1.4 Reproduction and Inheritance: 1-hour Pack

Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Explain why offspring produced by sexual reproduction show variation, but offspring produced by asexual reproduction normally do not.

(2)

2 Which structure protects and cushions the fetus inside the uterus?

- ☐ A) Placenta
- ☐ B) Amniotic fluid
- ☐ C) Umbilical cord
- ☐ D) Cervix

3 Give two factors, other than genes, that can cause variation between individuals of the same species.

(2)

4 Farmers use selective breeding to produce cows that give more milk.

(a) Describe the process of selective breeding. **(2)**

(b) Suggest one risk of using selective breeding. **(1)**

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5 Name the type of reproduction that produces offspring genetically identical to a single parent, and give one example of an organism that reproduces this way.

(2)

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6 State the number of chromosomes found in a normal human body cell, and the number found in a human gamete (sperm or egg cell).

(a) Number of chromosomes in a normal human body cell. **(1)**

(b) Number of chromosomes in a human gamete. **(1)**

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7 Explain the difference between pollination and fertilisation in flowering plants.

(2)

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8 Put these stages of a flowering plant life cycle in the correct order: 1) seed germinates, 2) pollen lands on stigma, 3) seed forms, 4) pollen tube grows, 5) ovule is fertilised. Write the order as a list of numbers corresponding to the stages above (1 to 5).

(5)

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9 Some plants reproduce asexually using runners (stems that grow along the ground). Suggest one advantage and one disadvantage of asexual reproduction for these plants.

(2)

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10 A class investigates inheritance by crossing fast-growing pea plants (trait F) with slow-growing pea plants (trait f). Fast-growing plants are tall and have genotype T T or T t, slow-growing are short and have genotype t t. The teacher crosses a true-breeding tall plant (T T) with a true-breeding short plant (t t) and all offspring are tall. The class then self-pollinates one of these tall offspring (genotype T t) and gets a second generation with 3 tall : 1 short ratio. Explain what these results suggest about the inheritance of height in these peas.

(4)

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11 Define the terms gene, chromosome and DNA.

(a) Gene. **(1)**

(b) Chromosome. **(1)**

(c) DNA. **(1)**

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12 Puberty is a period of change controlled by hormones. For each change below, classify it as Male (M), Female (F), or Both (B).

(a) Growth of pubic hair **(1)**

(b) Voice breaks and deepens **(1)**

(c) Menstruation (periods) begins **(1)**

(d) Testes begin producing sperm **(1)**

(e) Hips widen **(1)**

(f) Increased sweating and body odour **(1)**

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13 The table shows the average gestation period of two mammals. Assume 1 month = 4 weeks for this question.

Mammal	Average gestation period
Human	40 weeks
Elephant	22 months

(a) Convert the elephant's gestation period to weeks. **(2)**

.....

(b) Calculate how many more weeks the elephant's gestation period is than the human's. **(2)**

.....

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14 Describe the difference between pollination and fertilisation in a flowering plant.

(2)

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15 Characteristics can show continuous or discontinuous variation.

(a) Height **(1)**

(b) Blood group (A, B, AB or O) **(1)**

(c) Hand span **(1)**

(d) Ability to roll your tongue (yes/no) **(1)**

(e) Body mass **(1)**

(f) A student measures the height of 30 students in her class. Suggest the most appropriate type of graph to display this data and explain why. **(2)**

16 Some organisms can reproduce sexually or asexually.

(a) State one advantage of sexual reproduction compared with asexual reproduction. **(1)**

(b) State one disadvantage of sexual reproduction compared with asexual reproduction. **(1)**

(c) State one advantage of asexual reproduction compared with sexual reproduction. **(1)**

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17 Practical investigation: A student investigates germination. She places 50 cress seeds on damp cotton wool and counts how many have germinated (grown a root) each day for 7 days. Temperature and light are kept constant throughout.

(a) Identify one other variable, apart from temperature and light, that should be controlled in this investigation. **(1)**

(b) After 7 days, 42 of the 50 seeds had germinated. Calculate the percentage germination. **(2)**

.....

(c) Calculate the mean number of seeds germinating per day over the 7 days. **(2)**

.....

(d) Suggest why the student used 50 seeds rather than just 1 seed. **(1)**

.....

(e) The student repeats the whole investigation and gets 88% germination the second time. Calculate the mean percentage germination for the two repeats. **(2)**

.....

(f) Comment on how similar the two repeat results are and what this suggests about the reliability of the investigation. **(1)**

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Mark scheme · 1.4 Reproduction and Inheritance: 1-hour Pack

Question 1

sexual reproduction combines genetic material (alleles) from two parents, producing new combinations of genes, oe — **M1**

asexual reproduction involves only one parent, so offspring are genetically identical to that parent (clones), oe — **A1**

Answer: **Sexual reproduction mixes genetic material from two parents, creating new combinations of alleles in the offspring, so they vary. Asexual reproduction involves only one parent and no mixing of genes, so the offspring are genetically identical clones of that parent.**

Question 2

amniotic fluid cao (B) — **B1**

Answer: **Amniotic fluid**

Question 3

one environmental factor, e.g. diet/nutrition — **B1**

second environmental factor, e.g. exercise, climate, amount of sunlight, disease, oe — **B1**

Answer: **Environmental factors such as diet and amount of exercise can both cause variation between individuals of the same species**

Question 4

(a) select parents with the desired characteristic (highest milk yield) and breed them together — **M1**

(a) repeat over many generations, each time selecting offspring with the best milk yield, oe — **A1**

(a) Answer: **Farmers choose cows with the highest milk yield and breed them together. They repeat this over many generations, each time selecting the offspring with the best milk yield, until most of the herd shows the desired characteristic.**

(b) reduced genetic variation, making the population more vulnerable to disease or environmental change, oe — **B1**

(b) Answer: **It reduces genetic variation in the population, making it more vulnerable to disease or environmental change**

Question 5

asexual reproduction cao — **B1**

valid example, e.g. bacteria, strawberry plants (runners), spider plants, oe — **B1**

Answer: **Asexual reproduction, e.g. a strawberry plant producing new plants from runners**

Question 6

(a) 46 (23 pairs) cao — **B1**

(a) Answer: **46 (23 pairs)**

(b) 23 cao — **B1**

(b) Answer: **23**

Question 7

pollination = transfer of pollen to the stigma or another part of a flower stated — **M1**

fertilisation = fusion of the male gamete from pollen with the female gamete in the ovule (joining of nuclei) cao — **A1**

Answer: **Pollination is the transfer of pollen to a stigma; fertilisation is the fusion of the male gamete with the female gamete inside the ovule.**

Question 8

correct first two steps: 2 then 4 stated — **M1**

correct next step: 5 stated — **M1**

correct following step: 3 stated — **M1**

correct final step: 1 stated — **M1**

full correct order given as 2,4,5,3,1 cao — **A1**

Answer: **2, 4, 5, 3, 1**

Question 9

advantage: rapid production of many identical offspring or colonisation of area stated, oe — **M1**

disadvantage: low genetic variation so vulnerable to disease or environmental change, oe — **M1**

Answer: **Advantage: fast production of identical offspring useful in stable conditions. Disadvantage: low genetic variation makes the population vulnerable to disease or environmental change.**

Question 10

recognition that tall is dominant and short is recessive (T dominant, t recessive) stated — **M1**

first cross gives all tall offspring because parents were TT x tt producing only Tt — **M1**

self pollination of Tt gives genotype ratio 1 TT : 2 Tt : 1 tt which leads to 3 tall : 1 short phenotype — **M1**

conclusion linking the observed 3:1 ratio to dominant/recessive inheritance and heterozygous parents, cao — **A1**

Answer: **Tall is dominant and short is recessive. The TT x tt cross produced all Tt offspring (all tall). Self-pollinating Tt gives genotypes 1 TT : 2 Tt : 1 tt so the phenotypes are 3 tall : 1 short, supporting dominant/recessive inheritance.**

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Question 11

(a) a short section of DNA that codes for a characteristic/protein, oe **B1**

(a) Answer: **A gene is a short section of DNA that codes for a particular characteristic (or protein)**

(b) a long coiled thread of DNA made up of many genes, found in the nucleus, oe **B1**

(b) Answer: **A chromosome is a long, coiled thread of DNA made up of many genes, found in the nucleus**

(c) the molecule that carries genetic information/instructions in cells, oe **B1**

(c) Answer: **DNA is the molecule that carries the genetic instructions used in the growth and functioning of living things**

Question 12

(a) Both (B) cao **B1**

(a) Answer: **Both**

(b) Male (M) cao **B1**

(b) Answer: **Male**

(c) Female (F) cao **B1**

(c) Answer: **Female**

(d) Male (M) cao **B1**

(d) Answer: **Male**

(e) Female (F) cao **B1**

(e) Answer: **Female**

(f) Both (B) cao **B1**

(f) Answer: **Both**

Question 13

(a) 22 x 4 shown **M1**

(a) 88 weeks cao **A1**

(a) Answer: **88 weeks**

(b) 88 - 40 shown (ft from part a) **M1**

(b) 48 weeks cao ft **A1**

(b) Answer: **48 weeks**

Question 14

pollination is the transfer of pollen from the anther to the stigma oe **B1**

fertilisation is the fusion of the nucleus of a pollen (male) gamete with the nucleus of an egg (female) gamete, forming a zygote oe **B1**

Answer: **Pollination is the transfer of pollen from the anther to the stigma. Fertilisation is the fusion of the male gamete nucleus (from pollen) with the female gamete nucleus (egg cell) to form a zygote.**

Question 15

(a) continuous cao **B1**

(a) Answer: **Continuous**

(b) discontinuous cao **B1**

(b) Answer: **Discontinuous**

(c) continuous cao **B1**

(c) Answer: **Continuous**

(d) discontinuous cao **B1**

(d) Answer: **Discontinuous**

(e) continuous cao **B1**

(e) Answer: **Continuous**

(f) a histogram / bar chart with no gaps between bars, using grouped class intervals oe **B1**

(f) because the data is continuous/numerical, so results are grouped into ranges rather than separate discrete categories oe **B1**

(f) Answer: **A histogram (bars with no gaps), because height is continuous data and needs to be grouped into class intervals rather than plotted as separate categories.**

Question 16

(a) produces genetic variation in the offspring, which can help a species survive a changing environment or disease oe **B1**

(a) Answer: **It produces genetic variation among offspring, which can help a species survive if the environment changes or a new disease appears.**

(b) slower/needs two parents (a mate to be found)/uses more time and energy oe **B1**

(b) Answer: **It is slower and needs two parents, so a mate must be found.**

(c) faster; only needs one parent; many identical offspring produced quickly, useful in a stable environment oe **B1**

(c) Answer: **It is fast, needs only one parent, and produces many offspring quickly that are well suited to a stable, unchanging environment.**

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Question 17

(a) e.g. amount/volume of water, type/species of seed, size of seed used oe (any one sensible control variable) **B1**

(a) Answer: **For example, the amount of water added to the cotton wool should be kept the same.**

(b) 42 / 50 x 100 shown **M1**

(b) 84% cao **A1**

(b) Answer: **84%**

(c) 42 / 7 shown **M1**

(c) 6 seeds per day cao **A1**

(c) Answer: **6 seeds per day**

(d) gives a more reliable/representative result; reduces the effect of an anomalous (e.g. damaged or dormant) individual seed oe **B1**

(d) Answer: **Using a larger sample makes the result more reliable, as one seed failing to germinate for an unusual reason would not affect the overall percentage much.**

(e) (84 + 88) / 2 shown ft from part b **M1**

(e) 86% cao ft **A1**

(e) Answer: **86%**

(f) the two results (84% and 88%) are close/only 4 percentage points apart, suggesting the investigation is reasonably reliable oe **B1**

(f) Answer: **The two results are only 4 percentage points apart, so the investigation appears to be reasonably reliable.**

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