

**BUKIT PANJANG GOVERNMENT HIGH SCHOOL** 

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Preliminary Examination 2018

**SECONDARY 4 Express** 

## BIOLOGY

Paper 1

## 6093/01

Date: 17 August, 2018 Duration: 1 hr Time: 0745 – 0845 hr

## READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, class and register number on this question paper and the Optical Answer Sheet.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.

Choose the **one** you consider correct and record your choice in a **soft 2B pencil** on the separate Answer Sheet.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this question paper.

The use of an approved scientific calculator is expected, where appropriate.

| For Examiner's Use |     |  |
|--------------------|-----|--|
| Total              | /40 |  |

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This paper consists of **17** printed pages.

1 The table shows some of the structural features present or absent in four different types of cell types.

|               | cell P       | cell Q | cell R | cell S       |
|---------------|--------------|--------|--------|--------------|
| regular shape | $\checkmark$ | 1      | x      | $\checkmark$ |
| chloroplasts  | ×            | ×      | ×      | $\checkmark$ |
| nucleus       | $\checkmark$ | ×      | x      | $\checkmark$ |
| mitochondria  | $\checkmark$ | ×      | 1      | $\checkmark$ |

key √= feature present ×= feature absent

Which row correctly identifies cell types **P** to **S**?

|   | cell P         | cell <b>Q</b>  | cell R         | cell S         |
|---|----------------|----------------|----------------|----------------|
| Α | guard cell     | red blood cell | root hair cell | xylem vessel   |
| В | red blood cell | guard cell     | xylem vessel   | root hair cell |
| С | root hair cell | xylem vessel   | red blood cell | guard cell     |
| D | xylem vessel   | root hair cell | guard cell     | red blood cell |

2 The figure below shows a cell. Which of the following features in the cell shown suggest that it is an animal cell?



- (i) It has a cell wall to provide mechanical support.
- (ii) It has a flagellum to help in locomotion.
- (iii) It has mitochondria for the release of energy.
- (iv) It has a nucleus to control all its cellular activities.

| Α | (i) and (ii)   | В | (ii) only |
|---|----------------|---|-----------|
| С | (iii) and (iv) | С | (iv) only |

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**3** Excess sugars formed by photosynthesis may be converted into other carbohydrates. Which of the following is correct?

|   | storage carbohydrate | structural carbohydrate |
|---|----------------------|-------------------------|
| Α | cellulose            | starch                  |
| В | glucose              | glycogen                |
| С | starch               | cellulose               |
| D | glycogen             | glucose                 |

4 The concentrations of nitrates inside and outside four different root hair cells are shown below.

Which cell requires the most energy for the absorption of nitrates by active transport?

| cell | concentration outside the  | concentration inside the   |
|------|----------------------------|----------------------------|
|      | cell / moldm <sup>-3</sup> | cell / moldm <sup>-3</sup> |
| Α    | 9                          | 4                          |
| В    | 6                          | 9                          |
| С    | 3                          | 7                          |
| D    | 6                          | 3                          |

**5** The graph shows the changes in the mass of a piece of plant tissue in distilled water at 30 °C.



The following conclusions are made.

- (i) The plant cells are plasmolysed between 1.5 hrs to 2.5 hrs.
- (ii) The plant cells are fully turgid between 1.5 hrs to 2.5 hrs.
- (iii) The rate of osmosis is highest from 1.5 hrs to 2.5 hrs.
- (iv) There was no movement of water molecules from 1.5 hrs to 2.5 hrs.

Which conclusion(s) are correct?

- **A** (i) only
- **B** (ii) only
- **C** (ii) and (iii) only
- **D** (ii), (iii) and (iv) only
- 6 It is not advisable to add too much fertilizer around the roots of a plant. Why is this so?
  - A Active transport of mineral salts into the root hair cells would occur.
  - **B** Mineral salts would diffuse into the root hair cells.
  - **C** The root hair cells would lose water and the plant would wilt.
  - **D** Water molecules would move into the root hair cells by osmosis.

7 The pie-charts below show the composition of four foods.



Which food most quickly provides the most readily available energy?

- **8** Which of the following fluids from a healthy man would produce a positive result with the Biuret test?
  - (i) sweat
  - (ii) saliva
  - (iii) urine
  - (iv) blood plasma
  - A (i), (ii) and (iv) only
  - B (ii) and (iii) only
  - **C** (ii) and (iv) only
  - **D** all of the above
- **9** Four test tubes are set up in the following manner.

| test<br>tube | volume of<br>hydrochloric<br>acid / cm <sup>3</sup> | volume of cloudy<br>egg-white<br>suspension / cm <sup>3</sup> | volume of<br>distilled<br>water / cm <sup>3</sup> | volume of<br>boiled<br>protease / cm <sup>3</sup> | volume of<br>protease /<br>cm <sup>3</sup> |
|--------------|---|---|---|---|--|
| 1            | 5.0   | 2.0   | 1.0   | 0.0   | 0.0  |
| 2            | 5.0   | 2.0   | 0.0   | 1.0   | 0.0  |
| 3            | 5.0   | 2.0   | 0.0   | 0.0   | 1.0  |
| 4            | 0.0   | 2.0   | 0.0   | 0.0   | 1.0  |

All four test tubes are then placed in a water bath at 37 °C for 20 minutes.

What is the result?

| test tube |        |        |        |        |
|-----------|--------|--------|--------|--------|
| 1 2 3 4   |        |        | 4      |        |
| Α         | clear  | clear  | clear  | clear  |
| В         | clear  | cloudy | cloudy | clear  |
| С         | cloudy | cloudy | clear  | cloudy |
| D         | cloudy | clear  | cloudy | clear  |

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- 10 Which of the following statements is correct?
  - **A** Carbohydrates make up the main component in cell membranes.
  - **B** Fats are the main energy source.
  - **C** Proteins are important in the production of antibodies.
  - **D** Fibre is considered a nutrient.
- **11** The diagram shows part of the human alimentary canal.



Which two structures produce substances involved in the digestion of fat?

| Α | 1 and 5 | В | 2 and 3 |
|---|---------|---|---------|
| С | 3 and 4 | D | 4 and 5 |

**12** The graph below shows curve **X** which represents the activity of an enzyme at  $20 \, {}^{\circ}\text{C}$ .

Which curve represents the activity when the temperature is raised to 30  $^{\circ}$ C and with more enzymes added?



**13** The diagram below shows the arrangement of cells inside a green leaf.



Which cells contain chloroplasts?

| Α | V, W and X | В | V, W and Y |
|---|------------|---|------------|
| С | W, X and Y | D | W, X and Z |

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14 The experiment below was set up to investigate the effect of light intensity on rate of photosynthesis.



Which conclusion can be drawn from these results?

- Α Light intensity has no effect on the rate of photosynthesis.
- В Pond weed will photosynthesise at any light intensity.
- С The rate of photosynthesis decreases as the light intensity increases.
- D The rate of photosynthesis increases as the light intensity increases.
- 15 Which feature helps plants to make the most food by the process of photosynthesis?
  - broad and flat leaves Α В variegated leaves С
    - D shiny-surfaced leaves

## 16 A potometer is an apparatus which can be used to

Α measure the rate of water uptake in a shoot

spiky leaves

- В measure the rate of transpiration in a shoot
- С measure the rate of photosynthesis in a shoot
- compare the rates of transpiration in different conditions D

17 The diagram shows sections from a leaf, stem and root of a plant.



The plant was exposed to carbon dioxide containing radioactive carbon-14. In which tissues would you expect to find radioactive carbon-14 after 2 days?

- **A** 1, 3 and 6
- **B** 1, 4 and 5
- **C** 2, 3 and 6
- **D** 2, 4 and 5
- **18** Which of the following brings about blood clotting of a wound?
  - A red blood cells and components of the blood plasma
  - B platelets and components of blood plasma
  - **C** red blood cells and platelets
  - **D** platelets only

**19** Which blood vessel has the highest concentration of oxygen?

- A pulmonary vein
- **B** renal vein
- **C** hepatic vein
- D vena cava
- **20** Which of the following statements about circulation through the heart is **incorrect**?
  - **A** The pulmonary arteries carry deoxygenated blood to the lungs.
  - **B** The chambers on the right hand side of the heart contain oxygenated blood.
  - **C** The semilunar valves prevent blood flowing backwards into the ventricles.
  - **D** The pulmonary veins deliver blood to the left atrium.

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**21** The data in the following table were obtained from a person before and after a race.

10

|   | before race | after race |
|---|-------------|------------|
| rate of breathing / breaths/min                     | 15          | 30         |
| average volume of each breath / cm <sup>3</sup>     | 500         | 1500       |
| concentration of CO <sub>2</sub> in exhaled air / % | 5           | 5          |

If the person's rate and depth of breathing remained constant during the first 5 minutes of the race, what volume of carbon dioxide in cubic centimeter did he exhale during those 5 minutes?

A 150B 1875

- **C** 11250
- **D** 225000
- **22** The diagram below illustrates the changes in air pressure taking place inside the lungs during a complete cycle of breathing. Atmospheric pressure is 760mm mercury (mm Hg).



Air will rush into the lungs

- A between zero and 1.5 seconds
- **B** between 1<sup>st</sup> and 2<sup>nd</sup> second
- **C** between 2<sup>nd</sup> and 3<sup>rd</sup> second
- **D** at the 4<sup>th</sup> second only

**23** Three jars were set up as shown.



How will the concentration of dissolved carbon dioxide in the water of each jar change?

|   | jar 1     | jar 2     | jar 3     |
|---|-----------|-----------|-----------|
| Α | decreases | increases | no change |
| В | increases | increases | increases |
| С | increases | no change | decreases |
| D | no change | decrease  | decreases |

- 24 Which of the following is an example of excretion?
  - A release of adrenaline from the adrenal glands
  - **B** release of sweat from the sweat glands
  - **C** removal of carbon dioxide from the lungs
  - **D** removal of faeces from the alimentary canal
- 25 Which of the following is **not** true of the body's capillary network?
  - A It consists of many arteries and veins in all body parts.
  - **B** It forms a dense network that serves all living cells.
  - **C** The walls of its vessels are only one-celled thick.
  - **D** The combined surface area of its vessels is enormous.

- 26 Which of the following substances do **not** pass from the blood to the dialysis fluid in a kidney dialysis machine?
  - (i) white blood cells
  - (ii) proteins
  - (iii) urea
  - (iv) glucose

 A
 (i) and (iv)
 B
 (ii) and (iii)

 C
 (iii) and (iv)
 D
 (i) and (ii)

- 27 Which statement describes an aspect of the role of the anti-diuretic hormone?
  - **A** It is antagonistic to insulin.
  - **B** It controls the rate of secretion of water in the sweat.
  - **C** It regulates osmotic concentration of body fluids.
  - **D** Its absence causes diabetes mellitus.
- 28 What does negative feedback involve?
  - **A** Corrective mechanisms following from changes in internal environment bringing levels back to normal.
  - **B** Differential survival of those organisms best fitted to the environment.
  - **C** In economically important plants, crossing offspring with their parents to increase parental genetic contribution.
  - **D** Responses to changes in the external environment that increase the chances of survival.
- **29** A girl is reading a book on a bench and looks up to watch a ship on the horizon. Which of the following best describes the changes in her eyes?

|   | ciliary muscles suspensory ligaments |            |  |
|---|--------------------------------------|------------|--|
| Α | relax                                | slacken    |  |
| В | relax tighten                        |            |  |
| С | contract                             | ct slacken |  |
| D | contract                             | tighten    |  |

- **30** A small wild animal was brought into the laboratory. Every time it was handled, the rate of its heartbeat increased considerably. Which of the following best explains this observation?
  - **A** Adrenaline was secreted from the adrenal gland.
  - **B** Insulin was secreted from the pancreas.
  - **C** Testosterone was secreted from the testis.
  - **D** Thyroxine was secreted from the thyroid glands.
- **31** The diagram shows two different flowers from two different plants of the same species. Which letter represents cross-pollination?



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**32** The diagram shows the relationship between the blood systems of the foetus and that of the mother.



Identify the blood vessels and their contents.

|   | umbilical artery | umbilical vein | rich in waste | rich in food and |
|---|------------------|----------------|---------------|------------------|
|   |                  |                | products      | oxygen           |
| Α | Y                | Z              | Z             | Y                |
| В | Y                | Z              | Y             | Z                |
| С | Z                | Y              | Z             | Y                |
| D | Z                | Y              | Y             | Z                |

33 There are 20 chromosomes in each leaf cell of a maize plant. How many homologous pairs of chromosomes are there in the male nucleus of a pollen grain of maize?

| Α | 0  | В | 5  |
|---|----|---|----|
| С | 10 | D | 20 |

- **34** A person with Down syndrome usually has \_\_\_\_\_ copies of chromosome 21.
  - A
     0
     B
     1

     C
     2
     D
     3

- 35 What is a correct function of DNA?
  - **A** It is converted into protein by enzymes.
  - **B** It controls the uptake of proteins from the gut.
  - **C** It controls the manufacture of proteins.
  - **D** It regulates the conversion of carbohydrate into protein.
- **36** Within a group of humans, which one of the following is an example of continuous variation?
  - **A** the occurrence of two sexes
  - **B** the ability to roll tongue
  - **C** the different blood groups
  - **D** the different skin colours
- **37** The inheritance patterns of four conditions are shown. Which inheritance pattern proves that the condition is **not** caused by a recessive allele?



38 In pea plants, the allele for red flowers is dominant over the allele for white flowers. In an experiment, plants with red flowers are cross-pollinated with plants with white flowers. The cross resulted in 123 plants with red flowers and 125 plants with white flowers. Which of the following can be concluded about the parent plants' genotypes?

|                   | plant with red flowers plant with white flow |              |
|-------------------|--|--------------|
| A homozygous homo |  | homozygous   |
| B homozygous      |  | heterozygous |
| С                 | C heterozygous homozygous                    |              |
| D                 | heterozygous                                 | heterozygous |

**39** The concentrations of a persistent pesticide in the tissues of four organisms were measured. These organisms are part of a food web. The table below shows the results.

| organism | concentrations of insecticides |  |
|----------|--------------------------------|--|
|          | (parts per million)            |  |
| Р        | 120                            |  |
| Q        | 1800                           |  |
| R        | 1400                           |  |
| S        | 410                            |  |

Which of the following shows the energy flow between these organisms?

- $A \qquad P \rightarrow S \rightarrow R \rightarrow Q$
- $\mathsf{B} \qquad \mathsf{P} \rightarrow \mathsf{R} \rightarrow \mathsf{S} \rightarrow \mathsf{Q}$
- $\mathbf{C} \qquad \mathbf{Q} \rightarrow \mathbf{P} \text{ and } \mathbf{S} \rightarrow \mathbf{R}$
- $\mathbf{D} \qquad \mathbf{Q} \rightarrow \mathbf{R} \text{ and } \mathbf{S} \rightarrow \mathbf{P}$

**40** The diagram below shows how nutrients can be recycled in an aquatic environment.



Which of the following matches of processes is correct?

|   | Μ              | Ν         | 0             | Р              |
|---|----------------|-----------|---------------|----------------|
| Α | photosynthesis | predation | respiration   | decomposition  |
| В | feeding        | excretion | decomposition | death          |
| С | feeding        | predation | death         | decomposition  |
| D | predation      | feeding   | respiration   | photosynthesis |

**END OF PAPER**