

### Unit IV: Fuels

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| Q.1  | Bituminous coal burns with .....<br>a) Long smoky flame<br>b) Smoky yellow flame<br>c) Short non- smoky blue<br>d) None of the above  | b |
| Q. 2 | Anthracite has % C of _____.<br>a) 55-65%<br>b) 60-75%<br>c) 78-90%<br>d) 92-96%  | d |
| Q. 3 | Proximate analysis involves _____.<br>a) % Ash + % VM + % moisture<br>b) % C + %H + % O of coal<br>c) % C of coal<br>d) % VM + % moisture + %FC of coal   | a |
| Q. 4 | A good fuel is _____.<br>a) Moderate ignition temperature<br>b) Cheap and readily available<br>c) High calorific value<br>d) All of the above   | d |
| Q. 5 | Unit of Calorific value of a solid fuel in MKS system is _____.<br>a) Cal/g<br>b) Kcal/Kg<br>c) J/Kg<br>d) Cal/lit  | b |
| Q. 6 | Calorific value of a good fuel is _____.<br>a) High<br>b) low<br>c) Mild<br>d) None of the above  | a |
| Q. 7 | Full form of GCV is _____.<br>a) Gross Calorific value<br>b) Grace calorific value<br>c) Ground calorific value<br>d) Gram calorific Value  | a |
| Q. 8 | Relation between GCV & NCV is _____.<br>a) $GCV + NCV = \text{Latent heat of water vapour}$<br>b) $GCV = NCV + \text{Latent heat of water vapour}$<br>c) $\text{Latent heat of water vapour} = NCV - GCV$<br>d) None of the above | b |
| Q. 9 | SI unit of calorific value is _____.<br>a) Cal/gm<br>b) Lit/gm<br>c) J/lit  | d |

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|       | d) J/kg  |   |
| Q. 10 | Moisture, ash content, volatile matter and fixed carbon are measured for coal as a part of ____.<br>a) Proximate analysis<br>b) Proximate analysis & Ultimate Analysis<br>c) Ultimate Analysis<br>d) None of the above | a |
| Q. 11 | What is the percentage of <b>oxygen by volume</b> in the atmosphere?<br>a) 14<br>b) 23<br>c) 21<br>d) 79   | c |
| Q. 12 | LPG is predominantly _____.<br>a) Methane<br>b) Hydrogen<br>c) A mixture of butane + propane<br>d) Ethane  | a |
| Q. 13 | Biogas is produced by anaerobic fermentation of biological materials. The main constituent of biogas is _____.<br>a) Methane<br>b) Ethane<br>c) Butane<br>d) Propane   | a |
| Q. 14 | Which of the following is a non renewable energy resource?<br>a) Solar energy<br>b) Wind energy<br>c) hydroelectric<br>d) Coal   | d |
| Q. 15 | Bomb calorimeter is used for finding calorific value of _____ Fuels.<br>a) Nonvolatile liquid fuel<br>b) Gas fuel<br>c) Solid fuel<br>d) Both a and c above  | d |
| Q. 16 | Boy's calorimeter gives the calorific value of _____.<br>a) Volatile liquid Fuel<br>b) Gaseous fuel<br>c) Both a and b<br>d) None of the above   | c |
| Q. 17 | Wood when converted into coal has .... Calorific value<br>a) high<br>b) low<br>c) medium<br>d) none of the above   | a |

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| Q. 18 | The texture of anthracite coal is _____.<br>a) Brown fibrous<br>b) Lustrous black<br>c) Lustrous green<br>d) Dull grey | b |
| Q. 19 | A coal contains C= 92 % is _____<br>a) Peat<br>b) Lignite<br>c) Bituminous   | d |

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|       | d) Anthracite   |   |
| Q. 20 | For determination of % VM, coal sample is kept in muffle furnace for_____.<br>a) 500° C, 5 min<br>b) 725 °C,5 min<br>c) 800 °C, 8 min<br>d) 925° C ,7 min   | d |
| Q. 21 | Ignition temperature decreases progressively from anthracite to lignite, because<br><br>a) volatile matter content increases<br>b) carbon content decreases<br>c) moisture content decreases<br>d) ash content decreases  | a |
| Q. 22 | Which of the following constituents of a fuel does not contribute to its calorific value on combustion?<br><br>a) Hydrogen<br>b) Sulphur<br>c) Carbon<br>d) Nitrogen  | d |
| Q. 23 | Calorific value of a typical dry anthracite coal may be around_____Kcal/kg.<br><br>a) 1000<br>b) 4000<br>c) 8000<br>d) 15000  | c |
| Q. 24 | Principle of Bomb calorimeter is_____.<br>a) Total heat liberated by complete combustion of known amount of fuel is absorbed by known mass of water in calorimeter<br>b) Total heat liberated by complete combustion of known amount of fuel is eliminated by known mass of water in calorimeter<br>c) Total heat liberated by complete combustion of known amount of fuel is absorbed by known mass of kerosene in calorimeter<br>d) None of the above | a |
| Q. 25 | In Boy's gas calorimeter burner is surrounded by chimney called as_____<br>a) Combustion chamber<br>b) Upper chamber<br>c) Burnibng chamber<br>d) None of the above   | a |
| Q. 26 | Biodiesel is obtained from _____<br>a) mineral oil<br>b) crude oil<br>c) vegetable oil<br>d) none of these  | c |
| Q. 27 | Biodiesel is _____<br>a) non renewable<br>b) a toxic fuel<br>c) biodegradable<br>d) none of these   | c |

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| Q. 28 | Which of the following is a true statement?<br>a) Higher is the volatile matter higher is ignition temperature<br>b) Higher is the volatile matter lower is ignition temperature<br>c) Lower is the volatile matter higher is ignition temperature<br>d) Lower is the volatile matter lower is ignition temperature | b |
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| Q. 29 | Which of the following gas has highest calorific value?<br>a) Sulphur<br>b) Nitrogen<br>c) oxygen<br>d) Hydrogen   | d |
| Q. 30 | What is knocking?<br>a) Wear and tear of machine<br>b) Sharp metallic rattling noise<br>c) Warming up of machine<br>d) Increase in working temperature   | b |
| Q. 31 | Octane no. of petrol is percentage of _____.<br>a) Pentane and isopentane<br>b) Butane and isobutane<br>c) n heptane and iso-octane<br>d) none of the above                                    | c |
| Q. 32 | In petrol engine, knocking is due to _____.<br>a) slow combustion<br>b) Moderate combustion<br>c) spontaneous combustion<br>d) None of the above   | c |
| Q. 33 | 2 methylnaphthalene have Cetane no. _____.<br>a) 0<br>b) 100<br>c) 90<br>d) 28   | a |
| Q. 34 | Octane no. of iso-octane is _____.<br>a) 20<br>b) 90<br>c) 0<br>d) 100   | d |
| Q. 35 | _____ when mixed with petrol in proper proportion is called as power alcohol.<br>a) Propanol<br>b) Butanol<br>c) Ethanol<br>d) Iso Propyl alcohol  | c |
| Q. 36 | CNG is _____.<br>a) Compressed natural gas about 1000 atm.<br>b) Substitute of gasoline<br>c) 88% CH <sub>4</sub> + 10-11 % C <sub>2</sub> -C <sub>4</sub> + CO= 0.5-1%<br>d) all of the above | d |
| Q. 37 | Biodiesel is produced via _____.<br>a) Neutralisation process<br>b) Transesterification process.<br>c) Etherification Process.<br>d) None of the above   | b |

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| Q. 38      | Ethyl alcohol is manufactured commercially by _____<br>a) reaction of ethylene with water<br>b) hydrolysis of $C_2H_5Cl$<br>c) hydrolysis of ethyl acetate<br>d) fermentation of sucrose, starch  | d |
| Q. 39<br>* | 1.4 g of coal sample in Kjeldahl's experiment liberate ammonia absorbed in 50ml 0.1N $H_2SO_4$<br>The resultant solution required 14 ml of 0.1 N NaOH for complete neutralization Blank<br>titration reading in 25ml Find %N in coal_____.<br>a) 0.11 | c |

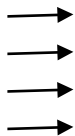
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|         | b) 0.011<br>c) 1.1<br>d) 1.01  |   |
| Q. 40 * | Theoretical oxygen required for a solid fuel has composition C-86%,H-11.75%,O-2.25 % ,is 2.995 kg. Calculate theoretical air supplied per kg of fuel.<br>a) 130.02<br>b) 13.02<br>c) 1.302<br>d) None of the above   | b |
| Q. 41   | Value of L latent heat of condensation of water vapour in cal/gm is _____<br>a) 578<br>b) 875<br>c) 857<br>d) 587  | d |
| Q. 42   | % S estimation in a mass of coal is given by_____.<br>a) %S= 16/233X weight of BaSO4/ weight of coal X 100<br>b) %S= 12/233X weight of BaSO4/ weight of coal X100<br>c) %S= 32/233X weight of BaSO4/ weight of coal X 100<br>d) None of the above  | c |
| Q. 43   | % O is given by _____<br>a) % O = 100 - (% C +% H+% S+% N+% Ash)<br>b) % O = 100- (% C +% H)<br>c) % O = 100- (% C +% S+% N)<br>d) % O = 100- (%H)   | a |
| Q. 44   | Calculate % O if % C = 79%, % H = 7%, % S =3.5%, % N= 2.1% and Ash4.4 %?<br>a) 2%<br>b) 3%<br>c) 4%<br>d) 1%   | c |
| Q.45    | Air contains 21% of _____ by volume<br>a) nitrogen<br>b) sulphur dioxide<br>c) hydrogen<br>d) oxygen   | d |
| Q. 46   | Air contains _____ % oxygen by mass<br>a) 23<br>b) 21<br>c) 22<br>d) 20  | a |
| Q. 47   | Combustion of methane is given by the following reaction<br>a) $\text{CH}_4(\text{s}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g}) + \Delta\text{H}$<br>b) $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g}) + \Delta\text{H}$<br>c) $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2(\text{l}) + \Delta\text{H}$<br>d) $\text{CH}_4(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g}) + \Delta\text{H}$ | b |



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| Q. 48 | Higher efficiency in the combustion of solid fuel cannot be achieved by_____.   | b |
|       | a) Proper fuel preparation<br>b) Keeping the flue gas exhaust temperature very high.<br>c) adopting efficient-fuel firing technique & equipment<br>d) Supplying correct quantity of combustion air. |   |
| Q. 49 | During combustion of gaseous fuels, deficiency of air_____.   | a |
|       | a) lengthens the flame  |   |

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|       | <ul style="list-style-type: none"> <li>b) Tends to shorten the flame.</li> <li>c) does not affect the flame length</li> <li>d) increases the flame temperature</li> </ul>   |   |
| Q. 50 | <p>Gross and Net calorific value of a fuel will be the same _____.</p> <ul style="list-style-type: none"> <li>a) if its ash content is zero.</li> <li>b) If its carbon content is very low</li> <li>c) If its hydrogen/hydrogen compound content is zero.</li> <li>d) Under no circumstances.</li> </ul>                      | c |
| Q. 51 | <p>The reactions in fuel cells are particularly _____</p> <ul style="list-style-type: none"> <li>a) neutralization reactions</li> <li>b) exothermic reactions</li> <li>c) endothermic reactions</li> <li>d) redox reactions</li> </ul>  | d |
| Q. 52 | <p>Presence of _____ in a dry gaseous fuel does contribute to its calorific value.</p> <ul style="list-style-type: none"> <li>a) nitrogen</li> <li>b) hydrogen</li> <li>c) both a and b</li> <li>d) none of the above</li> </ul>  | b |
| Q. 53 | <p>Air/gas ratio for complete combustion will be the highest for _____.</p> <ul style="list-style-type: none"> <li>a) LPG</li> <li>b) gobar gas</li> <li>c) hydrogen</li> <li>d) none of the above</li> </ul>   | a |
| Q. 54 | <p>Bituminous coal is heated in the absence of air at 900-1200° C to get high carbonized coal of _____</p> <ul style="list-style-type: none"> <li>a) Low Aromatic Hydrocarbons</li> <li>b) High Aromatic Hydrocarbons</li> <li>c) Both a and b</li> <li>d) None of the above</li> </ul>                                       | b |
| Q. 55 | <p>Anthracite coal _____.</p> <ul style="list-style-type: none"> <li>a) contains more volatile matter than bituminous coal.</li> <li>b) ignites more easily than bituminous coal.</li> <li>c) is essentially a coking coal.</li> <li>d) burns with short, bluish, yellow-tipped flame producing very little smoke.</li> </ul> | d |
| Q. 56 | <p>Fossil fuels mean _____.</p> <ul style="list-style-type: none"> <li>a) solid fuels</li> <li>b) liquid fuels</li> <li>c) Those fuels which are found in earth's crust.</li> <li>d) Premature fuels with low calorific value.</li> </ul>   | c |

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| Q. 57<br>* | Straight chain hydrocarbons give _____ knocking in petrol engine and _____ knocking in diesel engine<br>a) maximum, maximum<br>b) minimum, minimum<br>c) maximum, minimum<br>d) minimum, maximum | c |
| Q. 58      | Analysis of coal is necessary for  | d |

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|       | a) commercial classification<br>b) price fixation<br>c) industrial utilization<br>d) all of these  |   |
| Q. 59 | A good fuel is the one which burns completely on supply of _____<br>a) calculated air quantity<br>b) excess air<br>c) moist air<br>d) polluted air                 | a |
| Q. 60 | Main constituent of natural gas is.<br>a) CH <sub>4</sub> (up to 90%)<br>b) C <sub>2</sub> H <sub>6</sub><br>c) C <sub>3</sub> H <sub>8</sub><br>d) H <sub>2</sub> | a |
| Q. 61 | The Chemical name of cetane is _____<br>a) n hexadecane<br>b) n heptane<br>c) Octane<br>d) Decane  | a |
| Q. 62 | Addition of Ethyl Alcohol to petrol is<br>a) Increases the octane no.<br>b) Decreases the octane no.<br>c) Makes the combustion fast<br>d) Knocks badly            | a |
| Q. 63 | Which of the following has the highest octane no.?<br>a) Iso-octane<br>b) Cyclohexane<br>c) Toulene<br>d) n- Heptane   | a |
| Q. 64 | Which of the fuels has highest heat of combustion?<br>a) Petrol<br>b) Diesel<br>c) Kerosene<br>d) Hydrogen   | d |
| Q. 65 | The electrode used in hydrogen oxygen fuel cell is _____<br>a) Platinum<br>b) Palladium<br>c) Zirconium<br>d) Zinc   | a |
| Q. 66 | The quality of diesel is expressed in terms of _____<br>a) Octane-number<br>b) Cetane number<br>c) Index number<br>d) Viscosity                                    | b |

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| Q. 67 | In order to calculate LCV of a fuel _____<br>a) Percentage of hydrogen should be known<br>b) Moisture content is required<br>c) High calorific value of fuel is required<br>d) Amount of Air required for combustion is required. | c |
| Q. 68 | Which of them has lowest calorific value ?  | a |

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|       | <ul style="list-style-type: none"> <li>a) Solid Fuel</li> <li>b) Liquid fuel</li> <li>c) Gaseous fuel</li> <li>d) Petroleum</li> </ul>   |   |
| Q. 69 | <p>Which of the following petroleum fractions has lowest boiling point?</p> <ul style="list-style-type: none"> <li>a) Diesel</li> <li>b) Kerosene</li> <li>c) Petroleum ether</li> <li>d) Petrol</li> </ul>  | c |
| Q. 70 | <p>The addition of TEL to gasoline _____</p> <ul style="list-style-type: none"> <li>a) Decreases the octane no.</li> <li>b) Increases the octane no.</li> <li>c) Makes the combustion fast</li> <li>d) None of the above</li> </ul>  | b |
| Q. 71 | <p>Phosphoric acid fuel cell operates at _____</p> <ul style="list-style-type: none"> <li>a) 200 °C</li> <li>b) 100°C</li> <li>c) 350°C</li> <li>d) 175°C</li> </ul>   | a |
| Q. 72 | <p>The _____ of oxygen is the rate determining factor for the performance of the fuel cell.</p> <ul style="list-style-type: none"> <li>a) Reduction</li> <li>b) Oxidation</li> <li>c) Redox</li> <li>d) None of the above</li> </ul>   | a |
| Q. 73 | <p>The fuel used in Phosphoric acid fuel cell (PAFC) is _____</p> <ul style="list-style-type: none"> <li>a) Methanol</li> <li>b) Ethanol</li> <li>c) Propanopl</li> <li>d) Hexanol</li> </ul>  | a |
| Q. 74 | <p>The fuel cell was first used in _____.</p> <ul style="list-style-type: none"> <li>a) Commercial Aircraft</li> <li>b) Submarine</li> <li>c) Apollo project</li> <li>d) Ship</li> </ul>   | a |
| Q. 75 | <p>1 Calorie = _____ Joules</p> <ul style="list-style-type: none"> <li>a) 4.88</li> <li>b) 4.18</li> <li>c) 4.81</li> <li>d) 4.118</li> </ul>  | b |
| Q.76  | <p>In fractional distillation of crude oil, hydrocarbons are separated according to their boiling point range by stepwise cooling in such a way that</p> <ul style="list-style-type: none"> <li>a) vapours of lower boiling point condense first</li> <li>b) vapours of lower boiling point condense last</li> <li>c) vapours of higher boiling point condense first</li> <li>d) vapours of higher boiling point remain in vapour state</li> </ul> | c |

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| Q.77  | Cetane number of _____ is higher than _____<br>a) branched alkanes,aromatics<br>b) alkenes,cycloalkanes<br>c) aromatics,alkenes<br>d) straight chain alkanes,cycloalkanes | a |
| Q. 78 | Beckmann's thermometer is capable of reading temperature up to _____°C.<br>a)1/100  | a |

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|       | b) 1/10<br>c) 1/1000<br>d) none of the above   |   |
| Q.79  | Octane number of _____ is higher than _____<br>a) branched alkanes, aromatics<br>b) cycloalkanes, alkanes<br>c) aromatics, alkenes<br>d) straight chain alkanes, cycloalkanes  | d |
| Q.80  | The progressive transformation of wood to anthracite results in _____<br>a) increase in carbon content<br>b) increase in hardness<br>c) increase in calorific value<br>d) all of these                                     | d |
| Q.81  | Quality of coal is said to be good if<br>a) % of carbon is high<br>b) % of moisture is high<br>c) % of volatile matter is high<br>d) % of ash is high  | a |
| Q.82  | Molar ratio of alcohol to triglyceride required to complete transesterification reaction is _____<br>a) 1: 3<br>b) 3: 1<br>c) 1: 1<br>d) 1 : 5   | b |
| Q.83  | The major advantage of fuel cell is _____<br>a) It uses large weight and volume of gas-fuel storage<br>b) It uses platinum as a catalyst<br>c) It saves fossil fuel<br>d) Its performance is dependent on power plant size | c |
| Q. 84 | In Boy's gas Calorimeter, spiral tube enclosed in a fully insulated jacket is made up of _____<br>a) Brass<br>b) Zn<br>c) Cu<br>d) Alloy   | c |
| Q. 85 | Dry alcohol is _____<br>d) absolute alcohol<br>e) 100% alcohol<br>f) 50% water + 50% alcohol<br>g) Both a and b above  | d |



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| Q. 86     | Analysis of %S in ultimate analysis is also known as<br>a) Kjeldahls Method<br>b) Eschka Method<br>c) Dumas Method<br>d) None of the above  | b |
| Q.87<br>* | If 2.02 g of coal is combusted in combustion tube On passing the CO <sub>2</sub> increase in weight of KOH tube is 5.88 gm. Hence % C present in coal is ____<br>a) 71.39<br>b) 74.39<br>c) 77.39<br>d) 79.39 | d |
| Q.88<br>* | A coal has GCV = 7800 cal/gm and 4% hydrogen, its net calorific value is<br>a) 8875 cal/gm<br>b) 7588 cal/gm<br>c) 5788 cal/gm<br>d) 3005.8 cal/gm  | b |
| Q.89<br>* | A coal has NCV = 7000 cal/gm and 5 % hydrogen, its gross calorific value is<br>a) 7400 cal/gm<br>b) 6736 cal/gm<br>c) 7936 cal/gm<br>d) 7264 cal/gm   | d |
| Q.90<br>* | A coal sample weighing 1 gm, loses 0.09 gm weight on heating at 110 ° C for 1 hour. The moisture in the coal will be ____<br>a) 0.9<br>b) 9<br>c) 9.1<br>d) 91  | b |
| Q.91<br>* | The weight of oxygen for combustion of 1 kg of coal containing 95 % carbon and remaining sulphur will be ____<br>a) 2.62 kg<br>b) 2.00 kg<br>c) 3.52 kg<br>d) 4.1 kg  | a |

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| Q.92<br>*  | 0.25 gm of coal on burning in combustion chamber in a current of pure oxygen was found to increase in CaCl <sub>2</sub> U-tube by 0.08 gm. Hence % H present in the coal is _____<br>a) 3.55<br>b) 3.1<br>c) 3.7<br>d) 3.98  | a |
| Q.93<br>*  | 0.5 gm of solid fuel on combustion in bomb calorimeter raises the temperature by 1.5 °C .If total water equivalence of calorimeter set including water is 2400 gm, the gross calorific value will be<br>a) 3600 cal/gm<br>b) 7200 gm<br>c) 4800 cal/gm<br>d) none of these   | b |
| Q.94<br>*  | Choose the option that is true for natural gas<br>1. It burns with a hot but smoky yellow flame<br>2. It is the raw material in the manufacture of carbon black and hydrogen<br>3. It is used in the synthesis of ammonium buffers.<br>4. Microbiological fermentation of NG gives synthetic proteins used as animal feed<br>5. It is used in the manufacture of methanol, acetic acid and formic acid<br>6. It can be used in the synthesis of gaseous fuels like LPG<br>a) 1, 3, 5<br>b) 2, 4, 6<br>c) 1, 2, 3<br>d) 2, 4, 5 | A |
| Q.95<br>*  | Choose the option that is not true for power alcohol<br>1. power alcohol increases atmospheric pollution<br>2. power alcohol reduces demand for gasoline<br>3. power alcohol decreases the octane number of gasoline<br>4. power alcohol has capacity to dissolve gum products and absorb moisture<br>5. power alcohol reduces chances of overheating of engine<br>6. power alcohol decreases the life of engine<br>a) 1, 3, 6<br>b) 2, 4, 5<br>c) 2, 3, 6<br>d) 1, 2, 6   | a |
| Q. 96<br>* | Choose the option that is true with respect to ultimate analysis of coal<br>1. good quality coal should have high percentage of nitrogen<br>2. presence of sulphur in coal is undesirable<br>3. good quality coal should have moderate percentage of oxygen<br>4. good quality coal should have lower percentage of ash<br>5. nitrogen is estimated by volumetric flask<br>6. coal sample is burnt in a current of pure and dry oxygen in a combustion apparatus<br>a) 1, 3, 4<br>b) 2, 4, 6<br>c) 3, 4, 5<br>d) 1, 4, 6       | B |

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|  | <p><b>Note : * indicates questions for 2 marks</b></p> |  |
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