

BT605 – BIOSAFETY & BIOETHICS

FINAL TERM MOST IMPORTANT QUESTIONS

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GROUP LINK: <https://chat.whatsapp.com/BjC6W0jZx8o9yaC2ISh1Gu>

1. How to patent a gene?

1. *Make sure the gene is new and man-made* — natural genes can't be patented, but edited or synthetic ones can.
2. *Check if it's already patented* — search patent databases like USPTO or WIPO.
3. *Show it's useful* — explain what the gene does and why it matters (like treating a disease).
4. *Apply for a patent* — hire a patent lawyer and submit your application with gene details, sequence, and use.
5. *Wait for review* — the patent office will check if it qualifies.

2. What are special equipment of BSL-3?

Biosafety Level 3 (BSL-3) labs handle dangerous airborne pathogens. Special equipment includes:

1. *Class II or III Biosafety Cabinets (BSCs)* – for safe handling of infectious materials.
2. *HEPA Filters* – filter incoming and outgoing air to trap microbes.
3. *Directional Airflow System* – keeps air flowing from clean to contaminated areas.
4. *Hands-free Sinks & Eyewash Stations* – near exits for emergency use.
5. *Sealed Windows, Walls, and Floors* – easy to clean and prevent leaks.

6. **Negative Air Pressure** – prevents pathogens from escaping the lab.
7. **Autoclaves** – for sterilizing all waste and materials.
8. **Personal Protective Equipment (PPE)** – includes respirators, gowns, gloves, and sometimes face shields.

3. What is technical advisory committee?

A Technical Advisory Committee (TAC) is a group of experts who provide specialized advice and guidance on technical matters to an organization, project, or program. Their main roles include:

- Reviewing plans, designs, or research for technical accuracy and feasibility
- Recommending improvements or innovations
- Ensuring compliance with industry standards or regulations
- Providing insight on new technologies or trends

4. How risk is controlled by risk management team?

The risk management team controls risk through a structured process:

1. **Identify Risks** – Find potential problems that could affect the project or organization.
2. **Assess Risks** – Analyze the likelihood and impact of each risk.
3. **Prioritize Risks** – Focus on high-impact or high-probability risks.
4. **Plan Responses** – Create strategies like:
 - **Avoid** (change plans to eliminate risk),
 - **Reduce** (take steps to lower impact or chance),
 - **Transfer** (shift risk to a third party, like insurance),
 - **Accept** (live with the risk if it's minor or unavoidable).
5. **Implement Controls** – Apply safety measures, training, policies, or technology.
6. **Monitor and Review** – Regularly check risks and update plans as needed.

5. What is biosecurity?

Biosecurity is the protection of people, animals, plants, and the environment from harmful biological agents like viruses, bacteria, toxins, or genetically modified organisms. It involves measures to:

- Prevent the loss, theft, or misuse of dangerous biological materials
- Control access to labs and biological samples
- Monitor and respond to biological threats or outbreaks
- Train personnel in safe handling and emergency procedures

6. If fire emerges in a kitchen, what would you use? Water or Fire extinguisher? And why?

You should use a fire extinguisher, specifically a **Class K** (for grease fires) or **Class B** (for flammable liquids), not water.

Why not water?

If the fire is caused by oil or grease (common in kitchens), water can make it worse by spreading the fire or causing a flare-up.

Why a fire extinguisher?

Fire extinguishers are designed to smother the fire and cut off oxygen without splashing burning material.

7. What will you do if aerosol is released accidentally?

If an aerosol is accidentally released, follow these steps:

1. **Leave the area immediately** – to avoid inhaling the aerosol.
2. **Alert others nearby** – so they can evacuate too.
3. **Notify lab supervisor or safety officer** – report the incident right away.
4. **Ventilate the area** – if safe to do so, open windows or turn on fume hoods to clear the air.
5. **Avoid touching surfaces** – the aerosol may have settled as residue.
6. **Wear PPE if cleanup is needed** – use gloves, mask/respirator, and goggles.
7. **Follow spill response procedures** – as per lab safety guidelines or Material Safety Data Sheet (MSDS).
8. **Document the incident** – for safety records and prevention in the future.

8. What is biosafety?

Biosafety is the practice of preventing unintentional exposure to harmful biological agents (like viruses, bacteria, or toxins) and stopping their accidental release into the environment. It includes:

- **Safe lab practices**
- **Use of protective equipment**
- **Proper waste disposal**
- **Containment procedures (BSL-1 to BSL-4 levels)**

9. What are types of biohazards?

The main types of biohazards are:

1. **Biological agents** – bacteria, viruses, fungi, and parasites (e.g., *Mycobacterium tuberculosis*, HIV).
2. **Toxins** – poisonous substances from microbes, plants, or animals (e.g., botulinum toxin).
3. **Allergens** – biological materials that cause allergic reactions (e.g., mold spores, animal dander).
4. **Genetically Modified Organisms (GMOs)** – if they pose health or environmental risks.
5. **Human and animal waste** – blood, body fluids, and tissue samples that may carry disease.
6. **Sharps waste** – needles or scalpels contaminated with biological materials.

10. What should be included in basic first aid kit?

A basic first aid kit should include Adhesive bandages (various sizes), Sterile gauze pads and dressings, Adhesive tape, Antiseptic wipes or solution (e.g., alcohol or iodine), Antibiotic ointment, Tweezers, Scissors, Disposable gloves, Pain relievers (like ibuprofen or acetaminophen), Burn cream or gel, Instant cold packs, CPR face shield or mask, Safety pins, Cotton balls or swabs and A first aid manual or instructions.

11. What are equipment of BSL-2?

BSL-2 labs handle moderate-risk pathogens. Key equipment includes:

- **Class II Biosafety Cabinets (BSCs)** – for safe handling of infectious materials
- **Autoclave or sterilizer** – to decontaminate waste and materials
- **Eye wash stations and sinks** – for emergency washing and hand hygiene
- **Personal Protective Equipment (PPE)** – gloves, lab coats, face shields or goggles
- **Sharps disposal containers** – for safe needle and sharp waste disposal
- **Handwashing facilities** – essential for preventing contamination
- **Self-closing doors** – to control access

12. What are categories of hazardous substances?

Hazardous substances are generally grouped into these categories:

1. **Physical Hazards** – substances that are explosive, flammable, oxidizing, corrosive, or reactive (e.g., gasoline, acids).
2. **Health Hazards** – substances harmful to health through inhalation, ingestion, or skin contact (e.g., toxic chemicals, carcinogens, irritants).
3. **Biological Hazards** – microorganisms or toxins that cause infections or diseases (e.g., bacteria, viruses).
4. **Environmental Hazards** – substances that harm the environment, especially aquatic life (e.g., pesticides, heavy metals).

13. What is role of fire warden?

A fire warden is responsible for fire safety in a building or workplace. Their roles include:

- Checking and maintaining fire safety equipment (extinguishers, alarms, exits)
- Conducting fire drills to ensure everyone knows evacuation procedures
- Leading people safely out during a fire or emergency
- Ensuring evacuation routes are clear
- Reporting fire hazards or safety issues
- Training staff on fire prevention and response

14. What is difference between biosafety and biosecurity?

- Biosafety focuses on protecting people and the environment from accidental exposure to harmful biological agents through safe handling and containment.
- Biosecurity focuses on preventing theft, loss, or intentional misuse of dangerous biological materials, ensuring they don't fall into the wrong hands.

15. What should be security protocols for transportation of hazardous materials?

Security protocols for transporting hazardous materials include:

1. **Proper Packaging and Labeling** – Use approved containers and clear hazard labels.

2. **Documentation** – Carry detailed shipping papers and emergency contact info.
3. **Training** – Ensure all handlers and drivers are trained on hazards and emergency procedures.
4. **Secure Loading** – Properly secure materials to prevent spills or leaks during transit.
5. **Route Planning** – Choose safe, approved routes avoiding populated or sensitive areas if possible.
6. **Vehicle Security** – Lock vehicles and limit access to authorized personnel only.
7. **Communication** – Maintain contact with drivers and monitor shipments.
8. **Emergency Preparedness** – Equip vehicles with spill kits and fire extinguishers; have clear response plans.

16. What are equipment of BSL-4?

BSL-4 labs handle the most dangerous pathogens. Their special equipment includes:

- Full-body, positive-pressure suits with dedicated air supply
- Class III Biosafety Cabinets (glove boxes) for handling agents in sealed environments
- HEPA-filtered air supply and exhaust systems to prevent any pathogen escape
- Airlock entry and exit rooms with showers for decontamination
- Sealed, airtight lab construction (walls, floors, ceilings)
- Chemical shower decontamination systems
- Autoclaves inside the lab for sterilizing all waste before exit
- Strict access control and monitoring systems

17. What are duties of Japan biosecurity legislation?

Japan's biosecurity legislation focuses on:

1. Preventing the introduction and spread of infectious diseases from animals, plants, and humans.
2. Regulating import/export of biological materials to control risks.
3. Managing and controlling use of genetically modified organisms (GMOs) safely.
4. Setting standards for laboratories and facilities handling dangerous pathogens.
5. Ensuring proper response and reporting for biohazard incidents.
6. Promoting research and public awareness on biosecurity risks.

18. What are precautions of using centrifuge?

Precautions for using a centrifuge include:

1. **Balance the tubes properly** — load tubes symmetrically with equal weights to avoid vibration or damage.
2. **Use appropriate tubes and rotors** — ensure they are compatible and rated for the speed.
3. Inspect tubes for cracks or defects before use to prevent breakage.
4. Close the lid securely before starting the centrifuge.
5. **Do not open while spinning** — wait until it completely stops.
6. **Wear personal protective equipment (PPE)** — lab coat, gloves, and safety goggles.
7. **Clean spills immediately** — biohazard spills must be disinfected properly.
8. **Perform routine maintenance and checks** on the centrifuge for safe operation.

19. How noise should be controlled?

Noise can be controlled by:

1. **Engineering Controls** – using soundproofing materials, barriers, or enclosures around noisy machines.
2. **Maintenance** – regularly servicing equipment to reduce noise from wear or vibration.
3. **Administrative Controls** – limiting exposure time by rotating workers or scheduling noisy tasks when fewer people are around.
4. **Personal Protective Equipment (PPE)** – providing earplugs or earmuffs to workers in noisy areas.
5. **Design Changes** – choosing quieter equipment or modifying processes to reduce noise generation.

20. What vaccines could be prepared in BSL-3 and BSL-4?

Vaccines developed in BSL-3 and BSL-4 labs target serious infectious agents requiring high containment:

- **BSL-3 Vaccines:**
For pathogens like *Mycobacterium tuberculosis* (TB), *West Nile virus*, SARS-CoV-2 (COVID-19), and *Francisella tularensis* (tularemia). Examples include certain viral vaccines and bacterial vaccines for diseases with airborne or droplet transmission.
- **BSL-4 Vaccines:**
For the most dangerous, often lethal pathogens with no approved treatments, like *Ebola virus*, *Marburg virus*, *Lassa fever virus*, and *Nipah virus*. Vaccines for these require strict containment during research and production.

21. Explain relationship of patient with caregiver.

The relationship between a patient and caregiver is built on trust, communication, and respect. It involves:

- **Providing care and support** — the caregiver helps with medical, emotional, and daily needs.
- **Listening and understanding** — the caregiver pays attention to the patient's concerns and feelings.
- **Respecting privacy and dignity** — honoring the patient's rights and preferences.
- **Encouraging participation** — involving the patient in decisions about their care.
- **Building emotional connection** — offering empathy and reassurance to reduce stress and improve well-being.

22. What are benefits of security plan?

Benefits of a security plan include:

- Protects people and assets from theft, damage, or harm
- Prepares the organization for emergencies and quick response
- Reduces risks of security breaches or attacks
- Clarifies roles and responsibilities for staff during incidents
- Helps comply with laws and regulations
- Improves overall safety and confidence for employees and visitors
- Minimizes financial losses by preventing or limiting damage

23. What are benefits of training program?

Benefits of a training program include:

- Improves skills and knowledge of employees
- Increases productivity and efficiency
- Enhances job satisfaction and motivation
- Reduces errors and accidents through better understanding
- Prepares staff for new technologies or procedures
- Supports career development and growth
- Promotes consistent work quality across the team
- Helps the organization stay competitive

24. What are three categories of biohazards while handling animals?

When handling animals, biohazards fall into three main categories:

1. **Infectious Agents** — bacteria, viruses, fungi, or parasites that can cause diseases (e.g., *Salmonella*, rabies virus).
2. **Allergens** — animal dander, saliva, urine, or hair that can trigger allergic reactions.
3. **Physical Hazards** — bites, scratches, or injuries caused by animals that may also transmit infections.

25. What are uses of checklist?

Uses of a checklist include:

- **Ensuring all steps or tasks are completed** without forgetting anything
- **Improving consistency and quality** in processes
- **Helping organize work and prioritize tasks**
- **Facilitating training and communication** among team members
- **Reducing errors and increasing safety** by double-checking critical points
- **Tracking progress and accountability** during projects or inspections

26. Describe the design of high containment lab.

A high containment lab (like BSL-3 or BSL-4) is designed to safely work with dangerous pathogens. Key design features include:

- **Sealed, airtight construction** — walls, floors, and ceilings prevent leaks.
- **Controlled access** — multiple security doors with airlocks restrict entry only to authorized personnel.
- **Directional airflow** — air flows from clean areas to contaminated zones to prevent pathogen escape.
- **HEPA filtration** — all exhaust air is filtered to trap microbes before release.
- **Negative air pressure** — keeps air inside from flowing out accidentally.
- **Decontamination systems** — chemical showers, autoclaves, and sterilizers inside the lab for waste and personnel.
- **Durable, easy-to-clean surfaces** — resistant to chemicals and microbes for effective sanitation.
- **Emergency systems** — alarms, backup power, and communication tools for safety.

27. What is Risk Assessment?

Risk Assessment is the process of identifying potential hazards, analyzing how likely they are to happen, and evaluating the impact they could have. It helps to understand what risks exist so you can decide how to manage or reduce them. Steps include:

- Finding hazards
- Figuring out who or what might be harmed
- Assessing the chance and severity of harm
- Planning ways to control or eliminate risks
- Reviewing and updating the assessment regularly

28. What are effects of Global Warming?

Effects of global warming include:

- Rising temperatures leading to heatwaves
- Melting glaciers and ice caps, causing sea levels to rise
- More frequent extreme weather like storms, floods, and droughts
- Loss of biodiversity as habitats change or disappear
- Ocean acidification harming marine life
- Impact on agriculture with changing rainfall and growing seasons
- Health risks like heat stress and spread of diseases

29. What are elements of PPE (Personal Protective Equipment)?

Elements of Personal Protective Equipment (PPE) include:

- **Gloves** – protect hands from chemicals, infections, and injuries
- **Masks or Respirators** – protect respiratory system from dust, fumes, and pathogens
- **Goggles or Face Shields** – protect eyes and face from splashes and flying particles
- **Lab Coats, Gowns, or Coveralls** – protect skin and clothing from contamination
- **Hearing Protection** – earplugs or earmuffs to reduce noise exposure
- **Safety Shoes or Boots** – protect feet from injuries or hazardous materials
- **Head Protection** – helmets or caps for impact or contamination protection

30. Enlist 10 components of Spill Kit box.

10 common components of a spill kit box include Absorbent pads or mats, Absorbent socks or booms (to contain spills), Disposable gloves, Safety goggles, Face mask or respirator, Disposal bags or waste bags, Scoop or scraper tool, Cleaning cloths or wipes, Chemical neutralizers or absorbents (for acids/bases), Instruction manual or spill response guide.

31. Through which routes hazardous material can enter human body?

Hazardous materials can enter the human body through these main routes:

1. **Inhalation** – breathing in gases, vapors, dust, or aerosols
2. **Ingestion** – swallowing contaminated food, water, or hands

3. **Skin Contact (Absorption)** – chemicals passing through the skin
4. **Injection or Puncture** – cuts or needle sticks that introduce materials directly into the body

32. What are three reasons of electric hazard?

Three common reasons for electrical hazards are:

1. **Faulty or damaged wiring** – exposed wires or poor insulation can cause shocks or fires.
2. **Improper use of electrical equipment** – using devices incorrectly or overloading circuits.
3. **Lack of proper grounding or maintenance** – can lead to electrical faults and accidents.

33. What ethical issues are concerned with human embryo?

Ethical issues related to human embryos include:

1. **Respect for life** — debates over when life begins and the moral status of the embryo.
2. **Use in research** — concerns about destroying embryos for stem cell research or experimentation.
3. **Consent** — ensuring proper informed consent from donors of embryos or reproductive materials.
4. **Genetic modification** — ethical questions about altering embryos' genes for disease prevention or enhancement.
5. **Cloning** — moral implications of creating embryos for cloning purposes.
6. **Access and equity** — fairness in who can use assisted reproductive technologies involving embryos.

34. Explain UV radiation sterilization?

UV radiation sterilization uses ultraviolet (UV) light—specifically UV-C rays—to kill or inactivate microorganisms by damaging their DNA or RNA. This prevents them from replicating and causing infections.

Key points include:

- UV-C light (wavelength ~254 nm) is most effective for sterilization.
- Commonly used to disinfect air, water, and surfaces in labs, hospitals, and water treatment.
- It's a chemical-free, quick method but only works on surfaces directly exposed to the light (no shadow areas).
- Safety precautions are needed because UV-C can harm skin and eyes.

35. What is genetic screening?

Genetic screening is a medical test that looks for specific changes or mutations in a person's genes to identify the risk of inherited diseases or conditions. It helps to:

- Detect genetic disorders early
- Assess the chance of passing a condition to children
- Guide decisions about treatment or lifestyle
- Inform family planning

36. What are safety measures in Tuberculosis lab?

Safety measures in a Tuberculosis (TB) lab include:

- Use of BSL-3 practices because TB bacteria are airborne and highly infectious.
- Work inside Class II Biosafety Cabinets to contain aerosols.

- Wear appropriate PPE like N95 respirators, gloves, and lab coats.
- Use proper ventilation and negative air pressure to prevent pathogen escape.
- Regularly disinfect work surfaces and equipment.
- Properly decontaminate and autoclave waste before disposal.
- Limit access to trained personnel only.
- Follow strict protocols for specimen handling and transport.
- Conduct health monitoring and TB screening for lab staff.

37. What is significance of serial dilution in plate spread method?

The significance of serial dilution in the plate spread method is to:

- Reduce the concentration of microbes step-by-step so that when spread on a plate, individual colonies can grow separately.
- Allow accurate counting of colony-forming units (CFUs) to estimate the number of viable organisms in the original sample.
- Prevent overcrowding on the plate, which would make counting and isolation difficult.

Disclaimer:

For best results, it is advised NOT to rely on this file only. Go through video lectures, handouts and other sources as well.

Regards,

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