AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.1.2 CELL DIVISION

SCORE	PERCENTAGE
/55	%

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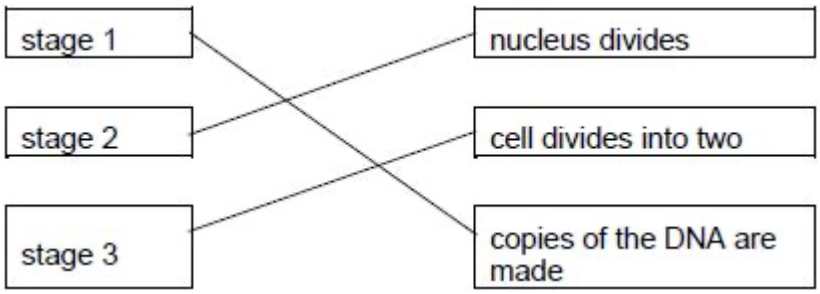
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Q1.

(a)



*allow **1** mark for 1 or 2 correct*

credit can be given where students have matched the boxes correctly, for example numbering the boxes

2

(b) 6 picograms

1

(c) meristem cells in plants can differentiate throughout the life of the plant

1

(d) any **two** from:

- may cure / treat diseases
  or
  cure medical conditions
  or
  produce replacement cells / tissues / organs

  allow example e.g. diabetes / paralysis
  allow cells can be stored for future use
  ignore used in medical treatments
  ignore patient makes / grows cells / tissues / organs

- cells unlikely to be **rejected** by patient)

  ignore same genetic information

- cells / tissues of any type can be produced

  ignore differentiated into most types of cells

- many cells produced

- cells produced could be used for research

- would reduce waiting time for transplants

2

ignore references to cost
ignore all reference to producing babies / IVF

(e) any **two** from:

- (potential) life is killed / destroyed

  allow embryo is killed

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ignore embryo is destroyed
ignore embryo is a life / becomes a baby

- shortage of donors / eggs
- egg donation / collection has risks
- do not yet know risks / side effects of the procedure on the patient

  ignore long term effects are not well understood
  allow may cause tumours / cancer
- may transfer (viral) infection
- poor success rate

  allow in terms of viable egg / embryo / cell / tissue / organ production

2

ignore references to cost
ignore unethical unqualified
Ignore reference to religion / beliefs

[8]

Q2.

(a) any **one** from:

- meristem(s)
- **tip** of shoot

  ignore stem and embryo
- **tip** of root

1

(b) to produce large numbers of identical plants

1

(c) 6×10^{-12} (grams)

1

(d) $\frac{28}{360} \times 15$

or

1.166666666(r)

allow $\frac{7}{90} \times 15$

allow correct rounding
allow 1.16

1

1.17 (hours)

*allow **1** mark for 1 hour 10 minutes **or** 1 and 1/6 hours **or** 70 minutes **only** if units given*

1

*an answer of 1.17 (hours) scores **2** marks*

(e) **stage 1**

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cell growth
or
increase in number of organelles

allow increase in named organelle e.g. ribosomes / mitochondria

1

DNA replicates*
or
two copies of each chromosome form*

**allow DNA duplicates / doubles*
**ignore genetic information replicates*
if this statement given as part of stage 2 allow **max 4 marks*

1

stage 2 / mitosis
one set of chromosomes moves to each end of cell

allow chromosomes separate or are pulled apart

1

nucleus divides

allow nucleus splits into two

1

stage 3
cytoplasm / cell membrane divides to form two (genetically) identical cells

allow cytokinesis

1

***max 4** if correct sequence but no reference to stage numbers*

***max 4** marks if no stage numbers given*
ignore names of phases

marks can be awarded for labelled diagrams

(f) any **two** from:

advantages:

- may be used to cure / treat (current / future) diseases
  or
  cure medical conditions
  or
  produce replacement cells / tissues / organs

  allow example e.g. diabetes / paralysis
  ignore used for medical treatments

- cells / tissues of any type could be produced

  allow cells differentiate into many types

- cells / tissues of any type could be produced

  ignore identical cells are produced unqualified

- many cells produced
- cells produced could be used for research
- would reduce waiting time for organ transplants

2

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any **two** from:

ignore references to cost
ignore unethical unqualified
ignore references to religion / beliefs

disadvantages:

- potential life is killed / destroyed

  allow embryo is destroyed
  ignore cells destroyed or wasted

- shortage of donors / eggs
- egg donation / collection has risks
- do not yet know risks /side effects of the procedure on the patient

  allow may cause tumours / cancer

- may transfer (viral) infection
- poor success rate to produce viable eggs / embryo

2

ignore references to cost

[14]

Q3.

(a) mitochondria

1

ribosomes

1

(b) to repair the muscles

1

(c) $\frac{5}{100} \times 21$

allow $\frac{1}{20} \times 21$

1

1.05 (hours)

*allow for **2** marks 1 hour 3 minutes **or** 1:03 (hours)*

1

*an answer of 1.05 hours scores **2** marks*

(d) $\frac{7}{20} \times 100$

allow 5 × 7

1

35 (%)

1

*an answer of 53 (%) scores **2** marks*

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(e) 78

1

(f) fertilisation

1

[9]

Q4.

(a) 46

1

(b) mitosis

1

(c) 3

1

(d) differentiation

1

(e) cell membrane

1

cytoplasm

1

(f) (stem cells from embryos) can become more types of cell

allow converse

allow (stem cells from embryos) are pluripotent

1

(g) less risk of rejection of umbilical cord stem cells

1

(h) could cause cancer

1

(i) any **one** from:

- embryos are created (for this purpose)
- embryos are destroyed
- the embryos do not develop into a foetus / child

ignore religious objections

1

[10]

Q5.

(a) mitosis

extra box ticked negates mark

1

(b) cell division is uncontrolled

extra box ticked negates mark

1

(c) any **one** from:

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- smoking / tar
- alcohol
- carcinogens

  allow named chemical
- viruses (living in cells)
- (ionising) radiation

  accept UV / X-rays / gamma waves

1

(d) bar plotted at 78%

ignore width of bar

1

(e) testicular

extra box ticked negates mark

1

(f) prostate

extra box ticked negates mark

1

(g) any **two** from:

- improved treatment / drugs
- earlier diagnosis
- more cancer screening
- improved patient knowledge (of risk factors)

  allow improved patient diet / lifestyle

2

[8]

Q27.

(a) A – nucleus

1

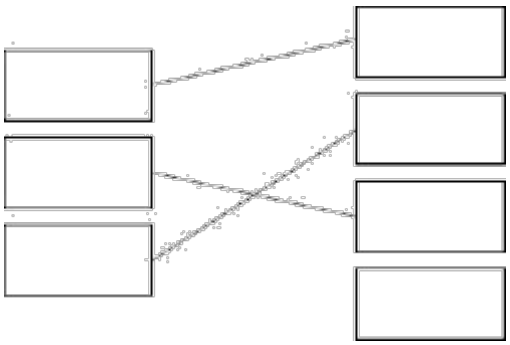
B – chromosome

1

C – gene

1

(b)



extra line from statement cancels the mark

3

[6]

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Q1.

(a) 33% of students achieved both marks for knowing the sequence of events in the cell cycle. 51% of students achieved one mark, which was usually for realising that in the final stage the cell divides into two.

(b) The majority of students thought the mass of DNA in the new cells produced by mitosis would be half of that in the cell at the start of the cell cycle. 30% of students said the mass would be the same.

(c) The majority of students incorrectly thought that animal stem cells divide by meiosis. 31% of students correctly said that meristem cells in plants can differentiate throughout the life of the plant.

(d) The majority of students copied sentences from the information given in the question. There had to be some added value in order to be awarded marks. A fifth of students scored 1 mark. This was often for saying therapeutic cloning would produce replacement cells or could treat some diseases. Very few gained 2 marks. A lot of students confused therapeutic cloning with IVF treatment.

(e) The majority of students copied the sentence about the embryo being destroyed, which had no added value, and so it was ignored. Those who rephrased this to say a life is killed or destroyed were awarded a mark. Another common correct response was that the procedure may not work.

Q2.

(a) 26% of students achieved the mark for saying stem cells are found in meristems or the tips of roots or shoots. A variety of incorrect organs or tissues were named, the most common being root, stem, xylem and embryo. Some students named parts of a cell, such as chloroplast or cytoplasm.

(b) 49% of students correctly identified producing a large number of identical plants as one economic use of plant stem cells. There was some confusion of genetic engineering and stem cell technology, as most other students selected to create genetically modified crops as their answer.

(c) This question was targeted at grades 8−9. 4% of students correctly converted 6 picograms into grams and wrote the answer in standard form.

Some students did not understand the term standard form and gave a number written in decimal form. This value was usually an incorrect conversion of picograms to grams. Common incorrect attempts at writing the value in standard form included 6×10^{-6} or 6×10^{-9}

(d) 15% of students achieved both marks for calculating the number of hours the cell spent in mitosis and giving the answer to three significant figures. 20% of students achieved one mark because they rounded the number incorrectly or gave their answer in hours and minutes. Many students referred to both 28 and 15 but used an incorrect calculation or did not realise there are 360° in a circle.

(e) 14% of students achieved more than two marks. The majority of students gained a mark for stating that the cell would grow during stage 1, or two copies of each chromosome form. The latter of these events was often included in stage 2, rather

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than stage 1. This error, or if stage numbers were omitted, limited the response to a maximum of four marks.

Some very good descriptions of mitosis, including spindle formation, were seen. However, a lot of students did not mention the nucleus dividing. A few students gained the final mark for saying cytokinesis occurred in stage 3. Few gave the full description of the cytoplasm or membrane dividing to form two identical cells.

42% of students did not achieve any marks. This was usually because they described the process of IVF. Some confused the cell cycle with meiosis and fertilisation.

(f) 31% of students achieved two or more marks.

Marks were generally awarded for advantages, rather than disadvantages. Common correct advantages given included:

- how stem cells can be used in patients
- diseases stem cells can be used to treat, for example paralysis
- that the cells would not be rejected by patients.

The most common disadvantage mentioned was that an embryo or potential life was destroyed. Saying the cells were wasted was insufficient.

A lot of students confused the process with that of IVF.

Q3.

(a) Mitochondria were the best known examples of animal cell components. Plasmids proved a powerful distractor despite only being associated with bacterial cells. 29% of students achieved full marks.

(b) 51% of students did not make the link needed between mitosis producing new cells and the need for new cells for repair.

(c) This calculation was quite well attempted, with 41% of students gaining two marks.

(d) This calculation was well attempted, with 48% achieving two marks. 11% of students did not attempt the question.

(e) 60% of students knew that a muscle body cell would have double the number of chromosomes found in a sperm cell.

(f) 87% of students were able to name the process of fertilisation.

Q27.

(a) This question was well answered with nucleus being the most common correct label. The most common error was to mix up chromosome and gene. ‘Gamete’ was sometimes incorrectly used to label the gene, but ‘characteristic’ was rarely used for any label.

(b) Once again, with linking boxes the most common error was to have extra lines drawn. Students should be encouraged to do these in pencil first so they can be

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erased. Quite a lot of responses had a characteristic linked to ‘affected by neither genes nor the environment’, suggesting a lack of understanding. However, most students gained at least one mark for this question.