Question	Answer	Marks	Guidance
1 a i	Golf (1)	1	
ii	7.7 (s)(1) Skoda (because it takes less than 7.7 seconds) (1)	2	**allow** 7.69..... (1) **allow** 'Skoda' [1] (even if working incomplete or incorrect)
b COMMON	Jo (no mark) idea that Jo will have the longest thinking time / distance (1) Chris (no mark) largest braking distance / less friction, **grip or traction** (1)	2	answer must be Jo to score the mark for the explanation **allow** slowest reaction [1] **NOT** slowest time / slowest reaction time answer must be Chris to score the mark for the explanation **if no marks scored** allow Jo (for tired) and Chris (for icy) (1)

c	yes / no (no mark) **any three from** idea that CO_2 **produced** when biofuel made (1) carbon dioxide is given out (when fuel burns) (1) (biofuel is made from) plants / animals / living things (1) (plants) photosynthesise [1] carbon neutral (1)	3	**Allow trees [1]** **but** plants photosynthesize (2) **allow** plants take in carbon dioxide when they grow (2) **Award marks for combining marking points:** eg. 'CO_2 given out (by fuel) compensated by photosynthesis [2] Eg. carbon dioxide given out when fuel burns = carbon dioxide taken in by plants [3]
d	brakes automatically go on and off (frequently or quickly) (1) when the car likely to skid (1)	2	**Allow** 'pumping of the brakes' [1] **allow** example of when likely to skid e.g. on icy roads (1) **allow** to continue to control the car while braking / prevents skidding or wheels locking (1)
	Total	**10**	

Question	Answer	Marks	Guidance
2 a COMMON	**ideas that** cost (per km) does not depend on distance travelled (1) petrol engines / cars cost more **to run** (per km) than diesel engines (1) cost (per km) decreases with speed up to 80 km/hr / increases above 80km/hr / ORA (1)	3	 Eg. Lower fuel consumption with diesel [1] **Ignore** diesel engines cost less **allow** cost is a minimum at 80km/hr
b	**any one from** few charging points (1) long time to recharge (1) frequent charging needed (compared to re-fuelling) [1] limited mileage / range (for one charge) (1) lower top speed [1] (high) cost of batteries (1) large space needed for batteries [1] (too) **quiet** (for pedestrians to hear) [1]	1	 **ignore** cost of car **ignore** need to be charged **allow** slower [1] **ignore** 'fossil fuels still needed for electricity for charging'
	Total	**4**	

Question	Answer	Marks	Guidance
3 a i	C (1)	**1**	
ii	**any two from** Reference to speed changing (1) Reference to load(1) Reference to road conditions (1) Reference to driving style (1)	**2**	**must relate to more fuel used** eg traffic is heavy / needs to stop and start a lot / lots of braking and accelerating/ traffic lights / not optimum speed eg large load carried / increased number of passengers /towing/ open windows / air con /heaters/ eg hilly / bends / wet/ windy eg heavy braking / rapid acceleration / wrong gear **allow** manufacturers' data is at a steady speed on a level road (1)

Question	Answer	Marks	Guidance
b	**advantages (maximum 2 marks)** no emissions at point of use (1) quieter car (1) cheaper to run / no road tax (1) conserving fossil fuel (1) **disadvantages (maximum 2 marks)** limited range / frequent recharging (1) limited speed (1) few recharging points / takes a long time to recharge (1) batteries expensive to replace / car expensive initially (1) few models to choose from (1)	3	 **ignore** environmentally friendly / AW **ignore** unqualified reference to pollution **allow** qualified quieter car as disadvantage (1)
	Total	6	

Question	Answer	Marks	Guidance
4	**(Level 3)** **calculates the force** **AND** **Gives a detailed linked answer in terms of forces or acceleration** Quality of written communication does not impede communication of the science at this level (5 – 6 marks) **(Level 2)** **calculates the force** **AND** **Gives a simplistic answer in terms of forces or acceleration** Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **(Level 1)** **calculates the force** **OR** **Gives a simplistic answer in terms of forces or acceleration** Quality of written communication impedes communication of the science at this level (1 – 2 marks) **(Level 0)** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted up grade C** **Indicative scientific points at level 3 may include:** **The calculation from level 1 and 2 and a link between change in distance or stopping time to acceleration or force.** • increases distance travelled by dummy so this reduces force / acceleration of dummy • increase stopping time of dummy so this reduces force / acceleration of dummy • reduced acceleration so reduced force • reduces the rate of change of momentum • **Indicative scientific points at level 1 and 2 may include:** • force = 28020 or 28000 N **seatbelts** • hold dummy in seat / stop dummy hitting windscreen • stretches • reduce forces on dummy • increase stopping time of dummy • decrease acceleration of dummy **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
5 a	Sand provides friction force (1) Going uphill KE lost/ slows the car down (1) car has less KE so less energy needed in braking (1)	2	going uphill increases drag (1) Sand absorbs some of the energy of the car(1)
b	**passengers (maximum two marks)** **risks** may be trapped if in accident or in water (1) **benefits** will prevent head hitting windscreen in accident (1) will prevent being thrown out of car in accident (1) **wider community (maximum two marks)** **benefits** reduction in number of serious injuries /deaths so reduction in hospital costs (1) less chance of trauma of relatives due to road accident / AW (1) **risk** more chance of injury to pedestrians / themselves as drivers take more risk (1)	3	**allow** specific example of where belt may injure passengers in accident (1) eg whiplash, bruising, crushed ribs **ignore** unqualified statements **allow** reduces injuries / chance of death (1)
	Total	**5**	

Question			Answer	Marks	Guidance
6			**Level 3 (5 or 6 marks)** Answer identifies up to six arguments at least two for and two against. Only five arguments scores 5 marks providing there are at least two for **and** two against arguments. Quality of written communication does not impede communication of science at this level. **Level 2 (3 or 4 marks)** Answer identifies up to four arguments at least one for and one against. Only three arguments scores 3 marks providing there is a for **and** against argument. Quality of written communication partly impedes communication of science at this level. **Level 1 (1 or 2 marks)** Answer identifies two arguments either for **or** against. One argument only; award 1 mark. Quality of written communication impedes communication of science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C** **Any point in the extract must be developed to gain credit.** **Indicative scientific points may include:** **For:** • no petrol / diesel or fuel **used** (in car) • no emissions **given out** (by car) or at point of use • less sound pollution / quieter environment • grants / lower tax make them less expensive • likely to **become** less costly • easily charged from mains or at home • conserves or reduces reliance on fossil fuels / fuel can be put to other uses **Against:** • fuel or power source needed for electricity • emissions / CO_2 at power station • emissions / CO_2 add to global warming • pedestrians may not hear (quiet) car • expensive to buy (at the moment) • charging facilities not always available • low top speed • idea of threats to jobs in petrochemical industry • long time / 12 hours to fully charge • easier / quicker to fill cars with fuel • short range • battery disposal or replacement issues **Use the L1, L2, L3 annotations in scoris. Do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
7			thinking **and** braking distances increase (with more speed) (1) thinking distance doubles (as speed doubles) (1) braking distance quadruples (as speed doubles) (1) braking distance increases due to reduced friction or grip (if road is wet) (1)	3	
			Total	**3**	