1.1 Cells and Organisation: 1-hour Pack

Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State the main function of white blood cells.

(a) State the function and give one way white blood cells do this. **(2)**

2 The body needs to transport oxygen and nutrients to all its cells.

(a) Name the organ system. **(1)**

(b) Give two main components of the blood that help transport oxygen and nutrients. **(2)**

3 The body contains three types of muscle tissue: skeletal, cardiac and smooth.

(a) State where skeletal muscle is found and give its general function. **(1)**

(b) State where cardiac muscle is found. **(1)**

(c) State one way smooth muscle differs from skeletal muscle in terms of control. **(1)**

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4 Which of these best defines an organ system?

- ☐ A) A group of similar cells working together
- ☐ B) A structure made of two or more tissues working together for a specific function
- ☐ C) A group of organs working together to perform a major body function
- ☐ D) The basic unit of life

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5 The underside of a leaf contains many small pores called stomata, each surrounded by a pair of guard cells.

(a) State the function of stomata. **(1)**

(b) Explain how guard cells control the size of the stomatal pore. **(2)**

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6 Stem cells in red bone marrow continually divide and differentiate to produce new blood cells.

(a) State what is meant by the term 'differentiate'. **(1)**

(b) Bone marrow stem cells can differentiate into red blood cells, white blood cells or platelets. Explain why the body needs a continuous supply of new blood cells from stem cells. **(2)**

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7 Fungal cells, like plant cells, have a cell wall, but the cell wall of a fungal cell is made of a different substance.

(a) State what a plant cell wall is made of. **(1)**

(b) State what a fungal cell wall is made of. **(1)**

(c) Fungal cells do not contain chloroplasts. State what this tells you about how fungi obtain their food, compared with plants. **(1)**

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8 An egg cell (ovum) is a specialised cell adapted for reproduction.

(a) Describe one adaptation of an egg cell relating to energy or nutrients, and explain its function. **(2)**

(b) After fertilisation by one sperm cell, the egg cell's membrane changes to prevent any further sperm cells from entering. Explain why this is important. **(2)**

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9 Blood contains red blood cells, white blood cells, platelets and plasma.

(a) State the function of platelets in the blood. **(2)**

(b) State two other reasons why forming a clot quickly at a wound is important for the body. **(2)**

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10 A student calibrates the eyepiece graticule on her microscope using a stage micrometre (a slide with a scale of known real size). At a particular magnification, she finds that 40 small divisions on the eyepiece graticule line up exactly with a length of 500 micrometres on the stage micrometre.

(a) Calculate the real length represented by 1 eyepiece graticule division at this magnification, in micrometres. **(2)**

.....

(b) The student then measures a plant cell using the same eyepiece graticule and finds it spans 8 graticule divisions. Calculate the real length of the cell, in micrometres. **(2)**

.....

(c) State why the student must recalibrate the eyepiece graticule if she changes to a different objective lens (a different magnification). **(1)**

.....

11 Plant cells contain some structures not found in animal cells.

(a) State the function of the cell wall. **(1)**

.....

(b) State the function of the chloroplast. **(1)**

.....

(c) State the function of the permanent vacuole. **(1)**

.....

(d) State one reason why plant cells need a cell wall but animal cells do not. **(1)**

.....

.....

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12 Amoeba is an organism made of only one cell. Explain how a single cell is able to carry out all of the life processes needed for survival.

(3)

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13 A student is preparing a slide of onion cells to observe under a microscope. Below are five steps, labelled A to E, in the wrong order. Write down the letters in a correct order in which the student should carry out the steps.

A: Add a drop of iodine solution to the microscope slide to stain the cells before lowering the coverslip.

B: Peel a thin layer of epidermis (skin) from the inside of an onion.

C: Lower the coverslip onto the slide slowly using a mounted needle, avoiding air bubbles.

D: Place the piece of onion epidermis flat onto a microscope slide.

E: View the slide under the microscope, starting with the lowest-power objective lens.

(4)

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14 Diffusion is important in gas exchange.

(a) Define the term "diffusion". **(2)**

(b) Give a reason why oxygen moves from the air in the alveoli into the blood. **(1)**

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15 Preparing and viewing a slide correctly requires good technique and safety awareness.

(a) Give one reason why a mounted needle, rather than fingers, is used to lower the coverslip onto the slide. **(1)**

(b) Give one safety precaution that should be followed when using iodine solution. **(1)**

(c) Explain why a student should start looking at a slide using the lowest-power objective lens before switching to a higher power. **(2)**

16 Stem cells are undifferentiated cells that can develop into different specialised cell types.

(a) State what is meant by a "stem cell". **(1)**

(b) Describe one way in which stem cells could be used to help treat a human disorder. **(1)**

(c) Give one ethical concern that some people have about using embryonic stem cells in medical research. **(2)**

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Mark scheme · 1.1 Cells and Organisation: 1-hour Pack

Question 1

(a) defence against infection or fight pathogens cao **B1**

(a) gives one way they do this: produce antibodies, engulf (ingest) microbes or produce antitoxins, oe **B1**

(a) Answer: **To defend the body against infection by attacking or destroying pathogens, for example by producing antibodies or engulfing microbes.**

Question 2

(a) circulatory system (accept cardiovascular system) **B1**

(a) Answer: **Circulatory system**

(b) red blood cells for oxygen transport **B1**

(b) plasma (blood plasma) for carrying dissolved nutrients; do not accept platelets **B1**

(b) Answer: **Red blood cells and plasma**

Question 3

(a) attached to bones (by tendons); contracts to move the skeleton/body, oe **B1**

(a) Answer: **Attached to bones; contracts to move the body.**

(b) in the walls of the heart cao **B1**

(b) Answer: **In the walls of the heart.**

(c) smooth muscle contracts involuntarily/automatically (e.g. in the walls of the gut or blood vessels), whereas skeletal muscle is under voluntary control, oe **B1**

(c) Answer: **Smooth muscle works involuntarily (automatically), unlike skeletal muscle, which is under voluntary control.**

Question 4

C cao **B1**

Answer: **C) A group of organs working together to perform a major body function**

Question 5

(a) allow gases (carbon dioxide and oxygen) to move into and out of the leaf, and allow water vapour to escape (transpiration), oe **B1**

(a) Answer: **Allow gas exchange (carbon dioxide and oxygen) and water vapour loss.**

(b) guard cells change shape as they gain or lose water, becoming more curved (turgid) when full of water and opening the pore, or straighter (flaccid) when short of water, closing the pore **M1**

(b) this allows the plant to control gas exchange and reduce water loss when needed, e.g. by closing stomata to conserve water, oe **A1**

(b) Answer: **Guard cells become curved and open the pore when full of water, or straighter and close the pore when short of water, allowing the plant to control gas exchange and water loss.**

Question 6

(a) a cell becomes specialised, changing to develop specific structures/functions for a particular job, oe **B1**

(a) Answer: **A cell becomes specialised for a particular job.**

(b) blood cells have a limited lifespan and are constantly being lost or worn out **M1**

(b) so new cells must continually be produced by stem cells dividing and differentiating to replace them, oe **A1**

(b) Answer: **Blood cells wear out and are lost over time, so stem cells must keep dividing and differentiating to replace them.**

Question 7

(a) cellulose cao **B1**

(a) Answer: **Cellulose.**

(b) chitin cao **B1**

(b) Answer: **Chitin.**

(c) fungi cannot photosynthesise/make their own food from light, so they must obtain nutrients from their surroundings (e.g. from dead or living organisms), unlike plants, oe **B1**

(c) Answer: **Fungi cannot photosynthesise, so unlike plants they must absorb nutrients from their surroundings.**

Question 8

(a) the cytoplasm contains a store of nutrients (food reserves) **M1**

(a) which provides energy and raw materials for the early stages of development if the egg is fertilised, oe **A1**

(a) Answer: **The cytoplasm contains a store of nutrients, providing energy for early development after fertilisation.**

(b) prevents more than one sperm cell fertilising the same egg **M1**

(b) this ensures the resulting embryo has the correct (normal) number of chromosomes, which is essential for normal development, oe **A1**

(b) Answer: **It stops more than one sperm fertilising the egg, ensuring the embryo has the correct number of chromosomes for normal development.**

Question 9

(a) they help blood to clot at a wound/cut **B1**

(a) this seals the wound to stop further blood loss, oe **B1**

(a) Answer: **Platelets help blood clot at a wound, sealing it to stop further blood loss.**

(b) prevents too much blood being lost, which could cause a drop in blood pressure / not enough oxygen reaching the body's cells, oe **M1**

(b) forms a barrier (a scab) that helps prevent pathogens/microorganisms entering the body through the open wound, oe **A1**

(b) Answer: **Clotting stops the body losing too much blood (and blood pressure dropping), and forms a barrier that helps stop pathogens entering through the wound.**

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Question 10

(a) 500 / 40 **M1**

(a) 12.5 micrometres cao **A1**

(a) Answer: **12.5 micrometres**

(b) 8 x 12.5, ft from (a) **M1**

(b) 100 micrometres cao **A1**

(b) Answer: **100 micrometres**

(c) the real length represented by one graticule division changes with magnification, so the calibration is only valid at the magnification it was carried out at, oe **B1**

(c) Answer: **The real length per graticule division depends on the magnification used, so calibration is only valid for that magnification.**

Question 11

(a) made of cellulose; supports/strengthens the cell and maintains its shape, oe **B1**

(a) Answer: **Supports and strengthens the cell, keeping its shape.**

(b) absorbs light energy (contains chlorophyll) for photosynthesis, oe **B1**

(b) Answer: **Absorbs light for photosynthesis.**

(c) contains cell sap; helps keep the cell rigid/turgid (support), oe **B1**

(c) Answer: **Contains cell sap and keeps the cell turgid/rigid.**

(d) plants have no bony skeleton, so the cell wall gives structural support/strength (allows the plant to stand upright); OR the cell wall stops the cell bursting as water enters by osmosis, oe **B1**

(d) Answer: **Plants have no skeleton, so the cell wall gives the plant support and stops cells bursting.**

Question 12

any one valid structure-function link: cell membrane controls substances entering/leaving (e.g. oxygen entering and wastes leaving); pseudopodia change shape to move towards and engulf food; food vacuoles digest food; contractile vacuole removes excess water; mitochondria carry out aerobic respiration to release energy; cytoplasm supports metabolic reactions; nucleus controls cell activities, oe **B1**

a second, different valid structure-function link from the same list or an equivalent explanation **B1**

a third, different valid structure-function link; award any three, without requiring a particular structure **B1**

Answer: **The cell membrane controls substances entering and leaving, allowing oxygen uptake and waste removal. Pseudopodia allow the cell to move towards and engulf food. A contractile vacuole removes excess water. These structures work within the one cell; other valid structure-function links are accepted.**

Question 13

B before D: peel the epidermis before placing it on the slide **B1**

D before C: place the epidermis before lowering the coverslip **B1**

A before C: add iodine to the slide before lowering the coverslip, as specified **B1**

C before E: lower the coverslip before viewing; award each ordering point independently when both letters occur exactly once. Full marks for any order satisfying all four points with all five letters exactly once: A, B, D, C, E; B, A, D, C, E; or B, D, A, C, E. **B1**

Answer: **A, B, D, C, E; B, A, D, C, E; or B, D, A, C, E.**

Question 14

(a) net movement of particles (accept overall movement of particles) **B1**

(a) from a region of higher concentration to a region of lower concentration (down a concentration gradient), oe; award direction only once **B1**

(a) Answer: **Net movement of particles from a region of high concentration to a region of low concentration.**

(b) the concentration of oxygen is higher in the alveolar air than in the blood, so oxygen diffuses down its concentration gradient into the blood, oe **B1**

(b) Answer: **Oxygen concentration is higher in the alveoli than in the blood, so it diffuses in.**

Question 15

(a) to avoid trapping air bubbles under the coverslip (which would block the view of the cells); OR to avoid pushing too hard and cracking the slide/coverslip, oe **B1**

(a) Answer: **To avoid trapping air bubbles under the coverslip.**

(b) iodine is an irritant/stains skin, so avoid contact with skin and eyes; OR wear eye protection; OR wash hands after use, oe **B1**

(b) Answer: **Avoid contact with skin and eyes (wear eye protection).**

(c) the lowest power gives the widest field of view, making it easier to locate the specimen/cells **M1**

(c) once located, the student can switch to a higher power for a more detailed/magnified view of a smaller area, ft **M1**

(c) Answer: **Low power gives a wide field of view to find the specimen, then higher power gives more detail.**

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Question 16

(a) an undifferentiated (unspecialised) cell that can divide to produce more cells and can become different types of specialised cell, oe **B1**

(a) Answer: **An unspecialised cell that can divide and become different specialised cell types.**

(b) e.g. bone marrow stem cells can be used to produce new blood cells for a patient with a blood disorder such as leukaemia; OR stem cells could be grown into replacement cells/tissues for a damaged organ, oe **B1**

(b) Answer: **Bone marrow stem cells can produce new blood cells for patients with blood disorders.**

(c) obtaining embryonic stem cells usually destroys the embryo **M1**

(c) some people believe the embryo is/could become a human life, so consider this morally wrong, ft; (accept alternative developed points about consent or when life begins) **M1**

(c) Answer: **Taking embryonic stem cells destroys the embryo, which some consider a potential human life.**

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