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ACUAG012

1703078

13/05/22

2.

a) The valency of an atom is the calculation of the number of ~~outer~~ electrons in the outer shell, if the number is between 1-4 then the valency is classed as +ve, but ~~if~~ for a compound with 4, 5, 6, 7 valency is decided by subtracting the electron from 8. Ionic bonding occurs when the electrons from an atom swap its electrons with another atom creating a ionic bond with each other, they gain attraction through electrostatic charging. Metallic bonding is bonding that occurs in metal, atoms are arranged in a regular pattern. The outer shell of metal atoms mean that the metal is arranged as free charged ~~electrons~~ ions with no charged electrons in between holding in place with electrostatic forces. Covalent bonding is where the atoms share electrons but don't permanently transfer them, normally this occurs with atoms of the same element or elements close on the periodic table.

b)

$$a = 0.362 \times 10^{-9} \text{ m}$$

$$a = 2\sqrt{2} \times R$$

$$R = \frac{2\sqrt{2}}{2}$$

$$0.362 \times 10^{-9} = 7813334599 \text{ m}$$

$$= 7.81 \times 10^{-9} \text{ nm}$$

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1.

c) ~~bio hydrogen~~ fuel soon as bio and bio ethanol
to be successful there would need to be a
big infrastructure put in place to accommodate
the new fuel, BME could use existing tech
the LPG currently using but would have to be
scaled up in order to accommodate and make the
fuel be economically viable as it has a low
calorific value meaning more fuel would need to
be used ~~for the~~ to give the same mileage as
petrol or diesel.

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1.

a) Hydrogen could be used as an alternative fuel in cars as it can reduce the overall fleet CO₂ output of commercial vehicles by between 15% - 30% meaning cars would be a good alternative.

Another good alternative but more so it can be used in combination with existing fuels to reduce the amount of fossil fuels used causing less damage emitting and then burning the fuel as it is a cleaner energy source.

b) Hydrogen as a fuel is difficult to store and is an unstable fuel source because of this it needs to be well looked after when we would cause practicality issues for the end user as they would have to adapt their way of life in order to accommodate the alternative fuel.

They may need to purchase extra products to contain and use the fuel for example a Hydrogen car would cost more to buy than a fossil fuel car because of this.

Dibutylol is an aggressively corrosive fuel because of its molecular structure because of this it is difficult to store the user will need to have corrosion resistant tanks in the car as regular ones will be eaten by the fuel it's also important to give regular maintenance to the engine because of the high corrosiveness (Gross) such as seals and pipes will need replacing more than usual.

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4.

i) The main elements in 7xxx is aluminium is Zinc and Magnesium, the benefits to us as lightweight good corrosion resistance and weldability, limitations of this alloy is its strength as its not as strong as its steel equivalent

ii) The 1st number indicates that the steel is a carbon steel the last 2 numbers show that it has a Carbon Percentage of 0.45%.

b) 3 types of composite classifications are Particle Reinforced, Fibre Reinforced and Structural Reinforced. Particle reinforced are harder and stiffer than the matrix material as the particles are part of a macro/micro or nanoscopic scale along with improved mechanical behavior depending on the interface bonding. Fibre composites will have high strength to weight ratios whilst utilizing a low density fibre and matrix material, but will fail with minimal deformations so need to be perfect. ~~but~~ Structural composites make up of both a composite and an inhomogeneous material formed in a homogeneous structure in order to maximize strengths of both properties.

c) Volume = 0.65

$E_F = 65 \text{ GPa}$

$E_m = 3.2 \text{ GPa}$

$E_F/E_m = (65/3.2)$

$(0.65/0.35) = 18.62$

$F_F =$

$F_C = 30 \text{ MPa} \times 0.03 = 9 \text{ N}$

$F_m =$

$F_C = F_F + F_m = 9 \text{ N}$

$F_m = 18.62 \times 9 \text{ N}$

$F_F = 9 - 1.652 = 7.348 \text{ N}$

$17.62 \times F_m = 9 \text{ N}$

$\frac{17.62}{1} = 1.652 \text{ N}$ $F_m = 1.652 \text{ N}$

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2.

c) Point defects can be found within ~~metals~~ ^{metals} with missing atoms within the lattice structure. This leads to vacancies within the structure causing the surrounding atoms to distort. Point defects can be caused by an atom interstitial in the lattice structure. Line defects are where whole rows of atoms in a solid form are arranged anomalously by regular ~~irregularly~~ spacing is most severe along a line called the line of dislocation. Area defects are a large area discontinuity in the lattice the defects occur during lattice growth but crystals having such defects are not considered usable for its manufacture and are degraded.

d) The ~~dislocation~~ dislocation movement is classed as the secondary creep, the dislocations are generated ~~by~~ and move when the stresses are applied to it to help.