

Biology, 2017 EC, entrance exam, version 2

Grade 12 · Biology · 2017 E.C.

MARKING KEY: CONFIDENTIAL

Time allowed: 120 minutes

Questions: 96

Total marks: 96

Sit this paper online with instant scoring, free on Temari.et.

temari.et/exam-prep/papers/grade-12-biology-2017-version-2

1. The vaccine against terrible cattle disease rinderpest was made by _____. (1)

A. Prof. Beyene Petros
B. ✓ Prof. Tilahun Yilma
C. Dr. Alipurdur Lemma
D. Dr. Gebissa Ejetta

Answer: B

Rinderpest was the cattle plague that wiped out herds across Ethiopia and the rest of Africa. Professor Tilahun Yilma, an Ethiopian veterinary microbiologist, used genetic engineering to build a vaccine on a vaccinia virus carrier, and it stayed stable in heat so it could travel to villages without a cold chain. Dr Aklilu Lemma is the tempting answer because he is the best known Ethiopian name in disease control, but his discovery was ended against the snails that carry bilharzia, not a cattle vaccine.

2. Which of the following Ethiopian Biologist has been honored by developing high yielding strains of sorghum? (1)

A. Dr. Tsehaynesh Meselle
B. Dr. Birhane Asfaw
C. Dr. Zeresenay Alemseged
D. ✓ Dr. Gebissa Ejetta

Answer: D

Dr Gebisa Ejeta is a plant breeder. He developed sorghum varieties that survive drought and resist the parasitic weed striga, which raised harvests for farmers in Ethiopia and across the Sahel, and he received the World Food Prize for that work. Dr Berhane Asfaw is the tempting choice because he is also a famous Ethiopian scientist, but his field is human fossils, not crop breeding.

3. Ethiopian Biologist who worked on effects of chemical pesticides on human is _____. (1)

A. Prof. Sebsibie Demisew
B. Prof. Legesse Negash
C. ✓ Prof. Yealemtsehay Mekonnen
D. Prof. Mogessie Ashenafi

Answer: C

Professor Yalemtehay Mekonnen studied how the chemical pesticides sprayed on farms and flower farms affect the health of the people who handle them. Her work is in human physiology and toxicology. Professor Legesse Negash is the tempting answer because he also works with plants, but his research is on growing and saving indigenous Ethiopian trees.

4. Ethiopian Biologist who has made a soap berry to eradicate snail which is intermediate host of bilharzia: (1)

A. Dr. Melaku Werede
B. Dr. Gebissa Ejetta
C. Dr. Birhane Asfaw
D. ✓ Dr. Aklilu Lemma

Answer: D

Bilharzia is spread by a worm that must pass part of its life inside a freshwater snail, so killing the snail breaks the chain of infection. Dr Aklilu Lemma noticed that water downstream of places where people washed clothes with endod berries, the soap berry, had dead snails in it, and he developed endod as a snail killer. Dr Melaku Werede is the tempting choice, but his contribution was the national gene bank and the saving of farmers' seed varieties.

5. Among the following renowned Ethiopian Biologists who discover two 160,000 years old human skulls which have a big impact on the study of human evolution? (1)

A. ✓ Dr. Berhane Asfaw

B. Dr. Tsehaynesh Meselle

C. Dr. Zeresenay Alemseged

D. Dr. Melaku Werede

Answer: A

The two skulls found at Herto in the Middle Awash are about 160,000 years old and are among the earliest known remains of our own species. Dr Berhane Asfaw was a co-leader of the team that found and described them. Dr Zeresenay Alemseged is the tempting answer, but his famous find is Selam, the child from Dikika, who belongs to *Australopithecus afarensis* and is more than 3 million years old.

6. All are the major research areas of EHNRI except: (1)

A. HIV vaccine trial

B. ✓ Forestry

C. Battle against TB

D. Nutritional state of mothers and baby

Answer: B

EHNRI is the Ethiopian Health and Nutrition Research Institute, so everything it works on is health or nutrition: vaccine trials, communicable diseases such as tuberculosis, and the nutritional state of mothers and their babies. Forestry is a plant and land science and belongs to the agriculture and biodiversity institutes. Tuberculosis is the tempting answer because it sits next to two nutrition items, but disease research is the core work of a health institute.

7. Ethiopian Biological research center which is involved in mechanized farming is: (1)

A. ✓ EJAR

B. ALIPB

C. AHRI

D. IBC

Answer: A

EIAR is the Ethiopian Institute of Agricultural Research. It works on crops, livestock, soils and farm machinery, which is why mechanized farming falls under it. IBC is the tempting answer because it also deals with plants, but its job is conserving genetic resources and ecosystems, not farm technology.

8. Ethiopian Biological research center which is highly devoted on research related to Leprosy is: (1)

A. IAR

B. ✓ AHRI

C. IBC

D. EHNRI

Answer: B

AHRI is the Armauer Hansen Research Institute in Addis Ababa. It is named after Gerhard Armauer Hansen, the scientist who identified the bacterium that causes leprosy, and the institute was set up to study leprosy and related diseases. EHNRI is the tempting answer because it is also a health institute, but its remit is nutrition and general public health.

9. Among the following institutes which one is working on the management of the ecosystem? (1)

A. ALIPB

B. EHNRI

C. ✓ IBC

D. EIAR

Answer: C

IBC is the Institute of Biodiversity Conservation. Its work is protecting species, habitats and the genetic material of Ethiopian plants and animals, which is ecosystem management. EIAR is the tempting answer because farming touches the land too, but its purpose is raising agricultural production, not conserving the ecosystem.

10. The resolution power of a microscope used to: (1)
- A. ✓ **Show objects clearly** B. Increase the size of objects
C. Make objects brighter D. Make objects look smaller

Answer: A

Resolution is the smallest distance between two points that a microscope can still show as two separate points. That is what makes the image sharp and detailed. Increasing the size of the object is the tempting answer, but that is magnification: a magnified image with poor resolution is only a bigger blur.

11. Preparation of specimen to see under the microscope is known as _____. (1)
- A. Resolution B. ✓ **Mounting**
C. Staining D. Magnification

Answer: B

Mounting is the whole act of getting the specimen ready on the slide: a thin piece of tissue is placed on the slide with a drop of water or stain and a cover slip is lowered over it without trapping air. Staining is the tempting answer because it is part of the same preparation, but staining only adds colour to make structures stand out.

12. Cells that are adapted to carry out a particular body function are: (1)
- A. Embryonic stem cells B. Undifferentiated cells
C. ✓ **Specialized cells** D. Unspecialized cells

Answer: C

A cell becomes specialized through differentiation: its shape and its contents change so it can do one job well, the way a red blood cell loses its nucleus to carry more oxygen. Unspecialized cells are the tempting answer, but those are the cells that have not yet taken on a job, which is the opposite of what the question describes.

13. A cell with a large number of mitochondria is expected to: (1)
- A. Produce more digestive enzymes B. Perform a lot of photosynthesis
C. Store more food D. ✓ **Make a lot of ATP**

Answer: D

The mitochondrion is where aerobic respiration finishes and most ATP is made, so cells with heavy energy demands, such as muscle cells and sperm, are packed with them. Doing a lot of photosynthesis is the tempting answer, but that needs chloroplasts, and chloroplasts are found in plant cells only.

14. Which of the following structures of the cell are involved in the synthesis of protein? (1)
- A. Chloroplast B. ✓ **Ribosome**
C. Golgi body D. Vacuole

Answer: B

The ribosome is where amino acids are joined into a polypeptide chain following the order carried by messenger RNA. The Golgi body is the tempting answer because proteins pass through it, but the Golgi modifies and packs proteins after they have already been made on the ribosome.

15. Which of the following organelle is the site of photosynthesis? (1)
- A. Lysosome B. Centriole
C. ✓ **Chloroplast** D. Leucoplast

Answer: C

The chloroplast holds chlorophyll on its thylakoid membranes, so it is the organelle that traps light energy and builds sugar. The leucoplast is the tempting answer because it is also a plastid, but it carries no pigment and its job is storing starch, oil or protein.

16. The movement of water molecules from a region of high concentration to low concentration is: (1)

- A. ✓ Osmosis
B. Diffusion
C. Passive transport
D. Active transport

Answer: A

Osmosis is the movement of water from where water is more concentrated to where it is less concentrated, through a partially permeable membrane. Diffusion is the tempting answer, and osmosis is indeed a special case of it, but when the particle that moves is water the exam expects the specific word osmosis.

17. Which of the following is true about rate of diffusion? (1)

- A. Diffusion increases when the temperature decreases
- B. ✓ **Diffusion increases when the temperature increases**
- C. Diffusion decreases when there is very high concentration difference between two areas
- D. Diffusion increases when there is very low concentration difference between two areas

Answer: B

Raising the temperature gives the particles more kinetic energy, so they move faster and spread out faster. That makes the rate of diffusion higher. The option about a very high concentration difference slowing diffusion is tempting, but the opposite is true: the steeper the gradient, the faster the net movement.

18. If an animal cell is put in concentrated salt solution which of the following event will happen? (1)

- A. The cell became plasmolysis
B. Water moves into the cell
C. ✓ **The cell became shrunk**
D. Salt moves into the cell

Answer: C

A concentrated salt solution is hypertonic to the cell, so water leaves the cytoplasm by osmosis and the cell shrinks. In red blood cells this shrunken, notched state is called crenation. Plasmolysis is the tempting answer, but that word describes a plant cell whose membrane pulls away from its cell wall, and an animal cell has no wall.

19. The most common monomer of carbohydrate is a molecule of: (1)

- A. Phospholipids
B. Fatty acids
C. ✓ **Glucose**
D. Triglycerides

Answer: C

A monomer is the single unit that repeats to build a large molecule. Glucose is the unit that links again and again to form starch, glycogen and cellulose, so it is the common carbohydrate monomer. Fatty acids are the tempting answer, but they are building blocks of lipids, not carbohydrates.

20. When 50 amino acids joined together through condensation reaction, how many peptide bonds are formed and water molecules are released respectively? (1)

- A. 48, 50
B. ✓ 49, 49
C. 50, 49
D. 49, 50

Answer: B

Each peptide bond joins two amino acids, so a chain of n amino acids contains $n - 1$ bonds. With $n = 50$ that gives $50 - 1 = 49$ peptide bonds. Every one of those bonds is made by condensation, which releases one water molecule, so 49 water molecules come out as well. The answer 50 bonds is tempting if you count the amino acids instead of the links between them.

21. Unsaturated fatty acids differ from saturated fatty acids except: (1)
- A. ✓ **They have all single bonds** B. They have one or more double bonds
C. They are more common in plants D. They are liquids at room temperature

Answer: A

The question asks which statement is not a difference, so look for the one that is false of unsaturated fatty acids. Having all single bonds describes saturated fatty acids: unsaturated ones carry at least one carbon to carbon double bond, and that kink is why they stay liquid at room temperature. Option B is tempting because it is a true statement, but a true statement is a real difference and so cannot be the exception.

22. Which of the following minerals is an important constituent of bone and teeth needed for many metabolic processes? (1)
- A. Iron B. ✓ **Calcium**
C. Sodium D. Phosphorus

Answer: B

Calcium is laid down with phosphate as the hard mineral of bone and teeth, and the same ion is needed for muscle contraction, nerve signalling and blood clotting. That combination of structure and metabolism is what the question describes. Phosphorus is the tempting answer because it sits in the same bone mineral, but the syllabus names calcium as the constituent with the wide metabolic role.

23. One of the following vitamins is needed for the formation of connective tissues which holds the body together? (1)
- A. Vitamin B B. Vitamin A
C. ✓ **Vitamin C** D. Vitamin D

Answer: C

Vitamin C is needed to make collagen, the fibrous protein that holds skin, blood vessel walls, gums and other connective tissue together. Without it wounds heal badly and gums bleed, which is scurvy. Vitamin D is the tempting answer, but its job is helping the gut absorb calcium for bone mineral, not building the protein fibre.

24. Water is crucial in the human body for a number of reasons. Which one is not correct about their functions? (1)
- A. It is a universal solvent in any environment
B. It is involved in the transport of substance around the body
C. It is involved in temperature regulation by loss of heat through sweating
D. ✓ **It is not involved in any chemical reaction which takes place in the body**

Answer: D

Water takes part in many reactions in the body. Digestion is the clearest case: starch, protein and fat are broken down by hydrolysis, which uses a water molecule at every bond that is split. So the statement that water is not involved in any chemical reaction is the false one. Calling water a universal solvent is loosely worded and tempting to pick, but the exam treats it as a correct statement about water.

25. Which one of the following is not the part of a balanced diet? (1)
- A. Proteins B. Lipids
C. ✓ **Cellulose** D. Carbohydrate

Answer: C

A balanced diet is built from nutrients the body can digest, absorb and use: carbohydrate, protein, lipid, vitamins, minerals and water. Cellulose is plant fibre, and the human gut makes no enzyme that can break it, so none of it is absorbed. It still matters for keeping food moving through the gut, but the question counts it outside the list of nutrients. Lipids are the tempting answer because fat is often called unhealthy, yet the body needs it for energy and for membranes.

26. Which one of the following is orders of digestive system that correctly illustrates from the beginning to the end? (1)
- A. ✓ **Ingestion → digestion → absorption → assimilation → egestion**
 - B. Digestion → absorption → assimilation → egestion → ingestion
 - C. Assimilation → egestion → absorption → ingestion → digestion
 - D. Egestion → assimilation → ingestion → absorption → digestion

Answer: A

Food is first taken into the mouth, which is ingestion. It is then broken down into small soluble molecules (digestion), passed through the gut wall into the blood (absorption), used inside the cells (assimilation), and what could not be digested leaves as faeces (egestion). Option B lists the same steps in the same order but starts at digestion, which is tempting until you ask how the food entered the body in the first place.

27. In grade 9 laboratory class, the teacher gives the students a sample of food and asked them to investigate the presence of glucose. What kind of test and result will enable the students to confirm the presence of glucose respectively? (1)
- A. ✓ **Benedict's test and orange colour**
 - B. Biuret test and purple colour
 - C. Emulsion test and milky white colour
 - D. Iodine test and blue black colour

Answer: A

Glucose is a reducing sugar, so it reduces the copper in Benedict's solution when the mixture is heated. The blue colour changes through green and yellow to an orange or brick red precipitate, and that colour is the positive result. The biuret test with its purple colour is the tempting answer, but biuret detects protein, not sugar.

28. Which of the following factor affecting enzyme activity without denaturing the enzyme molecule? (1)
- A. Low pH
 - B. High temperature
 - C. ✓ **Low temperature**
 - D. High pH

Answer: C

A low temperature slows the movement of enzyme and substrate molecules, so they collide less often and the reaction rate falls. The bonds that hold the enzyme's shape are untouched, so warming the mixture again brings the activity back. High temperature is the tempting answer, but heat breaks those bonds, the active site loses its shape and the enzyme is denatured for good.

29. The shapes of different teeth in humans are ideally suited to their various functions. Which type of teeth is not correctly matched with their functions? (1)
- A. Premolars → chewing food
 - B. ✓ **Canines → chewing food**
 - C. Molars → crushing food
 - D. Incisors → biting food

Answer: B

Canines are the pointed teeth at the corners of the mouth. Their shape suits gripping and tearing, and it is the flat, ridged premolars and molars that chew and grind. So the canine pairing is the one that does not match. Premolars for chewing is the tempting answer, but a premolar surface is broad and does exactly that job.

30. In a Benedict's test for sucrose, why does the test sample first boil with hydrochloric acid? (1)
- A. To reduce Benedict's solution
 - B. Retest mixture with Benedict solution
 - C. To neutralize the solution
 - D. ✓ **To hydrolyze non-reducing sugar**

Answer: D

Sucrose is a non-reducing sugar, so it leaves Benedict's solution blue even though it is a sugar. Boiling with hydrochloric acid hydrolyses it into glucose and fructose, which are reducing sugars, and the test then works. Neutralizing is the tempting answer, but that is a separate later step with sodium hydrogen carbonate, needed because Benedict's solution only works in alkaline conditions.

31. Which deficient nutrients are correctly paired with their deficiency diseases? (1)

- A. Protein → Scurvy
- B. Iron → Marasmus
- C. Carbohydrate → Beri-beri
- D. ✓ **Vitamin A → Night blindness**

Answer: D

Vitamin A is used to make rhodopsin, the pigment in the rod cells of the retina that lets the eye work in dim light. When it runs short, seeing in low light fails first, which is night blindness. Protein paired with scurvy is the tempting answer, but scurvy comes from lack of vitamin C, and lack of protein gives kwashiorkor.

32. When you breathe out during gas exchange, all of the following happens to the breathing movement except? (1)

- A. The volume of the thorax decrease
- B. ✓ **Pressure inside chest cavity decreases**
- C. Diaphragm moves upward
- D. Pressure inside chest cavity increases

Answer: B

When you breathe out, the intercostal muscles relax and the diaphragm moves up into a dome, so the volume of the thorax falls. Squeezing the same air into a smaller space raises the pressure inside the chest above the pressure outside, and air flows out. So the statement that the pressure inside the chest decreases is the false one. The paired option about pressure increasing is the same fact stated correctly.

33. The muscle that separate the chest cavity from the abdominal cavity is known as: (1)

- A. Nasal cavity
- B. Trachoma
- C. ✓ **Diaphragm**
- D. Epiglottis

Answer: C

The diaphragm is the sheet of muscle stretched across the body under the lungs, separating the chest cavity from the abdominal cavity, and its movement drives breathing. Trachoma is the tempting answer because the word looks like trachea, but trachoma is an eye infection and the trachea is the windpipe.

34. Which of the following is the correct pathway of breathing from the outer to the inner parts? (1)

- A. ✓ **Nasal cavity → trachea → bronchus → bronchioles → alveolus**
- B. Alveolus → bronchus → bronchioles → trachea → nasal cavity
- C. Alveolus → bronchioles → bronchus → trachea → nasal cavity
- D. Nasal cavity → alveolus → bronchus → trachea → bronchioles

Answer: A

Air is drawn in through the nasal cavity, down the trachea, into the right or left bronchus, along the branching bronchioles, and finally into the alveoli where gases cross into the blood. The reversed chains that begin at the alveolus are tempting, but the question asks for the path from the outside inward.

35. While oxygen is carried by the red blood cells, most digested food and wastes are carried by the: (1)

- A. ✓ **Plasma**
- B. White blood cells
- C. Platelets
- D. Red blood cells

Answer: A

Plasma is the straw coloured liquid part of the blood, and dissolved substances travel in it: glucose, amino acids, urea and most of the carbon dioxide as hydrogen carbonate. Red blood cells are the tempting answer, but they are specialised for oxygen because they are filled with haemoglobin.

36. The absolute maximum amount of air you can take into or breathe out of your lungs is called: (1)
- A. Tidal volume
B. ✓ **Vital capacity**
C. Residual volume
D. Breathing hygiene

Answer: B

Vital capacity is the largest volume of air a person can move in one breath, from the fullest breath in to the strongest breath out. Tidal volume is the tempting answer, but that is the small amount, around 500 ml, moved in quiet resting breathing.

37. Which of the following products are formed during anaerobic respiration of one glucose molecule in animal cells? (1)
- A. Ethanol, NAD, 2ATP
B. ✓ **Lactic acid, CO₂, 2ATP**
C. Alcohol, ADP, 2ATP
D. Lactic acid, O₂, CO₂

Answer: B

When an animal cell runs out of oxygen it still carries out glycolysis, and it converts the pyruvate to lactic acid so that NAD is regenerated and glycolysis can continue. The yield is small: a net of 2 ATP per glucose. The options naming ethanol or alcohol are tempting, but that is fermentation in yeast and in plant cells, not in animals.

38. Which of the following is the type of blood vessel that carries deoxygenated blood from the heart to lungs? (1)
- A. Systematic circulation
B. Pulmonary vein
C. ✓ **Pulmonary artery**
D. Pulmonary circulation

Answer: C

The pulmonary artery leaves the right ventricle and carries blood that is low in oxygen to the lungs. It is an artery because of the direction it travels, away from the heart, not because of the blood it holds. The pulmonary vein is the tempting answer, but it brings oxygenated blood from the lungs back to the left atrium.

39. The right side chamber valve which directs the flow of blood by opening and closing is called: (1)
- A. Bicuspid valve
B. ✓ **Tricuspid valve**
C. Mitral valve
D. Vena cava

Answer: B

The valve between the right atrium and the right ventricle has three flaps, so it is called the tricuspid valve. It stops blood flowing back into the atrium when the ventricle contracts. The bicuspid valve is the tempting answer, but it has two flaps and sits on the left side; mitral is only another name for that same left valve.

40. Which one of the following statement is true about pulmonary circulation? (1)
- A. Blood flows from the heart to all around the body and back again
B. Carry only oxygenated blood from the body
C. ✓ **Blood flows from the heart to lungs and back again**
D. It transport oxygenated blood from the heart and back again

Answer: C

Pulmonary circulation is the short loop from the right side of the heart to the lungs and back to the left atrium, where blood picks up oxygen and drops carbon dioxide. Option A is tempting, but blood travelling from the heart to the whole body and back is the systemic circulation.

41. Which organic molecule in our body has functions as antigens and antibodies of immune system? (1)

- A. Lipids
- B. Nucleic acids
- C. ✓ **Proteins**
- D. Carbohydrates

Answer: C

Antibodies are immunoglobulins, which are Y shaped proteins made by white blood cells, and most antigens on the surface of a pathogen are proteins as well. Nucleic acids are the tempting answer because DNA holds the instructions for making antibodies, but the instruction and the molecule it codes for are not the same thing.

42. The blood group of human being which is commonly referred to as 'universal acceptor' is: (1)

- A. ✓ **Blood group AB**
- B. Blood group O
- C. Blood group A
- D. Blood group B

Answer: A

Red cells of group AB carry both the A and the B antigen, so the plasma of an AB person contains neither anti-A nor anti-B antibody. There is nothing in that plasma to attack donor cells of any ABO group, so AB can receive from all of them. Group O is the tempting answer, but O is the universal donor: its cells carry no A or B antigen to be attacked.

43. All of the following factors that can increase the risks of developing hypertension except? (1)

- A. ✓ **Reducing salt intake**
- B. Excessive consumption of alcohol
- C. Increasing age
- D. Sedentary lifestyle

Answer: A

The question asks for the factor that does not raise the risk of high blood pressure. Cutting down on salt lowers the amount of water held in the blood, so the pressure falls rather than rises. Sedentary lifestyle is the tempting answer, but sitting still for most of the day is a well known risk factor and so belongs with the others.

44. The modern technological instruments are learnt from nature by the process of: (1)

- A. Sketching
- B. ✓ **Imitating**
- C. Photographing
- D. Drawing

Answer: B

Copying a design that already works in nature is called imitating, and the field built on it is biomimicry. Engineers watch how a living thing solves a problem and build the same idea in metal or plastic. Sketching, drawing and photographing are tempting because they all record what nature looks like, but recording a shape is not the same as building a working device from it.

45. The relevance and promise of biology as a field of science can be best explained by its application: (1)

- A. Economic growth and urbanization
- B. Reducing security problems
- C. Oil and mineral production
- D. ✓ **Agriculture and genetic engineering**

Answer: D

Biology pays its way most visibly through agriculture and genetic engineering: improved seed, better livestock, vaccines, insulin from engineered bacteria. These are direct products of biological knowledge. Economic growth and urbanization is the tempting answer, but that is a general social change that many fields feed into, not an application of biology.

46. Among the following which one is incorrect statement about the importance of nature for imitating technological products? (1)
- A. It is the sources of materials that enable to imitating
 - B. Used to develop modern technologies that provide services
 - C. Used to develop knowledge of problem solving ability
 - D. ✓ **To provide limited resources and techniques for society**

Answer: D

Nature offers an enormous range of models to copy, from the shape of a bird's wing to the structure of a termite mound, so calling its resources and techniques limited contradicts the whole idea of learning from it. The option about developing problem solving knowledge is tempting because it sounds vague, yet studying how living things solve problems is exactly what biomimicry gives us.

47. Which technological products have been made through imitation of termite mound architecture? (1)
- A. Weaving technology
 - B. New drone design
 - C. ✓ **Building technology**
 - D. Techniques of preserving vaccine

Answer: C

A termite mound stays close to one temperature all day, because its chimneys and side tunnels let warm air rise out and cool air enter low down. Architects copied that flow of air in buildings such as the Eastgate Centre in Harare, which stays cool with very little air conditioning. New drone design is the tempting answer, but drones copy the flight of birds and insects, not a mound.

48. Which one of the following are the impact of biology on society and natural world except? (1)
- A. Ensuring food security by increasing productivity
 - B. ✓ **Lack of involvement in application of microbial action**
 - C. Production of antibiotics and treatment for bacterial infection
 - D. Achieving better supply of energy and clean water

Answer: B

The question asks which item is not an impact of biology. Not using microbes is an absence of work, so it cannot be an achievement of the subject. The other three are real gains: higher crop yields, antibiotics, and biological treatment of water and waste. Producing antibiotics is the tempting answer for anyone reading quickly, but it is one of biology's clearest contributions.

49. Among which explanation is correctly concerned about ethical issue in biology? (1)
- A. ✓ **It refers about rightness or wrongness use of biological discoveries**
 - B. Concerned about only ethical treatment of plant species
 - C. Encourage issues about wrongly uses of technology against human
 - D. Focus on encouraging unethical treatment of research animals

Answer: A

Ethics in biology asks whether a discovery is being used in a way that is right or wrong, for example whether an animal should be cloned or whether a person's genetic data may be shared. That is what option A states. The option about the ethical treatment of plant species only is tempting, but limiting ethics to plants leaves out humans and animals, where most of the hard questions sit.

50. Which common characteristics of animals that have balanced arrangement of body parts around a central point or axis? (1)
- A. Multicellularity
B. Motility
C. Sensitivity
D. ✓ **Body symmetry**

Answer: D

Body symmetry is the way body parts are arranged in a balanced pattern around a point or a line. A starfish is radially symmetrical around a central point, while a fish or a person is bilaterally symmetrical about a line down the middle. Motility is the tempting answer because most animals move, but movement says nothing about how the parts are arranged.

51. Which one of the following is the common characteristic of invertebrate animals? (1)
- A. They have closed circulatory system
B. ✓ **They have an exoskeleton**
C. They are warm-blooded animals
D. They possess a backbone and internal skeleton

Answer: B

Many invertebrates carry their hard skeleton on the outside: the shell of a snail, the case of a crab, the cuticle of an insect. That outer case is the exoskeleton. Having a backbone and an internal skeleton is the tempting answer, but that is the definition of a vertebrate, which is the opposite group. Warm blood belongs to birds and mammals only, and a closed circulatory system is found in a few invertebrate groups, not as a general feature.

52. The form of animal fertilization which young develop within the female by receiving nourishment from mother's blood through placenta is: (1)
- A. ✓ **Viviparity**
B. Oviparity
C. Oviparity
D. Viparity

Answer: A

Viviparity means the young grow inside the mother's body and receive food and oxygen from her blood through a placenta, then are born alive. Nearly all mammals reproduce this way. Oviparity is the tempting answer, but an egg laying animal seals the food supply inside the egg as yolk, and the embryo develops outside the mother.

53. During reproduction, some individual insects develop from unfertilized eggs by the process of: (1)
- A. Organogenesis
B. ✓ **Parthenogenesis**
C. Metamorphosis
D. Gastrulating

Answer: B

Parthenogenesis is development from an egg that was never fertilised, so the young carry only the mother's genes. Male honeybees, the drones, form this way. Metamorphosis is the tempting answer because it is also an insect word, but metamorphosis is the change of body form after hatching, not a way of starting an egg.

54. Among which of the following organisms reproduce by external fertilization? (1)
- A. Birds
B. Rats
C. Crocodiles
D. ✓ **Frogs**

Answer: D

A female frog releases her eggs into the water and the male sheds sperm over them at the same time, so the sperm meets the egg outside the body. That is external fertilization, and it works only where there is water to keep the eggs and sperm alive. Crocodiles are the tempting answer because they lay eggs, but their eggs are fertilised inside the female before the shell is added.

55. Why temperature is the environmental factor that determine sex during incubation of crocodiles? (1)
- A. They have chromosomes
B. They can reproduce by asexually
C. ✓ **They do not have chromosomes**
D. They have amniotic eggs

Answer: C

Crocodiles have no sex chromosome pair like the X and Y that decide sex in humans, so the instruction has to come from somewhere else. The temperature of the nest during a sensitive stage of incubation switches development towards male or female. The option saying they have chromosomes is tempting, but every cell has chromosomes; what these reptiles lack is a sex chromosome system.

56. Which mating system of birds those involve with two or more members of the opposite sex during a reproductive season? (1)
- A. Polygyny
B. ✓ **Polygamy**
C. Monogamy
D. Polyandry

Answer: B

Polygamy is the general term for an animal that mates with more than one partner in a breeding season. Polygyny (one male with several females) and polyandry (one female with several males) are the two specific forms it covers. Polygyny is the tempting answer, but the question does not say which sex has the several partners, so the wider term is the safe one.

57. Which developmental processes of germ layers later develop into organs and organ system? (1)
- A. ✓ **Organogenesis**
B. Cleavage
C. Blastula
D. Partinogenesis

Answer: A

After gastrulation the embryo has three germ layers: ectoderm, mesoderm and endoderm. Organogenesis is the stage in which those layers fold, grow and differentiate into the actual organs and organ systems. Cleavage is the tempting answer, but cleavage is only the rapid early divisions that make the ball of cells before any organ exists.

58. All of the following are considered as a beneficial aspects of insects except? (1)
- A. Effective pollinators
B. Sources of useful product and protein
C. Biological control agents
D. ✓ **Non-edible type of animals**

Answer: D

The question asks for the item that is not a benefit. Saying insects are non-edible is not a benefit at all, and it is not even true: many communities eat insects, and they are a good protein source. Biological control is the tempting answer for anyone who reads insects as pests, but using one insect to control another is a real agricultural gain.

59. Which one of the following is true about harmful aspect of insect in agriculture? (1)
- A. ✓ **Damaging crops and reducing production**
B. Used as pollinators in crop reproduction
C. Production of various medicines
D. Production of cosmetics and dyes

Answer: A

Crop pests such as stalk borers, armyworm and locusts feed on leaves, stems and grain, so the plant makes less and the harvest falls. That is the harmful side of insects in farming. Pollination is the tempting answer because it involves insects and crops together, but pollination raises production instead of lowering it.

60. Which one of the following examples of behavior describes when an animal stops responding to stimulus or cue after a period of repeated exposure? (1)
- A. Conditioning
 - B. Reflex
 - C. Imprinting
 - D. ✓ **Habituation**

Answer: D

Habituation is the simplest form of learning: an animal meets the same harmless stimulus again and again, learns that nothing follows it, and stops responding. A bird that ignores a scarecrow after a few days has habituated. Conditioning is the tempting answer, but in conditioning the animal learns to link the stimulus with a reward or a punishment, so the response changes rather than fades away.

61. The Ethiopian wolf lives and hunt in packs. During patrolling their habitat, both male and female wolves of the group maintain their area with urine containing pheromone. This pattern of behavior is an example of: (1)
- A. Operant behavior
 - B. ✓ **Territorial behavior**
 - C. Learned behavior
 - D. Courtship behavior

Answer: B

Urine carrying pheromone left along the edge of the patrolled area is a scent message that marks the boundary and warns other packs away. Marking and defending an area is territorial behaviour. Courtship behaviour is the tempting answer because scent can attract a mate, but here both males and females mark while patrolling, and the target of the message is a rival, not a partner.

62. A quick withdrawal of your hand from a hot plate is an example of: (1)
- A. Learned behavior
 - B. Biological clock
 - C. Key stimulant
 - D. ✓ **Innate behavior**

Answer: D

Pulling the hand back from a hot plate is a reflex. The signal travels into the spinal cord and out to the muscle without waiting for the brain, and the response is present from birth in everyone. That makes it innate. Learned behaviour is the tempting answer, but nobody has to practise this one, and the speed is the point of it.

63. An increase in blood sugar level causes the pancreas to release the hormone insulin; insulin lowers blood sugar level, restoring the body to its original blood glucose level by converting glucose to glycogen. This is an example of: (1)
- A. Positive feedback mechanism
 - B. ✓ **Negative feedback mechanism**
 - C. Neutral feedback mechanism
 - D. Homeostatic imbalance

Answer: B

In negative feedback the response cancels the change that started it. Blood glucose rises, insulin is released, glucose is stored as glycogen, and the level comes back down to where it began. Positive feedback is the tempting answer, but that would push the level further in the same direction, the way contractions strengthen during childbirth.

64. Which one of the following statement explains the specificity of enzymes? (1)
- A. It can be destroyed by excessive heat
 - B. It can be used over and over again
 - C. ✓ **It catalyze one reaction only**
 - D. Speed up a reaction without being used up

Answer: C

Specificity means one enzyme fits one substrate and speeds up one reaction, because the active site has a shape that matches that substrate alone. Amylase works on starch and does nothing to protein. Option D is tempting, since speeding up a reaction without being used up is true of every enzyme, but that describes catalysis in general rather than specificity.

65. Which protein structures have three-dimensional arrangement and unique shape of all amino acids in a single polypeptide chain? (1)
- A. Quaternary structure
B. Primary structure
C. ✓ **Tertiary structure**
D. Secondary structure

Answer: C

The tertiary structure is the way a single polypeptide chain folds back on itself into one three dimensional shape, held by bonds between side chains of amino acids that lie far apart in the sequence. That fold is what creates the active site. Quaternary structure is the tempting answer, but it needs two or more separate chains joined together, and the question says a single chain.

66. Which enzyme-substrate model that shows a change in shape of active site of an enzyme? (1)
- A. Lock and key model
B. ✓ **Induced-fit model**
C. Allosteric enzyme
D. Regulatory enzyme

Answer: B

In the induced fit model the active site is flexible. When the substrate arrives, the site moulds itself around it, and the strain that puts on the bonds helps the reaction along. The lock and key model is the tempting answer, but it treats the active site as a rigid shape that does not change at all.

67. The type of inhibitor that blocks the binding of the substrate to the active site by competition is: (1)
- A. Non-competitive inhibitor
B. ✓ **Competitive inhibitor**
C. Uncompetitive inhibitor
D. Irreversible inhibitor

Answer: B

A competitive inhibitor has a shape close enough to the substrate to sit in the active site itself, so while it is there the substrate cannot bind. Adding more substrate can outcompete it and the rate recovers. A non-competitive inhibitor is the tempting answer, but it binds somewhere else on the enzyme and changes the shape of the active site from a distance.

68. If an enzyme depends on a cofactor for its activity, then the enzyme become active and functional when it is found in the form of: (1)
- A. ✓ **Holoenzyme**
B. Coenzyme
C. Apoenzyme
D. Mineral ion

Answer: A

Some enzymes are only half a working unit. The protein part is the apoenzyme, and it needs a cofactor, which may be a metal ion or an organic coenzyme. When the two are joined the enzyme is complete and active, and that whole complex is the holoenzyme. Coenzyme is the tempting answer, but the coenzyme on its own is only the helper, not the working enzyme.

69. Which of the following is true about feedback inhibition? (1)
- A. The end product binds to the active site of enzyme
B. ✓ **The end product binds to the allosteric site of enzyme**
C. The shape of the active site is not changed
D. It cannot prevent enzyme performance activity

Answer: B

In feedback inhibition the end product of a pathway binds to the allosteric site, which is a second site away from the active site. That binding changes the shape of the active site, so the enzyme slows down and the cell stops making a product it already has enough of. Option A is tempting, but binding at the active site itself is what a competitive inhibitor does.

70. Which commercial fermentation uses of enzyme that is important for clarification of fruit juices? (1)

- A. Lipases
- B. Amylases
- C. Protease
- D. ✓ **Pectinases**

Answer: D

Pectin is the substance in the cell walls of fruit that makes pressed juice cloudy and thick. Pectinase breaks the pectin down, so more juice is released and it runs clear. Amylases are the tempting answer because they are widely used in industry, but they break down starch, which matters in brewing and baking rather than in juice.

71. Which type organic molecules that are mainly derived from vitamins? (1)

- A. Apoenzyme
- B. Cofactor
- C. ✓ **Coenzyme**
- D. Holoenzyme

Answer: C

Coenzymes are organic non-protein helper molecules, and the body builds most of them from vitamins: NAD comes from niacin, FAD from riboflavin, coenzyme A from pantothenic acid. That is one reason a shortage of a vitamin blocks so many reactions at once. Cofactor is the tempting answer, but cofactor is the wider word that also covers metal ions such as zinc and magnesium.

72. In an enzyme catalyzed reaction, the substance that is used again and again is: (1)

- A. ✓ **An enzyme**
- B. The substrate
- C. The product
- D. The enzyme-product complex

Answer: A

An enzyme is a catalyst. It holds the substrate, lowers the activation energy, releases the product and comes away unchanged, so the same molecule can work on the next substrate straight away. The substrate is the tempting answer, but the substrate is used up in the reaction and turned into the product.

73. The process of heating treatment of germinated grain to dry the green malt and prevent from further germination is known as: (1)

- A. Steeping
- B. ✓ **Kilning**
- C. Germinating
- D. Malting

Answer: B

Kilning is the drying step. Warm air is passed through the germinated grain to dry it, which stops germination going further and develops the colour and flavour of the malt. Malting is the tempting answer, but malting is the name of the whole process, and steeping, germination and kilning are its stages.

74. Which one of the following involves cutting back the shoots of plants to about 10-15 cm above the ground and allowing the stumps to regrow and produce more branches? (1)

- A. Sawing
- B. Grafting
- C. ✓ **Coppicing**
- D. Cloning

Answer: C

Coppicing means cutting the shoots back to a short stump near the ground. The stump is still alive with its full root system, so it pushes out many new shoots and the tree can be harvested again and again. Grafting is the tempting answer because it also involves cutting, but grafting joins a shoot from one plant onto the root of another.

75. The state in which all people have physical, social and economical access to sufficient, safe and nutritious food is: (1)

- A. ✓ Food security
B. Nutrition security
C. Nutrition science
D. Balanced diet

Answer: A

Food security is defined by all four conditions in the option together: every person, at all times, is able to reach food that is enough, safe and nourishing, and can afford it. Physical access, social access and economic access are all part of that definition. A balanced diet is the tempting answer, but that describes what one person eats in a day, not whether a population can obtain food at all.

76. All are correct about genetic fingerprinting except: (1)

- A. ✓ **It is based on RNA analysis**
- B. It is unique to individuals except identical twins
- C. It is made by gel electrophoresis in the PCR machine
- D. It is used for crime investigation

Answer: A

Genetic fingerprinting compares DNA. Repeated sequences that vary from person to person are copied by PCR, cut, and separated by gel electrophoresis into a banding pattern that is unique except in identical twins. So the statement that it is based on RNA analysis is the false one. Option C is tempting because its wording is loose, but PCR and gel electrophoresis really are the tools used.

77. Which one of the following is the characteristic of bacteria? (1)

- A. ✓ Their DNA is contained within the cytoplasm of the cell**
 B. They are larger than eukaryotic cell
 C. They have membrane enclosed organelle
 D. They have cell wall made up of lipoprotein

Answer: A

Bacteria are prokaryotes, which means they have no nuclear membrane. Their single circular chromosome lies free in the cytoplasm in a region called the nucleoid. Option D is tempting, because bacteria do have a cell wall, but that wall is built of peptidoglycan, not lipoprotein.

78. Which one of the following archaea can live in extremely hot temperature? (1)

- A. Acidophiles** **B. ✓ Hyperthermophiles**
C. Psychrophiles **D. Psychrotrophs**

Answer: B

Hyperthermophiles are archaea that grow best at very high temperatures, in hot springs and deep sea vents where water may be above 80 degrees Celsius. Their enzymes hold their shape at heat that would denature ours. Acidophiles are the tempting answer because they also live in a harsh place, but the extreme they tolerate is acid, not heat.

79. Which one of the following fungi has been used as a test organism to determine Mg, Cu, Zn and Mo in the soil? (1)

- A. Aspergillus flavus
B. Aspergillus parasitic
C. Claviceps purpurea
D. ✓ **Aspergillus niger**

Answer: D

Aspergillus niger grows only when the trace elements it needs are present, and how much it grows depends on how much of them there is. That makes it a living measuring tool, so a sample of soil can be tested for magnesium, copper, zinc and molybdenum by growing this fungus on it. Aspergillus flavus is the tempting answer because the name is close, but it is known for producing aflatoxin on stored grain.

80. Which one of the following protozoa causes Chagas disease? (1)

- A. ✓ **Trypanosoma cruzi**
- B. Trypanosoma brucei
- C. Toxoplasma gondii
- D. Plasmodium falciparum

Answer: A

Chagas disease is caused by Trypanosoma cruzi, spread by the bite of the triatomine bug in Central and South America, and it damages the heart and gut over many years. Trypanosoma brucei is the tempting answer because the genus is the same, but that species causes African sleeping sickness and is spread by the tsetse fly.

81. All are correct about lysogenic cycle except: (1)

- A. DNA of the virus integrates into the host DNA
- B. ✓ **DNA of the virus doesn't integrate into the host DNA**
- C. May or may not kill the host cell
- D. It takes time

Answer: B

The lysogenic cycle is defined by the virus inserting its DNA into the host chromosome, where it sits as a prophage and is copied every time the host cell divides. So the statement that the viral DNA does not integrate is the false one. The paired option about integration is tempting to skip past, but it is the same fact stated correctly.

82. Which one is the viral symmetry refers to the shape with 20 triangular faces and 12 corners? (1)

- A. Complex
- B. Helical
- C. ✓ **Icosahedral**
- D. Cylindrical

Answer: C

An icosahedron is a solid with 20 triangular faces and 12 corners, and many viruses build their protein coat in that shape because identical protein units can pack into it neatly. Helical symmetry is the tempting answer, but that gives a rod or a spiral, as in the tobacco mosaic virus.

83. Which of the following soil bacteria produce powerful protein toxin that used to kill insect pests? (1)

- A. Metarhizium anisopliae
- B. Verticillium lecanii
- C. Beauveria bassiana
- D. ✓ **Bacillus thuringiensis**

Answer: D

Bacillus thuringiensis forms a crystal of protein toxin as it produces spores. When an insect larva eats the crystal, the alkaline gut activates the toxin and it destroys the gut lining, so the larva stops feeding and dies. Beauveria bassiana is the tempting answer because it also kills insects, but it is a fungus that infects and grows through the body rather than a bacterium that makes a protein toxin.

84. All are correct about catabolism except: (1)

- A. It occurs during cellular respiration
- B. It is energy releasing reaction
- C. It is destructive phase of metabolism
- D. ✓ **It is energy absorbing reaction**

Answer: D

Catabolism breaks large molecules down into smaller ones, and the energy stored in the bonds is released, some of it as ATP. Respiration is the main example. So the statement that it absorbs energy is the false one: energy absorbing reactions belong to anabolism, which builds molecules up. Option C is tempting, but calling catabolism the destructive phase of metabolism is the standard description.

85. Where the light-independent stage of photosynthesis does take place? (1)
- A. Grana
B. Thylakoids
C. Lamina
D. ✓ **Stroma**

Answer: D

The light independent stage, the Calvin cycle, is run by enzymes dissolved in the stroma, the fluid that surrounds the grana inside the chloroplast. Thylakoids are the tempting answer, but the thylakoid membranes hold the pigments and carry out the light dependent stage.

86. Which one of the following photosynthetic pigments found only in the photosynthetic members of Chromista and Dinoflagellates? (1)
- A. Chlorophyll 'a'
B. ✓ **Chlorophyll 'c'**
C. Carotenoids
D. Phycobilins

Answer: B

Chlorophyll c is found only in the photosynthetic members of the Chromista, such as diatoms and brown algae, and in the dinoflagellates. It differs from the others in lacking the long phytol tail. Phycobilins are the tempting answer because they are also restricted to particular groups, but those groups are the red algae and the cyanobacteria.

87. All are correct about photosystem II except: (1)
- A. ✓ **Consists of a pair of Chlorophyll 'a' molecules with an absorption peak at 700nm**
B. Consists of a pair of Chlorophyll 'a' molecules with an absorption peak at 680nm
C. It passes its electrons to photosystem I
D. It replenishes its lost electrons from photolysis of water

Answer: A

The reaction centre of photosystem II is a pair of chlorophyll a molecules called P680, because they absorb best at 680 nm. The pair with a peak at 700 nm is P700, and that belongs to photosystem I. So option A is the false statement. Option D is tempting, but photosystem II really does replace its lost electrons by splitting water, and that is where the oxygen we breathe comes from.

88. Which one of the following is incorrect about light independent reaction? (1)
- A. It is purely enzymatic
B. It is slower than the light reaction
C. ✓ **It is the first step in the mechanism of photosynthesis**
D. It is the second step in the mechanism of photosynthesis

Answer: C

The light independent reaction cannot start until the light reaction has supplied ATP and NADPH, so it is the second step, not the first. That makes the statement calling it the first step the incorrect one. Option B is tempting, but the light independent reaction is indeed the slower of the two, because it depends on enzymes working through several stages.

89. Which one of the following processes occurs during light independent reaction of photosynthesis? (1)
- A. Change solar energy to chemical energy
B. ✓ **Carbon Fixation**
C. Splitting of water molecules
D. Reduced NADP to NADPH

Answer: B

In the light independent reaction carbon dioxide is attached to the five carbon acceptor RuBP by the enzyme rubisco, and this joining of carbon dioxide into an organic molecule is carbon fixation. Option D is tempting, but NADP is reduced to NADPH during the light reaction; the Calvin cycle spends the NADPH and hands NADP back.

90. The first stage of cellular respiration that takes place in the absence of oxygen is called _____. (1)

- A. Krebs cycle
- B. Electron transport chain
- C. Link reaction
- D. ✓ Glycolysis

Answer: D

Glycolysis takes place in the cytoplasm and needs no oxygen. It splits one glucose into two molecules of pyruvate, and it comes first in every route, whether the cell goes on to respire aerobically or to ferment. The Krebs cycle is the tempting answer, but it runs in the mitochondrial matrix and only after the link reaction, and it stops when oxygen runs out.

91. The amount of net ATP that glycolysis provides to a cell is: (1)

- A. 38
- B. ✓ 2
- C. 36
- D. 4

Answer: B

Glycolysis spends 2 ATP at the start to phosphorylate the sugar and makes 4 ATP later by substrate level phosphorylation. The net gain is $4 - 2 = 2$ ATP per glucose. The answer 4 is tempting because that is the gross figure, but the question asks what the cell actually gains.

92. In the mitochondrial matrix pyruvic acid reacts with a molecule of coenzyme A to form: (1)

- A. Ethyl alcohol
- B. Lactic acid
- C. ✓ Acetyl CoA
- D. NAD

Answer: C

This is the link reaction. Pyruvic acid entering the mitochondrial matrix loses one carbon as carbon dioxide, is oxidised with NAD taking the hydrogen, and the two carbon fragment left is attached to coenzyme A to give acetyl CoA. Lactic acid is the tempting answer, but pyruvate becomes lactic acid only when there is no oxygen and the pathway stays in the cytoplasm.

93. A biochemical pathway that breaks down Acetyl CoA is _____. (1)

- A. ✓ Krebs cycle
- B. Pyruvate oxidation
- C. Link reaction
- D. Glycolysis

Answer: A

The Krebs cycle takes the two carbon acetyl group from acetyl CoA, joins it to a four carbon acid, and oxidises it round the cycle until both carbons have left as carbon dioxide, filling NAD and FAD with hydrogen on the way. Pyruvate oxidation, also called the link reaction, is the tempting answer, but that stage makes acetyl CoA rather than breaking it down.

94. The final electron acceptor in the electron transport chain is _____. (1)

- A. Water
- B. ✓ Oxygen
- C. ATP
- D. ADP

Answer: B

At the end of the electron transport chain oxygen takes the electrons, picks up hydrogen ions and becomes water. Because oxygen pulls the electrons off the last carrier, the whole chain keeps running, which is why aerobic respiration stops without it. Water is the tempting answer, but water is the product of that final step, not the acceptor.

95. The electron transport chain and the enzyme ATP synthase are embedded in the:

(1)

- A. Thylakoid membrane
- B. Grana
- C. Stroma
- D. ✓ **Cristae**

Answer: D

The cristae are the folds of the inner mitochondrial membrane, and the electron transport carriers and ATP synthase sit in that membrane. The folding gives a large surface, so many chains can work at once. The thylakoid membrane is the tempting answer, but that carries the electron transport chain and ATP synthase of photosynthesis inside the chloroplast.

96. All of the following occurs during Lactic acid fermentation except?

(1)

- A. ✓ **Releasing of ethyl alcohol**
- B. Lactic acid accumulates in muscle cells
- C. Liver converts Lactic acid to pyruvic acid
- D. NADH oxidized

Answer: A

Lactic acid fermentation regenerates NAD by reducing pyruvate to lactic acid. Ethyl alcohol is not made, so option A is the exception: alcohol comes from the other route, fermentation in yeast and plant cells. Option C is tempting, but the liver really does take the lactic acid away in the blood and change it back to pyruvic acid once oxygen is available again.

END OF THE MARKING KEY

Sit this paper online at temari.et/exam-prep/papers/grade-12-biology-2017-version-2.

More exam papers are at temari.et/exam-prep/papers.

Generated on Tikimt 2, 2019 E.C. (October 12, 2026 G.C.) · Temari.et