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Level: HL IB in Biology

Subject: Biology

Topic: IB HL Biology

Type: Mark Scheme

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All International Baccalaureate IB Topic Questions HL Biology

BIOLOGY

HL - IB

Key skills

Answer 1

The correct answer is D: FSH first stimulates the development of a follicle, and the follicle wall produces the hormone oestrogen; it can be said that FSH stimulates the production of oestrogen - however, when oestrogen levels become high enough, the secretion of FSH is inhibited. This is an example of a negative feedback loop.

The other options are incorrect, as the other negative feedback loop that occurs in the menstrual cycle, between progesterone and LH/FSH, occurs as follows: LH stimulates the wall of the follicle to develop into the corpus luteum, which secretes progesterone. Progesterone thickens and maintains the endometrium but also inhibits the secretion of FSH and LH from the pituitary gland.

Answer 2

The correct answer is A.

Answer 3

The correct answer is A; this is a correct description of the relationship between pollinator visits and temperature shown in this set of results.

B: Global warming will not affect all parts of the world in the same way. Some regions will see temperatures increase from an average in the mid-20s, and it is likely that these parts of the world will see a decrease in pollinator activity. Other regions may see an increase from an average in the mid-teens, so may see an increase in activity. Note that while these statements together may suggest that global warming will have little effect on pollinator activity overall, the reality is that pollinator activity is likely to be higher in regions with warmer average temperatures, so the adverse effects of global warming will be greater than any positive impacts.

C: There are two data points between 10 and 15 °C that do not fit this overall trend.

D: While the data show a correlation between temperature and pollinator visits, these results alone cannot show that the relationship is causal; more data would be needed to back up this conclusion.

Note that this question addresses content from the Nature of Science part of the specification.

Answer 4

The correct answer is D. According to the results the highest percentage of seeds germinated at a pH of 4. This indicates that this species of plant will have the greatest germination success in acidic soil. Note that while the germination rate is shown to be slightly higher at pH 5, the statement refers to number of seeds, which is represented by the percentage value.

A: Alkaline soil will have a pH value greater than 7 and at these pH values the germination percentage and rate of germination was low.

B: Even though the germination rate was the highest at pH 5, the total percentage of seeds that germinated was slightly lower than at pH 4.

C: There was a significant decrease in the rate of germination after pH 6, not pH 7. This is shown by the non-overlapping standard deviations between the rate at pH 6 and at pH 7. The standard deviations from pH 7 onwards all overlap each other, showing that there is no significant difference between these values.

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Answer 5

The correct answer is A because:

The hormone called 'human chorionic gonadotrophin' (hCG) is uniquely produced during pregnancy by the developing embryo and later the placenta. The urine of a pregnant woman contains detectable levels of hCG.

The mobile monoclonal antibodies in the testing sticks all originate from a single clone of B lymphocyte cells that all produce the same antibody specific to hCG.

These mobile monoclonal antibodies (that combine with hCG) are also attached to a dye.

When these dye-bearing antibodies bind to the layer of fixed antibodies on the test stick, a coloured line (visible due to the dye) shows up in the first result window.

Answer 6

The correct answer is A. In this type of test, the antibodies on the conjugate pad either bind to the drug in the urine or to the test line (not both, hence the term competitive binding), so when the drug is present the antibodies in the pad bind to the drug and do not bind to the test line. A positive test strip therefore only shows a single visible band on the control line.

B: This describes how a negative test result is achieved. If no drug is present then the antibodies remain unbound and can bind to the test strip, forming two visible bands.

C: This describes how a visible band forms at the control line, and is correct for both a positive and a negative result.

D: This describes the type of test with which you may be more familiar, such as the pregnancy test. In this type of test the molecule being tested for binds to the conjugate pad antibodies and to the test line antibodies. The information at the start of the question tells us that this cannot occur here due to the drug molecules being too small. This description would also achieve two visible lines, which does not match the positive test result shown in the image.

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This is a tricky question that requires the application of your understanding of monoclonal antibodies and pregnancy tests to an unfamiliar type of antibody test. The information in the question and your own knowledge of pregnancy tests should allow you to reason your way to the answer.

Answer 7

The correct answer is C. The information in the question states that ZP2 is normally broken down by the enzymes released by the cortical granules; it is this digestion of ZP2 that will cause the hardening of the zona pellucida and prevent polyspermy. If there is a mutation in the gene that codes for ZP2 then it may change shape and no longer be able to bind to the active site of the digestive enzymes, meaning that digestion will not occur and the zona pellucida will not harden. This will allow more sperm to digest the zona pellucida and enter the ovum.



A: While the explanation here is a correct possible outcome of a mutation in the gene that codes for ZP1, this outcome would prevent sperm from digesting the zona pellucida and entering the ovum rather than leading to polyspermy.

B: ZP2 is described as being involved with the later stages of fertilisation so its role is more likely to be the initiation of the cortical reaction. While prevention of the cortical reaction may well lead to polyspermy, prevention of the acrosome reaction (as stated in the table) will prevent fertilisation.

D: ZP3 is described as being involved with the initial stages of fertilisation, so sperm being unable to bind to ZP3 would be more likely to inhibit the acrosome reaction than the cortical reaction.

Answer 8

The correct answer is D. Oestrogen levels rise, inhibiting production of progesterone (1) and increasing the sensitivity of the uterus walls to oxytocin (2). The fall in progesterone levels means that the pituitary gland is no longer inhibited (3), allowing production of oxytocin to increase. Oxytocin stimulates the uterus walls to contract and stimulation of stretch receptors in the uterus walls stimulates (4) the pituitary gland to release more oxytocin.