1.4 Reproduction and Inheritance: Test Pack

Calculator allowed · about 50 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State one reason why living organisms reproduce.

(1)

2 Name the male gamete and the female gamete in humans.

(a) Male gamete (1)

(b) Female gamete (1)

3 State whether the following are examples of genetic variation or environmental variation.
1) Eye colour in humans 2) Scars from a cut 3) Height differences between two siblings raised in different diets

(1) Eye colour (1)

(2) Scars from a cut (1)

(3) Height differences due to different diets (1)

© Revision Library | revisionlibrary.co.uk

4 A student measured the height of 6 seedlings each day for 5 days. The mean heights (in cm) are shown in the table: Day 1: 2.0, Day 2: 3.1, Day 3: 4.0, Day 4: 4.8, Day 5: 5.3.

Day	Mean height (cm)
1	2.0
2	3.1
3	4.0
4	4.8
5	5.3

(a) Calculate the average growth rate in cm per day between Day 1 and Day 5. Give your answer to two decimal places. **(3)**

.....

(b) What type of graph would be best to show this change over time? **(1)**

---

5 In pea plants, purple flower colour (allele P) is dominant over white flower colour (allele p). Two heterozygous purple-flowered plants (genotype Pp) are crossed.

(a) State the possible gametes each parent plant can produce. **(1)**

(b) Using a Punnett square (or listing all combinations), state the genotype ratio of the offspring. **(2)**

(c) State the phenotype ratio of the offspring. **(1)**

© Revision Library | revisionlibrary.co.uk

6 Continuous variation (e.g. height) and discontinuous variation (e.g. blood group) are both seen within a species. Explain the difference between them, giving one further example of each that is not given above.

(3)

---

7 A farmer selectively breeds sheep for thick wool over many generations, so most of the flock becomes closely related. Explain why this could reduce the flock's ability to survive a new disease outbreak, compared with a more genetically varied flock.

(3)

---

8 Describe two differences between sperm cells and egg cells that help their roles in reproduction.

(3)

---

9 Give the meaning of each of the following key terms.

(a) Gamete **(1)**

(b) Fertilisation **(1)**

(c) Zygote **(1)**

© Revision Library | revisionlibrary.co.uk

10 Genetic information is organised at different levels within a cell.

(a) Put these structures in order of size, starting with the largest (the cell) and ending with the smallest (a gene): chromosome, DNA molecule, gene, nucleus, cell. **(1)**

(b) Define the term 'gene'. **(1)**

© Revision Library | revisionlibrary.co.uk

11 A student records the length, in days, of her menstrual cycle over 4 months: 28, 30, 26, 32.

(a) Calculate the mean cycle length. **(2)**

(b) Calculate the range of her cycle lengths. **(2)**

---

12 Practical investigation: A student extracts DNA from kiwi fruit. She mashes the fruit, mixes it with a salt and detergent solution, filters the mixture, then slowly adds ice-cold ethanol down the side of the tube. White, thread-like strands of DNA appear at the boundary between the two liquids.

(a) State the function of the detergent in this method. **(1)**

(b) State the function of the salt in this method. **(1)**

(c) Explain why the ethanol used is ice-cold. **(2)**

(d) Explain why the ethanol is added slowly down the side of the tube rather than being mixed in. **(1)**

(e) Describe the appearance of the DNA once it has precipitated. **(1)**

(f) Explain why this method would not work to extract DNA from a metal paperclip. **(1)**

© Revision Library | revisionlibrary.co.uk

13 Identical twins Priya and Anjali have exactly the same genes. Priya has taken up competitive swimming since age 8 and has more muscle definition than Anjali, who does not exercise regularly. Both twins have the same eye colour and blood group.

(a) State one feature of the twins that is caused only by their genes (inherited variation). **(1)**

(b) State one feature of the twins that has been affected by the environment. **(1)**

(c) Explain why identical twins can look different even though they have identical genes. **(2)**

© Revision Library | revisionlibrary.co.uk

Mark scheme · 1.4 Reproduction and Inheritance: Test Pack

Question 1

to produce more organisms / to make offspring cao **B1**

Answer: **To produce more organisms (to make offspring).**

Question 2

(a) sperm (sperm cell) cao **B1**

(a) Answer: **Sperm**

(b) egg (ovum) cao **B1**

(b) Answer: **Egg (ovum)**

Question 3

(1) genetic variation cao **B1**

(1) Answer: **Genetic variation**

(2) environmental variation / acquired characteristic cao **B1**

(2) Answer: **Environmental variation**

(3) environmental variation cao **B1**

(3) Answer: **Environmental variation**

Question 4

(a) use growth = 5.3 - 2.0 = 3.3 cm and divide by time 4 days **M1**

(a) 0.825 rounded to 0.83 cm/day cao **A1**

(a) units cm/day stated **A1**

(a) Answer: **0.83 cm/day**

(b) line graph / line chart cao **B1**

(b) Answer: **Line graph**

Question 5

(a) P and p cao **B1**

(a) Answer: **P and p**

(b) combinations PP, Pp, Pp, pp shown or listed **M1**

(b) 1 PP : 2 Pp : 1 pp cao **A1**

(b) Answer: **1 PP : 2 Pp : 1 pp**

(c) 3 purple : 1 white cao **B1**

(c) Answer: **3 purple : 1 white**

Question 6

continuous variation: characteristics can take any value across a range, often with no clear categories, oe **M1**

discontinuous variation: characteristics fall into a small number of distinct categories with no in-between values, oe **M1**

one valid new example of each given, e.g. continuous - hand span/foot length; discontinuous - ability to roll tongue/earlobe attachment **A1**

Answer: **Continuous variation can take any value across a range (e.g. hand span). Discontinuous variation falls into a small number of distinct categories with no values in between (e.g. being able to roll your tongue or not).**

Question 7

selective breeding reduces genetic variation, so most sheep share very similar alleles **M1**

if a new disease appears, few or no sheep may happen to have alleles giving resistance **M1**

so a much larger proportion of the flock could become ill or die than in a genetically varied population, where some individuals are more likely to be resistant **A1**

Answer: **Selective breeding reduces genetic variation, so nearly all the sheep are genetically similar. If a new disease appears, few or none may have alleles giving resistance, so a much larger proportion of the flock could die than in a genetically varied population, where some individuals are more likely to survive and pass on resistance.**

Question 8

one difference: sperm are small and motile with a tail, egg is larger and non-motile, oe **M1**

second difference: egg contains more cytoplasm and food stores while sperm has little cytoplasm and mainly DNA, oe **M1**

both differences linked to roles: sperm swims to reach egg; egg supports early embryo, cao **A1**

Answer: **Sperm are small and have a tail to swim while eggs are large and do not swim; eggs contain more cytoplasm and food stores to support the early embryo while sperm carry mainly DNA.**

Question 9

(a) a sex cell, e.g. sperm or egg cell oe **B1**

(a) Answer: **A sex cell (a sperm cell or an egg cell).**

(b) the fusion/joining of the nuclei of a sperm cell and an egg cell oe **B1**

(b) Answer: **The joining (fusion) of the nucleus of a sperm cell with the nucleus of an egg cell.**

(c) the single cell formed immediately after fertilisation oe **B1**

(c) Answer: **The single cell formed straight after fertilisation, before it starts to divide.**

Question 10

(a) cell, nucleus, chromosome, DNA molecule, gene cao **B1**

(a) Answer: **Cell, nucleus, chromosome, DNA molecule, gene.**

(b) a section/part of a DNA molecule that codes for a particular protein/characteristic oe **B1**

(b) Answer: **A gene is a short section of DNA that codes for a particular protein, and so controls a characteristic.**

Question 11

(a) 28 + 30 + 26 + 32 = 116 (sum shown) oe **M1**

(a) 29 days cao **A1**

(a) Answer: **29 days**

(b) 32 - 26 identified as largest minus smallest **M1**

(b) 6 days cao **A1**

(b) Answer: **6 days**

© Revision Library | revisionlibrary.co.uk

Question 12

(a) breaks down/disrupts the cell (and nuclear) membranes to release the DNA oe **B1**

(a) Answer: **It breaks down the cell membranes so that the DNA is released from the cells.**

(b) helps the DNA strands clump/stick together oe **B1**

(b) Answer: **It helps the strands of DNA to clump together so they can be seen and collected.**

(c) DNA is less soluble in cold ethanol than in warm ethanol **M1**

(c) so more DNA precipitates out of solution and can be collected oe **A1**

(c) Answer: **DNA is less soluble in cold ethanol, so more of it comes out of solution (precipitates) and can be seen and collected.**

(d) keeps the ethanol as a separate layer so DNA precipitates at the boundary where it can be seen and collected; mixing would disperse it oe **B1**

(d) Answer: **It keeps the ethanol layer separate from the filtrate, so the DNA precipitates in a visible layer at the boundary instead of being mixed through and scattered.**

(e) white, stringy/thread-like strands oe **B1**

(e) Answer: **It appears as white, stringy, thread-like strands.**

(f) a metal paperclip is not made of cells and does not contain DNA oe **B1**

(f) Answer: **A metal paperclip is not made of cells, so it does not contain any DNA to extract.**

Question 13

(a) eye colour or blood group (any one) oe **B1**

(a) Answer: **Eye colour (or blood group).**

(b) muscle definition/muscle mass (due to exercise) oe **B1**

(b) Answer: **Muscle definition, caused by Priya's swimming training.**

(c) environmental/lifestyle factors, e.g. diet, exercise, sun exposure, affect the phenotype oe **B1**

(c) these differences are due to environmental variation, not genetic variation, because their genes are identical oe **B1**

(c) Answer: **Differences between the twins must be caused by environmental (lifestyle) factors such as exercise, not by genes, since their genes are identical. This is environmental variation rather than genetic variation.**

© Revision Library | revisionlibrary.co.uk