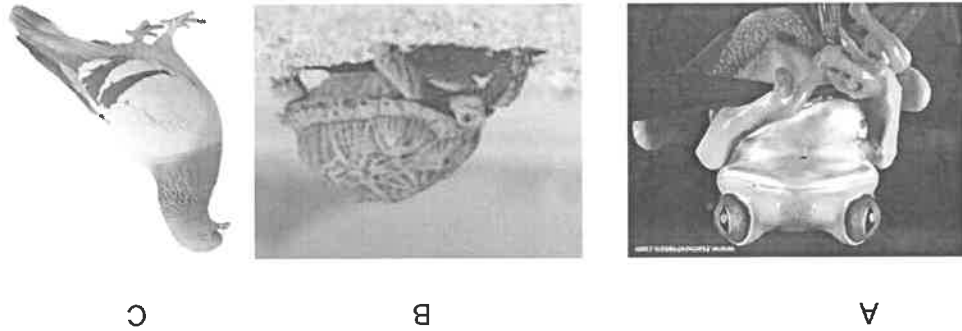
QUESTION 8 [16]

- 8.1 Name the main parts which form part of the respiratory system. (6 x 1/2 = 3)
- Nose, pharynx, larynx, Trachea, bronchus and lungs

- 8.2 Draw and label three (3) diagrams to clearly distinguish between the three (3) types of muscle cells found in the human body. (14 x 1/2 = 7)



- 8.3 What will be the effect on a person's health who has a lesser amount of either a or b in the diagram below, respectively? (5)



9.1 Study the following diagrams and answer the questions that follow.

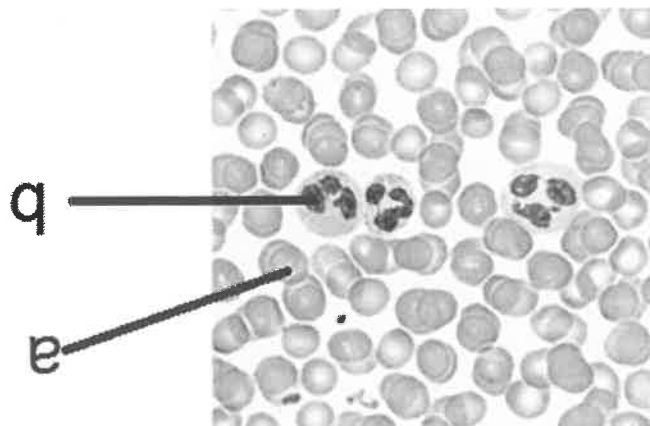
QUESTION 9

[15]

Store fat – animals in very cold areas – polar bear

8.4 What is the function of adipose tissue, and which animals will have many of these cells? (2 x ½ = 1)

- a – with less red blood cells the person will not transport enough oxygen to the brain and other organs and muscles – will become tired and could go in a coma – suffer from anaemia
- b – a person will be very susceptible for infection as the function of the white blood cells is immunity – to destroy any organism or particle intended to infect the body.



9.1.1 Distinguish between internal and external fertilization. Which of the organisms in the diagrams above use external fertilization to reproduce? (3)

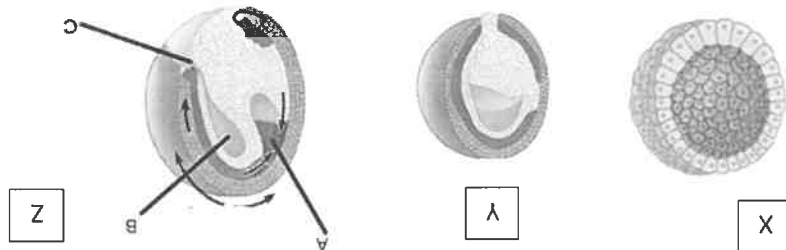
- o External fertilization occurs when eggs and sperm are discharged near each other
- o Internal fertilization occurs when sperm is deposited in or near the female reproductive tract

A - show external fertilization

9.1.2 Which of the organisms portray parental care? (1)

Bird - C

9.2 Study the diagrams below and answer the questions that follow.



9.2.1 Identify structures X and Y in the development of animals. (2)

X - Blastula Y - Gastrula

9.2.2 Label A, B and C in diagram Z. (3)

- A - Blastocoel
- B - Formation of simple digestive tract
- C - Blastopore

9.2.3 Name and briefly explain the process that takes place between the formation of structures X and Y. (6)

Gastrulation

- cells migrate to new locations,
- a rudimentary digestive cavity forms, and

- the basic body plan of three layers is established with
 - ectoderm outside—becomes skin and nervous systems,
 - endoderm inside—becomes digestive tract,
 - mesoderm in the middle—becomes muscle and bone.

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