Model Answers Biology B1

Name: .....

Diet, Exercise and Health Questions

Scientists estimate that about one third of cancers in the UK may be linked to obesity. Name two diseases linked to obesity. Do not give cancer as one of your answers. (2 marks)

Any **two** from:
- arthritis
- diabetes
- high blood pressure
- heart / blood vessel disease

Exercise helps a person to lose weight. Explain why. (3 marks)

It increases metabolic rate. Exercise needs energy **or** exercise increases energy used by body. This means that fat stores are used / broken down.

Other than increasing fitness, give two reasons why regular exercise is important in maintaining a healthy body. (2 marks)

Any two from:
- increases metabolic rate or increased respiration
- decreases blood pressure
- decreases obesity / decreased
- cholesterol / burns off fat
- lowers risk of heart disease
- lowers risk of arthritis or worn joints
- lowers risk of diabetes

Some slimming programmes include daily exercise. Explain how daily exercise helps a person to lose mass. (2 marks)
- (exercise) increases metabolic rate / respiration
- (exercise) needs / uses energy / calories
- (this) energy comes from food / fat
- less food / energy/ calories converted to fat

What is meant by *metabolic rate*? (2 marks)
- Rate of (chemical) reactions / rate of energy release / rate of respiration
- In cells / tissues / organs

Infectious Diseases, Immunity, Antibiotics and Painkillers Questions

Hand-gel dispensers are now placed at the entrance of most hospital wards. Explain why. (2 marks)
Kills / destroys bacteria / MRSA. Prevents / reduces transfer of bacteria.

How are antibiotic resistant bacteria developed? (2 marks)
Bacteria mutate or there is variation in bacteria. This leads to bacteria /resistant cells that survive an antibiotic. These antibiotic resistant cells go on to breeding and developing more antibiotic resistant cells.

Explain fully why antibiotics cannot be used to cure viral diseases. (2 marks)
Viruses live inside cells. Viruses are inaccessible to antibiotics.

A recent study found that babies in 90 % of hospitals are infected with the MRSA bacterium. Explain how the MRSA bacterium has developed resistance to antibiotics. (2 marks)
A mutation occurs which is no longer recognised by antibiotics.

Explain why MRSA is causing problems in many hospitals. (2 marks)
any **two** from:
- resistant to (most) antibiotics
- contagious **or** easily passed on **or** reference to open wounds
- patients ill therefore less able to combat disease

Explain how Semmelweiss's results could be used to reduce the spread of MRSA in a modern hospital. (2 marks)
People wash hands after contact with patient so bacteria / pathogen / MRSA not transferred to other patient

Why do bacteria and viruses make us feel ill? (2 marks)
Bacteria produce toxins / poisons
Viruses damage / kills cells

Most drugs that kill bacteria cannot be used to treat viral infections. Explain why. (2 marks)
Viruses live inside cells/are inactive
Viruses inaccessible to drug

Antibiotic-resistant strains of bacteria are causing problems in most hospitals. Explain, as fully as you can, why there has been a large increase in the number of antibiotic-resistant strains of bacteria. (4 marks)

- overuse of antibiotics
- bacteria mutate
- antibiotics kill non-resistant strains **or** idea of selection
- reduced competition
- resistant bacteria reproduce

Explain, as fully as you can, how the MMR vaccine protects children from these diseases (3 marks)

any **three** from:

- vaccine is inactive / dead form of (pathogen)
- stimulates antibody production
- stimulates antitoxin production by white cells
- antibodies kill (pathogen)
- antitoxins neutralise poisons
- antibodies quickly produced on reinfection

Explain why it is difficult to treat diseases caused by viruses. (2 marks)

any **two** from

- live inside / infect body cells
- difficult for drugs to enter (body) cells / drug would kill (body) cell
- antibiotics ineffective against viruses
- viruses mutate **frequently**

How do viruses cause illness? (1 mark)

Damage cells /reproduce rapidly **or** reproduce in cells

A person can be immunised against a disease by injecting them with an inactive form of a pathogen. Explain how this makes the person immune to the disease. (3 marks)

It stimulates antibody production by white cells. If later on, the live pathogen gets into your body, white blood cells recognise it and rapidly produce the antibodies. These antibodies destroy the pathogens before they can make you ill.

Nervous System Questions

Explain the pathway of a reflex action when touching something hot. (5 marks)
Stimulus / heat detected by temperature receptors in skin
Impulses travel along sensory neurone to spinal cord / CNS
Chemical transmission across synapse via relay neurone
Impulses to muscle / effector via motor neurone
Muscle / effector contracts, moving the hand away

Name the following structures in a reflex action.
(i) The structure that detects the stimulus. (*1 mark*)
Receptor
(ii) The neurone that carries impulses to the central nervous system. (*1 mark*)
Sensory neurone
(iii) The neurone that carries impulses away from the central nervous system. (*1 mark*)
Motor neurone
(iv) The structure that brings about the response. (*1 mark*)
Effector

Describe what happens at a synapse when an impulse arrives. (2 marks)
- impulse / information passes from one neurone to another **or** impulse / information passes across gap (synapse)
- chemical / transmitter involved
- chemical diffusion (across gap)

Some people have a condition in which information from the skin does not reach the brain. Explain why this is dangerous for the person. (2 marks)
Brain / person not aware of pain /stimulus / can't feel. Therefore, there is a possibility of (permanent / serious) damage / eg burning.

Hormones & IVF Questions

Hormones can also be used as 'fertility drugs.' Explain how a fertility drug helps a woman to become pregnant. (2 marks)
Contains FSH which causes egg to mature / develop / be produced. OR contains LH which stimulates the release of an egg.

In-vitro fertilisation (IVF) is used to help some women get pregnant. Name the two hormones used in IVF treatment. (2 marks)
FSH and LH.

Describe the process of IVF. (4 marks)
Eggs are collected from ovary .*Eggs are* mixed with sperm **or** fertilisation occurs. Fertilised egg divides, embryos are formed. Embryos are inserted into the womb /uterus. FSH matures egg **and** LH releases eggs.

Explain how a contraceptive pill works. (2 marks)
Inhibits FSH (production / secretion) (therefore) no eggs mature / released.

Explain the stages of the menstrual cycle in detail. (4 marks)
FSH is produced and secreted by the pituitary gland.
FSH causes the eggs in the ovaries to mature and stimulates the ovaries to release oestrogen.
Oestrogen is secreted by the ovaries.
Oestrogen inhibits FSH production and stimulates the pituitary gland to release LH.
LH stimulates the release of the mature egg cell (ovulation – day 14).
Progesterone is secreted by the ovaries.
Progesterone maintains the uterus lining and inhibits production of both FSH and LH.
If the egg is not fertilised, the uterus lining passes out of the body. (Period: days 1-5)

Drugs Questions

Explain in detail how drugs are tested. (3 marks)
The drug is tested on cells and tissues in the laboratory to see if it is effective. The drug is tested on live animals. If they suffer no serious side effects, the drug undergoes trials on healthy, human volunteers. If there is no serious side effects and the drug is proven to make a difference, the drug undergoes large-scale trials.

Explain in detail what happens in a double blind trial. (5 marks)
Double blind means that neither the participants nor the administrators know which drug they are getting.
Participants could be getting the new drug, or a placebo.
A placebo is a dummy pill with no active ingredient (drug).
The method avoids any bias from administrators/researchers.
The method a voids the problem of some people feeling better just because they think they have had treatment.
The method allows researchers to compare the tested drug's effectiveness with drugs currently used and with placebos.

Many recreational drugs harm the body. Some people become dependent on a recreational drug. What happens to people's bodies when they become dependent on a drug? (2 marks)
Drugs alter chemical processes in body. Person suffers withdrawal symptoms without drug.

The overall effect of alcohol on the health of the UK population is much more than the effect of heroin. Suggest an explanation for this. (2 marks)
Many more people in the UK use alcohol than heroin. The less harmful effect is multiplied so the overall effect of alcohol on the health of the UK is much more.

Many people use drugs recreationally. What is meant by the recreational use of drugs? (1 mark)
Using drugs for pleasure / to make you feel good / to reduce stress

Explain why a person might become addicted to a recreational drug. (2 marks)

Any **two** from:

- drug contains addictive chemicals
- drugs alter body chemistry
- cause withdrawal symptoms
- uses drug frequently

or uses a lot of the drug

or needs more drugs

Explain how the action of a drug makes a person become addicted to it. (1 mark)

Alters body chemistry

Scientists have developed drugs to reduce the concentration of cholesterol in the blood. Give the three main stages in testing a new drug before it is sold to the public. (3 marks)

Laboratory tests /tests on tissues **or** tests on animals **(1 mark)**

Tests for side effects on volunteers /healthy people / small numbers (1 mark)

Widespread testing **or** testing for optimum dose ***or*** test on patients / sick people ***or*** test to see if it is effective (1 mark)

Adaptations and Competition Questions

Describe in detail features and adaptions of a cacti. (4 marks)
Waxy coating on the surface of the cacti to prevent water loss
Spine-like leaves make the cacti difficult for herbivores to eat
Long, thin leaves have a smaller surface area to reduce water loss
Can store water in their stem
Long lateral roots maximise water absorption from the soil

Joshua trees have two different types of root:
- a system of shallow roots spread out over a large area
- roots about 1 m in diameter, shaped like bulbs, deep in the soil
Explain the advantage of each of these. (2 marks)
Shallow roots spread over a large area to increase water uptake (after) rain. Long roots for water storage **or** stability **or** safety from predators.

The leaves of creosote bushes:
- are covered with a layer of wax
- fold together during the day.
Explain how the leaves of the Creosote bush help it to survive in deserts. (2 marks)
Reduces water loss / evaporation wax protects plant **or** reflects heat **or** keeps plant cool **or** unpalatable folding reduces surface area **or** folding reduces warming.

Suggest two ways in which the arctic fox is adapted for life in very cold conditions.Explain how each adaptation helps the arctic fox to survive in very cold conditions. (4 marks)
- long / thick hair / fur (1)
for insulation (1)
- small ears (1)
for reduced heat loss (1)
- small feet (1)
for reduced heat loss (1)
- white fur / coat (1)
for camouflage / poor emitter (1)
- small surface area to volume ratio (1)
reduces heat loss (1)
- thick layer of fat (1)
insulates / keeps warm (1)

Energy Flow and Environmental Change Questions

How is energy lost in a food chain/web from producer onwards. (5 marks)
All organisms respire and respiration releases energy.
Some energy is lost in animals waste materials.
Some energy used in maintenance / repair.
Some energy used for movement.
Some energy lost as heat to surroundings.
Some organisms die (rather than being eaten)

Deforestation increases the amount of carbon dioxide in the atmosphere. Give two reasons why. (2 marks)
(any **two** from)
Burning, activity of microbes / microbial respiration, less photosynthesis **or** trees take in CO_2

Deforestation also results in a loss of *biodiversity*. What is meant by *biodiversity*? (1 mark)
A range of different species

Describe an experiment you could carry out to show how lichens can be used to indicate the levels of pollution as you move out of a city. (3 marks)
Measure the number of different lichens in the city then at set intervals moving away from the city. If lichens increase and different types appear then pollution is decreasing.

Rat tailed maggots are poor competitors. Suggest why they do not survive well in clean water. (2 marks)
Rat-tailed maggots are poor competitors, which means that other organisms are better adapted to compete efficiently for all the resources, such as food and space, in clean water.

If a water sample was tested and showed a high BOD, what would this tell you about the water? (2 marks)
A high BOD reading from a water sample would indicate a lot of bacteria were present in the water, thus the water would be polluted.

Reproduction and Cloning Questions

Why is adult cell cloning (Dolly the sheep) a form of asexual reproduction? (2 marks)
There was no mixing of genes / genetic material because the nucleus was removed from the egg cell before fusion

What is adult cell cloning? (Dolly the sheep) (4 marks)
This is where a nucleus is taken from the cell of an adult organism and put into an enucleated egg from another organism of the same species. An electric shock is given and the new egg is put into a surrogate mother. The cloned organism is genetically identical to the donor adult from which a cell was used to provide the nucleus/genetic material.

Why are the calves produced by embryo transplant not genetically identical to their true mother or their surrogate mother? (2 marks)
The calves are not genetically identical to their true mother because the embryos were produced by normal sexual reproduction – fusion of an egg and sperm. Therefore the genetic material in the embryo is different from that of the mother. The surrogate mother is not related to the calves, so will have different genetic material.

Explain how Dolly, a Finn Dorset ewe, was born to a Scottish Blackface ewe. (4 marks)
The egg was from a Scottish Blackface ewe. Its nucleus was removed. The nucleus was taken from a cell of a Finn Dorset ewe. The Finn Dorset nucleus was put into the empty egg, fused by electric shock and then put into a surrogate Scottish Blackface. The egg had the genes of a Finn Dorset. Because genes govern the development/have the blueprint for the resulting embryo/lamb/sheep, it will be a Finn Dorset. The breed of surrogate mother will have no influence on the genes/breed of the baby.

Dolly's birth was kept secret for six months whilst the researchers wrote their paper and had it peer-reviewed before publication. When the news broke in 1997, some of the deadlines included: 'Golly Dolly! It's the abolition of Man.' 'Terrified researcher tells of how Dolly kills and eats a lamb.' 'The clone rangers need to be stopped.' 'Human cloning not far away.' Comment on such sensationalism. (3 marks)
It has no correct scientific content. It is designed to scare people and sell newspapers. There was never any plan to clone humans; it is illegal and

has not happened. Dolly did not kill and eat a lamb – this story, like many in the tabloid press, was made up by journalists.

Human cloning is illegal and is not carried out (except in nature in the form of identical twins). Discuss the social and ethical issues around animal cloning. (3 marks)

Sheep and cows can be genetically modified to make medicines for humans in their milk. Lots are needed to make enough medicine to treat all ill people, such as people with hereditary emphysema. Breeding from the transgenic sheep cannot guarantee that the offspring will have the gene to make the medicine. But if sheep were cloned from this transgenic sheep they would have that gene. The benefits to people who are ill are huge. However, some people wish to clone their pet. This may not harm the pets produced but is rather whimsical and not benefiting mankind/lots of people. It would cost a lot of money.

Evaluate the use of adult cell cloning to conserve endangered species. Remember to give a conclusion to your evaluation. (3 marks + 1 for conclusion)

Pros

It is useful if species are difficult to breed. It also prevents extinction / continues genetic line.

Cons

It has a low success rate. There might also be development problem and cloning reduces the gene pool

Any argued conclusion.

The use of cloned animals in food production is controversial. It is now possible to clone 'champion' cows. Champion cows produce large quantities of milk. Describe how adult cell cloning could be used to produce a clone of a 'champion' cow. (4 marks)

- nucleus / DNA / chromosomes / genetic material removed (from unfertilised egg) of a cow
- nucleus from body cell of champion (cow)
- inserted into the egg / ovum
- electric shock to make cell divide **or** develop into embryo
- (embryo) inserted into womb / host / another cow

Scientists have recently cloned a mouse that had died and been frozen for 16 years. Explain what is meant by a clone. (2 marks)

Genetically (1 mark) identical (1 mark)

The scientists used an egg cell from a living mouse and the genetic material from a brain cell of the frozen mouse. Describe how the process of adult cell cloning could be used to clone the frozen mouse. (3 marks)

Remove nucleus from egg

Insert genetic material / nucleus / DNA / chromosomes from frozen mouse

Electric shock **or** allow to divide **or** insert into womb / uterus

People could ask scientists to use this technique to clone long-dead relatives, whose bodies have been deep-frozen. Most people would be opposed to cloning a human from a deep-frozen, long-dead relative. Give one reason why. (1 mark)

Ethical / religious / emotional reasons

Not known if it is safe / long term effects not known

Genetic Engineering & GM Crops Questions

Why are genetically modified sheep used to make a human protein to treat hereditary emphysema? (1 mark)
Because the protein is too large to be made in bacterial cells, which are much smaller than sheep cells.

Why is the human gene put into an early embryo sheep and not into a developed lamb? (2 marks)
By putting the gene into the early embryo, as the embryo develops and the embryo cell divides, all the cells derived from it will have the gene.

Why are only female embryos used? (1 mark)
Because we want the product to be in milk. Only female sheep can make milk.

Explain in detail the way in which genetically engineered sheep are produced to treat people with hereditary emphysema. (4/5 marks)
The human gene for the protein is cut out from a human chromosome.
Several copies of the gene are obtained.
They are put into fertilised eggs, in a glass dish.
The fertilised eggs are allowed to divide into a ball of cells.
One cell is taken from each ball of cells, and the chromosomes are checked to find out which ones are female.
The balls of cells that will develop into female sheep are put back into the female sheep wombs.
The embryos can then develop and lambs are born which will be able to produce the human protein in their milk.

Discuss the ethical issues of making the human protein in this way. (3 marks)
It allows scientists to make enough medicine to treat people with the disorder. The sheep do not suffer and will not be killed for meat like other sheep. The medicine can easily be collected by milking the sheep, so the sheep do not suffer any discomfort.

What are the advantages of using genetically modified bacteria to make human insulin? (4 marks)
A lot of insulin can be made – enough to treat all diabetic people in the world. The bacteria can be grown in laboratories so is not dependent on climate. The insulin will not be contaminated with any viruses/diseases.

The insulin is human insulin. People will not be worried about having insulin from pigs/killing pigs to get their pancreases.

How can scientists cut out genes from human chromosomes?
By using special enzymes (restriction endonucleases obtained from bacteria)

Why may GM corn that contains 'fish oils' be important for humans in the future? (3 marks)
Fish stocks are declining and the human population is growing, so we will not be able to eat as much fish as we need to give us these oils. The oils are essential for nerve and brain function and good health (they reduce the risk of heart disease). GM maize containing these oils could provide us with our needs.

Why do humans need to increase the amount of food grown in the world during the next 20 years and beyond? (1 mark)
Because the population is increasing.

Explain why using GM crops can reduce the amount of fertiliser and pesticide chemicals used. (2 marks)
GM crops that do not need as much nitrate/phosphate do not need as much fertiliser. GM crops that have resistance to insects do not need to be sprayed with insecticide.

Why can we not increase the use of chemicals such as pesticides and fertilisers to increase crop yields? (2 marks)
Because adding lots of fertiliser harms the soil, and spraying too much pesticide harms the people spraying it. Pesticides get into our food chain and may kill useful insects and birds.

What are the harmful effects of using chemicals like pesticides and fertilisers? (2 marks)
Useful insects have been killed. The pesticides accumulate up the food chain so predator birds have had difficulty breeding as their egg shells become thin. Pesticide residues have been found in all living things in all parts of the world.

Evolution Questions

Explain how evolution occurs through natural selection? (4 marks)
Organisms within species may show variation because mutation(s) occur in individuals. This results in the individuals with characteristics most suited to the environment being more likely to survive, reproduce/breed and pass on their genes to their offspring in the next generation.

Explain why Darwin's theory of evolution was not accepted at first.(2 marks)
- The theory undermined the idea that God made all the animals and plants that live on Earth.
- There was insufficient evidence at the time.
- The mechanism of inheritance / variation was not yet known at the time.

What does the theory of evolution state? (2 marks)
Present day organisms have evolved from simpler organisms over long periods of time **or** millions / billions of years

The dodo lived on a small island in the middle of the Indian Ocean. Its ancestors were pigeon-like birds which flew to the island millions of years ago. There were no predators on the island. There was a lot of fruit on the ground. This fruit became the main diet of the birds. Gradually, the birds became much heavier, lost their ability to fly and evolved into the dodo. Suggest an explanation for the evolution of the pigeon-like ancestor into the flightless dodo. (4 marks)
- mutation / variation
- produces smaller wings / fatter body
- wings no longer an advantage since no predators
- wings no longer an advantage since food on ground
- fatter body can store more energy when fruit scarce
- successful birds breed / pass on genes

Flamingos feed on organisms that live in mud at the bottom of lakes. Leopards prey on flamingos. Flamingos find it difficult to fly if their feathers get wet. Flamingos have evolved very long legs.
How would each of the following theories explain the evolution of these long legs?
(a) Darwin's theory (3 marks)
- Variation / range of leg sizes /due to mutation
- ones with longer legs could feed n deeper water / get more food

or
- long legged ones less likely to get feathers wet
or
- long-legged ones could escape from leopards
Those with the selective advantage survive / breed / pass on genes
b) Lamark's theory (2 marks)
- Flamingos stretched their legs as they had an inner need(to be able to feed in deeper water/ keep feathers dry / escape from leopards)
- Longer legs / acquired characteristic inherited by offspring

What is meant by natural selection? (2 marks)
- survival of fittest
- amplification of fittest ie has adaptations to survive (selective advatange)
- go on to breed **or** genes / characteristics passed on to next generation