

本試題是否可以使用計算機: 可使用, 不可使用 (請命題老師勾選)

Answer any 4 of the following 5 questions (each 25%):

1. What is leak channel of the cell membrane? Elaborate its importance with examples.
2. What is Fick principle? With examples, explain how it is used to estimate important physiological parameters.
3. Discuss the similarities and differences between the pulmonary circulation and the systemic circulation in human. What are the consequences when functions of pulmonary circulation become partly impaired?
4. For each description of aspects of running a Marathon race (A to E), select the most appropriate option from the list of physiological mechanisms (1 to 8) and give your reasoning accordingly:
 1. brainstem respiratory control
 2. higher center respiratory control
 3. local metabolic control of vascular tone
 4. baroreceptor reflex control of vascular tone
 5. low level of sympathetic activity
 6. high level of sympathetic activity
 7. low vagal tone
 8. high vagal tone
 - A. As the run proceeds in medium temperature conditions, the runner's skin becomes markedly flushed.
 - B. Regardless of exertion levels, the runners maintain their arterial oxygen pressures close to their normal resting values.
 - C. As the race proceeds the runners show marked sweating.
 - D. Runners have high levels of blood flow through their leg muscles.
 - E. A positive correlation is found between a runner's resting heart rate and time taken to finish the race.
5. The following figures (A to D) show the results of an experiment in which the sheep fetal arterial pressure (A), heart rate (B), femoral arterial blood flow (C) and femoral vascular resistance (D) were measured before, during and after a period (marked by the rectangle) when the mother underwent a stage of hypoxia. Determine true or false for statements (a) to (e) and give your reasoning accordingly:
 - a. Maternal hypoxia causes a 45% rise in fetal blood pressure.
 - b. The fall in femoral blood flow is mainly due to the slowing of

(背面仍有題目,請繼續作答)

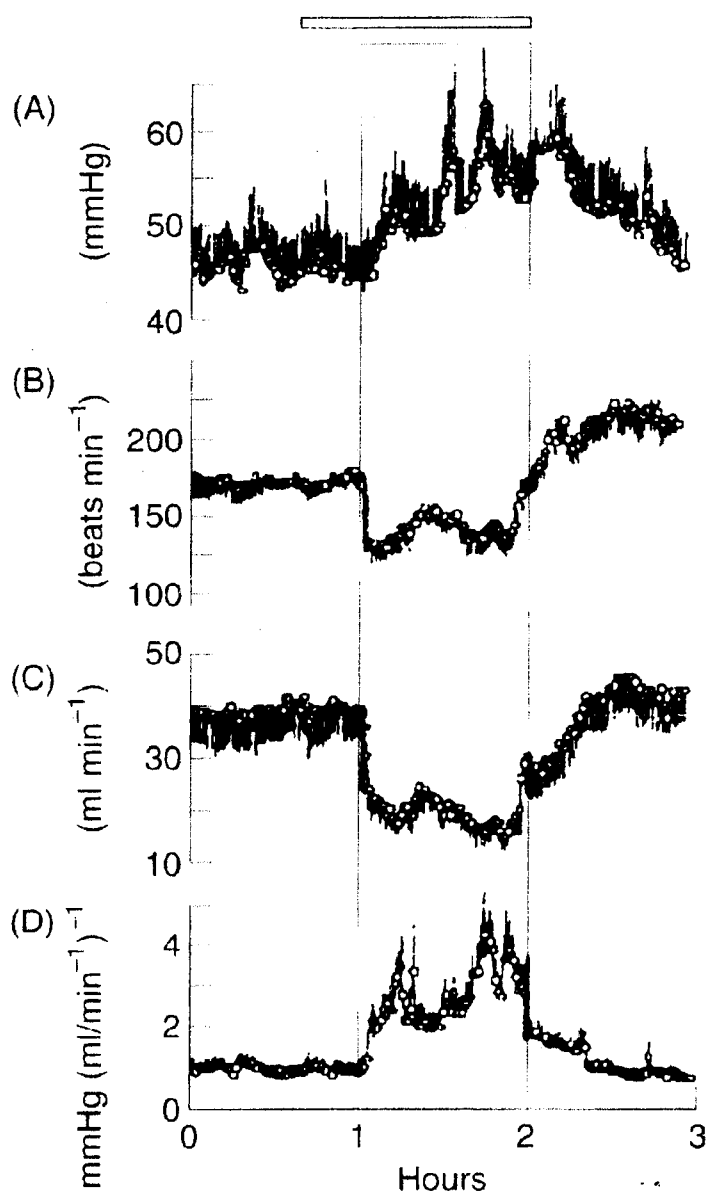
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the heart.

- c. Maternal hypoxia causes vasoconstriction in the fetal lower limbs.
- d. The fetal responses are similar to the diving reflex of seals.
- e. The responses aid survival.

(After Sanhueza *et al.* J. Physiol. (2003) 546, 899.)

----- End of questions -----