

ELECTROSTATICS 1

1. (a) (i) electron/negatively charged particle; 1
(ii) An explanation to include:
1. causing explosion/fire/ignition;
2. sparking; 2
[Ignore references to electrical shock/current]
(iii) pipe could be earthed/charge conducted away safely;
[Accept 'rubber' conductivity strip] 1
- (b) An explanation to include:
1. granules have like charges;
2. like charges repel; 2 [6]
2. (a) friction;
electrostatic;
electrons;
attract; 4
- (b) (i) correct direction of movement shown (towards metal plates); 1
(ii) An explanation to include:
• repelled from positive grid;
• attracted to negative plates; 2
[Allow like charges repel/unlike charges attract for 1 mark]
(iii) to make dust particles fall off/
in order to collect dust particles/to clean the plates; 1 [8]
3. (a) An explanation to include two from:
1. movement of fuel through pipes;
2. friction with surface of pipe causing charges to be produced;
3. electrons transferred between the fuel and the pipe; 2
- (b) spark could ignite the fuel/cause explosion; 1
- (c) An explanation to include:
1. copper wire acts as an earth;
2. which neutralises any charged object placed in contact with it; 2 [5]
4. (a) copper;
silver; 2

- (b) (i) two forces pushing outwards;
horizontal;
[Reject curved lines for force] 2
- (ii) An explanation to include:
1. positive;
2. like (charges) repel;
[Ignore poles] 2
- (iii) An explanation to include:
1. aluminium is a conductor / OWTTE;
2. charge / current would flow to earth / OWTTE; 2
- (c) (i) Any two correct suggestions, for example, Vander graaf /
lightning conductor / Plasma ball / photocopiers / spray painter /
precipitator (smoke cleaning) / insecticide sprays / particle accelerators /
inkjet printers; 2
- (ii) Any two correct suggestions, for example, shocks / dust /
electronic circuit damage / hair standing on end / explosions (fuel) /
could turn pace maker off / tumble dryer / lighting; 2

[12]

5. (a) (i) A description to include two of:
1. attracted / picked up by rod;
2. stick to rod;
3. paper (becomes charged) and is repelled from rod; 2
- (ii) plastic charged, copper and steel not
[All three correct for 2 marks, 2 correct for 1 mark] 2

- (b) An explanation to include two from:
1. lightning strikes poles (not the person) / poles attract the lightning;
2. charge / electrons / current travels along the poles;
3. to earth / (spike in) ground;
4. poles are good conductors (of electricity);
[Ignore conduct / absorb lightning] 2

[6]

6. (a) An explanation to include:
electrons / negative charge / negative particles;
transferred / moved from the ruler (to the cloth);
[reject for both marks positives move] 2

- (b) An explanation to include three of:
 (movement of petrol / lorry / tyres) can build up / transfer a charge / static electricity builds up;
 tyres are (good electrical) insulators ;
 they do not allow / stop charge / (static) electricity escaping / transferring to earth;
 spark;
 could cause an explosion / fire; 3
 electricity / charge escapes / transferred from /
 through strip / lorry is earthed / charge goes to earth;

[5]

7. (a) A suggestion to include:
 electrons;
 pass through tyres to earth; 2
 [Allow aircraft is earthed for 1 mark]

(b) $Q = I \times t / I = \frac{Q}{t}$
 $= \frac{2.0 \times 10^{-4} \text{ C}}{0.5 \text{ s}}$
 $= 4 \times 10^{-4} \text{ A};$ 4

[5]

8. (a) arrow drawn to the left; 1
 (b) the sizes are equal; 1
 (c) the strips have the same type of charge;
 similar charges repel 2
 (d) (i) electrons ; 1
 (ii) positive, there are more positive charges than negative 1

[6]

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|-----|-----|-------|--|---|------------|
| 9. | (a) | (i) | arrow drawn from right to left close to horizontal;
(if at angle the path extended must intersect duster) | 1 | |
| | | (ii) | they (the balloon and duster) have opposite/different charges;
opposite/positive & negative (charges) attract;
Reject magnetic poles for 2(both marks)
Reject positive electrons for the 1 st mark
Reject poles for either mark | 2 | |
| | (b) | (i) | the spark/lightning that passed to the ground; | 1 | |
| | | (ii) | the <u>cloud</u> ;
Ignore thunder/lightning/kite/string | 1 | |
| | | (iii) | by movement/flow/conduction of charge/ions/electrons;
Ignore key | 1 | [6] |
| | | | | | |
| 10. | (a) | | by movement of electrons/negative charge;
from earth/switch to the man;
Reject positive electrons (for both marks) | 2 | |
| | (b) | | movement/conduction of ions/charged particles;
in the string by movement of positive & negative ions/charges;
in the key by movement of (free) electrons; | 3 | [5] |