Year 9/10 Beasts on Land, in Air and Water

Examination
2015
Semester 1

Reading Time: 10 minutes
Writing Time: 90 minutes

Name:_____

MARKS:

PART A	Multiple choice:	/50
PART B	Short answer	/95
		/145

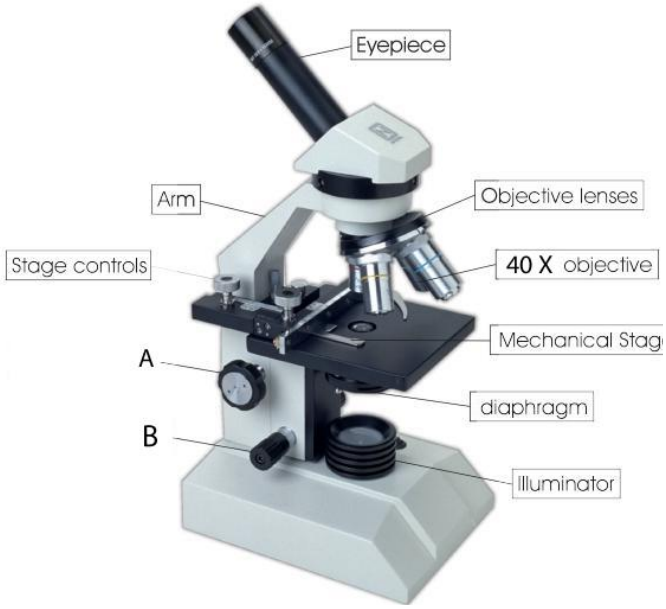
GRADE ☐ %

NAME_____

1.	A	B	C	D	**26.**	A	B	C	D
2.	A	B	C	D	**27.**	A	B	C	D
3.	A	B	C	D	**28.**	A	B	C	D
4.	A	B	C	D	**29.**	A	B	C	D
5.	A	B	C	D	**30.**	A	B	C	D
6.	A	B	C	D	**31.**	A	B	C	D
7.	A	B	C	D	**32.**	A	B	C	D
8.	A	B	C	D	**33.**	A	B	C	D
9.	A	B	C	D	**34.**	A	B	C	D
10.	A	B	C	D	**35.**	A	B	C	D
11.	A	B	C	D	**36.**	A	B	C	D
12.	A	B	C	D	**37.**	A	B	C	D
13.	A	B	C	D	**38.**	A	B	C	D
14.	A	B	C	D	**39.**	A	B	C	D
15.	A	B	C	D	**40.**	A	B	C	D
16.	A	B	C	D	**41.**	A	B	C	D
17.	A	B	C	D	**42.**	A	B	C	D
18.	A	B	C	D	**43.**	A	B	C	D
19.	A	B	C	D	**44.**	A	B	C	D
20.	A	B	C	D	**45.**	A	B	C	D
21.	A	B	C	D	**46.**	A	B	C	D
22.	A	B	C	D	**47.**	A	B	C	D
23.	A	B	C	D	**48.**	A	B	C	D
24.	A	B	C	D	**49.**	A	B	C	D
25.	A	B	C	D	**50.**	A	B	C	D

Circle the correct response to each question on the answer sheet.

The image of a microscope, shown on the right, relates to questions 1 to 3.



1) When using the high power objective lens, you should not adjust the:
   a) diaphragm,
   b) coarse focus,
   c) Illuminator,
   d) fine focus

2) The item labelled “diaphragm” on the diagram on the right:
   a) is used to magnify the object viewed through the objective lens.
   b) adjusts the amount of light passing through the lenses.
   c) is used to move the object on the stage,
   d) provides a coarse focus.

3) The eyepiece is labelled 10X while the objective lens is labelled 40X. A cell viewed under this microscope will be magnified;
   a) 10 times,
   b) 400 times,
   c) 40 times,
   d) 4 times.

4) Which one of the following chemical reactions below takes place only in plants?

   a) $C_6H_{12}0_6 + 6O_2 \longrightarrow 6CO_2 + 6H_20$

   b) glucose + oxygen $\xrightarrow{\text{Light energy}}$ carbon dioxide + water

   c) $6CO_2 + 6H_2O \longrightarrow C_6H_{12}0_6 + 6O_2 + \text{energy}$

   d) $6CO_2 + 6H_2O \xrightarrow{\text{Light energy}} C_6H_{12}0_6 + 6O_2$

5) Which two chemical processes does a plant undergo?

a) Photosynthesis and cellular respiration.
b) Cellular respiration and digestion.
c) Digestion and photosynthesis.
d) Photosynthesis and decomposition

6) A very important chemical process is given below in the form of a balanced chemical equation.

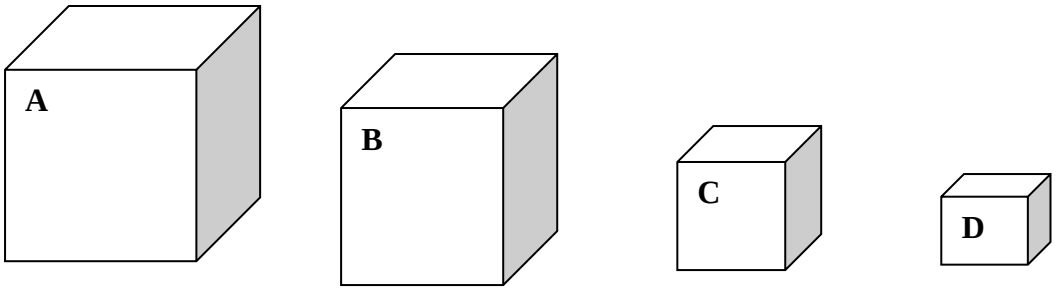
$$C_6H_{12}O_6(aq) + 6O_2(g) \Rightarrow 6CO_2(g) + 6H_2O(l)$$

Which comment is true?

i) During this chemical process atoms are rearranged to produce new products.
ii) Energy is released.
iii) At the completion of this reaction the products weigh more than the reactants.

a) i) and ii) only
b) ii) only
c) iii) and ii) only
d) i) and iii) only

7) All of the cubes shown below were placed in a bath with red food dye.The dye will reach the centre of which cube first?



8) Energy is exchanged at every level of a food chain. In what form is this energy past from organism to organism in a food chain?

a) Heat energy.
b) Chemical energy.
c) Solar energy.
d) Electromagnetic radiation.

9) Which of the following best represents the flow of energy through a food chain?

a) producer => carnivore => herbivore
b) herbivore => decomposer => producer
c) producer => herbivore => carnivore
d) decomposer => carnivore => herbivore

10) An increase or decrease in core body temperature triggers a response so that the body core temperature returns to a set value.
This mechanism is called?

a) Diffusion
b) Homeostasis
c) Metastasis
d) Positive feedback

11) Which of the following is not under homeostatic control?

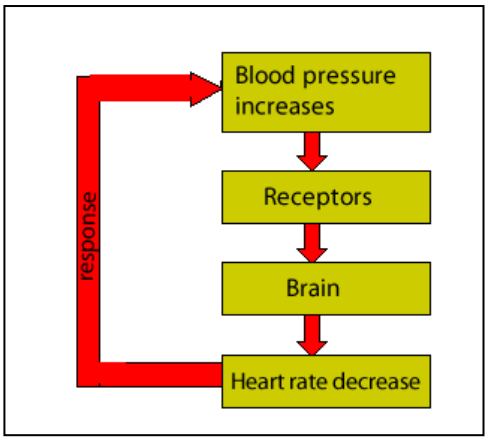
i) Carbon dioxide levels in the blood
ii) Length of body hair
iii) Amount of water in the body
iv) Eye colour

a) i and iv only
b) i, ii and iii only
c) iv and iii only
d) i and iii only

The following information is required for Questions 12 and 13.
The diagram on the right represents the body's control of blood pressure.

12) This is an example of

a) a variable response,
b) a positive reflex mechanism,
c) a non–homeostatic mechanism,
d) a negative feedback loop.



13) A homeostatic mechanism involves a receptor, control centre and an effector. The control centre is involved in deciding the appropriate response.
In the control of blood pressure, as shown on the right, the:

a) control centre is represented by the heart,
b) heart represents the effector,
c) an increase in blood pressure is the effector,
d) the brain stimulates the receptors in an attempt to decrease blood pressure

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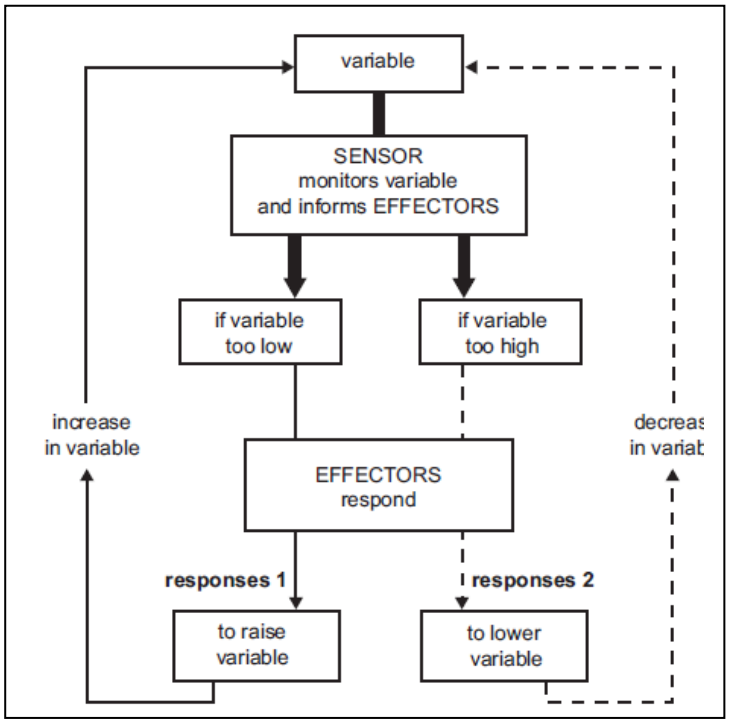
The following information is required for Questions 14 to 16.
One way in which the general principle of homeostasis can be outlined is given in the diagram below.



14) In the control of body temperature, if body temperature rises above normal limits then:

a) responses 2 involve constriction of the blood vessels,
b) responses 2 involve an increase in shivering,
c) the sensor is the blood pressure sensors in the carotid artery,
d) the sweat glands act as an effector.

15) Consider the homeostatic control of body water. If a person becomes dehydrated, the concentration of the salts in their body fluids increases and

a) as a consequence effectors in the brain respond creating a positive feedback loop,
b) as a consequence response 1 becomes relevant.
c) effectors include cells within the digestive tract.
d) as a consequence responses 2 involve an increase in water reabsorption from nephron tubules.

16) Considering the diagram above, the component that is being kept relatively constant is

a) the variable.
b) input to the sensor.
c) input to the effectors.
d) output from the effectors

17) Arteries and veins make up the circulatory system of many organisms but are very different. Which comment is true?

a) Arteries carry blood away from the heart at low pressure and veins carry blood to the heart at high pressure,
b) Arteries carry oxygenated blood and veins carry deoxygenated blood
c) Blood is forced through the veins by the action of the heart while blood is squeezed through arteries by the contraction of skeletal muscle.
d) Veins have valves that keep blood moving in one direction while arteries do not have valves.

18) Which comment is true?

a) The right atrium contains blood with a low oxygen concentration
b) The right atrium contains blood with low nutrient concentration.
c) The left atrium contains blood with low nutrient concentration.
d) The left contains blood with a high oxygen concentration.

19) When an athlete is sprinting what systems are predominantly working to supply the muscles with oxygen?

a) The digestive and urinary systems.
b) The nervous system and digestive systems.
c) The respiratory and circulatory systems.
d) The respiratory and digestive systems.

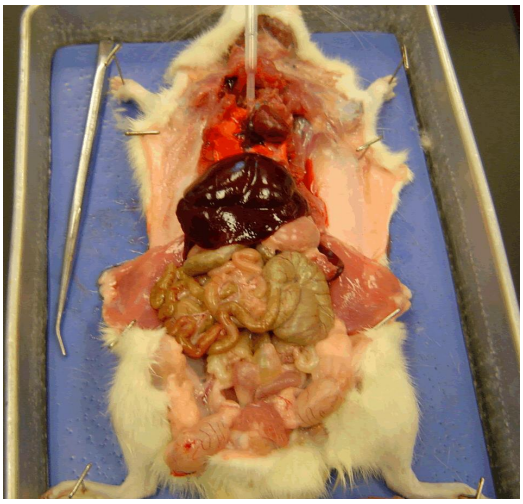
20) During a fish dissection a student identified the structure below. This structure is designed to

a) quickly digest food eaten by the fish,
b) return blood quickly back to the heart,
c) exchange gases between the blood and the water,
d) remove soluble wastes from the blood,.

21) A system in the body removes soluble wastes found in the blood.
These wastes are mainly removed from the body by the:

a) liver which is part of the urinary system,
b) large intestine which is part of the digestive system,
c) lungs which are part of the respiratory system,
d) kidneys which are part of the urinary system.

22) During a rat dissection a student was asked to identify the diaphragm and trachea.
In actual fact he was asked to find parts of the:
a) nervous system,
b) urinary system,
c) respiratory system,
d) digestive system.



23) In the lungs oxygen diffuses into the blood while carbon dioxide diffuses out of the blood. Diffusion is best described as:

a) the movement of a substance from an area of low concentration to an area of high concentration;
b) the movement of a substance from an area of high concentration to an area of low concentration
c) a state of equilibrium
d) a process increasing the surface area exposed to the air.

24) Which of the following increases the amount of carbon dioxide found in the atmosphere?

a) Using less water.
b) Consuming large amounts of solar generated energy.
c) Planting of large forests.
d) Deforestation.

25) Which option is <u>not</u> a description of part of the carbon cycle?

a) Plants absorb CO_2 from the soil is used during photosynthesis
b) Animals take carbon from food and release it as carbon dioxide.
c) Petroleum contains carbon that was once part of living animals.
d) Carbon dioxide found in the oceans is used by sea creatures to synthesise shells.

26) Which of the following are ***carbon sinks***?

i) Atmosphere
ii) Oceans
iii) Forests
iv) Fossil fuels

a) i) and ii) only
b) i) and iii) only
c) iv) only
d) i), ii) iii) and iv).

27) Which of the following is not recycled in ecosystems?

a) Nitrogen
b) Energy
c) Carbon
d) Phosphorus

The following information is required for Questions 28 to 32.

Lettuce seeds were exposed to flashes of light of two wave lengths, red (R) and far red (FR). The percentage of seeds germinating after each treatment was measured. The data is shown in the table below.

Light exposure	Germination %
None	9
Red	98
Red + FR	54
Red + FR + Red	100
Red + FR + Red + FR	43
Red + FR + Red + FR + Red	99
Red + FR + Red + FR + Red + FR	54
Red + FR + Red + FR + Red + FR + Red	98

28) From this data it is possible to conclude that germination of lettuce:

a) requires far red light,
b) requires both far red and red light,
c) is influenced by whether the last flash is red or far red light,
d) requires equal amounts of far red and red to get maximum germination.

29) What is the dependent variable in this investigation?

a) The amount of light the seeds were exposed to.
b) The pattern of light flashes the seeds were exposed to.
c) The percentage of seeds that germinated.
d) The average length of the seedlings.

30) What is the independent variable in this investigation?

a) The amount of light the seeds were exposed to.
b) The pattern of light flashes the seeds were exposed to.
c) The percentage of seeds that germinated.
d) The average length of the seedlings.

31) The group of seeds exposed to no light represented the:

a) independent variable,
b) dependent variable,
c) control,
d) apparatus.

32) Which of the following is a possible hypothesis for this experiment?

a) Seeds require water, and exposure to Red and Far Red (FR) light.
b) The pattern of exposure to Red and Far Red light is crucial to germination.
c) Equal amount of seeds should be used for every test.
d) Almost 100% of seeds germinated when the last flash was Far Red.

33) A gene can best be described as a:

a) protein that has genetic information and can be passed on from parent to offspring.
b) segment of DNA that codes for the synthesis of a specific protein.
c) protein that is found in the blood that attaches to viruses and destroys them.
d) chromosome that codes for the synthesis of many different proteins.

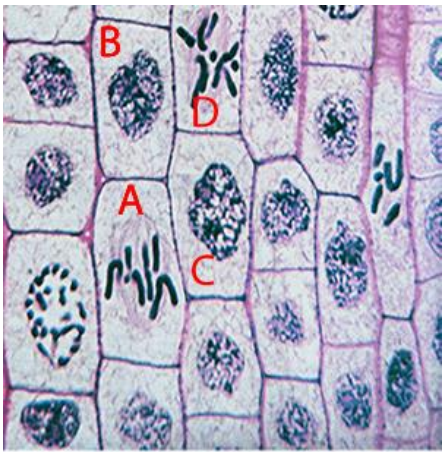
34) The process by which the nucleus of a cell divides into two identical nuclei is called:

a) meiosis,
b) mitosis,
c) binary fission,
d) nuclear splitting.

35) A sudden change to the genetic information of a cell is known as:

a) diffusion,
b) randomness,
c) a mutation,
d) a change factor.

36) Consider the image of an onion root tip shown on the right. Many cells are in different stages of cell division. Which comment is true?



a) Cell A is in anaphase.
b) Cell D is in metaphase
c) Cell A is in prophase
d) Cell B is in telophase.

37) Mitosis cannot be involved in the production of new:

a) egg cells
b) sperm cells
c) muscle cells
d) both a) and b)

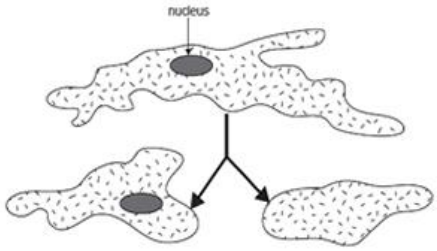
38) Birds build nests without prior knowledge. This behavior is innate and is

a) learnt by copying the behavior of others,
b) is encoded in DNA,
c) developed through trial and error,
d) All of the above.

39) Which process involves the synthesis of a protein according to the DNA code?

a) Transcription
b) Transformation
c) Transduction
d) Translation

40) Early experiments to investigate how a cell functions used amoebae (*Amoeba proteus*). An amoeba is a relatively large, single-celled organism. It is possible to cut an amoeba to produce half with the nucleus and the other half without a nucleus (enucleated). The diagram below shows the results of an amoeba cut in two.
The most likely reason for the enucleated half-cell to die after seven days is that:
a) water was lost by osmosis,
b) protein synthesis was reduced,
c) the membrane solidified,
d) no mitochondria were in the enucleated half-cell.



41) Which cell organelle is correctly matched with its function?

a) Mitochondria => transforms light energy into chemical energy
b) Chloroplast => transforms chemical energy into heat energy
c) Nucleus => controls what comes in and out of the cell
d) Ribosome => place where proteins are synthesized.

42) A bird relies on the same laws of physics to propel itself through the air as a rocket does. The size of the force generated by the bird as it flaps its wings is dependent on:

a) the mass of the bird,
b) the temperature of the air,
c) the amount of feathers on its body,
d) the mass of the air which is pushed down with every flap of its wings.

43) Which one of the following experiences the greatest force?

a) A 0.8 kg bird pushing 0.50 kg of air with a speed of 3.0 m/s downwards.
b) A 0.8 kg shark pushing 0.50 kg of water with a speed of 1.0 m/s backwards
c) A 0.1 kg jelly fish pushing 1.20 kg of water with a speed of 0.8 m/s backwards
d) A 15.1 kg crane pushing 2.9 kg of air with a speed of 2.5 m/s downwards.

44) A whale has a mass of 3,500 kg. Its volume is such that when fully submerged it displaces 3,250 kg of water. What is the weight of the whale when fully submerged?
a) 3,500 kg
b) 250 kg
c) 7,250 kg
d) 3,750 kg.

45) Which one of the following occurs randomly to create variation within a population?
a) continental drift,
b) mutation,
c) natural selection,
d) extinction.

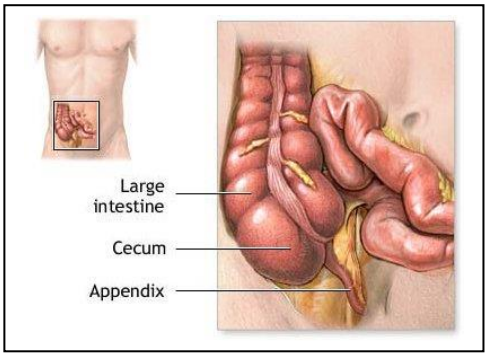
46) Consider the following, speciation, isolation, natural selection and mutation. If evolution is to occur in which order must these take place?
a) speciation, natural selection, mutation, isolation,
b) natural selection, mutation, speciation, isolation,
c) mutation, isolation, natural selection, speciation.
d) isolation, mutation, speciation, natural selection.

47) An adaptation is:
a) an abiotic factor that increases an animal's chance of survival,
b) physical and not behavioural,
c) a random occurrence that increases an organism's chance of survival,
d) a characteristic that increases an organism's chance of survival.

48) Africa and South America slowly drifted apart after once being a single landmass for millions of years. Monkeys on the two continents, although very similar, show numerous genetic differences. Which factor is probably the most important in maintaining these differences?
a) Similar environments
b) Varying rates of mutation
c) Geographic isolation
d) Identical ancestors.

49) Which of the following bird populations, living on an isolated island, provide the greatest potential for evolutionary change in colouration?
a) A population of 100, all of which are green.
b) A population of 1000, all of which are yellow.
c) A population of 10,000, with two different colour variations
d) A population of 100 with two different colour variations.

50) The appendix is an example of :
a) selective breeding,
b) a homologous structure,
c) a vestigial structure,
d) comparative structures.



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End of multiple choice questions. Section B, short answer questions, continue on the next page.

Section B SHORT ANSWER

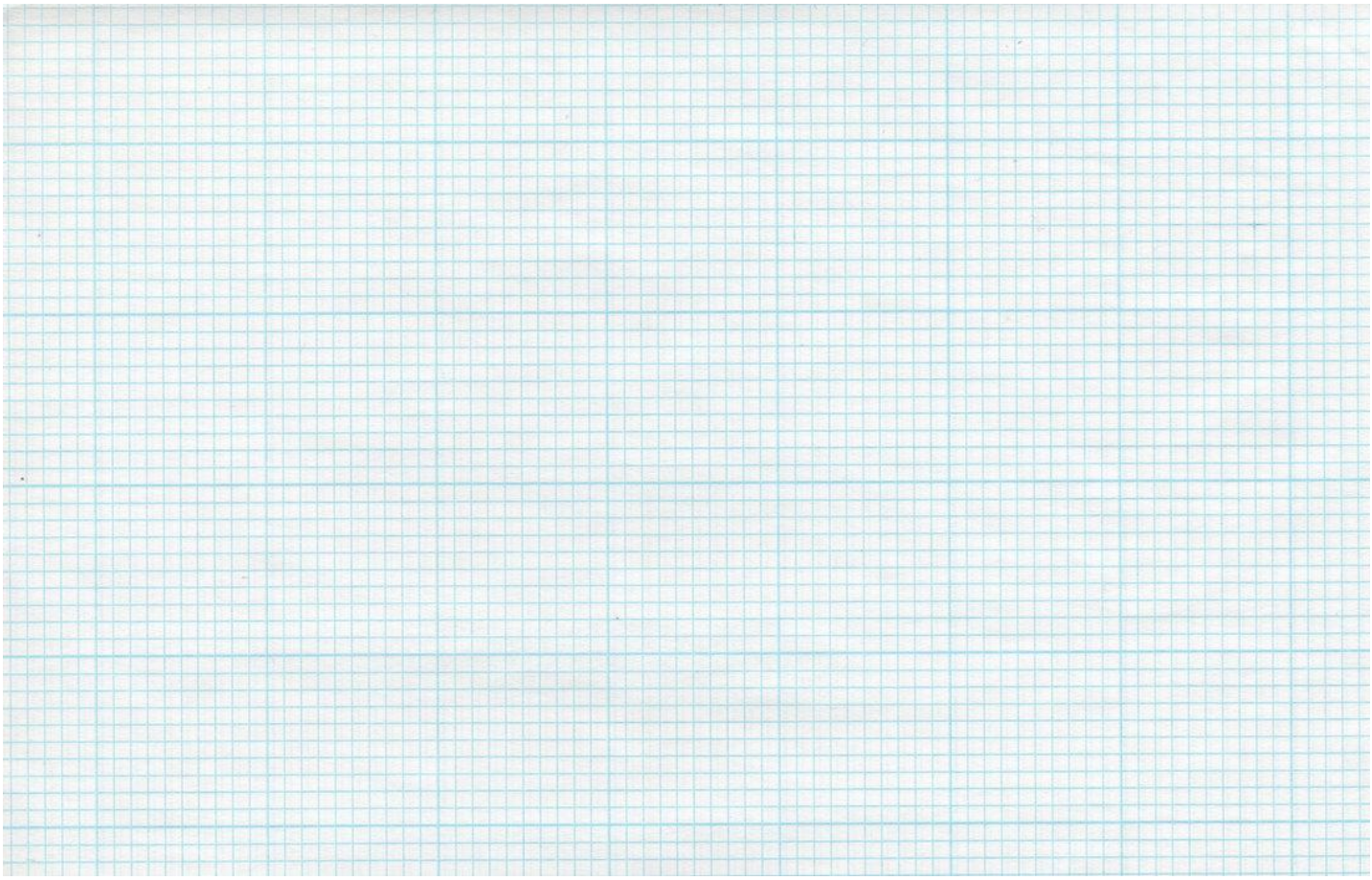
Answer all questions neatly in the space provided.

Amount of ethylene in ml/m²	Type 1 Apples: Days to Maturity	Type 2 Apples: Days to Maturity	Type 3 Apples: Days to Maturity
5	20	20	22
10	14	14	12
15	13	12	11
30	9	7	8
35	9	8	8
25	10	9	9
20	11	11	10

1) Ethylene is a plant hormone that causes fruit to ripen. Apples are usually picked green and kept under cold storage until it is time to take them to market. At this point they are exposed to ethylene gas. The data above concerns the amount of time it takes for fruit to ripen from the time of the first application of ethylene to the unripened fruit.

a) On an appropriate set of axis draw line graphs to represent the growth of each type of apple. Use the graph paper below and include a legend.

5 marks



5

b). i) What is the dependent variable?

_____

ii) What is the independent variable?

_____

2 marks

c) Two new hormones are discovered, hormone “X” and hormone “Y”. A scientist predicts that hormone “X” should ripen fruit the quickest since it was isolated from plants living in dry, hot conditions while hormone “Y” was isolated from plants living in tropical regions.

i) Describe (or outline in point form) an experiment you would carry out with type-1 apples to see which hormone was most effective in ripening fruit. Indicate a test that can be conducted to see if a fruit is ripe or not.

4 marks

ii) Explain fully what results would support or negate the scientist’s prediction.

1 mark

iii) What is a likely hypothesis for this investigation?

1 mark

8

2) Gills are well suited to enable aquatic animals to get oxygen from water.

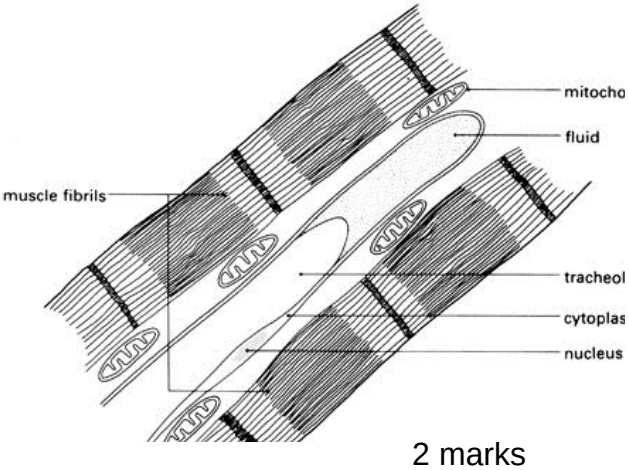
i) Outline two differences and two similarities between mammalian lungs and fish gills using the words below. More words may be used do assist in your explanation.
Tidal volume, counter current, alveoli, diffusion.

4 marks

ii) Sharks trapped in nets become immobile and quickly suffocate. Explain why.

2 marks

iii) A muscle cell is shown below. Clearly labelled are structures such as tracheoles and mitochondria. Identify the type of creature the cell is from and give a reason for your choice.



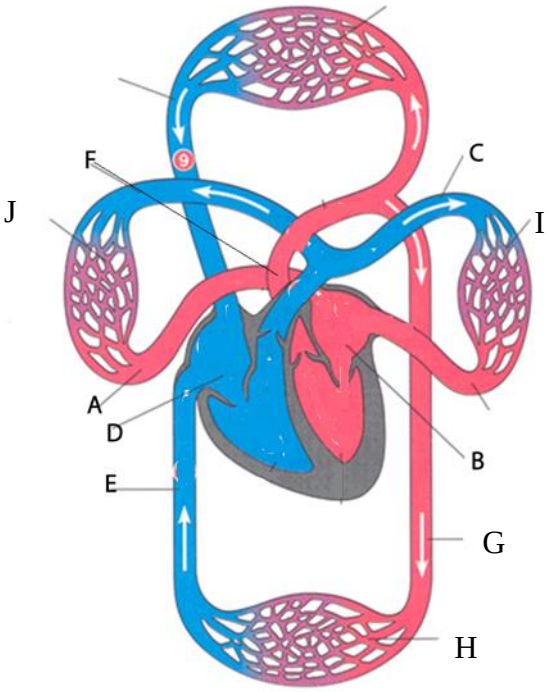
2 marks

3) i) Describe how blood moves through the heart as it comes from the vena cava. Use the words ***pulmonary artery, aorta, pulmonary vein, left atrium, right atrium, left ventricle, right ventricle.***

4 marks

ii) Below is a representative structure of the circulatory system of an organism.

a) A student was suggesting that this is most likely representative of a lizard. Do you agree?
Give a reason.



b) Circle the correct response?
c) In what area would you expect to find a thick walled blood vessel?
A , B, H, I, E, D

c) Where would blood at high pressure be found?
C, J, H, I, E, D

d) The site where nutrients leave the blood bound for the cells is:
A , B, G, I, E, D, H

e) The site where gases are exchanged between the blood and the atmosphere:
A , B, G, I, E, D, H

f) Two sites where red blood cells travel in single file through blood vessels.
A , B, G, I, E, D, H

6 marks

iii). Two type of circulatory systems exist, open and closed.

a) What organism has an open circulatory system?

1 mark

b) What organism has a closed circulatory system?

1 mark

c) What do both closed and open circulatory systems have in common?

2 marks

d) Explain the difference between an open and a closed circulatory system.

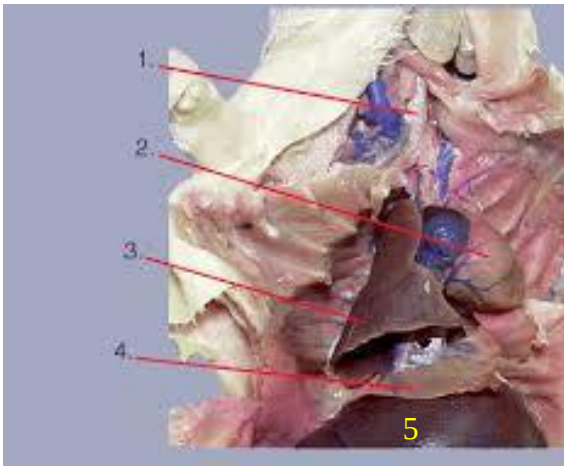
2 marks

e) The heart is commonly known as a double pump. Explain where blood travels from the heart with every beat to justify this description.

2 marks

8

4) Consider the picture of dissected rat shown on the right.
Identify each labelled structure and describe its function.



i) Structure 1 is a tube with rings of cartilage.
Name

Function

ii) Structure 2 is a muscular organ.
Name

Function

iii) Structure 3 are elastic spongy structures
Name

Function

iv) Structure 4 is a thin layer of muscle that separates the thoracic cavity from the abdominal cavity.
Name

Function

v) Structure 5 is a relatively large brown structure found just below structure 4
Name

Function

5) A simple, closed ecosystem is shown on the right. It is composed of a sealed, transparent, plastic bottle with soil, 3 grasshoppers and a plant. All ecosystems require an input of energy. It is left in a bright area for three days and the levels of CO_2, temperature, O_2 and sunlight measured.

a) What is the source of energy for this ecosystem?

b) What is the process that captures this energy?

1 mark

c) What two substances are produced by the plant in one process and later reused by the plant during a different process?

1 mark

d) Write a chemical equation for the process that occurs in the plant known as aerobic cellular respiration.

1 mark

e) What is the name of the process that occurs in both the grasshoppers and the plant when the Sun is shining?

1 mark

f) What critical process would cease to occur if the soil and all the contents of the bottle were completely sterilised so that no bacteria or fungi existed?

1 mark

g) John was heard to say to Stephen. "*Once the bottle is sealed the grasshoppers and the plant would die through lack of fresh air.*"
Do you agree or disagree.
Give a reason

2 marks

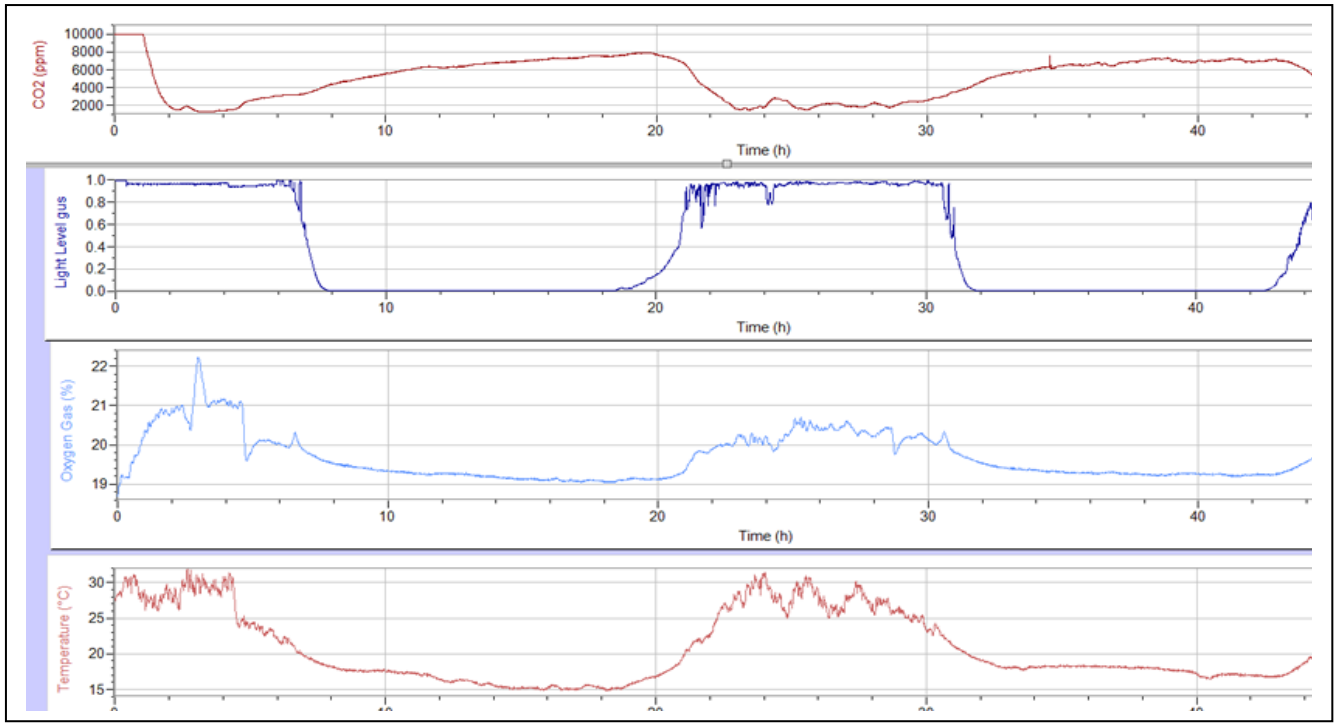
h) What would happen if the grasshoppers suddenly died?

1 mark

i) What would happen if the plant suddenly died?
Explain.

2 marks

Below are the results of the measurements taken over a 48 hour period.



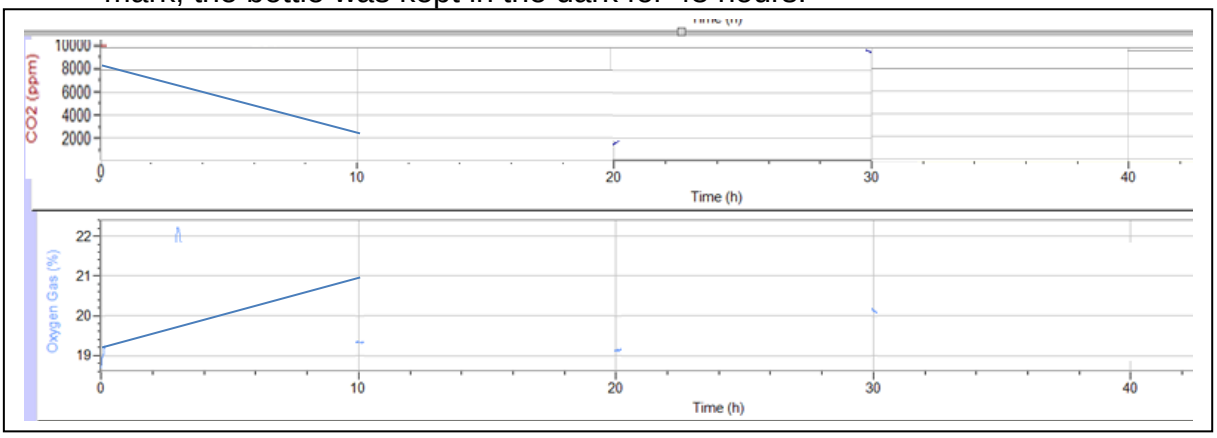
j) Explain why CO_2 is increasing at the 10 hour mark but starts to decrease at the 20 hour mark.

2 marks

k) Explain why O_2 is increasing at the 20 hour mark but starts to decrease at the 6 hour mark.

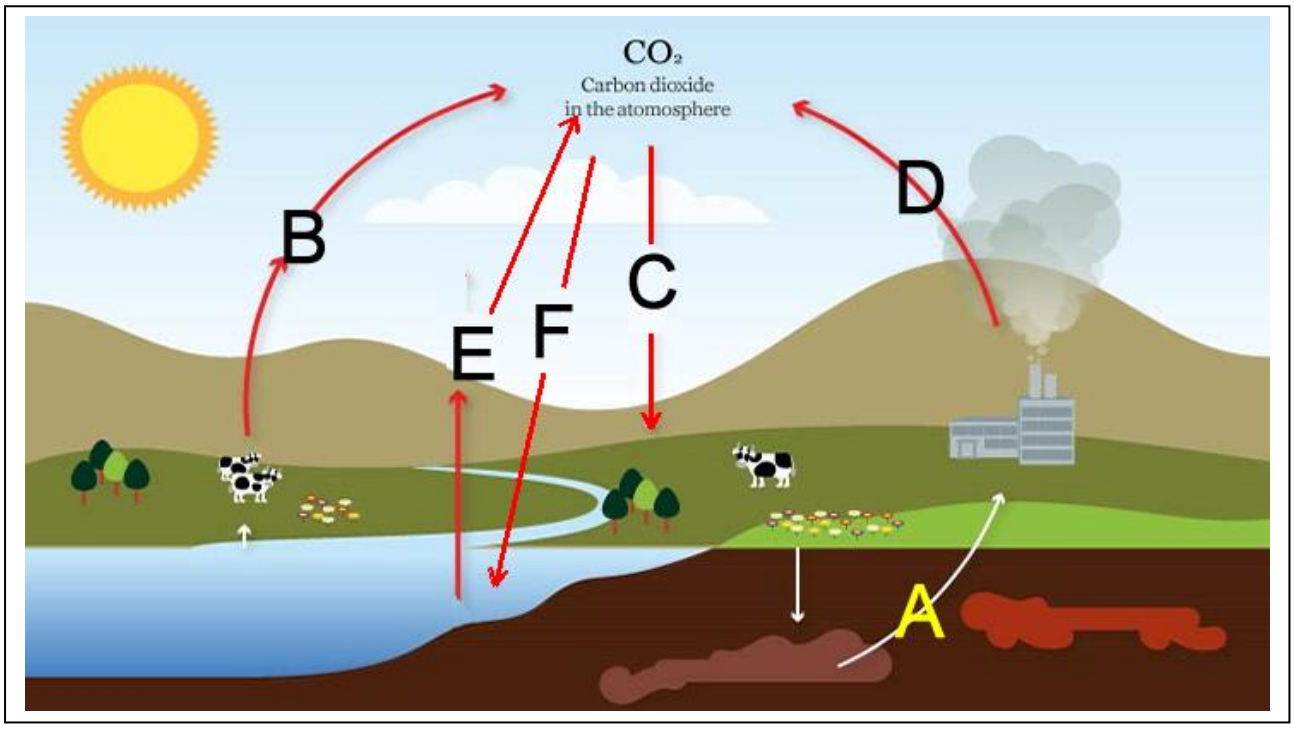
2 marks

l) Draw how might the results of levels of O_2 and CO_2 change if, at the 10 hour mark, the bottle was kept in the dark for 48 hours.



2 marks

6) Many essential nutrients and chemicals are recycled on Earth. One of these chemical elements is carbon. An incomplete diagram of the carbon cycle is shown below.



a) Why is carbon dioxide (CO_2) a greenhouse gas?

1 mark

b) What process is responsible for CO_2 in the atmosphere via pathway B?

1 mark

c) What process involves the use of fossil fuels?

1 mark

d) Which pathway causes an anthropogenic increase in the levels of atmospheric CO_2?

1 mark

e) What process represents pathway C?

1 mark

f) An increase in temperature accelerates what pathway leading to greater atmospheric CO_2?

1 mark

g) Large amounts of carbon are stored as limestone.
i) What is the source of this limestone?

1 mark

ii) Where are large deposits of limestone usually found on Earth?

1 mark

7) Evolution is a slow process which ultimately leads to the development of organism that are well adapted to their environment?

a) What is an adaptation? Give one example.

2 marks

b) Complete the following sentence using words from the list below.

Mutation, natural selection, survival of the fittest, variation

The Creationist “argument from design” or “irreducible complexity” is based on the idea that complex organisms or organs cannot develop by chance. The argument fails because, although _____ is random, _____ is not; it is directed in the sense of increasing adaptation.

1 mark

c) **Irreducible complexity** is an argument by supporters of intelligent design that certain biological structures, such as the eye, are too complex to have evolved from simpler less complete predecessors. The argument goes that the eye is so complex that even a small part missing would render this organ completely useless and as such must have been designed as a total organ. As opposed to having evolved from simpler or "less complete" predecessors through nature acting on a series of chance mutations.

Using the eye as an example, discuss how an organ of such complexity could have evolved. Discuss the evidence available for your theory of how the eye might have evolved and discuss imperfections in the eye that should not have come about if the eye had been carefully designed.

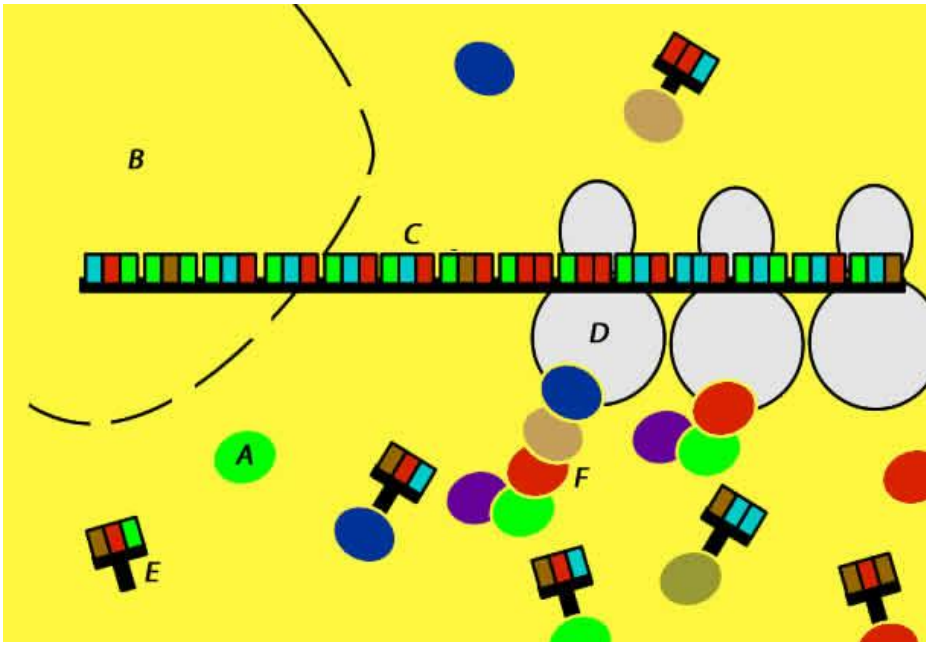
Use the following words in context

variation, mutation, natural selection, survival of the fittest,

6 marks

Use the space on the other side of this page if you need more writing space.

8) Genes found in the nucleus of our cells express themselves through the synthesis of proteins. Proteins can be structural, such as collagen, or involved in communication as in the case of neurotransmitters. The diagram below represents the synthesis of a new protein. Match the following words to labels on the diagram below and give a brief explanation of the function of each . (3 marks)



Structure	Label	General function
tRNA		
mRNA		
Ribosome		
Protein		
Amino acid		
Nucleus		

9) Use some of these words to complete the sentences below:
Chain, form, photosynthesis, sound, recycled, web, chemical, surroundings, trophic, proteins, fats, energy, level, organism, hydrogen, nutrients, heat, solar.

Energy and Matter in Ecosystems

Ecosystems all over the Earth have shared some of the very same atoms of carbon, hydrogen, nitrogen and oxygen at some point in time. All natural ecosystems, no matter how big or small, need a constant supply of_____. The Law of Conservation of energy states that energy cannot be created or destroyed only changed from one _____ to another. Your own body provides a very good example of this law. The heat energy that radiates form your body has originated from the _____ energy found in the food you eat. This energy present in the food we eat originated as _____ energy and trapped in food during a process called _____. Energy entering an ecosystem flows from organism to organism and most of it is lost as _____ energy. Heat is eventually transferred to the surroundings. The path that food energy takes from organism to organism in an ecosystem is called a food_____. Each energy level in a food chain is called a _____ level (feeding level). _____ are chemicals that are required for the growth and repair of cells in all living things. All proteins are combinations of chemical 'building blocks' called amino acids. These are made up of atoms of carbon, _____, oxygen and nitrogen. These atoms are _____ over and over again in natural ecosystems.

END OF THE EXAM. (Make sure your name is clearly written on the front of the exam and you have replaced the named Answer sheet part A inside the front cover)