Cell Biology part 19 AQA Combined Science

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Name: _____

Class: _____

Date: _____

Time: **65 minutes**

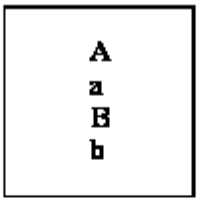
Marks: **54 marks**

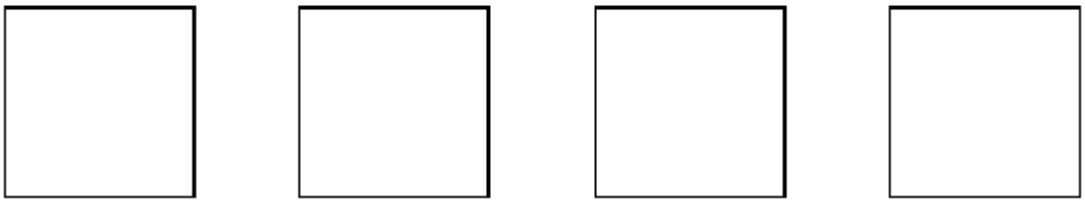
Comments:

Q1.

In the cell shown in the diagram as a box, one chromosome pair has alleles **Aa**. The other chromosome pair has alleles **Bb**. The cell undergoes meiosis.

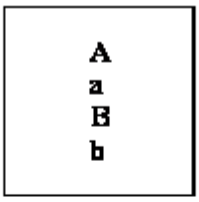
(a) Complete the diagram of the four gametes to show the independent assortment, or reassortment, of genetic material during meiosis.

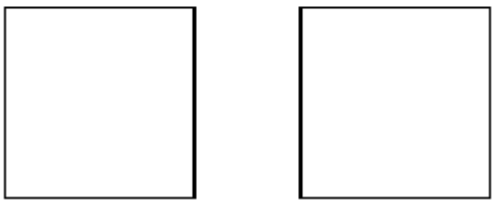




(2)

(b) If the cell undergoes mitosis instead of meiosis, draw the two daughter cells which result to show the chromosomes in each.





(2)

(c) State the number of chromosomes in:

(i) a normal human cell;

_____

(1)

(ii) a human gamete;

_____

(1)

(iii) the daughter cell from mitosis of a human cell.

_____

(1)

(Total 7 marks)

Q2.

Oxygen from our lungs is carried, by our blood, to cells in our body where aerobic respiration takes place.

(i) Complete the **two** spaces to balance the chemical reaction for aerobic respiration.

$$C_6H_{12}O_6 + 6O_2 \rightarrow \_\_\_\_ CO_2 + \_\_\_\_ H_2O$$

(1)

(ii) Name the substance with the formula $C_6H_{12}O_6$.

_____

(1)

(iii) Name the structures in the cytoplasm of our cells where aerobic respiration takes place.

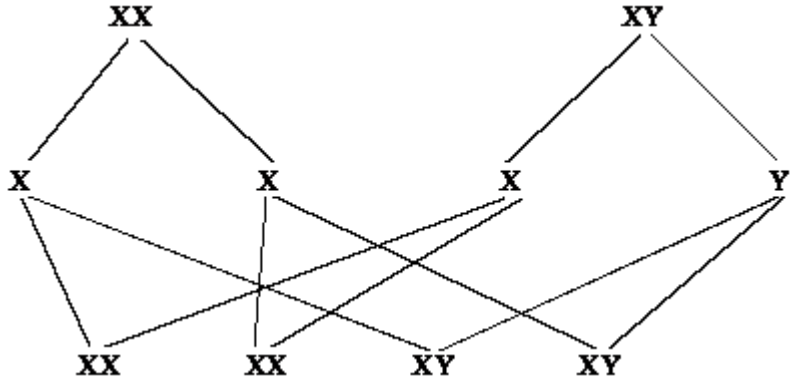
_____

(1)

(Total 3 marks)

Q3.

The genetic diagram shows how the chromosomes divide and combine in human reproduction.



(a) Draw circles around the symbols for the **two** male gametes.

(2)

(b) State the chance of a child being a girl.

_____

(1)

(c) (i) How many pairs of chromosomes are there in a human body cell?

_____

(1)

(ii) How many chromosomes are there in a human egg cell?

_____

(1)

(d) Chromosomes contain genes. From what substance are genes made?

_____

(1)

(e) In the process of mitosis, how do the number of chromosomes in the daughter cells compare to that in the original cell?

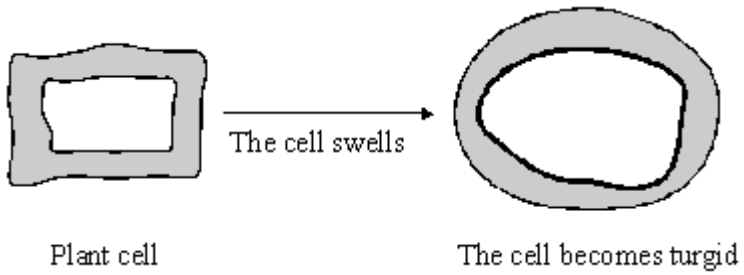
_____

(1)

(Total 7 marks)

Q4.

(a) The diagrams show what happens to the shape of a plant cell placed in distilled water.



(i) Explain why the cell swells and becomes turgid. Name the process involved.

_____

_____

_____

(2)

(ii) Give **one** feature of the cell wall which allows the cell to become turgid.

_____

(1)

(b) Describe the change which will occur if a piece of peeled potato is placed in a concentrated sugar solution and explain why this change occurs.

(3)

(Total 6 marks)

Q5.

Plant roots obtain some of their mineral salts from the soil by active transport.

What is involved in *active transport*?

(Total 4 marks)

Q6.

(a) How many pairs of chromosomes are there in a body cell of a human baby?

_____

(1)

(b) Place the following in order of size, **starting with the smallest,** by writing numbers **1** – **4** in the boxes underneath the words.

chromosome	nucleus	gene	cell
☐	☐	☐	☐

(1)

(c) For a baby to grow, its cells must develop in a number of ways.

Explain how each of the following is part of the growth process of a baby.

(i) Cell enlargement

_____

(1)

(ii) The process of cell division by mitosis

_____

_____

_____

_____

_____

_____

(3)

(d) Why is cell specialisation (differentiation) important for the development and growth of a healthy baby from a fertilised egg?

_____

_____

(2)

(Total 8 marks)

Q7.

Plants need chemical energy for respiration and for active transport.

(i) Write a balanced chemical equation which represents the process of respiration in plants.

_____

(2)

(ii) Describe the process of active transport in the root hair cells of plants.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 5 marks)

Q8.

As they go higher up a mountain, mountaineers take less oxygen into their bodies with each breath, as shown in the table below.

		MILLIGRAMS OF OXYGEN INTO **BLOOD** WITH EACH NORMAL BREATH	
HEIGHT	MILLIGRAMS OF OXYGEN TAKEN INTO **LUNGS** WITH EACH NORMAL BREATH	AT FIRST	AFTER STAYING AT 4500 METRES FOR TWO WEEKS
sea-level	300	60	90
1500 metres	250	50	
3000 metres	200	40	
4500 metres	150	30	45

(a) (i) How does the amount of oxygen taken into the blood with each breath vary with the amount of oxygen breathed into the lungs with each breath?

_____

(2)

(ii) Use the idea of diffusion to explain why the amount of oxygen taken into the blood varies in this way.

_____

_____

(1)

(b) (i) How does staying at an altitude of 4500 metres for two weeks affect the mountaineers?

_____

(2)

(ii) Suggest an explanation for this.

_____

_____

(1)

(iii) Add the two missing figures to the right-hand column of the table.

(2)

(Total 8 marks)

Q1.

(a) **A A a a**

Aa allele correctly separated

1

B b B b

Bb allele arranged to form four different pairings
all four pairings must be correct for the second mark

1

(b) **A** **A**

the two cells the same as the parent cell

a **a**

B **B**

b **b**

1 mark for each cell

2

(c) (i) 46

accept 23 pairs

1

(ii) 23

accept half if c(i)

1

(iii) 46

accept save as c(i)

1

[7]

Q2.

(i) 6 in both spaces

do not credit if any formula has been altered

1

(ii) glucose

*allow fructose **or** dextrose*

1

(iii) mitochondria

accept organelles

1

[3]

Q3.

(a) circles round right hand **X** and **Y** gametes

*put two ticks **or** crosses by the circles*

2

(b) 50:50 **or** 1:1 **or** 50% **or** 0.5 **or** ½ equal **or** evens

credit even

*do not accept 2:1 **or** 50 / 50*

1

(c) (i) 23

1

(ii) 23

credit the same as the one above to be marked consequential

1

(d) DNA

do not accept nucleic acid

1

(e) same

1

[7]

Q4.

(a) (i) water (molecules) enter(s) (the cell)

***or** water (molecules) pass(es) through the (semi-permeable) cell membrane*

1

by osmosis

***or** because the concentration of water is greater outside (the cell than inside it the vacuole)*

accept because of the concentration gradient provided there is no contradiction

1

(ii) any **one** from

(it is) elastic

(it is) strong

(it is fully) permeable (to water)

***or** water can pass through it*

do not credit semi-permeable

do not credit cell membrane is semi-permeable

1

(b) (the piece of) potato shrinks

***or** loses its turgor*

***or** becomes flabby*

or *becomes flaccid*

or *plasmolysis occur*

or *cytoplasm pulls away from the cell wall*

(because) concentration of sugar

or *because concentration of water*

1

(solution) is greater than concentration inside the cell / vacuole

inside the cell / vacuole is greater than concentration (of water) outside

1

water is drawn out of the cell

1

[6]

Q5.

any **four** from

molecules / ions

do not credit mineral salts

move(d) through / across the cell

wall / membrane

against (a / the) concentration

gradient

by a series of chemical

reactions

(because) diffusion cannot occur

energy (required)

(supplied by) respiration

oxygen required for respiration (to occur)

[4]

Q6.

(a) 23

1

(b) chromosome nucleus gene cell
2 3 1 4

1

(c) (i) any **one** from

(cells which are bigger) take up more space

(cells) have to get bigger **or** mature to divide

1

(ii) chromosomes duplicate **or**
make exact copies of self

accept forms pairs of chromatids

1

nuclei divide

*accept chromatids **or***
chromosomes separate

1

identical (daughter) cells formed

accept for example, skin cells make
*more skin cells **or** cells are clones*

1

(d) any **two** from

Differentiation mark
babies need **or** are made of different types of cells **or** cells that have different functions

accept different cells are needed
for different organs

Division or specialisation mark
as fertilised egg starts to divide each cell specialises to form a part of the body

accept specialised cells make
different parts of the body

Growth mark
specialised cells undergo mitosis to grow further cells

*accept cells divide **or** reproduce*
to form identical cells

2

[8]

Q7.

(i) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

energy is neutral

1

formulae all correct

with no omissions / deletions

correctly balanced

credit 1 mark if the answer is the exact
reverse of an incorrect answer for (a)

1

(ii) and **three** from

take up of (soluble) substances / ions against the concentration gradient

***or** when the concentration (of the*

substance / ions) is greater inside the cell / cytoplasm than outside it

through the (semi-permeable) (cell) membrane energy from mitochondria

***or** energy from respiration*
not just energy

3

[5]

Q8.

(a) (i) increasing one increases the other

gains 1 mark

but
they increase in proportion/ 1/5 taken in at first / 3/10 taken in after 2 weeks

gains 2 marks

2

(ii) *idea that* more/faster diffusion with higher concentration

for 1 mark

or
with more oxygen particles/molecules (in same space)

1

(b) (i) can take more oxygen from (the same) air/changes from 30 to 45/increases by 15

gains 1 mark

but
takes 50% more or 1.5 times as much

gains 2 marks

or
increases by 15 mg breath

2

(ii) more red blood cells develop
or
more haemoglobin in the blood
(not just 'acclimatises')

for 1 mark

1

(iii) 75
60

each for 1 mark

2

[8]