WINTER-15 EXAMINATION

Model Answer

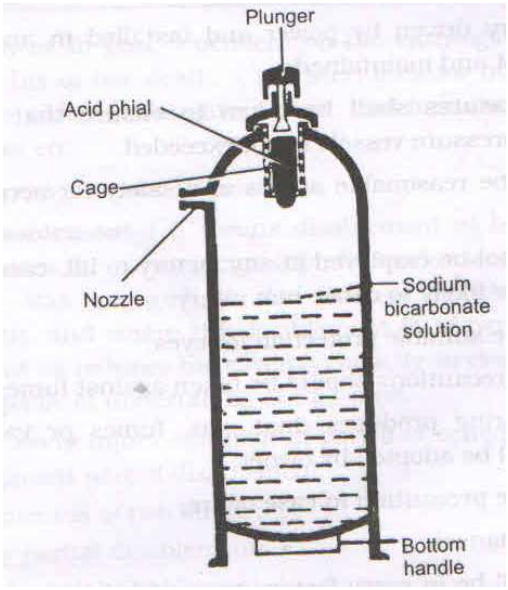
Important Instructions to examiners:

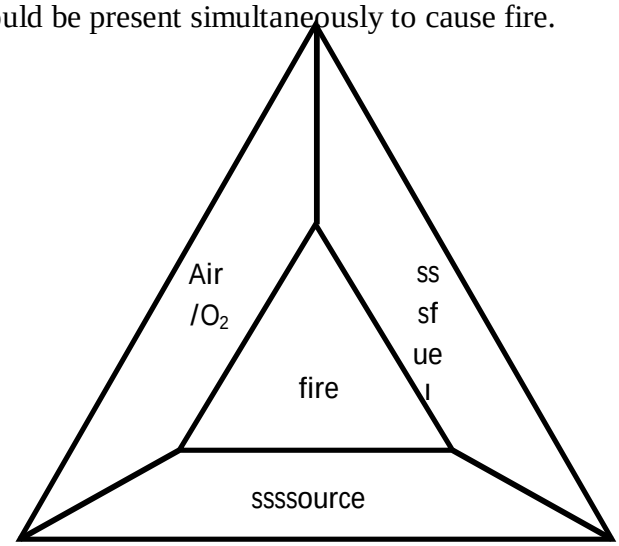
1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q No.	Answer	marks	Total marks
1-A	Any 3		12
1A-a	**Losses due to accidents in plants:** 1. Direct loss: These are losses to the employer, which he pays to the worker for compensation. Employer also pays for medical expenses incurred on the worker. 2. Indirect losses: These arise from the following sources a. Loss of time of the injured person b. Loss of time of his fellow workers c. Loss of time of the supervisors d. Loss due to damage caused to equipments and machineries. e. Loss due to reduction in the efficiency of the worker when he returns after recovery f. Loss in time of supervisors in selecting and training the new worker g. Loss to the injured worker	1 3	4
1A-b	**Factors to be considered for selection of proper respiratory devices :** i) The nature of the hazardous operation or process. ii) Type of the contaminant and its properties. iii) Duration for which the protection will be needed. iv) Location of the hazardous area. v) State of health of the personnel involved . vi) Functional and physical characteristics and limitation of the protective devices available.	1 mark each for any 4	4
1A-c	**Importance of plant maintenance :**	4	4

	1. The importance varies with the type of plant and its production. 2. Equipment break down leads to loss of production. If a piece of equipment goes out of order in a flow production factory, the whole line will soon come to a halt. 3. An un-properly maintained or neglected plant will sooner or later require expensive and frequent repairs because with passage of time all machines or other facilities wear out and need to be maintained to function properly. 4. Plant maintenance is important in production management because plant break down creates problems such as loss in production time , rescheduling of production, spoilt materials , need for over time, temporary work shortage.		
1A-d	**Characteristics of chemicals to be considered while storing:** i) Hazardous nature ii) Flammability iii) Corrosive or oxidizing nature iv) Water reactivity v) Ignition properties vi) Toxicity. vii) Chemical stability viii) Shock sensitivity	½ mark each	4
1-B	Any 1		6
1B-a	**Different respiratory equipments used as personal protective equipments in a chemical plant are:** 1. Air Purifying Type a. Mechanical filter respirators: These give protection against dust and particulate matters only and do not provide any protection against	2	6

	harmful vapours, gases or oxygen deficient atmospheres. b. Canister gas masks: This consists of a full face mast connected to a canister through corrugated hose. The canister contains certain neutralizing chemicals, which can absorb a particular contaminant. c. Chemical Cartridge Respirators: These are similar to canister gas masks with the difference that one or two chemical cartridges are used with a half face mask. These masks are effective only at very low concentration and cannot be used in emergency. 2. Air Supplied Type: Here air is supplied to the full face mast on hood so that the wearer gets constant supply of breathable air drawn from a non contaminated area away from working place. This includes- Air line respirators: They use a source of filtered and low pressure compressed air or oxygen, instrument air which is usually at low pressure and free from oil. Fresh air or Suction Hose Masks: Here the wearer draws in air by his own breathing effort, from a source supplying breathable air, placed at a distance. On account of limited hose length, this restricts the free movement of the operator. 3. Self Contained Breathing Apparatus: These are designed to supply complete respiratory protection is any concentration of toxic gases or even in environment deficient of oxygen. These are mainly of three types. a. With compressed air or oxygen cylinder b. Oxygen rebreathing or recirculating type c. Oxygen regenerating type	2 2	

1B-b	**Construction & Working of Soda Acid Fire Extinguisher :** **Construction:** In soda acid fire extinguisher the material used are dry chemical, bicarbonate of soda designed to be dissolved in water and a liquid chemical sulphuric acid. Sulfuric acid is kept in the acid bottle and sodium bicarbonate in the outer body. Nozzle is provided near the top and aplunger at the top. **Working:** When the plunger is struck, it breaks the acid bottle. The sulfuric acid and the sodium bicarbonate solution react together to release CO_2 gas. The gas generated creates pressure, which forces the water out of the extinguisher nozzle. Before using these extinguisher, it is advisable to check whether these extinguishers are upright type or turn over type. Direct the jet at the base of the fire and sweep it across the area of fire. Attack a vertically spreading fire at its lowest point and follow it up. Search out for hot spots and ensure that the fire is completely extinguished and that it is not smouldering.  	2 2 2	6

2	Any 4		16
2-a	**Fire Triangle:** A fire can be caused and sustained by a fuel, oxygen or oxidizer and source of heat(ignition source).These three forms three sides of a fire triangle. It requires all three should be present simultaneously to cause fire.  **Fire may be extinguished** by withdrawal of flammable contents, interrupting flammable flow, isolating fuel from air, heat removal to below reaction temperature. **Withdrawal of flammable contents** can be accomplished by 1).Blowing down the vessel and piping contents (2)Pump out or 3)draining Flammable flow may be interrupted by the shutdown of pumps, closing of valves. **Isolation of flammable flow** from the air is accomplished by blanketing with steam or water spray, foam, CO_2 etc.	2 2	4
2-b	**Harmful effects of ammonia:** Inhalation: Very toxic, can cause death., can cause severe irritation of the nose and throat, can cause life threatening accumulation of fluid in the lungs, coughing, shortness of breath.	4	4

	Skin contact: the gas irritates or burns the skin, permanent scarring can result, can chill or freeze the skin, burning sensation and stiffness, skin becomes waxy white or yellow. Eye contact: corrosive, the gas irritates or burns the eye, blindness can result, can freeze the eye,		
2-c	**Importance of record keeping in preventive maintenance:** It is very essential to keep records as they are the only reliable guides to measure the effectiveness of the preventive maintenance programme. Records give an idea regarding situation at present and where it is going. Good, updated records is very important in preventive maintenance programme. Record keeping is also helpful: 1. When budgeting for major overhauls. 2. For finding equipment reliability 3. For determining frequency of inspection 4. To prepare maintenance schedule 5. To predict equipment life 6. For equipment replacement analysis 7. To carry out cost reduction studies	4	4
2-d	**Safety precautions in the transportation of inflammable liquids:** 1. Inflammable liquids shall be transported in rugged pressure resistant safety cans. 2. Original containers of inflammable liquids shall be placed in an outside container or acid carrying bucket. 3. Not more than five gallons of inflammable liquids in glass container shall be transported on the freight elevator unless the original shipping carton is used and the materials are on an appropriate cart. 4. Before transportation details of the packing requirement should be obtained	1 mark each	4

<table>
<tr><td></td><td>from the hazard data sheet. The packing group for which the chemical belongs will decide the amount which can be transported at any one time.</td><td></td><td></td></tr>
<tr><td>2-e</td><td>
<table>
<tr><th>Class</th><th>Description</th><th>Suitable type of extinguishes</th></tr>
<tr><td>A</td><td>Fires involving ordinary combustion materials like wood , paper, cloth etc where effect of water is essential to extinguish.</td><td>Soda acid</td></tr>
<tr><td>B</td><td>Fires in flammable liquids like oil, solvents, petroleum prod, varnish paint where blanketing effect in essential</td><td>Foam , CO_2, gas, dry chemical powder</td></tr>
<tr><td>C</td><td>Fires involving gaseous substances under pressure where it is necessary to dilute burning gas at a very high rate with an inert gas or powder.</td><td>CO_2 Gas, chemical power</td></tr>
<tr><td>D</td><td>Fires involving metal like Mg, Al K etc. where its burning is reacting to water and which require special extinguishing media or technique</td><td>Special powder</td></tr>
<tr><td>E</td><td>Fires involving electrical equipment where the electrical non conductivity of the extinguishing media is of prime importance</td><td>CO_2, gas, dry chemical powder but when the ele3ctrical equipmentsis dancercised. Even soda acid or foam is suitable.</td></tr>
</table>
</td><td>4</td><td>4</td></tr>
<tr><td>2-f</td><td>Types of plant maintenance:
1. Preventive maintenance
2. Scheduled maintenance
3. Predictive maintenance
4. Breakdown maintenance
Scheduled maintenance:
Scheduled maintenance is a stich-in-time procedure which is aimed at avoiding breakdowns. Breakdowns can be dangerous to life and hence should be</td><td>2

2</td><td>4</td></tr>
</table>

	minimized. This method of maintenance incorporates inspection, lubrication, repair and overhaul of certain equipments which if neglected may result in breakdown. Scheduled maintenance practice is generally adopted for overhauling of machines, cleaning of water and other tanks, white washing of buildings etc.		
3	Any 4		16
3-a	**Shut down maintenance:** During shut-down maintenance generally chemical plants are closed half yearly or yearly for carrying out major maintenance work of total plant equipment. The sugar cane factory is stopped, once the sugar cane supply is over. During shut down of the plant, maintenance work like changing of parts, lubrication, overhauling of all the equipment in the plant, cleaning of equipment and plant are done. Written procedures for emergency shut downs as well as normal shut down must be prepared, rehearsed, kept up to date, and kept available to people that have to use them. Maintenance department and process plant people are involved in the process. **Disadvantages of shut down maintenance:** i) Stopping production, no matter the duration, results in decreased revenue. ii) The additional resources and other costs associated with the shutdown make it a very expensive endeavor. iii) Most shutdowns are highly complex and carry inherent safety risks. iv) As compared to other maintenance procedures, shutdowns are more unpredictable since there are many opportunities to discover or create problems involving expensive equipment and machinery.	2 1 mark each for any two	4
3-b	**Physiological effects of electricity:** The primary effect of electric shock is due to current actually flowing through the body. Electrical burns occur when the body completes a circuit connecting the power source with the ground. If the skin is very dry, a high voltage may	4	4

	cause a severe burn but there may be no other damage. On the other hand, a lower voltage applied to wet skin could cause death, particularly if the current passed through heart, but there might be no sign of burning. Four different kinds of damage can result from the passage of an electric current through the body. First is burning close to the contact point particularly at high voltages. Second effect is that breathing becomes increasingly difficult or suffocation. The third and fourth type directly concerns the heart and may rapidly become fatal.		
3-c	**Maintenance of personal protective equipment:** 1. The employer is obliged to maintain the equipment provided or replace equipment that becomes worn or defunct. Hard hats, being made of plastic will deteriorate over time. Their age of life expectancy will be advices by the maker so that the employer can budget and arrange to have them replaced at the end of their life. 2. Some personal protective equipment is for on-off use, eg. Paper boiler suits, disposable gloves or disposable respiratory protective equipment such as face masks. 3. Some equipment will have a life expectancy of a few years. If this is the case then employers should arrange for it to be adequately cleaned and sterilized so as to reduce cross infection between users. 4. Non disposable equipment must be stored in adequate accommodation to protect it from deterioration, damage, or harmful effects such as damp, sunlight, fungal attacks or general abrasion. **Respiratory Protective Equipment (RPE)** is graded according to its nominal protection factor (NPF). The required NPF for any given site can be calculated as,	1 mark each for any 2 2	4

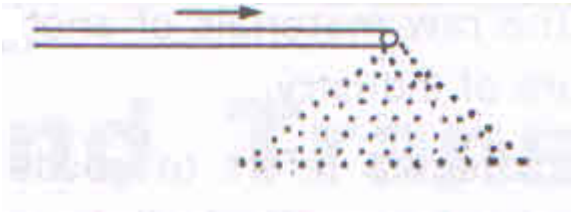
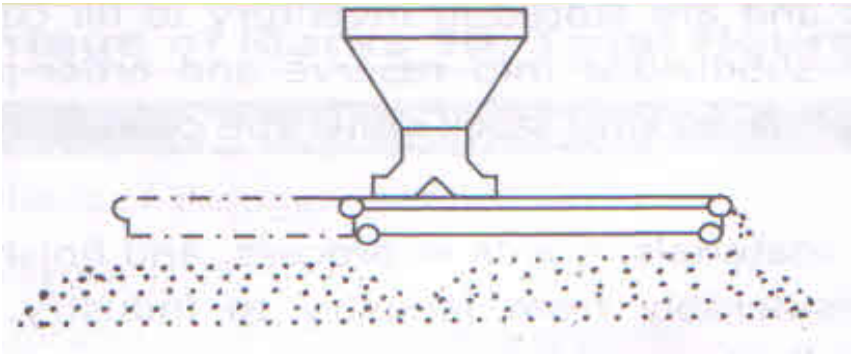
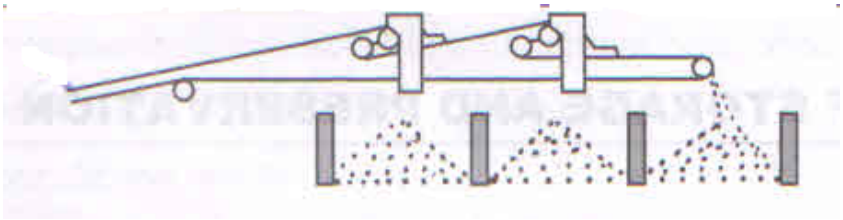
	NPF = $\frac{The\ time-weighted\ average}{The\ exposure\ limit}$ The time weighted average is found by monitoring the work shop using a sampling device. The exposure limit is the allowable limit within the workshop.		
3-d	**Fire Protection Water System:** water is relatively inexpensive and abundant is the most vital fire protection medium. Water has tremendous cooling capacities and particularly when combined with other agents, extinguish fire, control fire, exposure protection or prevent fire. The fire protection system consists of a water supply system and a distribution piping system to deliver the water to the using equipment and systems. The supply system consists of pumps taking suction from reliable source such as a city water system, elevated tanks etc. The fire protection pumping system components including pumps, diesel drivers, gears and control equipment must be well designed and tested for fire protection system. Fire pumps must be capable of delivering 150% of rated capacity at not less than 65% of rated head. The distribution system normally consists of alooped or gridded network of large pipe diameter, feeding all of the fire protection systems and equipment requiring water.	4	4
3-e	**Repair cycle:** In plant maintenance practice certain stages, such as a inspection, repairs and repeated for a given equipment in a given time. Typical **repair cycle** may be as follows: i) New equipment ii) Inspection-1iii) Inspection-2iv) Inspection-3 v) Repair 1 vi) Inspection-4vii) Inspection-5 viii) Inspection-6 ix) Repair2 x) Inspection-7 xi) Inspection-8 xii) Inspection-9 xiii) Repair3 xiv) Inspection-10 xv) Inspection-11 xvi) Inspection-12 xvii) Repair 4 xviii) Inspection-13 xix) Inspection-14 xx) Inspection-15 xxi) Overhaul-1	4	4

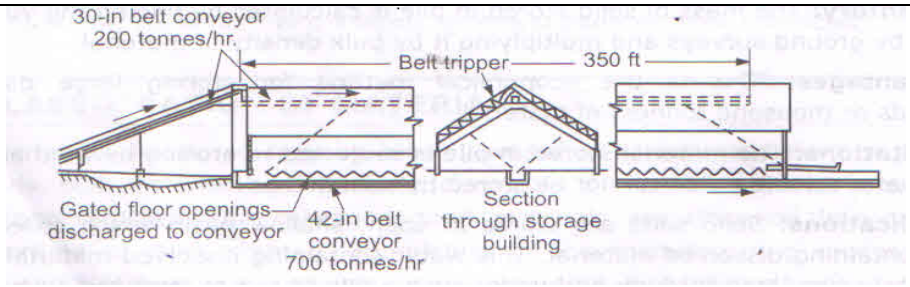
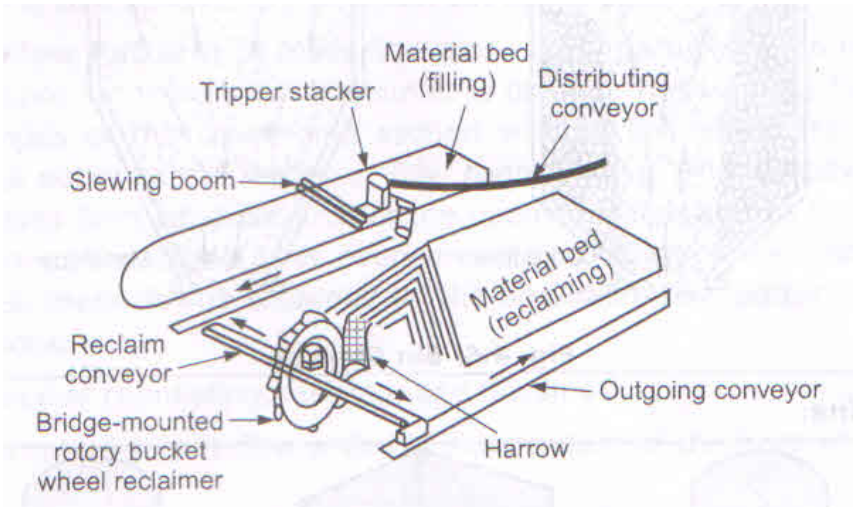
	It is clear that from new equipment to overhaul stage, in one cycle 15 inspection, 4 repairs and 1 overhaul are involved. The time duration between two consecutive steps depends upon the type of equipment.		
4-A	Any 3		12
4A-a	**Methods for controlling noise in industry:** **i) Reduction at source:** wherever possible it would be advisable to reduce the noise at the source itself.eg change the bearings if it makes noise due to wear. **ii) Vibration isolation:** In case of machine like reciprocating compressors and power presses, the mechanical vibrations are transmitted through the structures, walls and the floor which increases the noise level at the workplace. Reduction of noise levels can be achieved by, a) Using vibration resilient mounts to fix the machine to foundations. b) Special heavy foundations with a large weight compared to the weight of machine. **iii) Vibration Damping:**Machine parts, ventilation duct cause noise in this manner. Thenoise in these cases can be reduced by damping- by stiffening the member. **iv) Silencers:** Where noise due to movement of gases or air is the problem, silencers are the right solution. Silencers can be used at the inlet/outlet of compressors, exhausts, release of steam and gases and pressure relief valves of pneumatic machines. **v) Noise insulation:**It may be necessary to insulate the source from all the sides although insulating two or three sides also give reduction of a lower degree. **vi) Noise absorption:** Noise absorption material, normally soft and porous, prevent reflection of noise and also convert some of the noise energy into heat energy.	1 mark each for any 4	4
4A-b	**Advantages mass flow pattern over core flow pattern:**	1 mark	4

	i) Absence of channeling, surging and flooding. ii) Uniform and steady flow which is independent of the head of material in the bin. iii) The pressure across any horizontal section of the bin is uniform. iv) There are no dead regions within the bin. v) There is minimum segregation of bulk solid stored. vi) A first in first out flow pattern can be obtained.	each for any 4	
4A-c	 Helmet  Hand gloves  Ear plug  Apron Sketch of shoes and goggle	1 mark each for any 4	4

	Sketches of personal protective equipment		
4A-d	**Functions and responsibilities of maintenance department in chemical industry:** 1)Inspection 2)Engineering 3) Maintenance 4) Repair 5) Overhaul 6)Construction 7) Salvage 8) Clerical work **1)Inspection:** i) Inspection of the plant facilities to examine their condition and to check for repairs needed. ii) Inspection to ensure the safe and efficient operation of plant equipment and machinery. ▪ **)Engineering :** i) Engineering involves alternations and improvement in existing plant equipment to minimize breakdown. ii) Engineering and consulting services to production supervision. **3) Maintenance** : i) Maintenance of existing plant equipment. ii) Engineering and execution of planned maintenance, minor installations of equipment building and replacements. 4**) Repair:** i) To carry out corrective repair to alleviate unsatisfactory conditions found during preventive maintenance inspection. **5) Overhaul:** i) Overhaul is a planned, scheduled reconditioning of plant facilities such as machinery etc. ii) Overhaul involves replacement, reconditioning, reassembly, etc. **6)Construction :** i) In some organization, maintenance department is provided with equipment	**03** Listing any 6 points may be given mark 1/2 mark each 1mark for explainati on of any one.	4

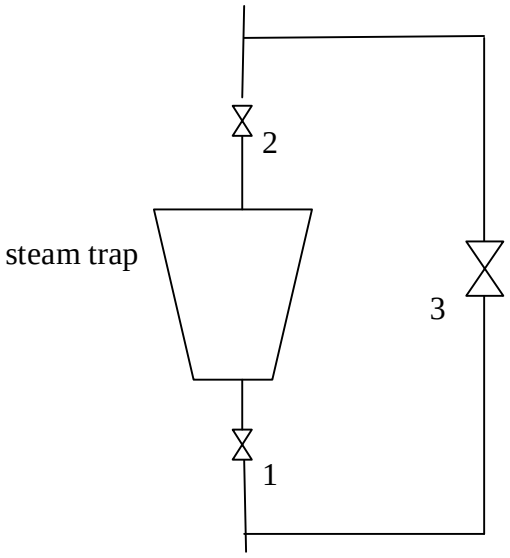
	and personnel and it takes up construction job too. **7) Salvage :**) Maintenance department may also handle disposition of scrap or surplus materials. **8) Clerical work:** i) Maintenance department keeps records at i) of costs, ii) of time progress on jobs pertaining to important features of building and production equipment.		
4-B	Any one		6
4B-a	**Objectives of Safety Audit are :** 1. Confirm that safety, health, fire and environmental program activities and controls are in place and functioning. 2. Verify that the facility is in compliance with internal benchmarks and government regulations. 3. Assess past and current practices to identify and correct safety impediments which may result in personal injuries, property damage or business interruption. **Safety audi**t is essential to determine the company's safety and is a proactive process by which and organization is able to continually evaluate and monitor the progress of its safety and health programs. Safety audit involves the examination and qualitative assessment of all activities such as research and development, design, occupational health and hygiene, environmental control, products and processes, storage and transportation, labeling and packing, operational measures, maintenance, housekeeping and training. Auditing will promote contact with individual workers as a manifestation of the management interest and concern relating to safety. It is also essential that an appropriate member of the management is directly involved in auditing and implementation of the audit report. Audits are designed to rate an organization's total safety and health program, identify it's strength and weakness , show where improvement	Two mark each for any two 02	6

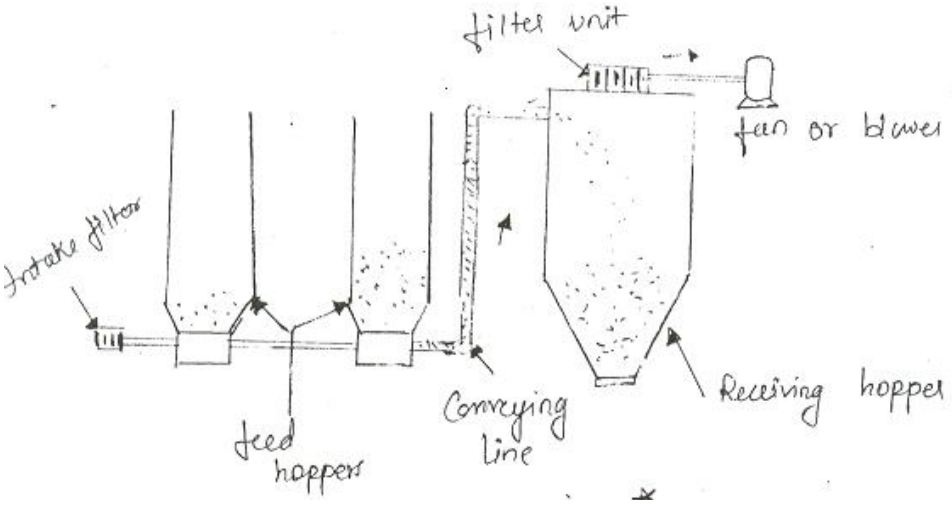
	are needed , and obtain commitment and target dates for correcting problems.		
4B-b	The bulk pulverized solids such as sulfur, coal etc. are usually stored outdoors in pile form. **Any one sketch of Belt Feeder/Shuttle Feeder/Tripper Discharge**  **Belt Feeder**  **Shuttle Feeder**  **Tripper Discharge** **Sketch of either Material Reclaimer or Bucket Reclaimer**	1 2 3	6

	 **Material Reclaimer**  **Bucket Reclaimer**		
5	Any 4		16
5-a	**Predictive maintenance:** Predictive maintenance makes use of human sense or other sensitive instruments such as audio gauges, vibration analyser, amplitude meter , pressure , temperature and resistance strain gauges etc. to predict trouble before the equipment fails. Unusual sounds coming out of a rotating equipment predict a trouble , an electric cable excessively hot at one point predict a trouble. Simple hand touch can point out many unusual conditions and thus predict a trouble. In predictive maintenance , equipment conditions are measure periodically or on a continuous basis and this enables maintenance men to take	2	4

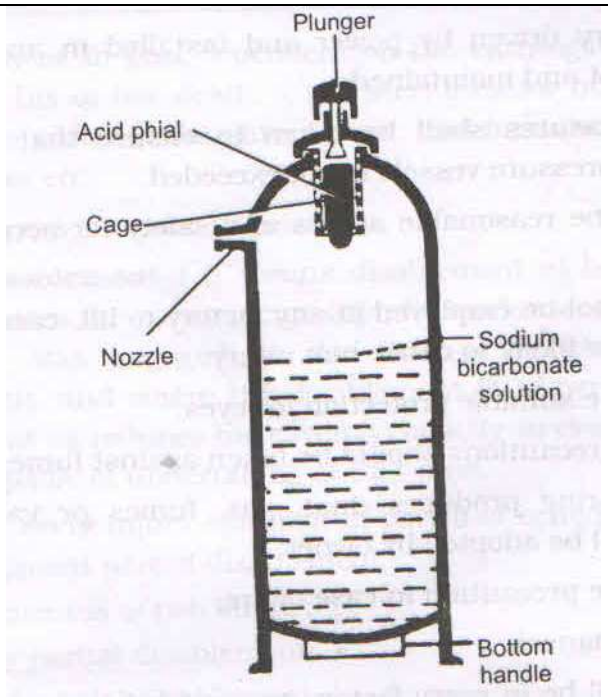
	a timely action such as equipment adjustment , repair or overhaul. Predictive maintenance extends the service life of an equipment without fear of failure. **Four senses adopted for predictive maintenance technique** (Human senses) : 1. ar :eg. Unusual sound coming out of rotating equipment. 2. Eye :eg. Excessive vibration of equipment or dislocation of moving part. 3. Touch :eg. Excessive temperature of equipment. 4. Smell :eg. Unusual smoke coming out of equipment. **Four sensitive instruments adopted for predictive maintenance technique:** 1. Audio gauges :eg. Unusual sound coming out of rotating equipment. 2. Vibration analysor: eg. Excessive vibration of equipment 3. Amplitude meter:eg. Excessive temperature of equipment. **4.** Pressure, temperature and resistance strain gauges: eg. Excessive temperature of equipment.	1 1	
5-b	**Sources of Radiation Hazard** : Nuclear Industry, Hospital (X-ray division)are some industries where radiation hazard takes place. The radiation is produced when atoms of natural radio active material decay or split, generating streams of photons vibrating at enormous speeds in wavelike form. Radiation has two basic forms: ionizing and nonionizing. In chemical plants workers may be exposed to various forms of nonionizing radiation. Radiation hazards occurred during testing of nuclear weapons, establishment of nuclear power plants, mining and refining of plutonium and thorium and preparation of radioactive isotope.	4	4
5-c	**Procedure for safety auditing:** Safety audit is carried out by a team whose members are not involved in the plant or activity being audited. The expertise of the team should be compatible	4	4

	with the type of audit. It is beneficial to include the managers of other plants or units in an audit team as well as one previous auditor of the same unit. Audits are carried out in a formal way using a carefully drawn up checklist of items and descriptive standards for each item. A line manager or supervisor of the plant under audit should be asked to accompany the auditor inspecting it. He should be informed of all corrections and improvements required by the auditors so that he can start taking the necessary steps before the audit report is submitted to management. The main object of inspection should be to determine whether the layout design and condition of equipment and protective features are up to standard and to ensure that the protective features will work in an emergency. The auditing should give a verbal report to the management on completion of audit followed by a clear and concise written report within two weeks.		
5-d	**ON LINE MAINTENANCE**; In a chemical plant it is normal practice to do on line maintenance work. This avoids total shutdown of the equipment or plant. This is possible if proper pipe fittings are installed at the time of erection. If we provide a stand by pump in a process pipe line, it is possible to attend the faulty pump, without stopping the production by using a stand by pump. When a valve is to be attended for its maintenance by removing it from pipe line then blind flange is useful e.g. The suction side valve of a pump is provided with blind flange and the only suction valve can be removed for maintenance without loss of materials. When the pressure vessels like reactor, distillation column, evaporator is leaking then it is difficult to do maintenance work without stopping the production. When the insulation get damaged due to any reason, it is possible to attend it without stopping the production since insulation is fixed externally. Only precaution is to be taken if the pipe line or equipment is at high	2	4

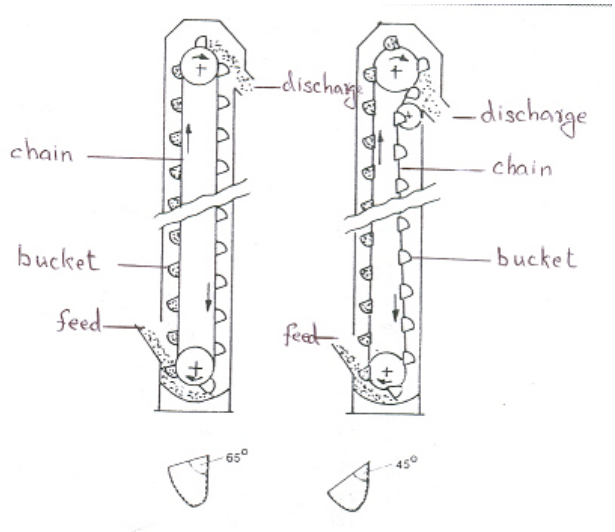
	temperature. e.g. suppose there is a steam trap in a pipe line. If we desired to replace a steam trap, we can close valve 1 and 2 and open 3 & divert the fluid through by-pass line. After replacement of the steam trap close valve 3 and open 1 & 2. Thus it is possible to attend maintenance jobs in the line without stopping the production.  	2	
5-e	**Pneumatic conveyor:** **Different types are:** 1. Positive pressure pneumatic conveyor 2. Negative pressure pneumatic conveyor 3. Pressure-vacuum system 4. Fluidising system 5. Blow tank **Negative Pressure or Vacuum Systems:** It is similar to domestic vacuum cleaner.	2	4

	Complete removal of solids from the conveyed gas, which otherwise may damage the fan or blowers. These systems do not require separate material feeding devices due to absence of adverse pressure gradients. Hence these systems have simple feeding mechanism but larger air filtration plant. Vacuum systems are useful in installations involving picking up of material from several points and discharging them to common point. Hence these systems are well suited for unloading the material from several hoppers and discharging them into pipeline.  ***Note: Same marking should be followed for positive pressure pneumatic conveyor or combine pressure system***	2	
5-f	**Classification of explosives:** Classes of explosive are : 1. Category X: Those explosives which have a fire or a slight explosion risk. 2. Category Y: Those explosives which have a mass fire risk or moderate explosion risk, but not the risk of mass explosion. 3. Category Z: Those explosives which have a mass explosion risk and	4	4

	major missile effect. 4. Category ZZ: Those explosives which have a mass explosion risk and minor missile effect. OR **Classification of explosives :** Explosives are divided in to eight classes. 1. Class 1 – Gun powder (KNO_3, C&S) 2. Class 2 – Nitrate mixture 3. Class 3 – Nitro compound class 4. Class 4- Chlorate mixture class 5. Class 5 – Fulminate class (with C, N_2& O_2) 6. Class 6 – Ammunition class 7. Class 7 – Firework class Class 8 – Liquid oxygen explosive class		
6	**Any 4**		16
6-a	**Hazardous properties of chemicals** : 1. Irritation of eyes, conjunctivitis, irritation of noise and thought. eg. Ammonia. 2. Blood cancer, eg. Irritation, burning, anaesthetic effects eg. Benzene. 3. Irritation of eyes , mucous membrane , depression , mental deterioration. eg. Bromine. 4. Fire hazard, explosion hazard eg.CO, CS_2 5. Corrosion hazard eg. Bromine. 6. Highly reactive hazard eg. Phosgene. 7. Disaster potential hazard eg.SO_2, naphtha H_2S.	4	4
6-b	**Dry chemical extinguisher:**	4	4

	 **Working** :On fires involving either liquids in containers or spilled liquids, direct the jet towards the near edge of the fire and with rapid sweeping motion, drive the fire towards the far edge until all the flames are extinguished. On fires in falling liquids, direct the jet at the base of the flame and sweep upwards. On fires in electrical equipments, direct the jet straight at the fire. Where the equipment is closed, direct the jet into any opening with the object of penetrating the interior.		
6-c	**Start up of a plant:** A chemical plant is started at two different times, 1. When it is constructed, erected and to be commissioned first time for production. The procedure here to be followed is to take water in the plant to check the fluid flowing through equipment and pipelines without any leakage, at the desired flow rate, pressure and temperature. If any leakage is observed, it can be rectified. This is the safest and	2	4

	cheapest way of checking the functioning of the plant equipment in total. 2. When plant is stopped for annual major shutdown, then the procedure to be followed for start- up of a plant is i) To take water in the plant to check the fluid flowing through equipment and pipelines without any leakage, at the desired flow rate, pressure and temperature. If any leakage is observed, it can be rectified. Thus is the safest and cheapest way of checking the functioning of the plant equipment in total. **ii)** Once it is assured that fluid flow takes place without any problem, the total plant water is drained off and water is removed and then slowly loaded in stepwise and retched to desire capacity in stepwise. It is always advisable to operate the plant with 50% capacity for few days and after full satisfaction of plant working, it is taken up to full capacity	2	
6-d	**Different types of workwear for body protection:** A. General workwear requiring no specific further protection Considerations: style, climatic, fabric, cost B. General workwear requiring further hazard protection 1. Mechanical a. Leather b. Rubber 2. Heat a. Wet b. Dry c. Fire apron d. Fire entry 3. Chemical	4	4

	a. Fabrics coated with PVC,Butyl,neoprene,hypalon 4. Radiation a. Fabrics made of cotton drill, impervious fabrics, absorbing fabrics 5. Biological a. respiratory fabrics b. Protection c. Skin d. Eyes C. Airfed workwear a. Hoods b. Suits D. Emergency clothing a. Gas tight b. Splash contamination c. Fire		
6-e	**Bucket elevator:** 	2	4

	Working: Buckets are loaded partly by material flowing directly into them and partly by scooping material from the boot. As the bucket reaches top, these will be inverted and the material will be off loaded. The empty bucket will again be loaded with material and so on.	2	