4.6 Early development: fertilisation to gastrulation

Name: _____ Class: _____ Date: _____ **Total: 23 marks**

KEY WORDS gastrulation

Objective

Order early development and map germ layers to organ systems.

1 Key knowledge and worked examples

■ The timeline

Day 0 fertilisation → day 5 blastocyst → day 6–7 implantation → week 3 gastrulation (ectoderm/mesoderm/endoderm) → day 26–28 neural-tube closure.

■ Worked example: why folate precedes conception

Neural-tube closure usually completes 26–28 days after fertilisation, about six clinical pregnancy weeks. Pregnancy may still be unrecognised; closure is not normally earlier than the first possible positive test. This early developmental window explains why folate provision begins before conception.

2 Practice

2.1 Which germ layer makes the nervous system? [3]

2.2 When does the blastocyst implant? [3]

2.3 How do clinical pregnancy weeks differ from conception age? [3]

3 Exam-style questions

3.1 Map the three germ layers.

For each layer, list three derivative structures ✓. Explain why a week-3 insult can produce a multi-organ syndrome. [7]

3.2 Elevated maternal AFP with an open spine on ultrasound (fictional).

Identify the developmental defect and its timing. Map defect level to deficit (lumbar vs cervical). Explain the AFP finding (fetal protein leaking through the open defect). [7]

Solutions

2.1

- Ectoderm.

2.2

- Day 6–7.

2.3

- Clinical weeks count from the last menstrual period: ~2 weeks ahead of conception.

3.1

- Ectoderm: nervous system, epidermis, enamel.
- Mesoderm: muscle, bone, heart, kidney, blood.
- Endoderm: gut lining, liver, pancreas, airway lining.
- The layers are adjacent fields: one disruption hits neighbours that will become different organs.

3.2

- Neural-tube closure failure at day 26–28.
- A lumbar lesion can affect leg movement and bladder function; a higher cervical lesion can affect all four limbs. Deficits depend on the level and extent of the lesion.
- AFP leaks from fetal exposure through the open defect into maternal blood/amniotic fluid.