Version 1.4

**General Certificate of Secondary Education**
**June 2012**

# Human Health and Physiology 44151F

# (Specification 4415)

# Unit 1: Topics in Human Health and Physiology (Foundation)

# Final

# *Mark Scheme*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.



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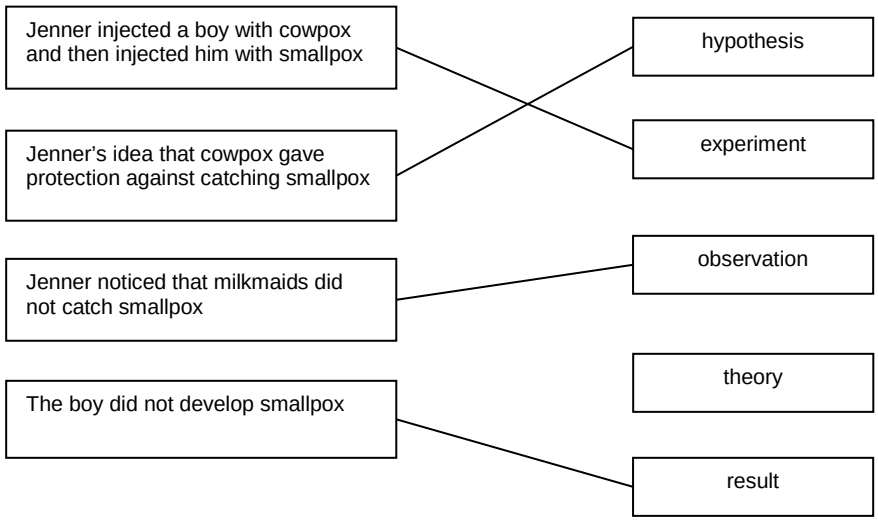
| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **1(a)** | Optometry | Allow alternative spellings | 1 |
| **1(b)** | Orthopaedics | Allow alternative spellings | 1 |
| **1(c)** | Obstetrics and gynaecology | Allow alternative spellings<br>Accept either answer on its own | 1 |
| **1(d)** | Endocrinology | Allow alternative spellings | 1 |
| **Total** | | | 4 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **2(a)** | Cytologists | | 1 |
| **2(b)(i)** | **X** cytoplasm<br>**Y** nucleus<br>**Z** (cell) membrane | Allow protoplasm<br><br>Allow plasma membrane / surface membrane | 1<br>1<br>1 |
| **2(b)(ii)** | Any **two** from eg<br>(Cancer cells have)<br>• Larger nucleus<br>• Two / more nuclei<br>• Irregular-shaped nuclei<br>• Less cytoplasm<br>• No gaps between them | Allow overlapping<br>Allow different shaped/deformed (cells)<br>Ignore features that cannot be seen eg divide rapidly | 2 max |
| **2(c)** | Any **two** from eg<br>• Smoking / tar from smoke / carcinogen in smoke / other named carcinogen<br>• UV rays / sunlight<br>• X rays | Allow two named carcinogens for 2 marks<br>Allow alcohol / pathogens<br>Ignore diet / drinking unqualified<br>Ignore inheritance unless qualified | 2 max |
| **Total** | | | 8 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **3(a)(i)** | Protein | | 1 |
| **3(a)(ii)** | Carbohydrate | | 1 |
| **3(a)(iii)** | Vitamin C | | 1 |
| **3(b)** | Any **two** from eg<br>• Health of / growth of bones<br>• Health of / growth of teeth<br>• Blood clotting<br>• Muscle contraction | Allow strength<br>Allow strength<br>Ignore rickets<br>Ignore growth unqualified | 2 max |
| **3(c)(i)** | High blood pressure | Allow heart disease / heart attack<br>Allow dehydration | 1 |
| **3(c)(ii)** | Diabetes | Allow increase weight / obesity / tooth decay<br>Ignore high blood sugar / high blood pressure / heart disease | 1 |
| **Total** | | | 7 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **4(a)(i)** | Ambulance siren / pneumatic drill | Accept jet plane / fireworks / gunshot | 1 |
| **4(a)(ii)** | 100 | Allow 98-102 | 1 |
| **4(b)** | Any **two** from<br>• Ear plugs<br>• Muffling / soundproofing machinery<br>**or** isolate machinery<br>• Reduce exposure time | Accept ear defenders / head phones / ear muffs | 2 max |
| **Total** | | | 4 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **5(a)(i)** | **B** | | 1 |
| **5(a)(ii)** | **D** | | 1 |
| **5(a)(iii)** | **C** | | 1 |
| **5(b)(i)** | Blood clot / atheroma | Allow narrowing / blocking of blood vessels by fat / cholesterol<br>Ignore cholesterol / fat levels in blood | 1 |
| **5(b)(ii)** | Any **two** from eg<br>• (high) cholesterol<br>• Smoking<br>• Obesity<br>• Genetic factors<br>• Lack of exercise<br>• High fat diet | Accept high blood pressure<br>Ignore factors relating directly to blood vessels<br>Ignore stress<br>Ignore diet unqualified / unhealthy diet<br>Ignore high salt / sugar | 2 max |
| **5(b)(iii)** | Exercise (regularly) | Ignore references to smoking, diet, weight loss and massage | 1 |
| **Total** | | | 7 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **6(a)** |  | | 4 |
| **6(b)** | eg<br>He gave a (healthy) boy a disease<br>Use of human (rather than animal tests) before other tests | Allow gave to boy rather than adult<br>Allow boy did not know the risks involved / did not consent<br>Ignore reliability | 1 |
| **6(c)** | C<br>B<br>D<br>A | All 4 correct gains 3 marks<br>2 or 3 correct gains two marks<br>1 correct gains 1 mark | 3 |
| **Total** | | | 8 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **7(a)** | **W** pituitary<br>**X** thyroid<br>**Y** adrenal<br>**Z** pancreas | Allow close spellings (eg pancrease) | 1<br>1<br>1<br>1 |
| **7(b)(i)** | Protease / lipase / carbohydrase / amylase | Do **not** accept insulin | 1 |
| **7(b)(ii)** | Now have treatment for diabetes | Allow cure / stop diabetes | 1 |
| **7(b)(iii)** | Idea of (cruelty) to dogs / animals | | 1 |
| **7(c)(i)** | Chromosome | | 1 |
| **7(c)(ii)** | An enzyme | | 1 |
| **7(c)(iii)** | DNA | | 1 |
| **Total** | | | 10 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **8(a)** | surface / area<br>capillaries | Ignore vessels | 1<br>1 |
| **8(b)(i)** | diarrhoea | Allow close spellings | 1 |
| **8(b)(ii)** | 17 | Correct answer gains 2 marks<br>If answer incorrect, evidence of adding up all other percentages and subtracting from 100 gains 1 mark | 2 |
| **8(b)(iii)** | 4 | Correct answer gains 2 marks<br>If answer incorrect then evidence of 50 / 100 x 8 gains 1 mark OR ½ x 8 OR 400/100 | 2 |
| **8(c)** | **X** Oesophagus<br>**Y** stomach<br>**Z** small intestine / duodenum | **X** Allow gullet<br>**X** Do not allow windpipe / trachea<br><br>**Z** Allow ileum<br>**Z** Do not allow illium | 1<br>1<br>1 |
| **Total** | | | 10 |

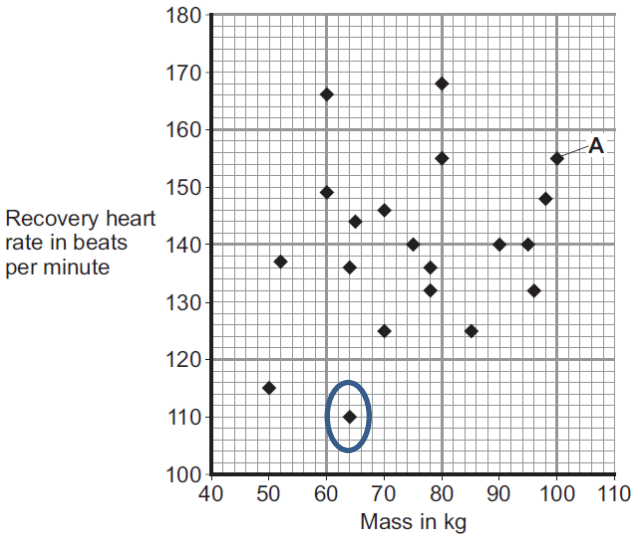
| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **9(a)(i)** | B | | 1 |
| **9(a)(ii)** | E | | 1 |
| **9(a)(iii)** | A | | 1 |
| **9(a)(iv)** | C | | 1 |
| **9(b)(i)** | Fertilisation greater chance in ICSI | accept 'the whole of the sperm enters the egg'<br>Allow in IVF sperm might not fuse with egg | 1 |
| **9(b)(ii)** | Any **two** from eg<br>• percentage of successful pregnancies decreases with age<br>• IVF more successful up to age of 37 / in younger women<br>• ICSI more successful in women over 40 / older women | If no other marks gained allow treatments most successful when less than / up to 35<br>**or**<br>treatments least successful at 43+ | 2 max |
| **Total** | | | 7 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **10(a)(i)** | A | | 1 |
| **10(a)(ii)** | C | | 1 |
| **10(b)(i)** | (Aa) Aa<br>AA Aa Aa aa | All three Aa */aA* correct for one mark<br>AA correct for one mark<br>aa correct for one mark | 1<br><br>1<br>1 |
| **10(b)(ii)** | Zero / none | | 1 |
| **Total** | | | 6 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **11(a)(i)** | Any **three** from eg<br>• Large colony of Penicillium<br>• Many or small colonies of bacteria<br>• Bacterial colonies do not grow / less grow near Penicillium colony<br>• Bacterial colonies smaller nearer Penicillium colony | | 3 max |
| **11(a)(ii)** | • Bacteria near Penicillium colony killed / inhibited<br>• By substance / antibiotic / penicillin / produced by Penicillium | Accept penicillin / substance produced by Penicillium kills bacteria for **2** marks | 1<br>1 |
| **11(b)** | • Lead to (mass) production of penicillin / antibiotics<br>• Which has saved many lives | Allow led to discovery of penicillin / antibiotics<br>Allow idea of curing / treating diseases (that previously caused death) | 1<br>1 |
| **Total** | | | 7 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **12** | Marks awarded for this answer will be determined by the quality of written communication.<br><br>The answer is coherent and in a logical sequence. It contains a range of appropriate or relevant specialist terms used accurately. The answer shows very few errors in spelling, punctuation and grammar. There is a clear scientific description of how the body gets rid of waste products including reference of most of carbon dioxide, urea, urine, faeces, sweat, and the organs that produce them .<br><br>The answer has some structure and the use of specialist terms has been attempted, but not always accurately. There may be some errors in spelling, punctuation and grammar. There is a scientific description of how the body gets rid of waste products including reference to at least two of carbon dioxide, urea / urine, faeces, sweat and the organs that produce at least one of them.<br><br>The answer is poorly constructed with an absence of specialist terms or their use demonstrates a lack of understanding of their meaning. The spelling, punctuation and grammar are weak. There is a brief description of how the body gets rid of waste materials including reference to at least one of carbon dioxide, urea, urine, faeces, sweat, which has little clarity and detail.<br><br>No relevant content.<br><br>Examples of scientific points that may contribute to a candidate's response:<br>• Carbon dioxide is produced by respiration<br>• Carbon dioxide is breathed out / removed by the lungs<br>• Urea is made in the liver<br>• Urea is lost in the urine<br>• The kidneys produce urine<br>• Urine contains water and mineral salts<br>• The large intestine produces faeces<br>• Faeces contain undigested food<br>• The skin produces sweat<br>• Which contains water and mineral salts | | 5- 4<br><br>2-3<br><br>1<br><br>0 |
| **Total** | | | 5 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **13(a)(i)** | Any virus disease eg (common) cold / influenza | Apply list principle to any non-viral disease | 1 |
| **13(a)(ii)** | Any bacterial disease eg MRSA<br>Salmonella | Allow food poisoning / diarrhoea<br>Apply list principle to any non-bacterial disease | 1 |
| **13(a)(iii)** | Any fungal disease eg athlete's foot / thrush | Apply list principle to any non-fungal disease | 1 |
| **13(a)(iv)** | Any protoctistan disease eg malaria / amoebic dysentery | Apply list principle to any non-protoctistan disease<br>Ignore diarrhoea unqualified | 1 |
| **13(b)** | Any **two** from eg<br>• Skin is barrier<br>• Mucus (in respiratory tract / vagina) traps pathogens<br>• Cilia move pathogens to outside<br>• Acid in stomach / vagina / urethra (kills pathogens)<br>• Scabs / blood clotting (at wounds) is barrier | Ignore references to white cells / antibodies / antitoxins.<br>Ignore skin is protective layer<br>Ignore hairs in nose trap pathogens<br>Allow ear wax traps pathogens<br>If **no** other marks gained, allow **one** mark for **two** unqualified methods eg skin and scabs | 2 max |
| **Total** | | | 6 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **14(a)** | Any **two** from<br>• Step-up rate /amount of step-ups<br>• Exercise time<br>• Rest time / time after exercise | D**o not** accept mass / (recovery) heart rate<br><br>Ignore 5 minutes unqualified<br>Ignore 1 minute unqualified | 2 max |
| **14(b)** | Scatter(graph) / scatter(gram) | Accept scatter diagram | 1 |
| **14(c)** | Ring around student with recovery heart rate of 110<br>  | | 1 |
| **14(d)** | eg there is no direct relationship between recovery heart rate and body mass | Accept no pattern / mass does not affect recovery rate | 1 |
| **14(e)** | Any **two** from eg<br>• Gender / sex<br>• Fitness<br>• Health<br>• Height<br>• Age<br>• Smoking | Allow diet<br>Do **not** accept weight / mass<br><br>Ignore BMI<br><br>Ignore body fat | 2 max |

| | | | |
|---|---|---|---|
| **14(f)** | Any **three** from eg<br><br>• (More / faster) oxygen/glucose<br>• (More faster glucose/oxygen) to muscles<br>• For (more / faster) (aerobic) respiration **or** less anaerobic respiration / less lactic acid produced<br>• (More / faster) energy release **or** more energy needed<br>• Carbon dioxide removed (faster)<br>• Lactic acid removed (faster) | 'More' / 'faster' must be given at least once to obtain full marks<br><br>Accept oxygenated blood | 3 max |

| | | | |
|---|---|---|---|
| **14(g)** | eg<br>• Do more / regular exercise<br>• Diet to reduce mass **or** eat less food / carbohydrate / fat | Ignore lose weight / diet unqualified<br><br>Ignore eat healthy / balance diet | 1<br>1 |

| | | | |
|---|---|---|---|
| **Total** | | | 12 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **15(a)** | **X** capillary<br><br>**Y** plasma<br><br>**Z** red blood cell | **X** Ignore wall(s)<br><br>**Y** Allow blood plasma<br>Ignore platelets | 1<br><br>1<br><br>1 |
| **15(b)** | • Oxygen moves (from air / alveolus) into blood<br>• Carbon dioxide moves from blood / into air / alveolus<br>• By diffusion (once) / diffusion described<br>**or** correct description of concentration gradient (for either oxygen or carbon dioxide) | | 1<br><br>1<br><br>1 |
| **15(c)** | Any **two** from<br>(Healthy person)<br>• More (air) spaces / alveoli<br>• Larger surface area<br>• Smaller (air)spaces<br><br>• Thinner walls / tissue / membrane | <br><br><br><br>Allow two correct features for emphysema but not clearly linked for one mark | 2 max |
| **15(d)(i)** | • Larger residual volume / air left in lungs<br>• Smaller expiratory reserve volume / volume of air that can be pushed out | Do not accept change in inspiratory capacity/volume of air taken in during normal breathing<br><br>Ignore <u>total</u> volume of air | 1<br><br>1 |
| **15(d)(ii)** | Any **two** from<br>• Larg(er) residual volume / amount of air left in lungs<br>• (so) can't breathe in as much air / oxygen<br>• Concentration of oxygen (in residual air) less / low<br>• (Alveoli) have small(er) surface <u>area</u> / fewer alveoli / thick(er) wall/tissues<br>• Less / little oxygen into blood | Accept explanations in terms of high(er) carbon dioxide levels in residual air<br><br>Ignore expiratory reserve volume<br><br><br><br>Accept less gas exchange | 2 max |
| **Total** | | | 12 |

| Question | Answers | Extra information | Mark |
|---|---|---|---|
| **16(a)** | Sufferers take time off work | Ignore health service costs | 1 |
| **16(b)(i)** | eg manipulation / repositioning of bones / back / spine | Allow 'cracking'<br>Ignore massage<br>Ignore acupuncture<br>Ignore muscles | 1 |
| **16(b)(ii)** | eg (suggest) exercise | Accept massage<br>Ignore acupuncture | 1 |
| **16(c)(i)** | **X** spinal cord | **X** Do **not** accept spine<br>Allow CNS / central nervous system | 1 |
| | **Y** nerve(s) / nerve tissue | **Y** Ignore neurone | 1 |
| | **Z** vertebra / vertebral column | **Z** Allow spine / backbone<br>Ignore spinal tissue / column | 1 |
| **16(c)(ii)** | Pressure on nerve/spinal cord/**X**/**Y**<br>**OR**<br>trapped nerve | Ignore bones rubbing together | 1 |
| **Total** | | | 7 |