
COMBINED SCIENCE

5129/21

Paper 2 Theory

October/November 2016

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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| Question | Answer | Marks |
|-----------------|---|--------------|
| 1(a)(i) | $0.043 \times 10 = 0.43$ | 1 |
| 1(a)(ii) | $0.43 \times 0.5 = 0.215$ | 1 |
| 1(b) | any one from <ul style="list-style-type: none"> • work is done against friction / air resistance • transferred as heat (to the surroundings) • transferred as sound | 1 |

| Question | Answer | Mark |
|-----------------|---|-------------|
| 2(a)(i) | A = palisade / mesophyll cell B = chloroplast C = nucleus D = cuticle | 4 |
| 2(a)(ii) | any one from <ul style="list-style-type: none"> • to waterproof the leaf • prevent loss of water from the leaf • reduce evaporation | 1 |

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| Question | Answer | Mark | | | | | | | | | | | | |
|---------------------------------|--|--|-----------------|---|--|-----------|-------------|-----------|-------------|--------|--------------------------------------|----------------|-----------------|----------|
| 2(b) | <table border="1"> <thead> <tr> <th colspan="2">net movement in dark conditions</th> <th colspan="2">net movement in bright light conditions</th> </tr> <tr> <th>into leaf</th> <th>out of leaf</th> <th>into leaf</th> <th>out of leaf</th> </tr> </thead> <tbody> <tr> <td>oxygen</td> <td>carbon dioxide OR water</td> <td>carbon dioxide</td> <td>oxygen water</td> </tr> </tbody> </table> | net movement in dark conditions | | net movement in bright light conditions | | into leaf | out of leaf | into leaf | out of leaf | oxygen | carbon dioxide OR water | carbon dioxide | oxygen water | 5 |
| net movement in dark conditions | | net movement in bright light conditions | | | | | | | | | | | | |
| into leaf | out of leaf | into leaf | out of leaf | | | | | | | | | | | |
| oxygen | carbon dioxide OR water | carbon dioxide | oxygen water | | | | | | | | | | | |
| 2(c) | <p>xylem any two from</p> <ul style="list-style-type: none"> • transports water • transports minerals • only upwards • supports plant <p>phloem any one from</p> <ul style="list-style-type: none"> • transports glucose • upwards and downwards | 2 1 | | | | | | | | | | | | |

| Question | Answer | Mark |
|----------|---|----------|
| 3(a)(i) | 80 | 1 |
| 3(a)(ii) | 32 160 4 | 3 |
| 3(b) | SO ₃ + H ₂ O \longrightarrow H ₂ SO ₄ | 1 |

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| Question | Answer | Mark |
|-----------------|--|-------------|
| 3(c) | any one from <ul style="list-style-type: none"> • copper carbonate • copper hydroxide • copper oxide | 1 |
| 3(d) | fossil fuels contain sulphur compounds (which burn) | 1 |

| Question | Answer | Mark |
|-----------------|---|-------------|
| 4(a) | 1.46 cm | 1 |
| 4(b) | start timer as it passes X stop timer as it passes Y | 2 |

| Question | Answer | Mark |
|-----------------|--|-------------|
| 5(a) | any two from <ul style="list-style-type: none"> • urea • bile • glycogen | 2 |
| 5(b) | any two from <ul style="list-style-type: none"> • amino acids • alcohol • hormones; • drugs / toxic chemicals | 2 |

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| Question | Answer | Mark |
|-----------------|-----------------|-------------|
| 6(a) | carbon monoxide | 1 |
| 6(b) | nitrogen | 1 |
| 6(c) | ammonia | 1 |
| 6(d) | hydrogen | 1 |
| 6(e) | argon | 1 |

| Question | Answer | Mark |
|-----------------|--|-------------|
| 7(a) | any one from <ul style="list-style-type: none"> • higher temperature • lower density | 1 |
| 7(b)(i) | any one from <ul style="list-style-type: none"> • good conductor of heat • resistant to corrosion / does not react with water | 1 |
| 7(b)(ii) | good absorber of heat | 1 |
| 7(c) | any one from <ul style="list-style-type: none"> • hot water lower density • heated water rises • by convection | 2 |

| | | | |
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| Question | Answer | Mark |
|----------|---|------|
| 8 | both rays correct refraction inside the lens both rays correct refraction leaving the lens | 2 |

| Question | Answer | Mark |
|----------|--|------|
| 9(a)(i) | farm worker | 1 |
| 9(a)(ii) | 10 000 | 1 |
| 9(b) | any two from <ul style="list-style-type: none"> • energy intake is more than energy used / 3750 kJ more than is required • excess food converted to fat • fat stored in body increasing weight | 2 |
| 9(c) | any two from <ul style="list-style-type: none"> • age • gender / sex • occupation | 2 |

| Question | Answer | Mark |
|-----------|------------------------|------|
| 10(a) | 8 2,5 17 40 | 4 |
| 10(b) | S and V | 1 |
| 10(c)(i) | TU ₂ | 1 |
| 10(c)(ii) | ionic | 1 |

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| Question | Answer | Mark |
|-----------|---------------------|------|
| 11(a)(i) | visible light | 1 |
| 11(a)(ii) | 3×10^8 m/s | 1 |
| 11(b) | frequency | 1 |
| 11(c) | water wave | 1 |

| Question | Answer | Mark |
|----------|---|------|
| 12 | <u>glands</u> <u>plasma</u> <u>target</u> | 3 |

| Question | Answer | Mark |
|-----------|--|------|
| 13(a)(i) | produces energy | 1 |
| 13(a)(ii) | carbon dioxide water | 2 |
| 13(b) | <u>same general formula</u> | 1 |
| | any one from <ul style="list-style-type: none"> • gradation in physical properties • same chemical properties • formula differs by CH₂ • same functional group | 1 |

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| Question | Answer | Mark |
|----------|---|------|
| 13(c) | $ \begin{array}{c} \text{H} \\ \\ \text{H} - \text{C} - \text{H} \\ \\ \text{H} \end{array} $ | 1 |

| Question | Answer | Mark |
|----------|---|------|
| 14(a) | the voltage increases then returns to <u>zero</u> | 2 |
| 14(b) | any one from <ul style="list-style-type: none"> • strength of magnet • speed of movement | 1 |
| 14(c) | $V = I R$ or $I = V/R$ or $I = 0.0003/9$ 3.33×10^{-5} A/Amps | 3 |

| Question | Answer | Mark |
|----------|------------------------|------|
| 15(a) | light | 1 |
| 15(b) | <u>grass</u> 2 4 | 3 |

| | | | |
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| Question | Answer | Mark |
|-----------------|---|-------------|
| 16(a) | Y X Z W | 2 |
| 16(b)(i) | removal of oxygen | 1 |
| 16(b)(ii) | hydrogen more reactive (than W) | 1 |
| 16(c) | any one from <ul style="list-style-type: none"> • conduct electricity • malleable • high melting point • shiny | 1 |

| Question | Answer | Mark |
|-----------------|---|-------------|
| 17(a)(i) | neutral | 1 |
| 17(a)(ii) | any one from <ul style="list-style-type: none"> • if appliance casing becomes live • current exceeds fuse rating / current is too high it melts | 1 |
| 17(b) | casing cannot become live | 1 |
| 17(c) | 7A chance of damage to appliance is small up to this amount | 2 |

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| Question | Answer | Mark |
|----------|-------------|------|
| 18 | E E D | 3 |

| Question | Answer | Mark |
|-----------|------------|------|
| 19(a) | | 2 |
| 19(b)(i) | hydrogen | 1 |
| 19(b)(ii) | pH = 3 – 5 | 1 |

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| Question | Answer | Mark |
|-----------------|----------------------------------|-------------|
| 20(a) | Lead | 1 |
| | gamma radiation cannot penetrate | 1 |
| 20(b)(i) | 20 000 | 1 |
| 20(b)(ii) | 5.25 years | 1 |