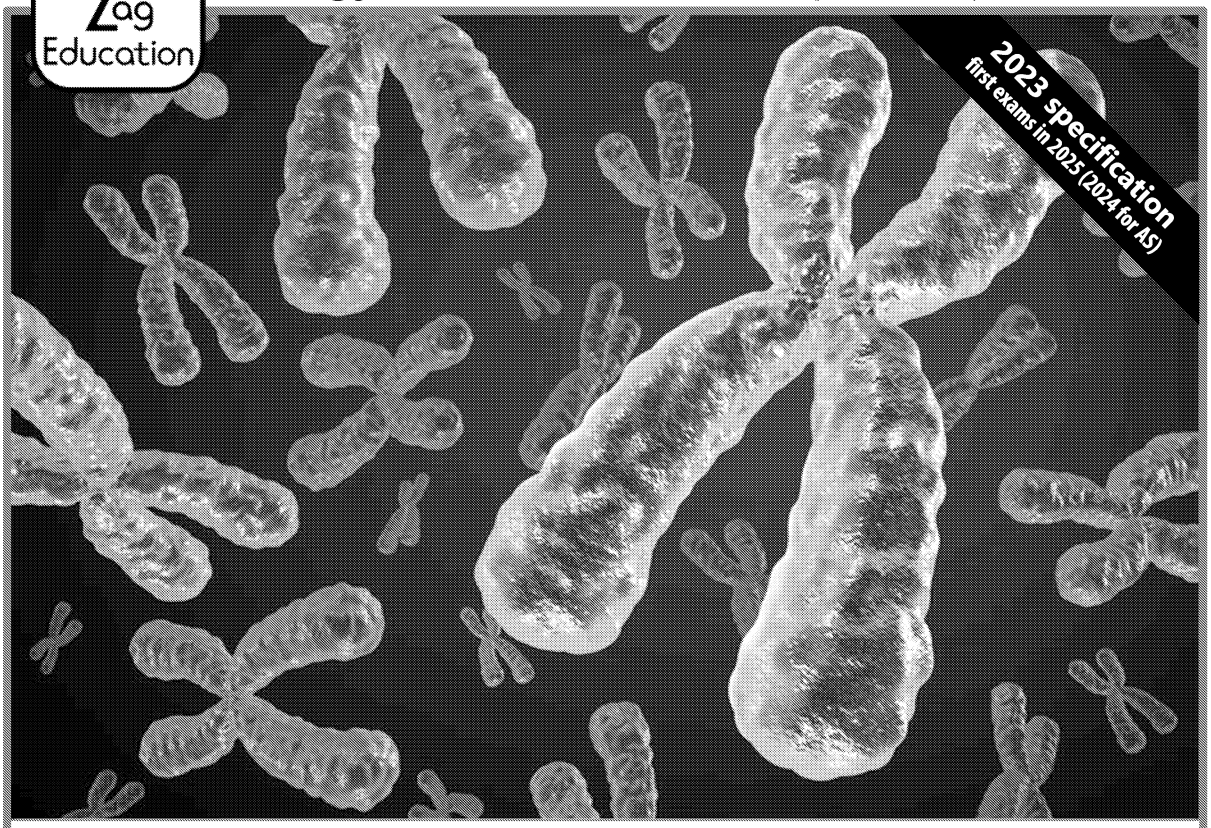
Zig Zag Education

Biology

AS / A Level | OCR A | H020/H420



Multiple-Choice Practice Questions

for AS / A Level Year 1 OCR A Biology

Modules 1–4

Update v1.1, May 2024

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POD 7298

Contents

Teacher's Introduction

For the **AS and A Level Year 1 Biology course**, the OCR exam board includes emphasis on multiple-choice questioning. In AS, MCQs comprise 20 / 70 marks of the **Breadth in Biology** paper, while in the A Level qualification, they comprise 15 / 100 marks from each paper (**Component 1: Biological Processes** and **Component 2: Biological Diversity**).

Multiple-choice questions test a range of skills, from comprehension to quick and accurate problem solving, to awareness of common misconceptions. This multiple-choice bank resource has been designed to ensure that students encounter a range of multiple-choice questions before their exam, including factual recall, application of knowledge, mathematical skills and practical skills from Modules 1–4 of the AS and Year 1 A Level courses.

The resource is split into two sections:

Remember!
Always check the exam board website for new information, including changes to the specification and sample assessment material.

Section One: Multiple-Choice Question Bank 1
This section includes 125 multiple-choice questions that span each topic making up the AS and Year 1 A Level course. The questions mimic the exam style of the OCR exam board and reflect the depth, difficulty and format of the questions the student will face in their upcoming exam.

A mark scheme is provided at the end of the section, which includes the answers along with worked solutions. The additional commentary to accompany them gives students an opportunity to identify the areas that still need improvement, and also to see where any mistakes were made and correct themselves for next time.

Section Two: Multiple-Choice Question Bank 2
This section includes another 123 multiple-choice questions that similarly span each topic that makes up the AS and Year 1 A Level course. The questions deliberately mimic those presented to the student in Section One; this has been done so that, after working through the worked solutions of Section One, students can complete another set of questions and directly compare their attempts. The format allows students to correct their mistakes from Section One, identify areas where they have improved their understanding and highlight areas that still require further work.

A mark scheme for Section Two is also provided at the end of the section. The mark scheme does not include worked solutions.

We hope you find this resource to be a valuable addition to your classroom.

January 2017

Update v1.1, May 2024:
Changes have been made to reflect the 2023 accessibility and clarity amendments to the specification.

The following questions (and associated answers) have been removed as they are no longer covered by the specification:
- Section Two, Topic 11, questions 2 and 11

The following questions have been amended for clarity in matching the specification:
- Section One, Topic 11, questions 5 and 7, and Section Two, Topic 11, question 6: T-regulator cell replaced as possible options
- Section Two, Topic 11, question 1: Question amended to focus on ring rot
- Section Two, Topic 11, question 4: Question amended to focus on fibrin
- Section Two, Topic 13, question 10: Standard deviation formula provided

Other minor improvements:
- Section One, Topic 3, question 5: Wording improved to clarify there is only a single answer
- Section One, Topic 8, questions 3 and 4 answers: Throat corrected to trachea
- Section One, Topic 11, question 1: *E. coli* italicised to match correct biological convention

Section One: Multiple-Choice Questio

Topic 1: Practical Skills

1) Some students cultivate baker's yeast in a test tube at 20 °C, 30 °C, 40 °C rate of respiration. Later, the students repeat the experiment in a dark may have an impact on respiration rate. Identify the independent var

A. Rate of respiration, temperature

B. Temperature, availability of light

C. Availability of light, rate of respiration

D. Temperature, species of yeast

2) Identify the dependent variable in these experiments.

A. Rate of respiration

B. Temperature

C. The classroom

D. Availability of light

3) Identify a control variable in these experiments.

A. Choice of classroom

B. Depth of test tube

C. Rate of respiration

D. Nutrients available in yeast

4) You are planning to study how vigorous exercise affects ventilation ra Which of equipment would you likely use?

A. Colorimeter

B. Spirometer

C. Potometer

D. Manometer

5) Which unit would be most appropriate for measuring the length of an

A. am (attometres)

B. mm (millimetres)

C. nm (nanometres)

D. μm (micrometres)

6) Which unit would be most appropriate for measuring the length of an

A. am (attometres)

B. mm (millimetres)

C. nm (nanometres)

D. μm (micrometres)

7) If you are using units of measurement in a table column, where should

A. In the headings of each table column

B. Next to each value in the table

C. In a separate key beneath the table

D. Do not include units of measurement in tab

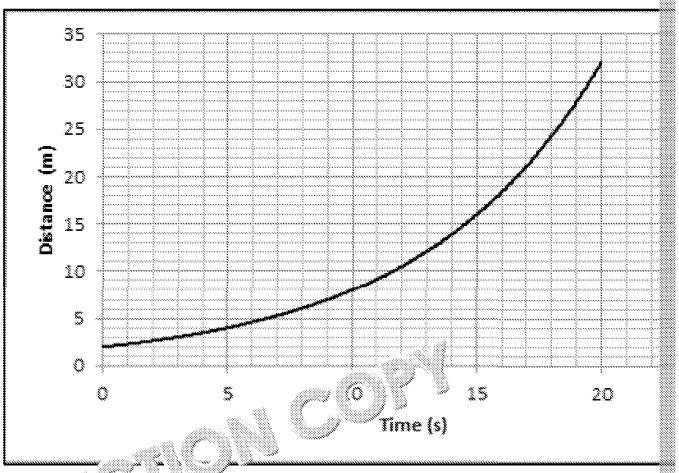
8) Complete the sentence: mathem[illegible]alysis usually requires _____

A. Quantitative

B. N[illegible]iv

C. Qu[illegible]ative

D. Significant



9) Calculate the [illegible] gradient from 10 s to 15 s.

A. 0.[illegible]

B. 0.63 m/s

C. 1.60 m/s

D. 1.80 m/s

10) Find the mean of this set of numbers: 16, 29, 37, 25, 27, –7, 31, 20, 31, 4[illegible]

A. 25

B. 27

C. 29

D. 31

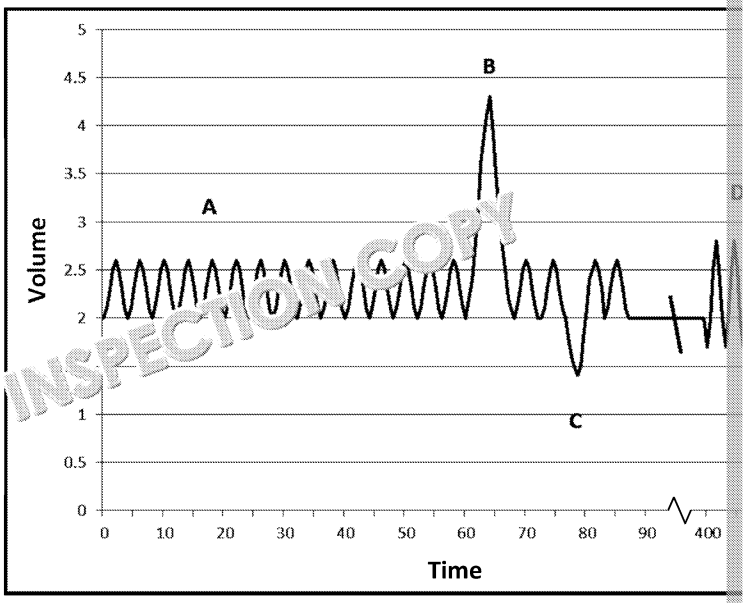
11) Which of these numbers is sh[illegible]t [illegible]ree significant figures?

A. 94.591

B. 0.[illegible]

C. 137,000

D. 8,206



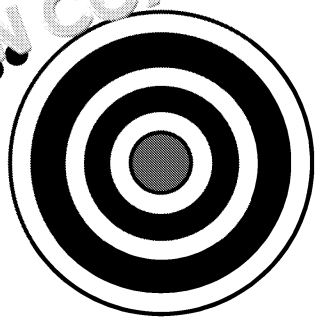
12) The graph above shows spirometer results in a student study. There a graph. Where should they be added?

A. In a headed key next to the table

B. In the text describing the graph

C. At the end of the x and y axes respectively

D. Directly after the name of each variable, in br ets



13) How would you describe the archer aiming at the target above? (The

A. Precise but not high resolution

B. High resolution but not precise

C. Precise but not accurate

D. Accurate but not precise

14) Pick a sentence that describes the di ere ce etween random and sys

A. You can calibrate y r re ts to take random errors into account errors

B. S tic errors increase when an experiment is repeated, while

C. Random errors are minimised by repeating an experiment, while s

D. Random errors reduce the accuracy of results, while systematic e precision of results.

Topic 2 (Cell Structure)

1) Why can a light microscope not produce useful images at greater than

A. The magnification is limited by our ability to perfect the fine shap

B. It is not possible to cut slices of tissue thin enough without destro

C. The wax used for embedding tissue samples distorts light too mu magnifications.

D. The resolution is limited by the wavelength of light waves.

2) What is the purpose of differential staining?

A. To make the whole specimen easier to see

B. To highlight specific cell structures and make them more visible

C. To make the stained tissue appear sharper, increasing resolution

D. To reduce deflection of light

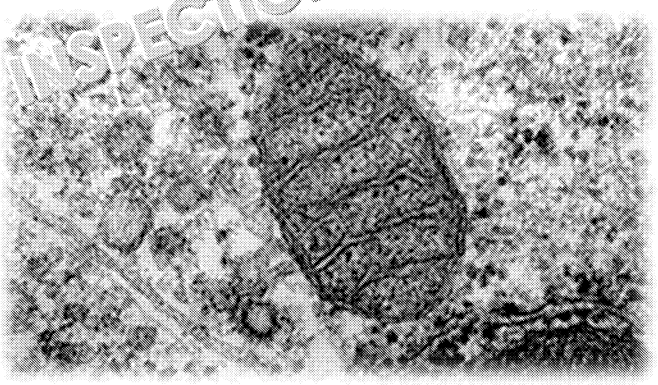
3) Students measure a structure as 12 mm long when studied under the o 29.7 μm. What approximate magnification is being used?

A. 40×

B. 360×

C. 400×

D. 3,600×



4) Which organelle do you think is shown in the electron micrograph ab

A. Golgi apparatus

B. Ribosome

C. Nucleolus

D. Mitochondria

5) Which organelle listed below is not bound by a membrane?

A. Centriole

B. Chloroplast

C. Nucleus

D. Smooth endoplasmic reticulum

6) What function does a lysosome carry out?

A. Engulfing damaged organelles and foreign matter

B. Transporting hydrophobic lipids around the cell

C. Processing steroid hormones and cholesterol

D. Forming a protective envelope around the nucleus

7) Which of these structures modifies complete proteins to produce glyco

A. Rough endoplasmic reticulum

B. Smooth endoplasmic reticulum

C. Golgi apparatus

D. Mitochondria

8) Which description below is *not* true of prokaryotic cells?

A. They store their genetic material in the form of DNA.

B. They have a more developed cytoskeleton than eukaryotic cells.

C. They have cell walls made of murein (also known as peptidoglyca

D. They are usually smaller than eukaryotic cells.

1) Which sentence describes hydrogen bonding?

A. A slightly positive oxygen is attracted to a slightly negative hydr
molecule.

B. A slightly positive hydrogen is attracted to a slightly negative oxy
same molecule.

C. A slightly positive oxygen is attracted to a slightly negative hydr
neighbouring molecule.

D. A slightly positive hydrogen is attracted to a slightly negative oxy
neighbouring molecule.

2) Choose the property of water which allows some insects to walk on its

A. Adhesion

B. Solvent

C. Cohesion

D. Thermal stability

3) Which of these molecules could you make by combining many sugar

A. Polypeptide

B. Polysaccharide

C. Triglyceride

D. RNA

4) A mo of amylopectin is made up of:

A. α-glucose molecules joined by 1–4 and 1–6 glycosidic bonds

B. β-glucose molecules joined by 1–2 and 1–4 glycosidic bonds

C. α-glucose molecules joined by 1–4 glycosidic bonds only

D. β-glucose molecules joined by 1–4 glycosidic bonds only

5) Below are some statements about cellulose. Choose the statement wh

A. Cellulose is highly branched, which means it is effective for energ

B. Cellulose is straight and arranged into tightly packed fibres, mak
energy storage.

C. Cellulose is highly branched, and for a web-like protective coa
cell membrane.

D. Cellulose is straight and forms many hydrogen bonds between fib
substance in the cell wall structure.

6) Pick the sentence which correctly describes a triglyceride.

A. Three fatty acids joined to a glycerol molecule

B. Three glycerol molecules joined to a fatty acid

C. Three fatty acids joined to a glycolipid

D. Three glycolipid molecules joined to a fatty [illegible]

7) Amino acids have three parts – a [illegible]o (NH_2) group, a variable R-g[illegible]

A. An aldehyde (C[illegible]ap

B. A[illegible]e [illegible] group

C. A [illegible]oxyl (COOH) group

D. A ketone (COOH) group

8) Which kind of bond joins amino acids together, forming a protein?

A. Glycosidic

B. Monatomic

C. Peptide

D. Ester

9) When many large molecular sub-units join together to make one prote[illegible] protein's…

A. Primary structure

B. Secondary structure

C. Tertiary stru[illegible]

D. C[illegible]ary structure

10) How many different sequences of three amino acids are possible?

A. 400

B. 8,000

C. 60

D. 27

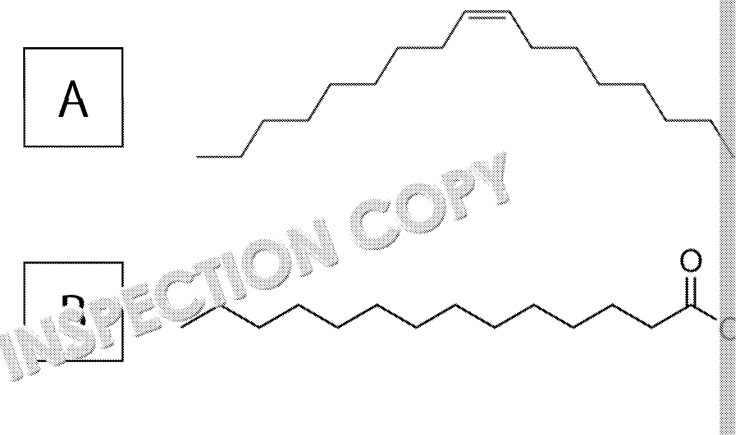
11) Which group of proteins do virtually all enzymes belong to?

A. Globular

B. Fibrous

C. Structural

D. Membrane



12) Above are diagrams of two fatty acids. Which statement below is true?

A. Both A and B are unsaturated.

B. A is saturated and B is unsaturated.

C. B is saturated and A is unsaturated.

D. Both A and B are saturated.

13) Which is the correct molecular formula for a hydrogen carbonate ion?

A. H_3CO^-

B. CHO_3^+

C. HCO_3^-

D. CHO^{3+}

14) Which result would indicate the presence of lipids in an emulsion test?

A. Formation of a cloudy white liquid

B. Mixture turns from straw-yellow to deep blue

C. Mixture turns from bright blue to brick red

D. An emulsion test does not test for the presence of lipids.

15) Pick one component which is required to adapt Benedict's test for non-

A. The digestive enzyme trypsin

B. A strong acid, such as hydrochloric acid

C. An alkaline powder, such as sodium hydroxide

D. Benedict's test only works on reducing sugars.

16) What does the R_f value describe in chromatography?

A. The absolute distance that the solvent travels up the stationary pha

B. The distance the solute travels, divided by the distance the solvent

C. The absolute distance that the solute travels up the stationary pha

D. The distance that the solvent travels, divided by the distance the s

Topic 4 (Nucleotides and Nucleic Ac

1) Which of these bases is a purine?

A. Cytosine
B. Uracil
C. Thymine
D. Guanine

2) Finish the sentence: "ATP comprises:

A. An alanine base, a hexose sugar and three inorganic phosphate gr
B. An alanine base, a pentose sugar and two inorganic phosphate gr
C. An alanine base, a hexose sugar and two inorganic phosphate gro
D. An adenine base, a pentose sugar and three inorganic phosphate g

3) The two strands of DNA are joined by many _____ _____

A. Hydrogen bonds
B. Ionic bonds
C. Covalent bonds
D. Nucleic bonds

4) If a template DNA strand reads ATTGCA G, he equivalent section of

A. TUUCGUC
B. GCCATGA
C. U GU
D. TAACGTC

5) The DNA code is described as _____ because it is common to a
_____ because multiple different triplets sometimes code for th

A. Universal, overlapping
B. Non-overlapping, degenerate
C. Universal, degenerate
D. Degenerate, non-overlapping

6) Which of these stages is a part of transcription?

A. tRNA brings amino acids into ney can be joined by pept
B. A polymerase enzy ca s RNA nucleotides to join to comple
C. mRNA is by the ribosome, to synthesise a protein.
D. D lymerase creates a new complementary DNA strand.

1) What function does the enzyme catalase have in the human body?

A. It breaks down amylose (a sugar storage molecule) into maltose.

B. It breaks down hydrogen peroxide to form water and oxygen.

C. It breaks down the cell membrane to release old red blood cells.

D. It breaks down large, indigestible proteins into smaller peptides.

2) A digestive enzyme that is most active in the stomach is likely to have

A. 1

B. 3

C. 7

D. 12

3) This model of enzyme activity suggests that the substrate slightly changes shape making it more effective:

A. Lock and key model

B. Activation model

C. Induced fit model

D. Complementary model

4) An enzyme-controlled reaction has a temperature coefficient (Q_{10}) of 2 at a temperature of 45 °C. The temperature is increased from 20 °C to 40 °C. How does the reaction occur?

A. Four times faster

B. Eight times faster

C. Ten times faster

D. Twenty times faster

5) Which term correctly describes a molecule that fits into a secondary site and changes the enzyme's shape so it cannot bond with its substrate?

A. Permanent inhibitor

B. Non-competitive inhibitor

C. Competitive inhibitor

D. Active inhibitor

6) In terms of enzyme-controlled reactions, what is a co-factor?

A. A non-protein molecule which joins to an enzyme to create the specific active site

B. A chemical which binds to an enzyme and slows down its rate of reaction

C. A competitor enzyme which also works on the same substrate but produces a different product

D. A non-protein component, such as an ion, which is required for an enzyme to work

1) Which of these correctly describes the fluid mosaic model of cell mem

A. A triglyceride bilayer with cholesterol channels that control the m across the membrane

B. A phospholipid bilayer with extrinsic p s and intrinsic prote

C. A phospholipid bilayer with channels that control the across the membra

D. A tri yer with extrinsic proteins and intrinsic protein

2) Glycol s are a component of all cell membranes. What is their mai

A. To allow cells to recognise other cells and form tissues

B. To control cell division

C. To allow certain molecules to cross the cell membrane

D. To catalyse metabolic reactions

3) Channel proteins help molecules to cross the cell membrane. These m

A. Too large and/or too hydrophilic to cross the membrane

B. Too large and/or too hydrophobic to cross the membrane

C. Toxic to the membrane

D. Too slow-moving to cross the memb an

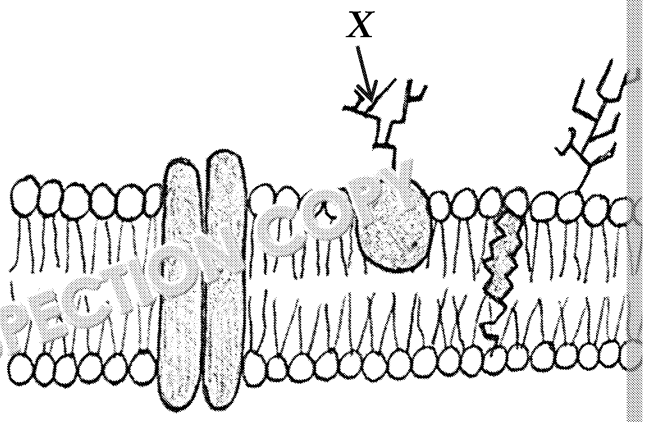
4) The temperature surro ing a cell drops from 35 °C to 20 °C. How m regulate its flu dea with this reduction in temperature?

A. In the proportion of saturated fatty acids in the cell membra

B. Increase the proportion of unsaturated fatty acids in the cell mem

C. Increase the number of membrane-crossing protein channels, to l the cell

D. Reduce the number of membrane-crossing protein channels, to al to move more freely



5) On the diagram above, molecule X is part of cellular signalling. What

A. Cholesterol

B. Carrier protein

C. Glycoprotein

D. Actin

6) Which term could describe the process of a cell ejecting material by su
membrane, and then allowing a vesicle to bud off from the membrane

A. Phagocytosis

B. Endocytosis

C. Pinocytosis

D. Exocytosis

7) An ar el in a water potential of –450 kPa is placed into a solu
of –15 Describe the likely state of the cell after fifteen minutes.

A. Plasmolysed

B. Crenated

C. Cytolysed

D. Turgid

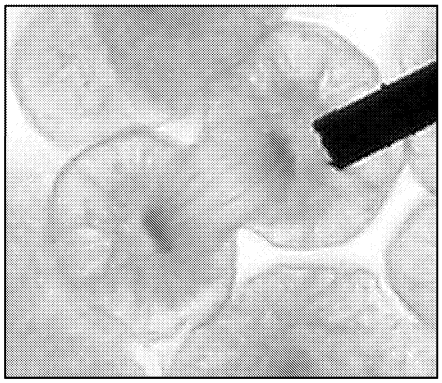
1) Suggest one purpose of the G1 checkpoint during interphase.

A. To check that the DNA has not been damaged or incorrectly copi

B. To confirm that the mitochondria are functioning correctly

C. To check that homologous chromosomes are lining up correctly a

D. To confirm that the nuclear membrane has properly reformed after cell div



2) Which stage of mitosis is shown in the picture/diagram above?

A. Prophase

B. Metaphase

C. Anaphase

D. Telophase

3) Which [illegible] disintegrates in the early stages of mitosis?

A. Spindle fibres

B. Nuclear envelope

C. Golgi apparatus

D. Cell membrane

4) Which of these is *not* a function of mitosis?

A. Enabling the zygote to divide into many cells

B. To increase genetic diversity

C. To allow the body to grow

D. To repair tissue damage

5) Which of these sentences correctly describes a *difference* between mitos

A. Mitosis creates cells in the adult body while meiosis only occurs i

B. Mitosis creates diploid daughter cells, while meiosis creates haplo

C. Mitosis creates four daughter cells, while meiosis only creates two

D. Mitosis occurs at a specific point in the life cycle, while meiosis ha

6) During which stage of meiosis do homologous chromosomes line up a

A. Prophase I

B. Prophase II

C. Metaphase I

D. Metaphase II

7) Which specialised cell has an acr[illegible] which contains enzymes that

A. Sperm cell

B. C[illegible] epithelial cell

C. Gu[illegible] cell

D. Neutrophil

8) Which list is in the correct order (cell, tissue, organ, organ system), fro

A. Cartilage, chondrocyte, trachea, respiratory

B. Cartilage, chondrocyte, respiratory, trachea

C. Chondrocyte, cartilage, trachea, respiratory

D. Chondrocyte, trachea, cartilage, respiratory

9) What is an apical meristem?

A. A plant tissue which produces branches, and is mostly involved in

B. A plant tissue which is found at the tip of shoots and roots, and ca many different types of cell

C. A plant tissue which develops into xylem tissue when its cells die,

D. A tissue which is found at the centre of flowers, and produc

1) A cube has sides measuring 5 cm × 5 cm × 5 cm. What is its surface ar

A. 0.83 : 1

B. 1.2 : 1

C. 4.17 : 1

D. 5 : 1

2) If the len[illegible]de of the cube is doubled, how much does the v

A. Fo[illegible]es

B. Five times

C. Eight times

D. Ten times

3) Which of these qualities is *not* a feature of an effective gaseous exchan

A. Thin, to allow substances to move across easily

B. Sticky, to trap and neutralise pathogens

C. Moist, to improve absorption of gases

D. Huge surface area, to maximise the area across which air comes i

4) Which cells in the trachea produce mucu[illegible] is used to trap dirt a

A. Ciliated epithelial cell[illegible]

B. Chondrocyt[illegible]

C. S[illegible]us epithelial cells

D. Goblet cells

5) Which of these tissues forms the gaseous exchange surface within the

A. Bronchioles

B. Trachea

C. Bronchi

D. Alveoli

6) Which sentence describes the role of the internal intercostal muscles i

A. They contract, pulling the ribcage dow[illegible]s and inwards.

B. They relax, pushing the rib[illegible]wnwards and inwards.

C. They contract, pul[illegible] the ribcage upwards and outwards.

D. Th[illegible]la[illegible]ing the ribcage upwards and outwards.

7) Which formula could you use to calculate a person's tidal volume?

A. Reserve Volume ÷ Pulmonary Ventilation Rate

B. Pulmonary Ventilation Rate × Breathing Rate

C. Pulmonary Ventilation Rate ÷ Breathing Rate

D. Reserve Volume × Breathing Rate

8) Which term refers to the pores in [illegible] skin, which allow air to reach t

A. Trachioles

B. C[illegible]la

C. St[illegible]

D. Spiracles

1) Which of these features is specific to a double circulatory system?

A. Large lungs to maximise air flow

B. Blood which directly bathes cells

C. A system of branching vessels comprising arteries, veins and capillaries

D. A heart with four chambers

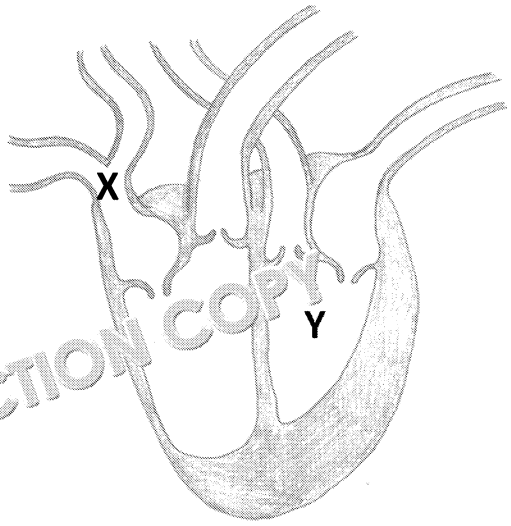
2) Identify one difference between arteries and veins.

A. Arteries have valves to prevent blood flowing backwards; veins do not

B. Arteries have thick walls rich in elastic muscle, while veins have thin walls

C. Arteries always carry oxygenated blood, while veins carry deoxygenated blood

D. Arteries only supply blood to the upper body, while veins are found in the lower body



3) Name the blood vessel labelled as X.

A. Aorta

B. Pulmonary artery

C. Vena cava

D. Pulmonary vein

4) On the same diagram, name the component labelled as Y.

A. Left ventricle

B. Left atrium

C. Right ventricle

D. Right atrium

5) Which organ system absorbs tissue fluid in order to destroy potential

A. Lymphatic system

B. Circulatory system

C. Vascular system

D. Hydrostatic system

6) Which sentence describes the role of Purkyne tissue in the cardiac

A. It sets the heart rate and stimulates atrial contraction.

B. It prevents the ventricles from contracting at the same time as the

C. It contracts to pull the semilunar valves closed.

D. It conducts a wave of excitation which causes the ventricles to co

7) Which of these effects is caused by the opening of the semilunar valve

A. Increase in ventricular pressure

B. Increase in atrial pressure

C. Decrease in pulmonary pressure

D. Increase in aortic pressure

8) The electrocardiogram output above shows a patient's heartbeat. Wha above

A. Bradycardia

B. Ectopic heartbeat

C. Fibrillation

D. Tachycardia

9) Hydrogen carbonate (HCO_3^-) ions gradually diffuse out of red blood c ion is transported in to replace them?

A. Chloride ions (Cl^-)

B. Potassium ions (K^-)

C. Sodium ions (Na^+)

D. Potassium ions (K^+)

10) How do carbon dioxide concentration affect oxygen binding with haem

A. It makes oxygen more likely to disassociate from haemoglobin.

B. It has no effect on oxygen-haemoglobin binding.

C. It causes oxygen molecules to bind more strongly to haemoglobin.

D. It makes oxygen more likely to bind with haemoglobin.

Topic 10 (Transport in Plants)

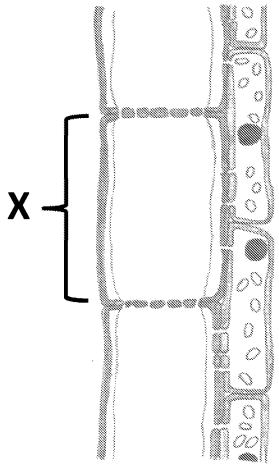
1) Which of these is *not* a valid reason that multicellular plants need a m

A. To move CO_2 throughout the plant so it can be used in photosynt

B. To move mineral ions throughout the plant so they can be used t

C. To move water throughout the plant wh[illegible] is needed

D. To move sugars throughout the plant so they can be used for resp



2) What name is given to the unit marked as X?

A. Companion cell

B. Sieve end plate

C. Sieve tube elem

D. Ph[illegible] tu[illegible]

3) Cambium is a vascular meristem. What does this mean?

A. It is a tough structural tissue which provides support to the vesse

B. It is a specialised respiration tissue, with many mitochondria to p transport.

C. It is a dead tissue, which allows for fast translocation of water an

D. It is an undifferentiated tissue, which can divide into xylem or ph

4) Suggest one way in which xylem is adapted to its function.

A. It is mostly made from dead cells with no end walls, to reduce re

B. It is compact, to restrict the flow of water

C. In trees, it turns into wood when it dies, protecting the plan

D. It can turn into more when more of this tissue is needed.

5) Which of these changes would normally *increase* the rate at which tran

A. Reducing the temperature

B. Increasing the humidity

C. Reducing the width of xylem vessels

D. Increasing the wind speed

6) Which instrument is appropriate for measuring transpiration rate?

A. Sphygmomanometer

B. Colorimeter

C. Spectrometer

D. Potometer

7) If water flows into the root via cell walls, bringing ions with it, which p

A. The symplast pathway

B. The transcellular pathway

C. The apoplast pathway

D. The vacuolar pathway

8) Which of these words describes a plant which would thrive in a deser

A. Hydrophyte

B. Cryptophyte

C. Xerophyte

D. Gametophyte

9) Which of these is a correct definition of translocation?

A. Pull of water through the xylem, caused by evaporation from the l

B. Flow of sugar and other organic molecules through the phloem ca hydrostatic gradients

C. Pull of sugars and other organic molecules through the xylem, cau concentration gradients

D. Loss of water from the leaves, caused by opening of stomata

1) Which of these organisms would not be considered a pathogen?

A. Tobacco mosaic virus

B. *E. coli* bacterium

C. Athlete's foot fungus

D. Plague-carrying flea

2) Complete the sentence: Malaria is caused by:

A. A [illegible]ium

B. A fungus

C. A protoctist

D. A virus

3) Which term describes a tsetse fly, which carries the *Trypanosoma* patho from trypanosomiasis?

A. Transmitter

B. Vector

C. Host

D. Replicator

4) What is the purpose of callose in pl[illegible]?

A. Blocks sieve tu[illegible] the movement of pathogens

B. Ir[illegible] en[illegible]mes in herbivores to stop them digesting it

C. Sti[illegible]utes growth of new leaves to replace ones which have been

D. Coats leaves to stop airborne pathogens from entering the leaf

5) Which cell type is released in large numbers during an infection, to en

A. Plasma cell

B. Neutrophil

C. T-helper cell

D. Keratinocyte

6) What are opsonins?

A. Small signalling proteins that [illegible] the clonal expansion of B

B. Molecules, usually [illegible]bo[illegible]s, that bind to antigens and mark cel

C. Che[illegible]ical [illegible]gers that trigger B cells to phagocytise pathogen

D. N[illegible]ous compounds that trigger swelling around the primary

7) Which immune cells survive and circulate for a long time, and are act
specific antigen?

A. B-memory cells

B. T-helper cells

C. Plasma cells

D. T-killer cells

8) Why do agglutinin antibo[illegible] two identical binding sites?

A. They bind in[illegible] places on the antigen to prevent the pathogen fr

B. T[illegible]d to the antigen and then bind to a neutrophil to allow p

C. They cross-link, binding to two pathogens to immobilise them and

D. Binding sites are easily damaged, and so the second site can be us
becomes ineffective.

9) A TB vaccine involves injecting a patient with the inactivated, 'dead' f
kind of immunity does this provide?

A. Artificial, active

B. Artificial, passive

C. Natural, active

D. Natural, passive

10) For people with coeliac disease, consumi[illegible] triggers an inappro
can shorten the villi and damage th[illegible]al lining. What type of co

A. Systemic disease

B. Sec[illegible]e disease

C. C[illegible]nicable disease

D. Autoimmune disease

11) How would you achieve herd immunity?

A. By vaccinating a whole cohort of young people, so they can't tran

B. By vaccinating enough people that a pathogen can't transmit itse
survive in a population

C. By vaccinating animals which carry a disease (such as TB in cows)
pass it on to humans

D. By vaccinating specific people who are at high risk of a disease, t
of spreading

12) Identify one reason why over[illegible]biotics is a problem.

A. Bacteria that a[illegible]dly exposed to antibiotics gradually deve

B. A[illegible]tic[illegible]end to damage the body's stomach and intestinal lini

C. A[illegible]tics cause the body to reduce its white blood cell count, si
is not stimulated.

D. A mutation that causes antibiotic resistance can occur, and will sp
antibiotics are commonplace.

Topic 12 (Biodiversity)

1) A political polling company deliberately weights its interviews so tha
18–35 year olds, 40% of responses come from 35–55 year olds, and 40%
year olds. What kind of sampling is this?

A. Opportunistic sampling
B. Stratified sampling
C. Systematic samplin
D. Ran m

2) Which hese methods would *not* provide information about biodiv

A. Counting the number of species present in five randomly located
B. Counting percentage cover of plants in quadrats, to estimate relat
C. Marking, releasing and recapturing individuals from a species to
population size
D. Sequencing the genes of endemic species to find out how many l

3) Which formula is used to calculate Simpson's Index of Diversity?

A. $x = 1 - [\Sigma \left(\frac{n}{N}\right)^2]$
B. $x = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$
C. $x = \Sigma \frac{(O-E)^2}{E}$
D. $x = \frac{MC}{R}$

Marram Grass	1
Bird's Foot Trefoil	4
Primrose	7
Pyramidal Orchid	12
Wood Sage	9
Gorse	6

4) Use these values to calculate an Index of Diversity for a beach sample

A. Needs more information
B. 0.21
C. 0.79
D. 1.22

5) A short section o m some is studied for a population of ants. It
these ly orphic. What is the proportion of polymorphic loci in

A. 0.0286
B. 34.9
C. 4,475,000
D. Not enough information

6) What is a monoculture?

A. A field without hedgerows, reducing the space for birds to nest

B. A biotic habitat that is only suited to one specific animal

C. A laboratory experiment in which plants are cloned and cultivate genetic diversity

D. An agricultural environment domina ec by ne crop species

7) Which of these is an ex ple *ex situ* conservation?

A. So Do s Marine Conservation Zone

B. Ba s Wildlife Reserve

C. Berlin Zoological Garden

D. Kafue National Park in Zambia

8) Which of these is a goal of the Convention on Biological Diversity?

A. To increase biodiversity by resettling endangered species

B. To establish a National Park system in all countries by 2050

C. To reduce the impact of climate change through temperature targ

D. To ensure fair access to the benefits of genetic resources, such as s breeding programs

Topic 13 (Classification and Evoluti

1) Which of these lists is in the correct order – from the largest taxon to t

A. Class, order, family, genus

B. Order, class, genus, species

C. Kingdom, class, family, order

D. Phylum, class, family, or

2) *Patella pellucid* a freshwater limpet. Which of these sentences

A. *Pa* its specific name and *pellucida* is its generic name.

B. *Patella* is its generic name and *pellucida* is its specific name.

C. *Patella* is its binomial name and *pellucida* is its specific name.

D. *Patella* is its specific name and *pellucida* is its binomial name.

3) An organism is a heterotroph, with a cell wall made from chitin. Whi belong to?

A. Fungi

B. Protoctista

C. Plantae

D. Archaea

4) An organism has circular DNA a (small) ribosomes. Which kin

A. Animalia

B. P

C. Fu

D. Protoctista

5) Which of these sentences best describes phylogeny?

A. Term used to describe a specific level of a classification system

B. Any system of classification based on non-overlapping groups

C. A classification system based on shared evolutionary history and

D. A classification system based on similar ecological niches

6) How do fossils support the theory of evolution?

A. They show that species which e ed have since become ex

B. They let us see how e m phology of animals and plants gradu

C. The ro fe on Earth has existed for millions of years.

D. T ow that evolutionary change is rare and usually occurs in

7) Identify one way in which DNA can tell us how organisms are related

A. Different groups of organisms have different genetic codes, with t coding for different amino acids.

B. Organisms with more similar DNA sequences within a group are

C. Organisms which are closely related have the same number of ch

D. More complex organisms tend to have larger genomes, with more

8) Rabbits belonging to the same species all have either a white or a tawn variation is this an example of?

A. Continuous, interspecific

B. Continuous, intraspecific

C. Discontinuous, interspecific

D. Discontinuous, intraspecific

Student	Height	Student
Marcus	168 cm	*Svetlana*
Alison	171 cm	*Ameer*
Greg	176 cm	*Jason*
Li	159 cm	*Max*

9) Calculate the standard deviation of this set of data, from a class of seco

$$\sigma = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n - 1}}$$

A. 5.92

B. 6.28

C. 6.72

D. 7.19

10) Which test is commonly used to compare two means?

A. Student's t-test

B. Chi-squared test

C. Spearman's rank correlation

D. Standard deviation

11) Marsupial and placental moles are distantly related mammals, but the
and developed large, thick burrowing claws. What is this an example

A. Adaptive radiation

B. Divergent evolution

C. Convergent evolution

D. Ecological radiation

12) According to the model of natural selection, which of these sentences i

A. Organisms pass environmental variation on to their offspring du

B. Having an allele which provides an advantage makes organisms
survive and reproduce.

C. Over time, a population either becomes better adapted to its envi
made extinct.

D. Evolution tends to be faster when a population is reduced to a sm
'genetic bottleneck'.

Answers to Multiple-Choice Questio

Topic 1: Practical Skills

1. **B. Temperature and availability of light.** These are the independent variab conducting the experiment, and are set by the class.
2. **A. Rate of respiration.** This is a dependent v ecause its value is exp changing the independent variables.
3. **D. Nutrients available to yeast.** Controlling for a variable is a specific scien eliminate the effect of variable which you are not studying on your result. of yeast will affect the nutrients available to them, this would affect respiratio make the results less valid.
4. **B. Spirometer.** A spirometer can be used to measure changes in lung volum colorimeter measures intensity of colour and a potometer measures rate of w measures pressure changes.
5. **D. μm (micrometres).** The average plant cell is between 10 and 100 μm in s
6. **C. nm (nanometres).** Viruses vary substantially in size, but small viruses ar even the very large viruses only stretch to 250 nm.
7. **A. In the headings of each table column.** This is concise and makes the tab preserving crucial information. OCR prefers that units of measurement shou column heading of a table.
8. **A. Quantitative.** Quantitative data contains measurement and numbered va
9. **C. 1.6 m/s.** To calculate the gradient of a line, you divide the units moved al along the x axis – in this case, 8/5 or 1.6. The distance is measured in metres gradient is referred to in metres per second.
10. **A. 25.** The mean can be calculated by adding up all the values in a set of dat number of values. There are seven and 29 lie either side of the median (middl (most common value).
11. **C. 137,** When counting significant figures, count from the first non-zero information, count as far as the last non-zero figure, and no further.
12. **D. Directly after the name of each variable, in brackets.**
13. **C. Precise but not accurate.** Precision is a measure of how closely clustered accuracy is a measurement of how close they are to the actual value.
14. **C. Random errors are minimised by repeating an experiment, while syste** errors may be flaws in your equipment, or problems with the experimental d minimised by repeating the experiment, because they are built into the struc

Topic 2 (Cell Structure)

1. **D. The resolution is limited by the wavelength of light waves.** When you
closer together than half the wavelength of light (400–700 nm), light waves in
image will look fuzzy.

2. **B. To highlight specific cell structures and make them more visible.** For e
stains lipid-rich areas, while iodine stains cell wall
and starch granul

3. **C. 400×.** To calculate the magnification, divide the image size by the actual s
convert micrometres into milli
ere is a small amount of inaccuracy

4. **D. Mitochondrion.** Mitochondria are approximately 1 μm in length, and ha
folds c
ris
ach can be seen as lines on the electron micrograph.

5. **A. Cen** The centriole is made of protein microtubules, and produces s
of the others are membrane-bound organelles.

6. **A. Engulfing damaged organelles and foreign matter.** The lysosome uses h
down bonds and destroy harmful material such as pathogens and viruses, as

7. **C. Golgi apparatus.** The RER and SER are involved in moving proteins and
mitochondria carry out respiration and produce ATP.

8. **B. They have a more developed cytoskeleton than eukaryotic cells.** In fact
developed cytoskeleton. However, they do pass on genetic material in the fo
transmit their genes as RNA.

Topic 3 (Biological Molecules)

1. **D. A slightly positive hydrogen is attracted to a sl tly negative oxygen i**
Hydrogen and oxygen in the same
are attached by covalent bonds,
bonding means. A hydro
bo
formed between two neighbouring pol
of one molecule ha
s gl
positive charge due to the shape of the molecu
electro
n
, while the oxygen pole has a slight negative charge.

2. **C. Coh** This property means that, due to hydrogen bonds forming be
tend to stick together. This creates surface tension, which means that light i
without it 'breaking'.

3. **B. Polysaccharide.** A monomer sugar is also known as a monosaccharide –
'poly' means 'many'. A polypeptide is made up from many amino acids, joi

4. **A. α-glucose molecules joined by 1–4 and 1–6 glycosidic bonds.** The 1–4 g
common, while the rarer 1–6 glycosidic bonds create the branches in the mol

5. **D. Cellulose is straight and forms many hydrogen bonds between fibres, maintaining cell wall structure.** Individual hydrogen bonds are weak, but t
cellulose molecules, and this gives the fibres a high tensile strength. There a
glycogen and starch, which cells tend to use for energy st rage.

6. **A. Three fatty acids joined to a glycerol mo e.** Glycolipids are a differe
a lipid joined to a sugar polymer; the
ou
in the cell membrane.

7. **C. A carboxyl (COOH) g p.** The group loses its OH group when joining
amino acid.

8. **C. Pe** Peptide bonds combine amino acids into polypeptides, which a
shape t
ome proteins. Glycosidic bonds join two monosaccharide (suga
join lipids.

9. **D. Quaternary structure.** The primary structure of a polypeptide is its amin secondary structure is the shape that amino acid chain makes, due to interac (usually a helix or a flat sheet). The tertiary structure is how that chain is fol dimensional shape, and the quaternary structure is made when multiple pol combined to form a larger protein.

10. **B. 8,000.** There are twenty different amino acids used in proteins. Each of th by any of the amino acids, so the possible numbe s qu ences is $20^3 = 8{,}000$.

11. **A. Globular.** These proteins are roug pl zal in shape, although the sh highly specific to each enzym nzymes are found in membranes, but

12. **C. B is saturated a s nsaturated.** Unsaturated fatty acids have at leas hydro ch n, causing a kink in their molecular shape. Saturated fatty their h bon chain, and are straight.

13. **C. HCO_3^-.** It is important to note that the 3 is subscript (near the bottom of th number of oxygen units in the ion, while the − is superscript (near the top of t charge of the molecule.

14. **A. Formation of a cloudy white liquid.** This is caused by lipids coming out droplets. B) describes the result of the iodine test in the presence of starch, w Benedict's test in the presence of a reducing sugar.

15. **B. A strong acid, such as hydrochloric acid.** The sample needs to be heated of the acid – this breaks down glycosidic bonds and converts the non-reducin donate hydrogen ions (i.e. is reducing).

16. **B. The distance the solute travels, divided by the distance the solvent trav** solutes, which allows scientists to identify different compounds present in a measuring the absolute distance that the solute and s t have travelled, a latter. The solvent always travels further up e fa ary phase, and so R_f v and 1.

Topic 4 (Nucleotides and Nucleic Ac

1. **D. Guanine.** Cytosine, thymine and uracil are all cyclic pyrimidine bases, w which is made up of two joined carbon-nitrogen rings.

2. **D. An adenine base, a pentose sugar and three inorganic phosphate group** – 'adenosine' is a combination of adenine and ribose, a five-carbon or pentos the three phosphate groups.

3. **A. Hydrogen bonds.** Two bonds form between adenine and thymine, and t cytosine and guanine, creating the 'rungs' of the double helix molecule.

4. **C. UAACGUC.** The mRNA sequence has bases which are complementary t strand. However, mRNA has the base uracil instead of thymine.

5. **C. Universal, degenerate.** Universal means that the DN code is shared by degenerate means that several different triplet de for the same amin overlapping, but this refers to the fact th sequence AGCTAC (for exam GCT CTA TAC. Each base is ac ace, and the ribosome 'moves along

6. **B. A polymerase e s RNA nucleotides to join to complementa** the pr mRNA molecules from DNA. mRNA can then leave into pr t the ribosomes. Answers A.) and C.) describe stages in transl process of DNA replication.

Topic 5 (Enzymes and Reactions)

1. **B. It breaks down hydrogen peroxide to form water and oxygen.** This stops from building up in body cells. Amylase breaks down amylose into maltose, proteins into smaller peptides. Red blood cells are not degraded by one spec are involved in the process.

2. **B. 3.** The stomach is acidic and therefore has a low pH, usually between 1.5 a active in the stomach are ones which can work effectively in these conditions.

3. **C. Induced fit model.** The lock and key model suggests that enzymes have a shape, and are activated by a specific substrate 'key' which fits perfectly into t model is a refinement of this theory – it recognises that the substrate can cha

4. **A. Four times faster.** A temperature coefficient of Q_{10} means that for each 10 temperature, the reaction rate doubles. For an enzyme, this is only true up to temperature; above that temperature, the enzyme molecules begin to denatu

5. **B. Non-competitive inhibitor.** The inhibitor is called non-competitive becau substrate for access to the enzyme's active site, and its effect on the enzyme c substrate is present.

6. **D. A non-protein component, such as an ion, which is required for an enzy** component is a large organic molecule, it is referred to instead as a co-enzym the protein, it is called a prosthetic group.

Topic 6 (Membranes in Cells)

1. **B. A phospholipid bilayer with extrinsic protei[illegible]trinsic protein cha** phospholipid bilayer consists of molecule[illegible]sphate 'heads' that are hy the cytoplasm / tissue fluid, and fatty acid tails that face inwards into the bila useful cross-membrane channels, as it is too small and hydrophobic, and wou transporting mol[illegible] dissolved in water.

2. **A. To allow cells to recognise other cells and form tissues.** Cells can use gly similar cells and join together with them, creating a tissue. These molecules a recognise the body's own cells.

3. **A. Too large and/or too hydrophilic to cross the membrane.** Hydrophilic m and are repelled by the hydrophobic tails inside the membrane bilayer. Large between the fatty acids.

4. **B. Increase the proportion of unsaturated fatty acids in the cell membrane** have 'kinks' in their hydrocarbon chain; this makes the molecules irregularly together so closely. Increasing the amount of water in the cell would not affe

5. **C. Glycoprotein.** Cell membrane glycoproteins consist of an extrinsic prote and a carbohydrate chain which sticks out into the cytoplasm. Glycolipids a membrane, but they are made up from a phospholipid joined to a sugar, whi phospholipid bilayer and helps to stabilise it. Actin is a fibrous protein found but not in the cell membrane.

6. **D. Exocytosis.** Exocytosis is the general process of moving large molecules *out* with cell membrane and releasing them by forming a vesicle. Endocytosis engulfing material in the membrane and then bringing it into the cell packag specific describes the use of this process to absorb liquids. Phagocytosis onl

7. **C. Cytolysed.** Water potential is 0 for pure water, and decreases as a solutio with solutes. The cell would burst due to the rapid entry of water from the d animal cell would become crenated (shrivelled) in a highly concentrated solu The other words relate to plant cells and how they interact with their cell wa

Topic 7 (Cell Division, Diversity and Orga

1. **A. To check that the DNA has not been damaged or incorrectly copied du** prevent cells from malfunctioning, and reduces the likelihood of tumours de cell cycle checkpoint, but not during interphase – this happens in the middle

2. **D. Telophase.** The nucleus is separating into two nuclei and the nuclear en – however, the cell is yet to divide fully into two.

3. **B. Nuclear envelope.** The envelope usually keeps the genetic material sepa mRNA molecules can pass through it.

4. **B. To increase gen[illegible] diversity.** Meiosis increases genetic diversity, but mi cells of the body need to have the same instructions if they are to work effect

5. **B. Mit[illegible]eates diploid daughter cells, while meiosis creates haploid ce** meiosis (gametes) are then able to fuse during reproduction to make a diploi process which creates four daughter cells and occurs at a specific point in the egg production.

6. **C. Metaphase I.** At this stage, the homologous chromosomes pair up; they s Anaphase I.

7. **A. Sperm cell.** The enzymes of the acrosome digest part of the ovum's (egg the sperm can fertilise the egg. Neutrophils are white blood cells, and also c they use to break down pathogens they have engulfed.

8. **C. Chondrocyte, cartilage, trachea, respiratory.** Chondrocytes (remember, cartilage tissue, which forms incomplete, horseshoe-shaped rings down the l is part of the respiratory system, along with the mouth, nasal cavity, other ai

9. **B. A plant tissue which is found at the tip of sh[illegible]roots, and can dif types of cell.** Apical meristem tissue is unspecialised, but the cells are able t specialised tissues. They are found at the tips of shoots and roots, and can di the plant.

Topic 8 (Exchange Surfaces)

1. **B. 1.2 : 1.** The surface area can be calculated by working out the area of one multiplying by six for the six faces of the cube. The volume can be calculate Completing these calculations gives a volume of 150 : 125, or 1.2 : 1.

2. **C. Eight times.** The original volume is $n \times n \times n$ cm, or n^3 cm. If you double is $2n \times 2n \times 2n$ cm, or $8n^3$ cm.

3. **B. Sticky, to trap and neutralise pathogens.** The mucus in the trachea traps them reaching the gaseous exchange surface. This is not a function of an effe

4. **D. Goblet cells.** The ciliated epithelial cells then brush the mucus up the tra swallowed, so pathogens are destroyed by stomach acid. Chondrocytes are found in the trachea, while squamous epithelial [illegible]e thin cells adapted t and the capillaries.

5. **D. Alveoli.** These 'air sacs' [illegible] large area and allow mass transport of ga

6. **A. They contract[illegible]ge the ribcage downwards and inwards.** Meanwhil relax. The diaphragm moves upwards, lung volume decreases, and air is pu

7. **C. Pul[illegible]y ventilation rate ÷ breathing rate.** PVR is a measurement of t breathing rate = number of breaths per time period. Dividing PVR by breath inhaled in one full breath, or tidal volume.

8. **D. Spiracles.** These allow gases to enter and leave the insect's body, but ca and prevent drowning.

Topic 9 (Transport in Animals)

1. **D. A heart with four chambers.** This enables blood to be pumped to the lun simultaneously.
2. **B. Arteries have thick walls rich in elastic muscle, while veins have thinne** most arteries do not, the pulmonary artery carries deoxygenated blood, and b throughout the body.
3. **C. Vena cava.** Deoxygenated blood from around the body enters the heart th
4. **A. Left ventricle.** The ventricles are the lower chambers of the heart. Remem in diagrams.
5. **A. Lymphatic system.** The lymphatic system only absorbs a small amount of – the rest is returned to the blood.
6. **D. It conducts a wave of excitation which causes the ventricles to contract.** wave of excitation that starts a heartbeat, making the atria contract. The signa there is a gap between atrial and ventricular contraction, to allow the ventricle The atrioventricular node is stimulated by the wave of excitation, and sends it Purkyne tissue, which conducts the wave of excitation to the base of the heart contract from the base.
7. **D. Increase in aortic pressure.** The opening of the semi-lunar valve allows p ventricle to be pumped into the aorta.
8. **B. Ectopic heartbeat.** This term describes an occasional 'extra' heartbeat, and stimulants – for some people, it is harmless. Bradycardia describes an abnorm tachycardia describes an unusually fast rate. Fibrillation is a highly irregular contracting in an uncoordinated pattern.
9. **A. Chloride ions (Cl^-).** They stop the charge inside the red blood cells from b effect is known as the chloride shift.
10. **A. It makes oxygen more likely to disassociate from haemoglobin.** This me (i.e. in heavily respiring tissues), these tissues can access much-needed oxyge

Topic 10 (Transport in Plants)

1. **A. To move CO_2 throughout the plant so it can be used in photosynthesis.** the air for photosynthesis, and do not usually need to transport it for this pur
2. **C. Sieve tube element.** The plate is found at the end of the sieve tube elemen adjoined to it.
3. **D. It is an undifferentiated tissue, which can divide into xylem or phloem** stem cell that can differentiate into different tissues, like the vascular tissues o
4. **A. It is mostly made from dead cells with no end walls, to reduce resistanc** main xylem tissue is dead, the adjoining companion cells have many mitocho functions.
5. **D. Increasing the wind speed.** This causes humid air to blow away from the vapour concentration gradient. Increasing the humidity would reduce transp concentration gradient would be lower. Reducing the temperature would als water evaporates more slowly when the temperature is low.
6. **D. Potometer.** This instrument measures uptake of water by roots, which sh transpiration. A sphygmomanometer measures blood pressure and a colorim while a spirometer measures changes in lung volume.

7. **C. The apoplast pathway.** Because the water does not have to cross a cell m freely through the interstitial gaps between cellulose molecules. Molecules f move through the cytoplasm of adjacent cells, while molecules following the cytoplasm and large, permanent vacuoles within the cells.

8. **C. Xerophyte.** This word refers specifically to a plant which is adapted to ve is adapted to living in water (plants such as water lilies fall into this category other words for this course; however, a cryptoph[illegible] plant which spends cycle dormant underground as a bulb, or [illegible]nderwater. A gametoph cycle of a non-seeded plant like [illegible]oss, where it has only one set of c

9. **B. Flow of sugar an[illegible]ganic molecules through the phloem caused** explanati[illegible]rel[illegible]ydrostatic gradients is known as the mass-flow hypo althou[illegible]e are some unresolved pieces of conflicting evidence.

Topic 11 (Communicable Diseases)

1. **D. Plague-carrying flea.** The flea is a vector for the plague bacterium, but it directly cause the disease.

2. **C. A protoctist.** Malaria is caused by microorganisms from the genus *Plasm* different species – Plasmodium falciparum is the one responsible for most de

3. **B. Vector.** A vector is an organism which spreads a pathogen without suffe suffers from an infection and may also pass it on to a host; in either case, the

4. **A. Blocks sieve tubes to slow the movement of pathogens.** Callose is also damaged. It blocks the sieve tube, reducing loss of sugar but also preventin through the plant's transport system.

5. **B. Neutrophil.** Neutrophils contain[illegible]e[illegible]mes called lysozymes – they that they don't digest and da[illegible]s of their own cell. Plasma cells create helper cells are invo[illegible]vating other immune cells. Keratinocytes are primar[illegible]nc[illegible]st disease.

6. **B. Mo[illegible], usually antibodies, that bind to antigens and mark cells for** group of molecules which bind to both antigens and phagocytic cells, makin They are usually antibodies, although they may also be blood plasma protein

7. **A. B-memory cells.** When a B-memory cell recognises its specific antigen, this produces a large-scale immune response to the pathogen. T-helper cells are act cells create and release antibodies, while T-killer cells destroy cells marked with

8. **C. They cross-link, binding to two pathogens to immobilise them and encour** composed of three polypeptides, joined together via strong disulfide bridges. A identical variable regions, while opsonin antibodies have two different regions, s

9. **A. Artificial, active.** The TB vaccine is artificial because the pathogen is inac vaccination. It is active because it stimulates the body to produce its own an foreign antibodies.

10. **D. Autoimmune disease.** This term re[illegible]s t[illegible]diseases which are caused by t own cells. A systemic disease i[illegible]w[illegible]h affects multiple organs and tissue can be spread by cont[illegible]other people.

11. **B. By [illegible]ati[illegible]ough people that a pathogen can't transmit itself fast e** Once a[illegible]roportion of the population is vaccinated, a pathogen can't infec above one) to even keep at a constant level in the population, and it will die o

12. **D. A mutation that causes antibiotic resistance can occur, and will spread ve commonplace.** Antibiotic resistance is always a risk, but it is a massive advan are commonplace. These resistant bacteria will multiply very quickly, and are another host.

Topic 12 (Biodiversity)

1. **B. Stratified sampling.** The company are separating people out into demog interviews to achieve a fixed number of responses from each group.
2. **C. Marking, releasing and recapturing individuals from a species to estim** absence of other information, the size of one population won't tell you anyth species could dominate the landscape, or could be one of diverse range of re give you information about species diversity, and D would give you inform
3. **A.** $x = 1 - \left[\Sigma\left(\frac{n}{N}\right)^2\right]$. The higher the value you get, the more diverse the ec standard deviation, and C is the equation for a chi-squared test. D.) is one estimation formula for the mark-release-recapture method.
4. **C. 0.7** Index of Diversity is calculated by dividing *n*, the number of ea of orga counted, and squaring each result. The squared results are add give a diversity value between 0 and 1, where higher values indicate more d
5. **A. 0.0286.** A proportion is usually a percentage, or a figure between 0 and 1 dividing the number of polymorphic loci (358) by the total number of loci (12 that describes how much genetic variation there is in this section of DNA.
6. **D. An agricultural environment dominated by one crop species.** These enviro biodiversity, and in fact other species are actively removed because they compet
7. **C. Berlin Zoological Garden.** *Ex situ* biodiversity involves the creation of a separated from the world outside. All of the other examples describe *in situ* environment is preserved by regulations and strict restrictions on land use.
8. **D. To ensure fair access to the benefits of genetic resources, such as seed b**

Topic 13 (Classification and Evoluti

1. **A. Class, Order, Family, Genus.** An eastern gorilla, for example, is in the cl Primates, the family Hominidae and genus Gorilla.
2. **B. *Patella* is its generic name and *pellucida* is its specific name.** When com referred to as a bin
3. **A. Fu** ete trophs must absorb organic material, instead of building it chitin-b ell walls.
4. **B. Prokaryotae.** Eukaryotic cells have mostly linear DNA in the form of chrom
5. **C. A classification system based on shared evolutionary history and relations** describes taxonomy. D doesn't have a specific name, but it would be an exampl
6. **B. They let us see how the morphology of animals and plants gradually ch** are millions of years old, this doesn't necessarily suggest that evolution has b fact that certain species have become extinct doesn't prove that new species h them. The reason that fossils support the theory of evolution is that we can tr time, and recognise how adaptations relate to changes in the animal's environ
7. **B. Organisms with more similar DNA sequences within a group are more** humans share roughly 98.8% of their coding DNA base pairs with chimpanz
8. **D. Discontinuous, intraspecific.** The variation is discontinuous because the and it's intraspecific because it is describing variation within a species.
9. **C. 6.72.** The correct equation to use is $s = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$ where x is each indiv is the total number of values
10. **A. Stu t-** A chi-squared test is a measure of how much your result results, Spearman's rank correlation is a measure of how closely correl Standard deviation is a measure of how spread out a group of data is.
11. **C. Convergent Evolution.** Marsupial and placental moles share a distant an more similar because they have adapted to fit a similar ecological niche – sub
12. **A. Organisms pass environmental variation on to their offspring via meio** on to offspring, but environmental variation is not.

Section Two: Multiple-Choice Questio

Topic 1 (Practical Skills)

1) Students measure the rate at which Benedict's reagent turns from blue different sugar molecules (at 80 °C). Later, the students repeat the exp temperatures, to find out whether the reaction is still effective at lower independent variables in each reaction?

A. Benedict's reagent, rate of reaction

B. Benedict's reagent, temperature

C. Type of sugar molecule, temperature

D. Type of sugar molecule, rate of reaction

2) Identify one dependent variable from the experiments above.

A. Benedict's reagent

B. Temperature

C. Type of sugar molecule

D. Rate of reaction

3) Identify a control variable in both experiments above.

A. Quantity of Benedict's reagent

B. Temperature in room

C. Type of sugar molecule

D. Rate of reaction

4) Which technique would be appropriate for separating and identifying a within a mixture?

A. Thin-layer chromatography

B. Colorimetry

C. Serial dilution

D. Spirometry

5) Which unit would be most appropriate for measuring the average hu

A. Picometres

B. Micrometres

C. Nanometres

D. Millimetres

6) Convert 1,500,000 micrograms to kilograms.

A. 1,500,000 kg

B. 15,000 kg

C. 1,500 kg

D. 1.5 kg

7) Which of these definitions describes a modal average?

A. The middle value of a set of data in numerical order

B. The result obtained by adding up a set of values and dividing by t
of values

C. The most common value in a set of data

D. A single figure which describes how spread out a data set is

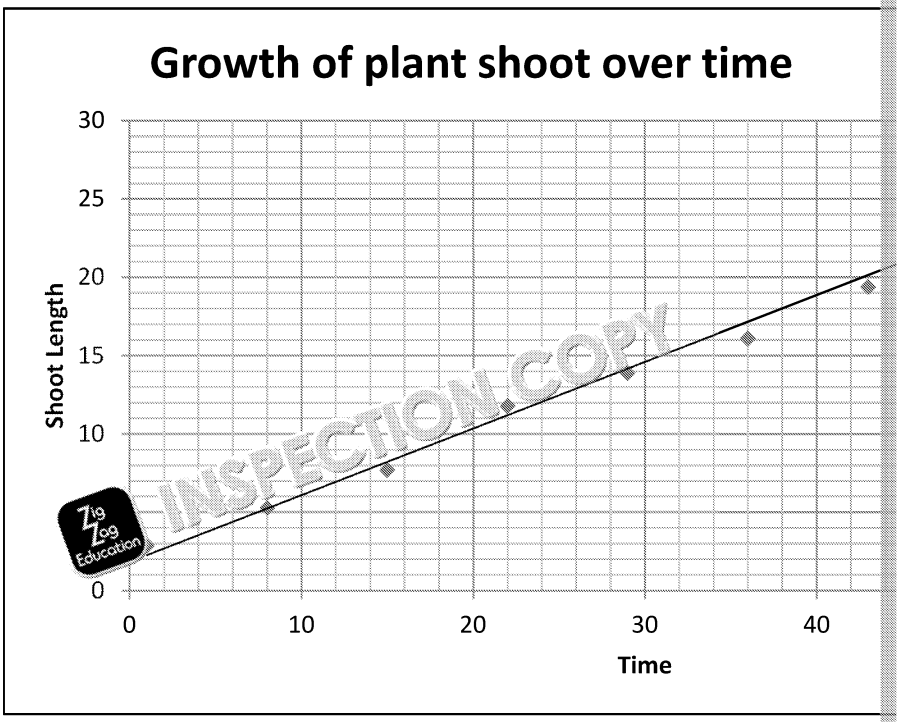
8) Which of these numbers is shown to three significant figures?

A. 140.5

B. 0.0

C. 1,606

D. 9.07



9) The graph above shows a sapling plant growing over time. Calculate t

A. 0.43

B. 0.51

C. 2.13

D. 2.38

10) The sapling plant size is measured in millimetres, and time is measure
have not been included in the graph. Where should the units for sho

A. In the key next to the table

B. In the text describing the graph

C. Directly after *Shoot Length*, in brackets

D. At the end of the y axis

11) A scale gives multiple readings that individually can be as much as 5% averaged to provide a more correct reading. How would you describe

A. Precise but not accurate

B. Accurate but not precise

C. Neither precise nor accurate

D. Both accurate and precise

12) A measurement of 17.5 g is made on a scale with a precision of 0.1 g. C error on this measurement.

A. ±

B. ± 0.57%

C. ± 0.75%

D. ± 1.75%

13) Which type of error may arise from a problem with equipment or exp be minimised by repeating the experiment?

A. Random error

B. Calculation error

C. Systematic error

D. Anomalous error

1) Which of these can be seen under a light microscope?

A. Chloroplast
B. Ribosome
C. Golgi apparatus
D. Haemoglobin protein

2) Why can live cells not be viewed under a scanning electron microscope?

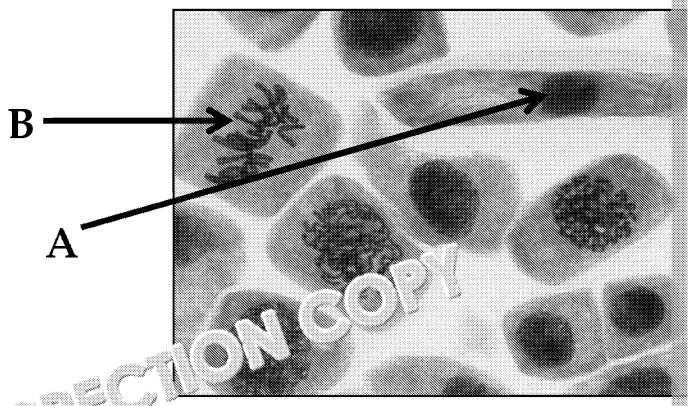
A. The electron beam kills the cells by disrupting protein synthesis.
B. The specimen must be cooled to a very low temperature, to minimise movement of particles.
C. The specimen must be suspended in a highly alkaline solution, which
D. The specimen must be viewed in a vacuum, so that electrons are not

3) A light microscope's eyepiece lens has a magnification of 5×, while the objective lens has a magnification of 40×. What is the overall magnification achieved by the microscope?

A. 8×
B. 40×
C. 100×
D. 200×

4) Sudan Red dye specifically stains lipids, while eosin stains the cytoplasm. These procedures examples of

A. Metachromatic staining
B. Specificity staining
C. Differential staining
D. Immobilisation staining



5) Study the photomicrograph above. Which cell component is present in

A. Golgi apparatus
B. Nuclear envelope
C. Cell membrane
D. Mitochondria

6) Students measure a photomicrograph image as 60 mm long. The mag
size was the original object?

A. 7.5 nm

B. 75 nm

C. 7.5 µm

D. 75 µm

7) Which component cont[illegible] molecules, and is found within anot

A. G[illegible]

B. N[illegible]us

C. Nuclear envelope

D. Rough endoplasmic reticulum

8) Which two functions would you associate with the centrioles?

A. Moving proteins around the cell and holding ribosomes in place

B. Moving sugars across the cell membrane and maintaining an elec

C. Moving lipids around the cell and synthesising steroid hormones

D. Moving chromosomes to either pole of the cell and forming cilia

9) Choose the sentence that describes the relationship between the Golgi

A. The Golgi apparatus creates vesicles to transport proteins to the r
which modifies them.

B. The Rough ER [illegible] vesicles to transport proteins to the Golgi a
w[illegible]m.

C. Th[illegible]gi apparatus translates mRNA into protein, and the roug
the completed protein around the cell.

D. The rough ER translates mRNA into protein, and the Golgi appar
the completed protein around the cell.

10) Which sentence correctly describes a difference between prokaryotic a

A. Eukaryotic cells have organelles while prokaryotic cells do not.

B. Prokaryotic cells have cell walls while eukaryotic cells do not.

C. Eukaryotic cells have a highly developed cytoskeleton, while pro

D. Eukaryotic cells have circular DNA while pr[illegible]yotes have linea

1) Which property of water makes sweating a useful way to cool down?

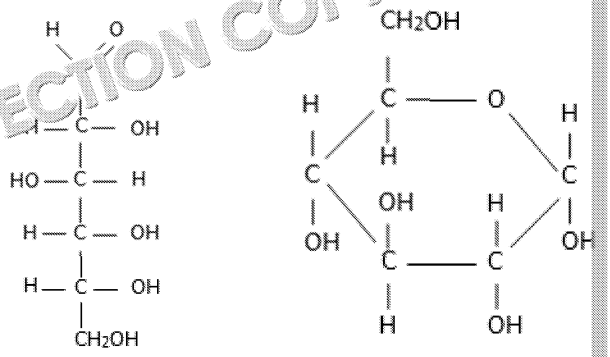
A. High latent heat of vaporisation
B. High specific heat capacity
C. Cohesion
D. Capillarity

2) Which result is accomplished by a condensation reaction?

A. Br[illegible] a dipeptide's glycosidic bond to produce two amino aci
B. Joining two amino acids with a glycosidic bond to form a dipepti
C. Breaking a disaccharide's glycosidic bond to produce two monos
D. Joining two monosaccharides with a glycosidic bond to produce a

3) Which of these bonds joins together glucose molecules to make cellul

A. A 1–4 glycosidic bond between two α-glucose molecules
B. A 1–6 glycosidic bond between two α-glucose molecules
C. A 1–4 glycosidic bond between two β-glucose molecules
D. A 1–6 glycosidic bond between two β-glucose molecules



4) Describe these molecules.

A. A pentose sugar (ribose) and a hexose sugar (glucose)
B. A pentose sugar (glucose) and a hexose sugar (fructose)
C. Two different forms of the hexose sugar glucose
D. Two different forms of the hexose sugar fru[illegible]

5) Which of these statements is t[illegible] glycogen?

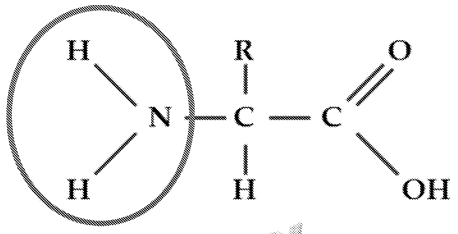
A. Glycogen fo[illegible] fibres, which makes it good for building
B. C[illegible]n forms tough, rigid fibres, which makes it an effective cy
C. Gly[illegible]gen is small and branched, which makes it a good short-ter
D. Glycogen is branched and compact, which makes it a good long-t

6) Why are phospholipids effective building blocks for cell membranes?

A. They are hydrophilic molecules, and therefore allow water to ent
B. They are good energy stores, and may be detached from the mem and digested.
C. They absorb a great deal of heat energy and provide insulation fo it from becoming too hot or cold.
D. They have a hydrophilic hea h faces the cytoplasm and a hy which faces inward , orming a bilayer.

7) Whic -carbon molecule provides the backbone for triglycerides?

A. Ethanol
B. Glycerol
C. Acetate
D. Fatty acid



8) What is this part of an amino acid called?

A. Nitrate group
B. Amine gro
C. C l group
D. Radical group

9) The sequence of amino acids that makes up a protein is known as the

A. Primary structure
B. Secondary structure
C. Tertiary structure
D. Quaternary structure

10) _____ _____ link cysteine amino acids together in a prote they are relatively strong and difficult to brea

A. Hydrogen bonds
B. Disulfide bridges
C. Ion on
D. H obic interactions

11) Which tissue would you expect to be rich in collagen?

A. Cartilage

B. Hair

C. Adipose tissue

D. Blood

12) What is a prosthetic group?

A. A strong, rigid [illegible]ed from multiple interlocking peptides

B. A [illegible]er peptide which is attached to a much larger protein

C. A [illegible] product of an enzyme-driven reaction

D. A non-protein compound which is attached to a protein and enab[illegible]

13) What is the formula of a phosphate ion?

A. PO_4^{3+}

B. POH_4^{3+}

C. PO_4^{3-}

D. $P_3O_4^-$

14) Which result would indicate the presence of starch in an iodine test?

A. Formation of a cloudy white liquid

B. Mixture turns from straw-yello[illegible] blue

C. Mixture turns from [illegible]gn[illegible]e to brick red

D. An iodin[illegible]s not test for the presence of starch

15) Which [illegible]ptation could you make to the Benedict's test to make it qu[illegible]

A. Heat the sugar in a water bath at 80 °C, in the presence of hydroch[illegible]

B. Reduce the amount of Benedict's solution used, while adding sug[illegible]

C. Dissolve the sugar in an alcohol solvent, such as ethanol, and use [illegible]

D. Place the reagent and solution into a colorimeter and shine light o[illegible]

Topic 4 (Nucleotides and Nucleic Ac

1) Which of these molecules is a pyrimidine?

A. Adenine

B. Threonine

C. Cytosine

D. Guanine

2) Complete the sentence – ATP is made by joining a ribose sugar to…

A. An adenine nucleotide and two phosphate groups

B. An adenine nucleotide and three phosphate groups

C. An adenine base and two phosphate groups

D. An adenine base and three phosphate groups

3) Identify one difference between DNA and RNA.

A. DNA is usually double-stranded, while RNA is usually single-str

B. The sugar in DNA is deoxyribulose, while the sugar in RNA is rib

C. DNA is typically a shorter molecule than RNA.

D. DNA contains the organic base uracil, while RNA does not.

4) What does it mean to say that DNA is anti-parallel?

A. Adenine on the coding strand always pairs with thymine on the c strand, and cytosine always pairs with guanine.

B. DNA is read in the opposite direction to mRNA.

C. When DNA replicates, each daughter molecule is made out of on and one new strand.

D. DNA strands have their 5', terminal phosphate group at opposite

5) Which of the following components was a crucial part of the Meselson

A. A heavy isotope of nitrogen, ^{15}N

B. A light isotope of oxygen, ^{15}O

C. A heavy isotope of carbon, ^{14}C

D. A light isotope of sulfur, ^{16}S

6) AGT and AGC both code for the amino acid serine. Which property o

A. Semi-conservative

B. Degenerate

C. Non-overlapping

D. Universal

7) In humans, the triplet code GGA codes for glycine. Which of these sta

A. GGA does not code for glycine in bacteria because they have diffe

B. If GGA codes for glycine, this means that no other sequence codes

C. The sequence GGAGGA in RNA could be read as coding for two
for the amino acids coded for by GAG and AGG.

D. A mutation causing a base substituti[illegible]C could still code fo

8) Josh is an AS Level stud[illegible] exam paper, he writes this statemen

'DNA is [illegible] form mRNA, which leaves the nucleus and is us
sequen[illegible]he ribosomes'.

What mistake has Josh made?

A. Replication doesn't make mRNA; instead, transcription does.

B. Replication doesn't make mRNA; instead, translation does.

C. The process of reading mRNA and creating a protein occurs with

D. The process of reading mRNA and creating a protein occurs at th

Topic 5 (Enzymes and Reactions)

1) Which amino acid interactions tend to be common in the centre of glo

A. Ionic

B. Hydrophobic

C. Covalent

D. Disulfide

2) Enzymes are described as having specificity. What does this mean?

A. Enzymes have a defined 3D shape which is not easily modified by or pH.

B. Each enzyme has an exact amino acid sequence, which does not v in a species.

C. Enzymes only function under a specific set of climatic conditions

D. Each enzyme only catalyses one specific reaction, or a few similar

3) A digestive enzyme that is most active in the duodenum is likely to ha

A. 2

B. 5

C. 8

D. 11

4) Which of the effects described below would *consistently* decrease the r controlled reaction?

A. Increasing the temperature

B. Reducing the pH

C. Introducing a non-competitive inhibitor

D. Increasing the substrate concentration

5) An enzyme-controlled reaction (in a test tube) has a temperature coeffi temperature is increased from 10 °C to make the reaction four times fa temperature of the test tube?

A. 20 °C

B. 30 °C

C. 40 °C

D. 50 °C

6) In terms of enzyme-controlled reactions, what is a co-enzyme?

A. An ion which joins to an enzyme to create the specific shape of its

B. An enzyme which is part of a several-stage process that breaks do into a smaller one

C. An organic molecule which is not part of an enzyme but is requir to function

D. A chemical which binds to a [illegible]me and slows down its rate of

7) Malonic acid is [illegible] with the active site of succinate dehydrogenase, from [illegible] the active site. Which term best describes this effect?

A. Competitive inhibition

B. Non-competitive inhibition

C. Reversible inhibition

D. Non-reversible inhibition

Topic 6 (Membranes in Cells)

1) Choose a function which is *not* carried out by the cell membrane.

A. Producing spindle fibres which line chromosomes up along the c

B. Receiving hormone signals via receptor molecules, and triggering

C. Controlling which molecules enter and exit the cell

D. Allowing the immune system to recognise the body's own cells

2) Which structure that phospholipids form is essential to cell membran

A. G

B. Micelle

C. Bilayer

D. Helix

3) Which of these changes could a membrane make to decrease its perm

A. Reduce the number of intrinsic proteins in the membrane

B. Increase the number of unsaturated fatty acids in the membrane

C. Reduce the number of glycoproteins on the outer surface of the m

D. Increase the number of saturated fatty acids in the membrane

4) Which change would *reduce* the rate of diffusion across a membrane?

A. Increase the temperat

B. Reduce the concentration gradient

C. In the surface area

D. Reduce the diffusion distance

5) Identify the correct definition of active transport.

A. Movement down a concentration gradient across a membrane

B. Movement against a concentration gradient which requires energy

C. Movement down a concentration gradient with the aid of protein

D. Movement across a membrane with the aid of an inorganic ion

6) Which word describes an animal cell which has shrivelled, due to a hi outside the cell?

A. Crenated

B. Turgid

C. Cytolysed

D. In

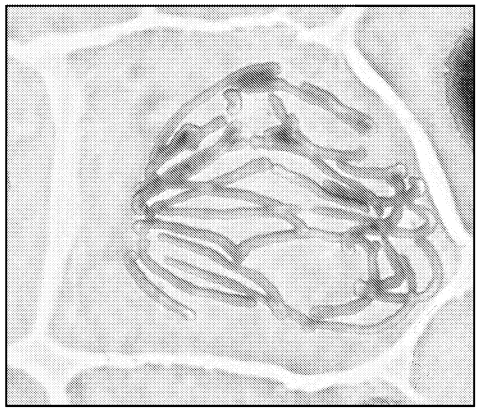
1) Which event does *not* occur during interphase?

A. The cell grows in size and carries out normal metabolic functions.

B. Chromosomes line up across the equator of the cell.

C. Checkpoints assess any damage to DNA and can 'pause' the cell cy

D. DNA is replicated with the aid of DNA Polymerase.



2) Which stage of mitosis is shown in the picture/diagram above?

A. Prophase

B. Metaphase

C. Anaphase

D. Telophase

3) Which of the events below causes genetic variation during mitosis?

A. Crossing over of homologous chromosomes

B. Random mutation

C. Independent assortment

D. Random fertilisation

4) During which stage of meiosis do the nuclear envelopes reform aroun

A. Anaphase I

B. Anaphase II

C. Telophase I

D. Telophase II

5) Some human cells possess a specialised organelle called a flagellum. W

A. It causes red blood cells to divide in two without a nucleus.

B. It acts like a lasso, allowing neutrophils to trap pathogens.

C. It extends from gut epithelial cells and aids with peristalsis.

D. It acts as a tail, enabling sperm cells to swim towards the ovum.

6) Why do guard cells have inner and outer walls with different thickne

A. The thicker, outer wall traps moist air and reduces water loss fro

B. The thicker, inner wall stays rigid while the outer wall bends, ope

C. The thicker, outer wall traps airborne pathogens, preventing them

D. The thicker, inner wall prevents the cell fro[illegible]rsting when air p

7) Suggest one way in which the [illegible] meristem is different from bot

A. The meristem [illegible] living cells, while xylem and phloem ar

B. T[illegible]ris[illegible]has no lignin in its cell walls, while xylem and phlo[illegible] m[illegible]e tissue stronger.

C. The meristem consists of cells separated by complete cell membra and xylem form multi-cell columns.

D. The meristem has few organelles, while the xylem and phloem ha organelles.

8) Choose the method used by stem cell researchers to treat diabetes in

A. Allowing the cells to grow around a bioscaffold, and develop a new

B. Programming stem cells to use excess fats, reducing obesity and p

C. Triggering the cells to produce insulin, which can be injected into

D. Programming the cells to differentiate into pa[illegible]reatic β-cells, whi

1) A cuboid has sides measuring 7 cm × 3 cm × 2 cm. What is its surface a

A. 0.51: 1

B. 0.98: 1

C. 1.02: 1

D. 1.95: 1

2) If each of the cuboid's sides was doubled in length, how much would t

A. 2

B. 6

C. 8 times

D. 15 times

3) Put these lung components in the correct order, from largest to smalles bronchioles, trachea.

A. Trachea, alveoli, bronchi, bronchioles

B. Trachea, bronchi, bronchioles, alveoli

C. Bronchi, bronchioles, trachea, alveoli

D. Alveoli, bronchioles, bronchi, trachea

4) Which sentence describes the role of the external intercostal muscles in

A. They contract, pulling the ribcage upwards and outwards

B. They relax, pushing the ribcage upwards and outwards

C. They contract, pulling the ribcage downwards and inwards

D. They relax, pushing the ribcage downwards and inwards

5) Callum is a young athlete. Immediately after exercise, he has a tidal v breathing rate of 35 breaths per minute. What is his pulmonary venti

A. 31.5 $dm^3 min^2$

B. 38.9 $dm^3 min^2$

C. 31.5 $dm^3 min^{-1}$

D. 38.9 $dm^3 min^{-1}$

6) In fish, which thin structures stick out and allow water to flow across t area for gaseous exchange?

A. Gill filaments

B. Spiracles

C. Opercula

D. Gill arches

7) Why i ter-current flow of water and blood important for fish?

A. It maintains an oxygen concentration gradient between the water

B. It ensures that oxygenated water meets the most deoxygenated bl

C. It puts the capillaries under pressure, making them more permeab

D. It causes the capillaries to become flattened, moving red blood cel

1) Describe the system which has blood separated from the tissue fluid b

A. Single circulatory system

B. Double circulatory system

C. Open circulatory system

D. Closed circulatory system

2) Which of these features is specific to capillaries?

A. Thick collagen layer, to withstand high pressure

B. Permeable walls which allow blood plasma to leak out

C. Valves to prevent blood from flowing backwards

D. Occasional nodes which contain white blood cells

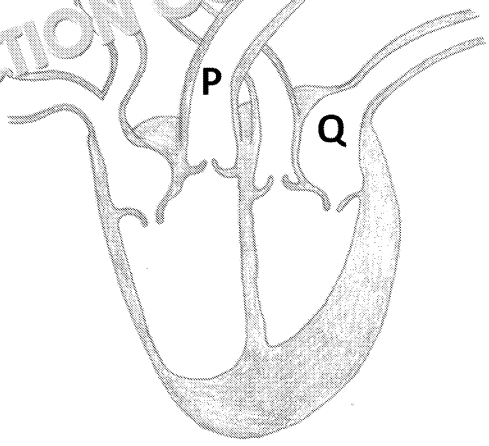
3) Which component would you not find in tissue fluid?

A. White blood cells

B. Glucose

C. Platelets

D. Carbon dioxide



4) Name the blood vessel labelled as P.

A. Aorta

B. Pulmonary artery

C. Vena cava

D. Pulmonary vein

5) On the diagram, name the component labelled as Q.

A. Left atrium

B. Left ventricle

C. Right atrium

D. Right ventricle

6) Which process below occurs during diastole in the cardiac cycle?

A. The semilunar valves open.

B. The atrioventricular valve closes.

C. The atria and ventricles slowly fill with blood.

D. Blood is forced out of the ventricles, into the blood vessels.

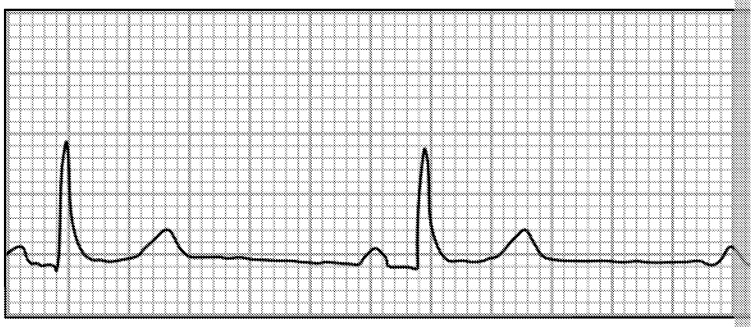
7) Which part of the heart does an artificial pacemaker mimic?

A. Bundle of His

B. Sinoatrial node

C. Atrioventricular node

D. Purkyne tissue



8) The electrocardiogram output above shows a patient with a heart rate of 120 bpm. What condition does this patient have?

A. Ectopic heartbeat

B. Arrhythmic heartbeat

C. Bradycardia

D. Tachycardia

9) Choose the true statement from the list below.

A. Fetal haemoglobin associates with O_2 at lower concentrations of O_2 than adult haemoglobin does.

B. Adult haemoglobin associates with O_2 at lower concentrations of O_2 than fetal haemoglobin does.

C. Fetal haemoglobin does not respond to changes in CO_2 concentration, whereas adult haemoglobin does.

D. Adult haemoglobin does not respond to changes in CO_2 concentration, whereas fetal haemoglobin does.

10) Why is it important that haemoglobin associates with H^+ ions from hydrogen carbonate in the blood?

A. This changes the shape of haemoglobin, allowing it to carry more oxygen.

B. They form a protective layer around haemoglobin's oxygen associating site.

C. Haemoglobin can carry additional oxygen molecules when it is associated with H^+ ions.

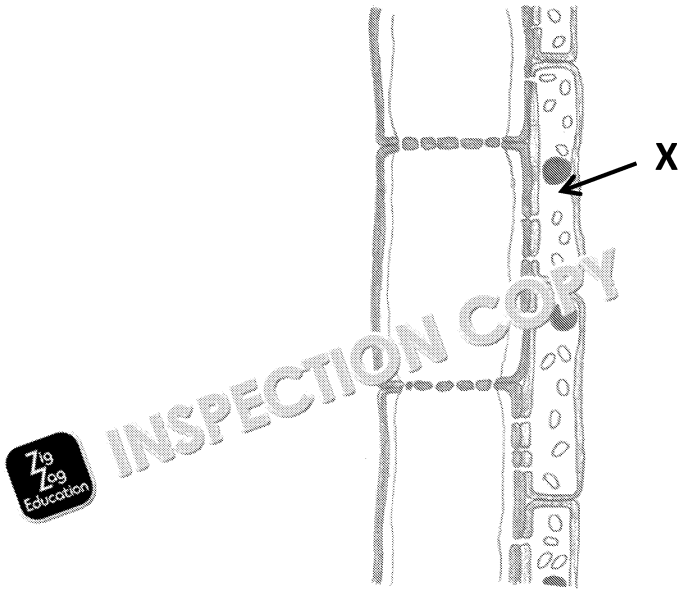
D. This prevents the blood from becoming too acidic, which can cause damage to cells.

1) Which of the items below is an unusual feature of xylem tissue?

A. The cells are separated by sieve plates, with pores to allow transp
B. Most of the cells are dead, and have no membranes or end walls.
C. The cells contain many mitochondria to allow rapid respiration.
D. The cells have a large surface area to maximise uptake of water.

2) If water flows into the root via the cytoplasm of the root hair cells, wh

A. The symplast pathway
B. The transcellular pathway
C. The symplast pathway
D. The vacuolar pathway



3) What name is given to the unit marked as X?

A. Phloem tube cell
B. Sieve end plate
C. Sieve tube element
D. Companion cell

4) Choose the correct definition for transpiration.

A. The process by which sugars are transported around the plant, fr
B. The process by which CO_2 is transported around the plant so it ca
C. The process by which the plant converts glucose into other essenti
D. The process by which water moves up through the stem of a plan the leaves

5) How could a potometer be used to assess the rate of transpiration of a

A. Collection and condensation of water vapour evaporated from lea

B. Cutting a ring of xylem tissue, and collecting the water which lea damaged xylem

C. Measuring the distance travelled by an air bubble created in the p

D. A potometer doesn't measure transpiration, it measures translocat

6) Which of these adaptations would be useful for a hydrophyte?

A. La[illegible]ir [illegible] to improve buoyancy

B. Sm[illegible]aves to reduce transpiration rate

C. Rolled leaves to trap moist air

D. Fast-growing tendrils to cling to a host plant

7) Which force moves sugars from sources towards sinks in a plant, acco

A. Cohesion

B. Adhesion

C. Hydrostatic pressure

D. Osmotic pressure

1) Which bacterial disease causes rings of discoloration and a change of t

A. Rinderpest

B. Black Sigatoka

C. Ringworm

D. Ring rot

2) Which polysa[illegible] is deposited in sieve tubes to slow the moveme

A. C[illegible]

B. Tylose

C. Lignin

D. Cellulose

3) Describe the role of the protein fibrin in primary defence.

A. It stimulates platelets to begin the process of clotting.

B. It converts thrombokinase to prothrombin, which agglutinates an

C. It forms fibres around the wound, and aids clotting.

D. It agglutinates around the wound, and aids clotting.

4) What is histamine?

A. A small signalling pro[illegible] that encourages the clonal expansion o

B. A type of an[illegible]y that binds to antigens and marks cells for pha

C. A [illegible]ical messenger that triggers B cells to phagocytise pathoge

D. A nitrogenous compound that causes swelling around the primar

5) Which cells produce large numbers of antibodies, and so provide a po against reinfection?

A. Macrophages

B. T-helper cells

C. Plasma cells

D. T-killer cells

6) What is the main role of a T-helper cell?

A. Engulfs and digests pathogens using hydrolytic enzymes

B. Produces cytokines that encourage B cells to develop and differen

C. Engulfs p[illegible]s and presents their antigens to other immune c

D. D[illegible] damage to lymphatic vessels and produces clotting agents

7) Choose the sentence which best describes the structure of an antibody.

A. A Y-shaped protein, with polypeptides held together by hydroge

B. A Y-shaped protein, with polypeptides held together by disulfide

C. An X-shaped protein, with polypeptides held together by disulfi

D. An X-shaped protein, with polypeptides he[illegible]gether by hydrog

8) A baby receives temporary prote[illegible]om a disease, due to antibodi
Which kind of immuni[illegible]oes t[illegible]is provide?

A. A[illegible]al, [illegible]

B. A[illegible]l, passive

C. Natural, active

D. Natural, passive

9) Which sentence describing epidemics is correct?

A. They mostly involve pathogens which are stable and mutate slow

B. They are referred to as endemics if they occur globally.

C. They are often fought by immunising the people most at risk from

D. They can be permanently prevented by achieving herd immunity.

1) A group of Geography students stands in a town square, asking the p will complete their survey. Which kind of sampling is this?

A. Opportunistic sampling

B. Stratified sampling

C. Systematic sampling

D. Random sampli

2) A qua s sides of 50 cm. A class of students uses a random num co-ordi es and place 20 quadrats. What area of land is studied in to

A. 2.5 m^2

B. 5 m^2

C. 10 m^2

D. 500 m^2

3) Which sentence describes the difference between species evenness an

A. Species richness describes the number of species present, while s shows how abundant each species is.

B. Species evenness describes the number of species present, while s shows how abundant each species is.

C. Species richness is a measure of bi rsity, while species evenn of genetic diversity

D. Species ev s measure of biodiversity, while species richn o ic iversity.

Western Hemlock	10
Sitka Spruce	25
Alder	3
Red Cedar	7
Yellow Cedar	1
White Spruce	4

4) Use these values to calculate an Index of Diversity for a tree sample fr Alaska (to 2 dp).

A. Needs more information

B. 0.32

C. 0.68

D. 3.2

5) An area of subtropical forest in central Africa has an Index of Diversity
Suggest which sentence is likely to be true.

A. The forest has one dominant tree species which crowds out compe
B. A small change to the environment is likely to have catastrophic e
C. A forest species chosen at random has a high genetic diversity.
D. The ecosystem is resilient to the introduction of predators or new

6) A short section of chromosome is studied for a human population. It
proportion of polymorphic loci is 1.2%. How many polymorphic gene

A. Not enough information
B. 13
C. 130
D. 1,300

7) Which of these is not an effect of climate change over the last century?

A. Gradual migration of many species towards the equator
B. Increased extinction probability for rare species
C. Reduced crop yields as soils become less suitable
D. A substantial increase in temperature at the poles

8) In 1930s America, a drought weakened intensively farmed land, and
as the Dust Bowl – which in turn led to mass migration. Which effect

A. Eutrophication
B. Soil erosion
C. Mass extinction
D. Monoculture

9) Which of these is an example of *in situ* conservation?

A. The Royal Botanic Gardens at Kew
B. The Hortobágy National Park in Hungary
C. Edinburgh Zoo
D. The Global Seed Vault in Svalbard

Topic 13 (Classification and Evoluti

1) Which of these lists is in the correct order – from the largest taxon to t

A. Order, genus, family, species

B. Order, class, family, genus

C. Class, phylum, family, species

D. Phylum, class, order, fam

2) *Vanessa tameamea* is a ed butterfly which lives only in Hawaii. Which is true

A. *Vanessa* is its binomial name and *tameamea* is its specific name.

B. *Vanessa* is its specific name and *tameamea* is its binomial name.

C. *Vanessa* is its specific name and *tameamea* is its generic name.

D. *Vanessa* is its generic name and *tameamea* is its specific name.

3) An organism grows long filaments called hyphae. Which kingdom d

A. Plantae

B. Animalia

C. Protoctista

D. Fungi

4) An organism has a cell wall mad f cellulose and pectin. Which k

A. Plantae

B. A ia

C. Pr ista

D. Fungi

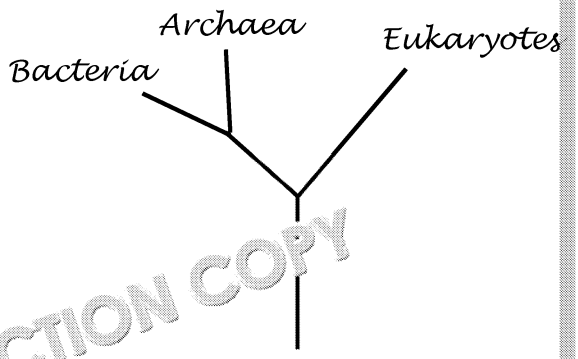
5) An organism is a multicellular heterotroph which is capable of mover does it belong to?

A. Plantae

B. Animalia

C. Protoctista

D. Fungi



6) A scie[illegible] diagram to show the evolutionary relationship b[illegible]
Why i[illegible]ong?

A. Bacteria are more closely related to eukaryotes than they are to ar[illegible]

B. Archaea are more closely related to eukaryotes than they are to ba[illegible]

C. Fungi are missing from the evolutionary tree.

D. Protoctista are missing from the evolutionary tree.

7) Which of the list below would *not* be useful evidence when building a[illegible]

A. Gene sequencing for two captured individuals (one from each spe[illegible]

B. Analysing differences in behaviour between species

C. Measuring body size for two captured individuals (one from each[illegible]

D. Analysing differences in skeletal structu[illegible]w[illegible]en species

8) Which of the following is po[illegible]sibl[illegible], according to the Darwinian the[illegible]

A. Bacteria pa[illegible]n antibiotic resistance by sharing plasmid DNA

B. A[illegible]c wolf passing on genes for white fur colour to its offsprin[illegible]

C. Fossils showing that that over time, entire classes of animals such[illegible] become extinct

D. A horse developing an unusual bone shape due to a fracture, and[illegible] its offspring

9) Humans can either have O, A or B alleles for blood type, producing d[illegible]s AB blood types. Which kind of variation is this an example of?

A. Continuous, intraspecific

B. Continuous, interspecific

C. Discontinous, intraspecific

D. Discontinuous, interspecific

Weight (kg)	
3.5	2.7
3.4	3.6
2.9	4.5
2.4	3.2
4.0	2.9
3.9	[illegible]3

$s =$

10) Calculate the standard deviation of this set of baby weight data, from a
should [illegible]ed

A. 0.338

B. 0.369

C. 0.582

D. 0.608

11) How many babies are more than one standard deviation from the mea

A. 3

B. 4

C. 8

D. 9

12) Numbats and anteaters are not closely related, but they have both dev
elongated tongues, to help them dig through nests and catch insects. W

A. Convergent evolution

B. Ec[illegible]al radiation

C. Adaptive radiation

D. Divergent evolution

13) How does natural selection affect the frequency of alleles in a populati

A. It always acts to reduce the genetic diversity of a population.

B. It causes advantageous alleles to become fixed, while others die o

C. It causes new mutations, increasing the genetic diversity of the po

D. Natural selection doesn't change the frequency of alleles.

14) Bacterial antibiotic resistance can become widespread very quickly. W
reason for the fast spread of resistance?

A. Bacteria divide very quickly under optimal conditions.

B. B[illegible] can share DNA via circular plasmids.

C. Ba[illegible] share vesicles of proteins which allow them to degrade a

D. A gene for resistance provides a huge advantage, and is strongly s

Answers to Multiple-Choice Questio

Topic 1

1	C
2	D
3	A
4	A
5	[illegible]
6	[illegible]
[illegible]	C
[illegible]	D
9	A
10	C
11	B
12	B
13	C

1
2
3
4
5
6
7
8

1
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3
4
5
6
7

Topic 2

1	A
2	D
3	D
4	C
5	B
6	[illegible]
7	B
[illegible]	D
[illegible]	B
10	C

1
2
3
4
5
6

Topic 3

1	A
2	D
3	C
4	C
5	D
6	D
7	B
8	[illegible]
9	[illegible]
[illegible]	B
[illegible]	A
12	D
13	C
14	B
15	D

1
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3
4
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7
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Topic 8

1	D
2	C
3	B
4	A
5	C
6	A
7	A

Topic 9

1	D
2	B
3	C
4	B
5	A
6	C
7	B
8	C
9	A
10	D

Topic 10

1	B
2	C
3	D
4	D
5	C
6	A
7	C

Topic 11

1	D
2	A
3	C
4	D
5	C
6	B
7	B
8	D
9	C

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