Sexual Reproduction in Flowering Plants

Standard difficulty · 20 questions · 40 marks · Time: 42 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. A typical angiosperm anther is:
(a) bilobed with two microsporangia
(b) four-lobed with eight microsporangia
(c) single-lobed with two microsporangia
(d) bilobed, with four microsporangia (tetrasporangiate)

2. In onion (2n = 16), the number of chromosomes in an aleurone cell of a cereal grain is:
(a) 24 **(b)** 8 **(c)** 16 **(d)** 32

3. Which of these is triploid (3n)?
(a) an egg cell **(b)** a pollen grain (its vegetative cell)
(c) a nucellus cell **(d)** the central cell after triple fusion

4. How many meiotic divisions are needed to form 28 seeds?
(a) 7 **(b)** 28 **(c)** 35 **(d)** 56

5. Seeds of sunflower are:
(a) formed without fertilisation
(b) albuminous (they keep the endosperm)
(c) non-albuminous (the endosperm is used up)
(d) without any embryo

6. Pollination in Hydrilla is by:
(a) bats **(b)** birds **(c)** insects **(d)** water

7. Polyembryony is seen in:
(a) citrus and mango **(b)** apple, strawberry and cashew
(c) black pepper and beet **(d)** Viola, Oxalis and Commelina

8. Assertion (A): The endosperm of rice (2n = 24) has 36 chromosomes in each cell.
Reason (R): The endosperm forms when a male gamete fuses with the egg cell.
(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Section B — Short answer — 8 × 2 = 16 marks

9. What is double fertilisation?

10. Pea has 2n = 14. How many chromosomes are there in a cell of the fruit wall, a cell of the seed coat, an antipodal cell?

11. How many meiotic divisions are needed to produce 104 seeds? How many pollen grains and how many male gametes take part?

12. A flower has 8 anthers, each with 4 microsporangia, and each microsporangium has 200 microspore mother cells. How many pollen grains can the flower produce?

13. After fertilisation, what do the nucellus (in black pepper) and the micropyle develop into?

14. What is polyembryony? Give an example.

15. A typical (Polygonum-type) embryo sac of mustard (2n = 36) has how many mitotic divisions from the functional megaspore? How many chromosomes does each synergid have?

16. Which agent pollinates flowers visited by sunbirds and hummingbirds? Give one adaptation that suits this agent.

Section C — Word problems — 4 × 4 = 16 marks

17. Describe the development of the male gametophyte (pollen grain).

18. Apple has 2n = 34. Find the number of chromosomes in an embryo cell, an endosperm cell, a microspore mother cell, a cell of the seed coat, a nucellus cell, and explain why the endosperm is triploid.

19. A plant must set 140 seeds. (a) How many microspore mother cells and megaspore mother cells must undergo meiosis? (b) How many male gametes take part in double fertilisation? (c) If each of 8 anthers has 4 microsporangia, how many microspore mother cells must each microsporangium have, at least?

20. Describe double fertilisation in mustard (2n = 36), giving the chromosome number of each nucleus involved and of each product.

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Answer key

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Q	Answer	Working
1	**(d) bilobed, with four microsporangia (tetrasporangiate)**	—
2	**(a) 24**	an aleurone cell of a cereal grain is triploid (3n): 3 × 8
3	**(d) the central cell after triple fusion**	—
4	**(c) 35**	28 megaspore mother cells give 28 functional megaspores; 28 pollen grains need 7 microspore mother cells
5	**(c) non-albuminous (the endosperm is used up)**	—
6	**(d) water**	—
7	**(a) citrus and mango**	more than one embryo in a seed
8	**(c) A is true, but R is false.**	A is true: endosperm is 3n = 3 × 12. R is false.
9	**In angiosperms, one male gamete fuses with the egg (syngamy) to form the diploid zygote, and the other fuses with the two polar nuclei (triple fusion) to form the triploid primary endosperm nucleus.**	—
10	**a cell of the fruit wall: 14; a cell of the seed coat: 14; an antipodal cell: 7**	n = 7
11	**130 meiotic divisions; 104 pollen grains; 208 male gametes (one fuses with the egg, one with the polar nuclei in each ovule)**	104 for the megaspores + 104 ÷ 4 for the pollen
12	**25,600**	8 × 4 × 200 × 4 (each mother cell gives a tetrad)
13	**the nucellus (in black pepper): the perisperm; the micropyle: a small pore in the seed coat**	—
14	**More than one embryo in a seed; citrus and mango**	—
15	**3; 18**	7-celled, 8-nucleate: 3 antipodals, 2 synergids, 1 egg, 1 central cell with 2 polar nuclei
16	**birds; colour, scent or nectar to attract the animal, and sticky pollen**	—
17	**Sporogenous cells in the microsporangium act as microspore mother cells (2n), each dividing by meiosis into a tetrad of four microspores (n). Each microspore becomes a pollen grain with a two-**	—

Q	Answer	Working
	layered wall (exine of sporopollenin with germ pores, intine). Its nucleus divides by mitosis into a large vegetative cell and a small generative cell; in some species the generative cell divides again into two male gametes before release (3-celled pollen).	
18	**an embryo cell: 34; an endosperm cell: 51; a microspore mother cell: 34; a cell of the seed coat: 34; a nucellus cell: 34. The endosperm comes from the primary endosperm nucleus, formed when one male gamete (n) fuses with the two polar nuclei (n + n)**	n = 17
19	**(a) 35 microspore mother cells and 140 megaspore mother cells; (b) 280; (c) 2**	each microspore mother cell gives 4 pollen grains; each megaspore mother cell gives 1 functional megaspore
20	**The pollen tube enters a synergid and releases two male gametes (18 each). One fuses with the egg (18) to form the zygote (36): syngamy. The other fuses with the two polar nuclei (18 + 18) to form the primary endosperm nucleus (54): triple fusion. The zygote grows into the embryo and the PEN into the endosperm**	syngamy + triple fusion = double fertilisation

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