BIOLOGY UNIT – 4 (MODEL QUESTIONS)

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Compare and contrast the structure of chloroplast with the structure of a mitochondrion

Similarities

- both have (circular) DNA (1)
- both have ribosomes (1)
- both have double membranes

Differences

- chloroplasts have stroma and mitochondria have a matrix (1)
- chloroplasts have {thylakoids / thylakoid membranes / grana / intergranal lamellae} and mitochondria have {a folded inner membrane / cristae} (1)
- chloroplasts have starch grains and mitochondria do not (1)

Definitions

Habitat –
- a place where organisms live (1)

Population -
- organisms of **one** species found in a particular area (1)

Niche –
- the role of an organism in its habitat (1)

Anthropogenic Climate Change -

- (anthropogenic) caused by the effect of humans (1)
- (climate change) changes to (mean) {temperature / rainfall} (1)

Biodiversity – the measure of the number of different species that also represents the genetic diversity within a species.

Evaluate the use of body temperature of a corpse to estimate the time of death

- body temperature is readily available information (1)
- {calibration curves / formulae} available to work backwards to estimate time of death (1)
- but the change in body temperature is due to several factors (1)
- credit example of one of these factors (1)

AND

- therefore of limited use unless used in conjunction with other methods (1)

Suggest ways to reduce the effects of anthropogenic climate change

- named example of method to reduce the burning of fossil fuels (1)
- because this will reduce the carbon dioxide released into the atmosphere (1)

OR

- reforestation (1)
- because more plants will absorb more carbon dioxide for photosynthesis (1)

OR

- reduce the number of cattle being farmed (1)
- as this will reduce the methane being released into the atmosphere (1)

Explain how products of the light-independent reaction become NPP below ground

- because {light-independent reactions / Calvin cycle} produce {GALP / glucose / hexose} (1)
- {GALP / glucose / hexose}} used to produce sucrose (1)
- {GALP / glucose / hexose}} used to produce amino acids (1)
- (sucrose / amino acids) transported in the phloem to the {roots / rhizomes} (1)
- {glucose / sucrose / amino acids} used to synthesise {organic material / biomass / named organic molecule / NPP} (1)

Explain why both T helper and T killer cells both required in the immune response to a virus

- T helper cells {activate / stimulate} B cells (to divide) (1)
- because antibody will be needed for opsonisation (1)
- T helper cells {activate / stimulate} T killer cells (to divide) (1)
- because T killer cells destroy (virus-infected) cells (1)
- so that virus can be {engulfed / destroyed} by macrophages (1)

Definitions

Biomass - • how much organic matter present in organisms (1)

Action Spectrum • rate of photosynthesis at different wavelengths of light

Distinguish between abundance and distribution

Abundance – the relative representation of the number of a particular species amongst the other species

Distribution – where the organism is found/located

Differences between nuclear and mtDNA

- nuclear DNA is linear and mtDNA is circular (1)
- nuclear DNA has unbound {phosphate group / sugar} whereas mtDNA does not (1)
- mtDNA has (far)fewer {phosphodiester bonds / base pairs} (1)

Explain how forensic entomology can indicate that a body has been removed from the place of death

- some {insects /species} only found in certain habitats (1)
- therefore if non-native species found on the body, it has been moved (1)

Explain the role of gut flora in protecting body from infection

- to compete with (pathogenic) bacteria for {nutrients / named nutrient / space} (1)
- so they {reduce / destroy / prevent the growth of} (pathogenic) bacteria (1)

Describe how a vaccine results in artificial active immunity

- vaccine contains an {inactive / attenuated} form of the {pathogen / virus / bacteria / microorganism} (1)
- macrophages engulf and display antigen on cell surface (1)
- macrophages will present the antigen to T helper cells (1)
- T helper cells will activate {B / T killer} cells (1)
- (T / B) memory cells produced (1)

Explain the role of light in light-dependent reactions

- to {release / excite} electrons (from chlorophyll) (1)
- so that electrons can be used in {chemiosmosis / (photo)phosphorylation} (1)
- photolysis to {replace electrons lost by chlorophyll / provide protons for formation of reduced NADP (1)
- to produce ATP and reduced NADP for the {light-independent reactions / Calvin Cycle} (1)

Ecosystem – Physical/chemical environment in which living organisms interact with each other and with the abiotic elements of their environment.

Explain why restriction enzymes are used to cut DNA in fragments of different lengths for gel electrophoresis

- because restriction enzymes recognise specific (base) sequences (1)
- because these recognition sites are not equally spaced along the DNA (1)
- the enzyme hydrolyses the phosphodiester bonds (1)
- therefore different sized fragments move different distances through the gel (1)

Differences between structures of linear and circular DNA

- linear DNA has (3′ and 5′) ends but circular DNA does not (1)
- linear DNA is associated with (more) {proteins / histones} than circular DNA (1)
- linear DNA will have (unbound) {phosphate / deoxyribose} but circular DNA will not (1)
- linear DNA will have (one) fewer phosphodiester bond than circular DNA (with the same number of mononucleotides) (1)

Explain why amino acids cannot be produced from glucose alone

- because amino acids contain nitrogen (1)
- because some {amino acids / R groups} contain sulfur (1)
- nitrogen obtained from nitrates / sulfur obtained from sulfates

Explain the role of microorganisms in recycling carbon/lipids/protein present in dead organic matter to the atmosphere

microorganisms secrete {enzymes / named enzyme} / eq ;

credit correct details of decomposition ;

2 e.g carbohydrase breaks down glycogen, protein broken down into amino acids,

idea that products of decomposition are {taken up into / used by} microorganisms ;

{glucose / hexose} used in respiration (by the microorganisms) ;

releasing {carbon dioxide / methane / eq} (into the atmosphere) ;

idea that other breakdown products return to the soil ;

Explain how light energy converted to chemical energy in form of ATP

- light is absorbed by {photosystems / chlorophyll} (1)
- which {excites electrons / releases high-energy electrons / releases electrons to higher energy levels} (1)
- these electrons are passed along a series of (electron) carriers (1)
- therefore releasing energy to phosphorylate ADP into ATP (cyclic)(1)
- phosphorylation of ADP via the proton gradient to form ATP (non-cyclic)

Explain how primary and tertiary structure of any protein determine their chemical properties

- primary structure is the sequence of amino acids that will determine the (tertiary) structure of {holin / protein}
(1)

- as this will determine the {bonds / position of bonds}
(1)

- (amino acids with) polar R groups will face into the channel
(1)

- (amino acids with) non-polar R groups will face outwards to the {fatty acids / phospholipids / membrane}

Comment on the reliability of the conclusions drawn from this study

1. Check whether mean value calculated. This will indicate more reliability
2. Check for errors bars overlapping. If not overlapped, then data reliable and vice versa
3. Identify which data has lowest error bar range. This will be most reliable
4. Check for standard deviation values. If S.D values are high, then data is more widely spreaded so less reliable and vice versa.

Antibiotic -

1. {substance / chemical / drug / medicine} ;
2. that {kills / inhibits the growth of / eq} {(a different) bacteria / microorganism / prokaryote} ;

Describe how GALP is converted to protein

GALP converted into {hexose / glucose / sugar} (1)

amino acids made from {hexose / glucose / sugar} and nitrates (1)

amino acids joined by {peptide bonds / condensation reactions} (1)

glucose respired to produce ATP for protein synthesis (1)

Explain the role of the Golgi Apparatus in the decomposition of organic matter

1. {enzymes / named enzyme} are involved in {decomposition / breakdown of organic matter / eq} ;
2. idea that these enzymes are involved in the **hydrolysis** of {named organic molecule / named bond} ;
3. Golgi apparatus (in fungi) involved in modification of (these) enzymes ;
4. Golgi apparatus (in fungi) package these enzymes into vesicles to be released / eq ;

Explain why seeds contain starch and cell walls contain cellulose

{seeds / starch} {are an energy store / provide a source of energy (for embryo plant) / eq} ;

(starch) {compact / branched / hydrolysed quickly / eq} ;

cell wall has to {have (high) strength / be strong} ;

molecules (cellulose) held together with lots of hydrogen bonds

Compare between structures cellulose and starch molecule

Similarities :

1. both made of glucose ;
2. both contain (1 - 4) glycosidic bonds ;

Differences :

Any two from

3. starch composed of α glucose and cellulose made of β glucose ;
4. starch (amylopectin) has 1 - 6 (glycosidic) bonds and cellulose does not
5. starch (amylopectin) is branched and cellulose is {unbranched / straight} ;
6. in starch, glucose molecules are not inverted and cellulose has every other glucose molecule inverted ;

Explain how light dependent reactions enable hydrogen to be incorporated into GALP

the hydrogen that goes into GALP comes from the water / eq ;

water is split by light / reference to **photolysis** ;

producing H^+ and {electrons / OH^-} ;

{chlorophyll / photosystem} releases electrons / eq ;

so reduced NADP is formed / eq ;

reduced NADP used in conversion of GP to GALP / eq ;

Describe how graph could be used to estimate data for future years?

Draw a line of best till the year upto which whose data is to be estimated. Use extrapolation and the help of a computer model to for estimating your desired data.

Explain why viruses are used as vectors in gene therapy and why different types have to be used in gene therapy?

Viruses attach to specific cells and release their genetic material that enters the cells. That is why viruses are used in gene therapy. Viruses have specific attachment proteins on their target cells and hence cannot attach to all cell types. Hence, different types have to be used in gene therapy.

Describe the structure of a cell membrane

1. phospholipid bilayer / eq ;
2. proteins present (in the bilayer) / eq ;
3. cholesterol embedded amongst the fatty acid tails / eq ;
4. {glycoproteins / receptors / glycolipids} attached on the surface ;

Explain why dendrochronology can be used as evidence for global warming

dendrochronology is the study of tree rings ;

idea that the size of the rings depends on the size of the xylem vessels ;

idea that size of rings depends on availability of water ;

idea that size of ring depends on temperature ;

idea that size of rings depends on (the rate of) photosynthesis ;

Explain the importance of macrophages in non-specific and specific immune response to infection

phagocytosis / {microorganism / eq} is {engulfed by / eq} (the macrophage) ;

idea that the {microorganism / eq} is within a {vacuole / vesicle} ;

(then) {microorganism / eq } destroyed by the macrophage enzymes / eq ;

idea of antigens (of destroyed microorganism) attach to (MHC) molecules on the surface of the macrophage ;

for presentation of antigen to T helper cells ;

T helper cells become activated / {immune / eq} response initiated / eq ;

antibody-binding sites on the surface of the macrophage ;

for opsonisation / eq ;

Explain why the pollen found in peat bogs can be used in global warming

pollen is preserved (in peat bogs) / eq ;

idea that plants can be identified from pollen ;

idea that the plants that can grow depends on {rainfall / temperature / climate / eq} ;

Describe one way in which bacteria can be grown in the laboratory

An agar medium containing glucose medium must be prepared. Inoculate a strain of bacteria using a cotton swab dipped in a sample and swiped across the agar. Cover the petri dish and use tape to secure the lid. Ensure to leave gaps in the tape to allow oxygen to pass through and prevent growth of other strains of anaerobic bacteria. Incubate the petri dish at 30 degrees centigrade for 24 hours after which, a culture of bacteria will be produced.

Describe the roles of the chloroplast membranes in photosynthesis

compartmentalisation (from cytoplasm) / idea of keeping photosynthesis separate from other (metabolic) reactions in the cell ;

{increase / large} surface area (of membrane) so that {more / more} {photosynthetic pigments / photosystems / light absorbed};

contain {photosynthetic pigments / named pigment / photosystems} ;

so that light can be absorbed ;

provide a thylakoid space / eq ;

so that {protons / eq} can accumulate ;

contain the electron carrier (proteins) ;

so that {protons / eq} can be pumped into thylakoid space ;

Suggest how presence of maternal antibodies can interfere vaccination

idea that the (maternal) antibodies will bind to the {antigens / virus} (in the vaccine) ;

therefore macrophages will engulf the antigens / eq ;

idea that the antigens {cannot bind / will not be available to bind} to the B cells ;

Describe how GALP is used to produce lipids?

GALP is used to produce {glucose / (simple) sugars / hexose};

{glucose / GALP/ (simple) sugars / hexose} is used to make glycerol / GP used to make fatty acids;

fatty acids and glycerol joined by ester bonds;

reference to condensation reactions (forming ester bonds between fatty acids and glycerol);

idea that enzymes are involved (in lipid synthesis);

idea that glucose is a source of {energy / ATP} (for lipid synthesis;

Describe the role of tRNA in protein synthesis

{binds to / brings / eq} **specific** amino acid / eq;

carries this amino acid to the {ribosome / mRNA};

idea that tRNA binds to {mRNA / codon};

{holds amino acid in place / amino acid lined up / eq} **and** a peptide bond formed (between adjacent amino acids);

Explain why forensic entomology is considered to be the best option for measuring time of death of a corpse which has been dead for more than 3 days?

measuring body temperature (is not accurate) as it would have {levelled off / reached ambient temperature / eq};

measuring extent of rigor (would not be accurate) as the muscles become stiff and then relax again;

extent of decomposition (not accurate) as it depends on {ambient temperature / presence of oxygen / presence of water / location};

Explain why there is only three/two trophic levels in food chains

1. energy is lost between trophic levels / eq ;
2. idea that there will not be enough energy (to sustain another trophic level) ;

Describe how interferons work (6)

Interferons prevent viral replication. It results in the synthesis of proteins such as ribonuclease which breaks down viral RNA of an RNA virus and protein kinases which inhibits translation. This in turn prevents the protein coat of the virus to not get produced. It also increases recognition of virus-infected cells y T-killer cells so that they can be destroyed faster and less time is available for new virus particles to get produced. Interferons also cause apoptosis (self-destruction) which releases incomplete virus particles that are engulfed by phagocytes during phagocytosis.

Describe the immune response of the body to viral infections

T killer cells destroy virus-infected cells by releasing enzymes into the pores of the cells. Macrophages engulf and destroy the pathogens. Plasma cells produce antibodies which enhance opsonization or agglutination of virus particles. T memory cells get produced for providing protection against the same virus at the future.

Explain how multiple copies of DNA can be produced using PCR (mammoth DNA taken as example)

(4)

The PCR, polymerase chain reaction can be carried out. Identify the mammoth DNA and place it in a medium of primers, DNA polymerase & free nucleotides. The mixture should be heated to 95°C to break the hydrogen bonds between the two strands of DNA. It should then be cooled to 55°C where the primers can bind to the DNA. It should then be heated to 75°C when DNA polymerase is most active forming new DNA strands of complementary base paired nitrogenous bases. This cycle should be carried out around 30 times to produce a large amount/volume of mammoth DNA.

Explain why antibiotics cannot be used to treat people with cancer?

Antibiotics are used against only bacteria because antibiotics work by target sites which are only found in bacterias.

Explain the role of mRNA in protein-synthesis (AS)

(mRNA) is a copy of the { DNA / genetic } code ;

to take this { code / information / eq } { out of the nucleus / into the cytoplasm / to the ribosomes } ;

for { translation / eq } ;

idea of post transcriptional modification to enable one { gene / (pre) mRNA } to code for more than one peptide ;

Explain why some amino acids can attach to more than one type of tRNA molecule

The gene code of the amino acid is degenerate. Degenerate means having more than one code which means there will be a different tRNA for each codon in the mRNA.

Suggest why there are fewer than 64 different anti-codons even though there are 64 different mRNA codons?

There are stop codons whose anticodons in the tRNAs don't exist.

Describe the role of lignin in xylem vessels

for {strength / support} ;

for {waterproofing / impermeable to water / eq} ;

Describe an investigation that could be carried out in a laboratory to determine a suitable combination of antibiotics to use against any bacteria (M. Tuberculosis taken as example)

idea of culturing *M. tuberculosis* with { agar / broth } ;

idea that different antibiotics are used ;

in a number of different combinations ;

credit mode of applying antibiotic;

Soaked filter paper disc on agar, added to broth and incorporated into the agar.

idea of incubating bacteria with antibiotic for a period of time ;

credit reference to using { aseptic technique / named aseptic technique } ;

Work near a Bunsen burner

credit appropriate description of how results are assessed to determine most suitable combination ;

7 e.g. most suitable combination has largest zone of inhibition, most suitable combination has the least turbidity

Describe the structure of a plant cell wall

idea that cellulose molecules lie parallel with each other ;

cellulose molecules joined by hydrogen bonds (to form microfibrils) ;

idea that (layers of) microfibrils criss-cross with each other ;

idea of a { matrix / pectin / pectate / hemicellulose } ;

credit { secondary thickening / lignification / middle lamella } ;

Describe how an investigation could be carried out to compare the distribution and abundance of these seaweeds on another seashore

idea that the {two seashores / transects} should have similar {abiotic factors / (relevant) named abiotic factor } ;

reference to using a (belt / line) transect ;

idea that seaweeds are sampled at regular intervals (along the transect) ;

idea of {recording / counting / identifying / eq} which seaweeds are present;

credit an indication of how seaweed (abundance) is measured;

more than one {transect / eq} used ;

5 e.g. using a quadrat, touching the transect, percentage cover, ACFOR scale

credit an indication of how results are {recorded / manipulated} ;

7 e.g. graph of abundance against height of seashore, diagram similar to one in the question, indication of a calculation

Describe the symptoms and effects of Tuberculosis

breathing problems / eq ;

blood in sputum / coughing up blood / eq ;

(TB causes) suppression of immune system / eq ;

credit other symptom that could result in death ;

e.g. fever, organ failure, brain damage, (opportunistic) infection, pneumonia

Describe how forensics can be used to measure time of death

	NB each set of mps can be credited anywhere in the answer
1. (state of) rigor ;	**1. ACCEPT** rigor mortis / muscle contraction
2. idea of looking at the degree of rigor ;	Degree of rigor mortis = 2 marks
3. idea that (ambient / body) temperature has to be taken into account ;	
4. idea that this method has time limitations ;	**4.** e.g. changes in rigor occur in first few hours
OR	
5. (stage of) decomposition ;	
6. idea that decomposition occurs in a specific sequence ;	
7. idea that ambient temperature has to be taken into account ;	
8. credit details or what would be looked for ;	**8.** e.g. {decomposers / insects} arrive in specific sequence, body becomes bloated
OR	
9. (forensic) entomology / the study of insects ;	
10. idea that insects colonise the body in a specific sequence ;	
11. stage in life cycle depends on ambient temperature ;	
12. credit details of what would be looked for;	**12.** e.g description of life cycle, eggs collected and hatched for identification

Describe how HIV causes any opportunistic disease/Tuberculosis

	expression
1. HIV reduces the activity of the immune system ;	**1. ACCEPT** weakened immune system / reduced T cell count
2. because the virus destroys {T helper / CD4 } cells ;	**2. ACCEPT** T killer cells destroy infected T helper cells
3. idea that TB is resistant to destruction by macrophages ;	**3. ACCEPT** macrophages destroyed
4. idea that antigen presentation to T helper cells is impaired (further) ;	**4. ACCEPT** T helper cells are not activated
5. therefore { B / T killer } cells cannot be activated / eq ;	
6. no antibodies (from plasma cells) for {opsonisation / agglutination / eq} ;	**6. DO NOT ACCEPT** kills TB
7. no {perforins / enzymes / eq} (from T killer cells) to destroy virus-infected cells ;	
8. idea that TB is an opportunistic infection ;	
9. credit description of how TB results in death ;	**9.** e.g. high fever, lung damage,

BIOLOGY UNIT – 5 (MODEL QUESTIONS)

Created By Devjyoti Dey Mugdho

Suggest how living microorganisms are genetically modified?

1. the FGF-I gene is removed from (the DNA) of a human ;	ALLOW gene is synthesised based on known DNA sequence
2. gene/plasmid is cut using a restriction enzyme/endonuclease ;	
3. gene and plasmid are joined using (DNA) ligase ;	
4. plasmid with the FGF-1 gene is inserted into bacteria ;	ALLOW other appropriate microorganisms e.g. yeast
5. credit additional information on method of inserting plasmid into the bacteria ;	

Describe how the products of the Kreb Cycle are used during chemiosmosis?

1. reference to {reduced NAD / reduced FAD / reduced coenzymes} ;
2. transport {hydrogen atoms / (protons and) electrons} to the electron transport chain ;
3. electrons move along electron transport chain (in series of redox reactions) ;
4. energy (released) is used to pump {protons / H^+ / hydrogen ions} into the inter-membrane space ;
5. protons {diffuse/move} (down electrochemical gradient) through {ATP synthase / ATPase / stalked particle} (back into the matrix) ;
6. (catalysing the) formation of ATP from ADP and Pi ;

Describe how microarrays and bioinformatics can be used to detect any disease? (Parkinson taken as example)?

A description that includes the following points: • microarrays allow identification of {active genes / gene transcription} (1) • the activity of many genes can be analysed in a single sample (1) • by collecting information about genetic differences from many individuals (with or without Parkinson's) (1) • bioinformatics /computers/databases /algorithms used to analyse the data (1) • (key) differences between healthy and Parkinson's disease individuals can be identified (1)	ALLOW Develop algorithms to identify genomes / gene sequences	**Expert** **(4)**

Describe how plant photoreceptors effect the growth of plants?

1. reference to phytochromes ;
2. conversion of phytochrome red to far-red or vice versa ;
3. as ratio of {red to far-red decreases / far-red to red increases} more mRNA synthesis ;
4. (more mRNA synthesis results in) more auxin (IAA) ;
5. more auxin stimulates more shoot growth / cell elongation ;

Define habituation?

r	
	1. idea of a {reduced response to / ignoring} a stimulus ; 2. that is {repeated / harmless / unimportant / eq} ; 3. idea that habituation is a form of learning ;

Describe how impulses received by the heart maintain the Cardiac Cycle?

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1. SAN initiates wave of depolarisation
2. idea that electrical impulses spreads across the atria/causes atria to contract ;
3. (wave of depolarisation) is delayed by AVN ;
4. wave of depolarisation spreads across ventricles/causes ventricles to contract ;
5. frequency at which heart muscle fibres contract is regulated by the frequency of electrical impulses arriving at the SAN / speed at which electrical impulses spread across the heart determines the length of the cardiac cycle} ;

Explain advantage of using an organ/tissue from the patient rather then the organ/tissue from the donor for surgery?

1. a donor tendon may be recognised as being foreign / eq ;
2. results in an immune response / eq ;
3. leading to rejection of the (graft / repair / tendon) ;
4. use of donor tendon requires immunosuppression ;

Describe how action potential takes place and resting potential is maintained in a neurone?

1. (voltage gated) sodium (ion) channels open ;
2. allowing sodium ions to diffuse/move into the axon / neuron ;
3. the {axon/neuron} becomes {depolarised / positively charged inside} ;
4. (voltage-gated) sodium (ion) channels close ;
5. (voltage gated) potassium (ion) channels open ;
6. potassium ions {diffuse/move} out of the axon, repolarising the membrane ;
7. the membrane becomes hyperpolarised, closing (voltage gated) potassium (ion) channels ;
8. potassium ions {diffuse/move} back into the axon through the (non-gated) potassium (ion) channels, restoring the resting potential / Na^+ K^+ pump re-establishes resting potential ;

Describe how FMRI can be used to check if habituation occurs

1. idea that fMRI involves brain activity in real time ;
2. idea that fMRI measures oxygen uptake ;
3. idea that active area of brain { gets more blood / oxygenated blood / uses oxygen };
4. {oxyhaemoglobin / deoxyhaemoglobin } involved ;
5. idea that fMRI uses {radio waves / signal / energy} ;
6. active brain emits less energy ;
7. more active area appears lighter / less active area appears darker ;
8. idea that brain activity falls with {habituation / repeated

Describe the role of calcium ions in muscle cells during contraction?

1. calcium ions {are released from sarcoplasmic reticulum / enter the sarcoplasm } ;
2. calcium ions bind to troponin ;
3. (change in shape of troponin) moves tropomyosin away from myosin binding site ;
4. allowing myosin (heads) to attach to actin ;
5. (contraction as) actin is pulled past the myosin / reference to sliding filament theory ;

Explain how ATP produced by oxidative phosphorylation in mitochondria?

1. reference to chemiosmosis;
2. {use / release} energy from electrons;
3. protons moved {through the inner membrane / into the intermembrane space} ;
4. reference to {ATP synthase / stalked particles};
5. formation of phosphate bond between phosphate in ADP and inorganic phosphate / eq;
6. by the movement of protons (from intermembrane space) into matrix ;

Suggest how an anesthetic drug reduces pain?

1. idea that calcium (ion) channels {blocked / closed};

2. idea that {fewer / no} calcium ions enter {(pre)synaptic knob};

3. idea that vesicles do not {fuse with / move to} presynaptic membrane ;

4. idea of less neurotransmitter release ;

5. idea of reduced {binding / movement} to receptors on the {postsynaptic membrane / postsynaptic neurone} ;

6 idea of reduced depolarisation / action potentials / entry of sodium ions / impulses (to brain) ;

Explain how bright light shone into the eye is detected by cells in the retina leading to nerve impulses in the brain?

1. reference to {***photoreceptor*** / ***rod*** / ***cone***} cells ;

2. reference to {***rhodopsin*** conversion into ***retinal*** and ***opsin*** / conversion of cis-retinal to trans-retinal} ;

3. idea that {***sodium*** / ***cation***} channels close and sodium ions {cannot enter / are pumped out} ;

4. reference to {***hyperpolarisation*** / ***generator potential*** / inside more ***negative***} ;

5. reduced release of {***glutamate*** / ***neurotransmitte***r} ;

6. reference to ***depolarisation*** of ***bipolar*** cell ;

7. reference to {***action potential*** / ***impulse***} in {sensory neurone / optic nerve} ;

Why do myelinated neurons conduct impulses faster than non-myelinated ones?

- the myelin sheath is an (electrical) insulator (1)
- therefore the action potential only occurs at nodes of Ranvier (1)
- and therefore the nerve impulse 'jumps' from one node to the next / reference to saltatory conduction (1)

Explain how size of the pupil changes when moving from dim to bright light?

- circular muscles contract **and** radial muscles relax (1)
- circular muscles arrange in concentric rings around pupil **and** radial muscles run radially (1)
- pupil reflex is the reflex contraction and relaxation of the antagonistic muscles of the iris (1)
- therefore pupil becomes smaller so less light enters the eye. (1)

Describe PET scans could be used to identify activated part of brain?

- isotope {that emits positrons / is incorporated into glucose} (1)
- more active neurones with increased respiration (1)
- will require increased supply of glucose (1)
- positrons (emitted from glucose) produce gamma rays that detected and are converted into an image (1)

Describe how a neurotransmitter transmits a nerve impulse across a synapse?

- impulse (arriving) at the pre-synaptic knob opens (voltage-gated) calcium ion channels (1)
- calcium ions diffuse in and cause vesicles containing neurotransmitter to fuse with the presynaptic membrane (1)
- neurotransmitter is released into the synaptic cleft and binds to receptors on postsynaptic membrane (1)
- opening (ligand-gated) sodium channels (1)
- depolarising the membrane and initiating an action potential (1)

Describe how heart rate is controlled in response to changes in blood following exercise?

- cardiovascular control centre in the medulla oblongata (1)
- detects change in blood pH (following exercise) (1)
- as blood pH increases (more) impulse are sent via the parasympathetic nerve (1)
- slowing (the rate of impulses from) the SAN (1)

State what is meant by pluripotent stem cell

- {self-renewing/ continuously dividing} cell (1)
- that can give rise to {many / most} of the different cell types (1)

State the advantages of a keyhole surgery?

1. idea of less invasive ;
2. idea of shorter recovery time ;
3. reduced risk of infection ;

Describe the role of the hypothalamus in maintaining the internal body temperature during exercise

1. (thermo)receptors in { skin / hypothalamus } ;
2. send { impulses / action potentials } to the { hypothalamus / thermoregulatory centre / heat loss centre } ;
3. causes { vasodilation / blood vessels to dilate } so more blood flows to the { skin / superficial capillaries } ;
4. hair arrector muscles relax (so) more heat loss by { convection / radiation } ;
5. increased sweating so more { evaporation } ;
6. inhibition of { shivering / muscle contraction } so less heat generated ;
7. decreased { metabolism / metabolic rate / respiration } so less heat generated ;
8. credit idea of { panting / salivation / decreased adrenaline production } ;

Compare the mechanisms used in hormonal and nervous coordination

Hormonal coordination	Nervous coordination	
use chemicals	use impulses	;
transported in blood	carried by neurones	;
slow	fast	;
long lasting response	short-lived response	;
widespread effects	localised effects	;

Explain why the oxygen consumption of an alligator increases after a short period of physical activity?

1. lactate produced during anaerobic respiration (accumulates in the blood) ;
2. oxygen is required to convert lactate back to { pyruvate / glucose } (after period of activity) ;
3. so that glycogen stores are replenished (in muscles) ;
4. oxygen is used in aerobic respiration ;
5. oxygen is used to oxidise reduced NAD (to produce water and NAD) ;
6. reference to other correct requirement for oxygen ;

Describe the role of ventilation centre in controlling breathing rate during low oxygen level in blood?

1. stretch receptors control the resting breathing rate ;
2. {chemosensors / chemoreceptors} detect {low oxygen / low pH / high CO_2} concentration (in blood) ;
3. send impulses to ventilation centre ;
4. ventilation centre sends more frequent impulses to the { diaphragm / intercostal muscles } ;
5. increasing frequency of contraction of (breathing muscles / intercostal muscles / diaphragm) ;
6. increasing the rate and depth of breathing ;

Explain the role of IAA in the effect of light on these coleoptiles

1. IAA moves away from light / there is more IAA on the darker side of the stem / eq ;
2. (H) **bonds** between **cellulose** molecules weakened / broken / eq ;
3. the cells elongate ;
4. due to {uptake of water / increase in turgor pressure / eq} ;
5. (IAA) causes coleoptiles to { bend / grow } towards the light ;

Suggest two reasons why impulses travel in only one direction across a synapse?

1. Neurotransmitter vesicles are only found in the presynaptic knob
2. Neurotransmitter complementary receptors are only found in the post-synaptic membrane

What is negative feedback?

1. idea that a change in one direction causes a change in the opposite direction ;
2. to ensure a constant value / set point / narrow range of values / eq ;

Differences between slow and fast twitch muscle fibres?

Fast twitch muscle fibre	Slow twitch muscle fibre
anaerobic	aerobic
lactate production	no lactate production
few mitochondria	many mitochondria
less ATP produced	more ATP
more creatine (phosphate)	less creatine (phosphate)
less myoglobin	more myoglobin
low capillary density	high capillary density
more glycogen	less glycogen
more easily fatigued	less easily fatigued
white /paler	red / darker
contract rapidly	contract slowly
larger diameter fibres	smaller diameter fibres
larger capacity of sarcoplasmic reticulum	smaller capacity of sarcoplasmic reticulum

Explain why plant shoots grown in the dark are taller than plant shoots grown in the light?

1. darkness converts Pfr to Pr / light converts Pr to Pfr ;
2. { more Pr / less Pfr } in **dark** ;
3. more IAA present in the dark ;
4. IAA { softens / eq } cell walls ;
5. uptake of water by osmosis ;
6. causes **cell** elongation ;

Explain how the loop of Henle acts as a countercurrent multiplier to produce conc. urine

- flow of filtrate in tubules in opposite direction (1)
- because sodium ions actively transported out of the ascending limb (1)
- therefore water out from descending limb (and solutes from ascending limb) (1)
- due to increase in concentration gradient between tubular fluid and interstitial space (1)

Describe how ADH is involved in osmoregulation

- water potential of blood monitored by osmoreceptors in hypothalamus (1)
- release of ADH from (hypothalamus) pituitary gland (1)
- (in blood to kidneys)where ADH acts on {collecting ducts / distal convoluted tubul}) (1)
- increase in permeability to water of cell membranes (1)
- more water reabsorbed so water potential of blood back to normal range (1)

PHYSICS U4 MODEL QUESTIONS

Deriving the equation for centripetal acceleration $a = \frac{v^2}{r}$ by using a vector diagram if necessary.

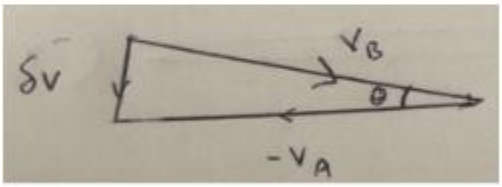
(Small angle, so) $\delta\theta = \delta v / v$

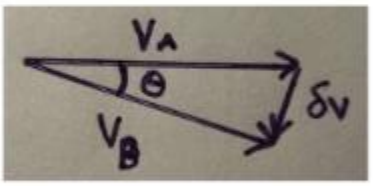
Use of $\delta\theta / \delta t = \omega$ and $v = r\omega$

Use of $\delta v / \delta t = a$

Algebra to show $a = v^2 / r$

Example of derivation

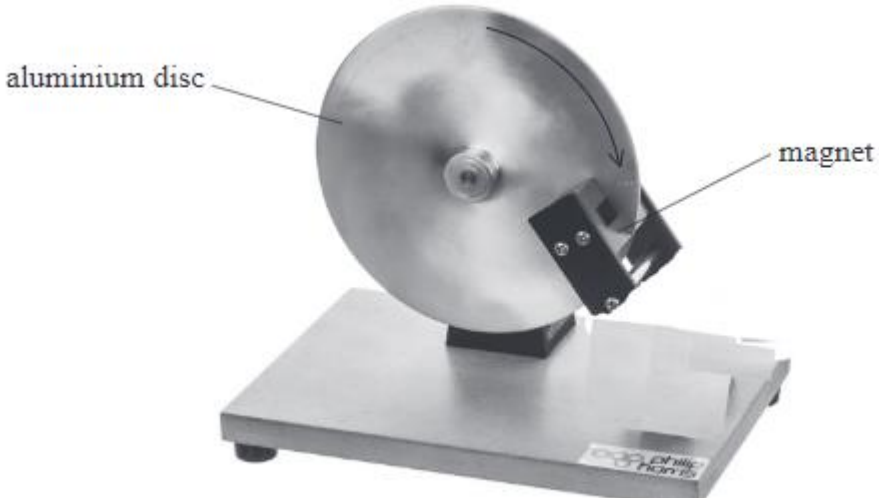




Small angle, so $\delta\theta = \delta v / v$
$\delta\theta = \omega\delta t$
$\delta\theta = v\delta t / r$
$v\delta t / r = \delta v / v$
$\delta v / \delta t = v^2 / r$

Notes for Banking

Explain why muons observed in Earth are observed to have greater mean lifetime?



A student suggests that the disc will start to rotate as the magnet is moved and that the disc will rotate in the same direction as the movement of the magnet.

Discuss

There is a change in the magne[illegible] (linkage with aluminium disc)
Or disc is cutting magnetic field/flux

So an e.m.f. is induced

Leads to a current (in the disc) (accept eddy current)

Force acts on the disc, as there is a current in a magnetic field (accept reference to motor effect, FLHR or $F = BIl$ if current in disc has been mentioned)
Or field due to current in disc interacting with field due to magnet to cause force on disc

According to Lenz's law
Or the direction of e.m.f./current is such to oppose (the cause of) the change in flux

The disc moves to reduce this change (the same direction as the magnet) so correct suggestion

Explain why LINAC works with a constant frequency power supply?

The beam/electron/positron is gaining speed

The length of tubes increases **or** the length of gaps between tubes increases

So time between beam exiting (successive) tubes is constant
Or time spent in each tube is constant
Or time spent between (each successive pair of) tubes is constant

The p.d. has to reverse in this time period and hence frequency is constant

Explain the role of electric and magnetic fields in the production of high-speed particles in a cyclotron/Describe the mechanism of cyclotron

Protons accelerated by electric field between the dees
Or Protons accelerated by potential difference across the gap

The magnetic field is perpendicular to proton motion

This causes a centripetal acceleration/force for a circular path

The p.d./field/polarity (across the gap between the dees) has reversed when the proton reaches the gap again
Or
The p.d./field/polarity (across the gap between the dees) reverses while the proton is in the dee

(Each successive half-circle) path of the proton has a larger radius with greater speed/momentum/energy

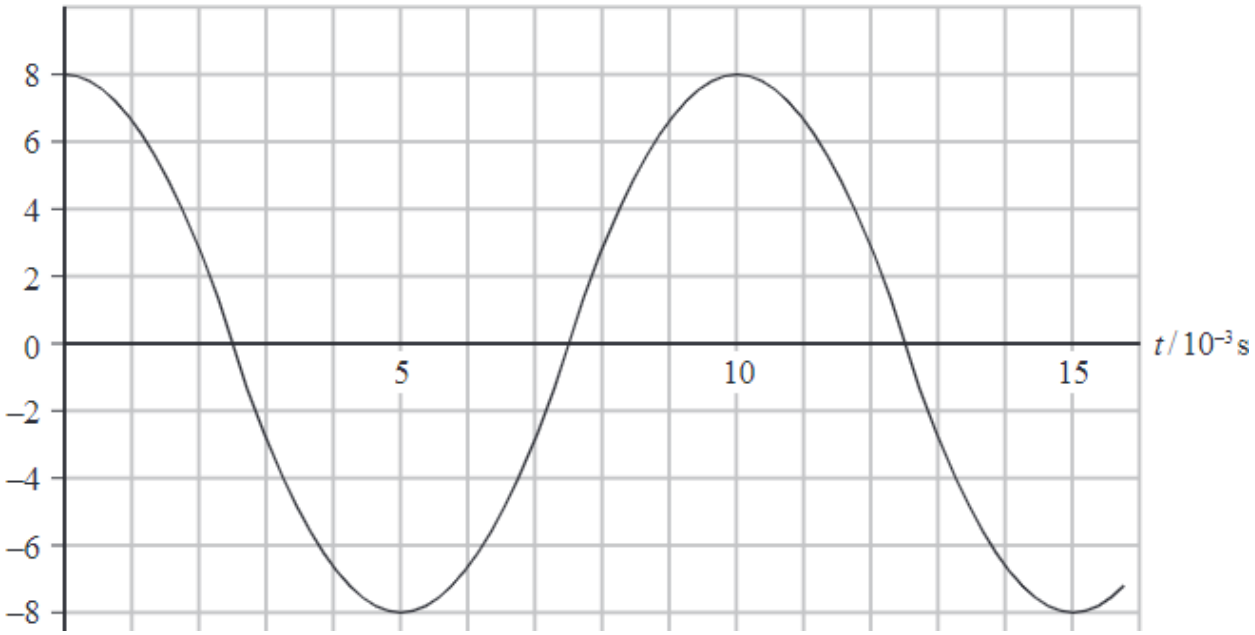
Discuss the extent to which the results of the alpha scattering experiments justified the replacement of the plum-pudding model with a nuclear model of the atom

Most alpha particles passed straight through the gold foil
Some alpha particles were deflected by small angles
Either model would predict small or zero deflections because in the nuclear model the atom is mostly empty space and in the 'pudding' model matter is too spread out
A few proportion of alpha particles were deflected by more than 90°
This did not fit the plum pudding model as this deflection requires a high concentration of charge (to provide a large force)
Or
This could only be explained by the nuclear model as this deflection requires a high concentration of charge to (provide a large force)
This did not fit the plum pudding model as this deflection requires a high concentration of mass (so that the alpha particle is deflected and not the gold nucleus)
Or
This could only be explained by the nuclear model as this deflection requires a high concentration of mass (so that the alpha particle is deflected and not the gold nucleus)

Explain the significance of this expression obtained for the operation of cyclotron

$$t = \frac{2\pi m}{Bq}$$

Time independent of speed **Or** Time independent of radius
So particles take constant time to complete circular path
Or so particles spend the same time in each dee
So a fixed frequency can be used for the p.d.
because the p.d./field across the gap will be in the correct direction to increase the speed of the particles as they cross each time



- **Explain why the value of e.m.f varies between a maximum value and zero**
- **Explain why the area under the graph represents the change in flux linkage**

Induced e.m.f. is equal to the rate of change of flux (linkage)
Or Induced e.m.f. is proportional to the rate of change of flux (linkage)

Maximum e.m.f. when coil is horizontal **Or** e.m.f. zero when coil is vertical

When the coil is horizontal;
(The side of the coil) is cutting the flux at maximum rate.
Or the flux linkage is zero so any movement will lead to decrease/increase

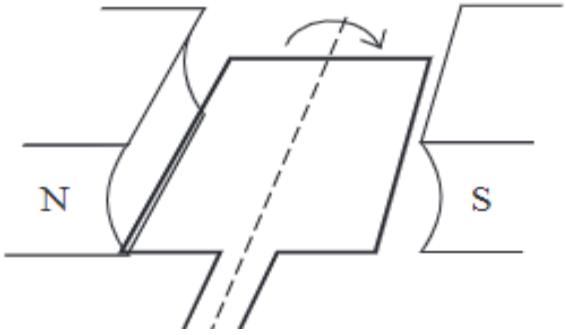
When the coil is vertical;
The (side of the) coil is moving parallel to the flux
Or (The side of the coil) is not cutting the magnetic field lines
Or the flux linkage is maximum and slight movement of the coil will lead to very little change.

$\varepsilon \, dt = d(N\varphi)$

where area = $\varepsilon \, dt$ **and** $d(N\varphi)$ = change in flux linkage

- **Answer of second question**

The Coil -



Explain why protons need high kinetic energy to produce such particles such as baryon during collision

Mass-energy is conserved (according to $E = mc^2$)

need large amounts of energy to create a large mass particle
Or need large amount of energy as "c^2" is a large value

extra energy needed comes from kinetic energy of protons
Or need to overcome (electrostatic) repulsion forces (between protons)

Or
Rest energy of a particle is mc^2

Rest energy of high mass particle is much greater than that of two protons

To conserve energy, lots of kinetic energy is required

Explain how LINAC accelerates a proton

Adjacent drift tubes have opposite potentials/polarity/charge

There is an electric field between drift tubes
Or There is an electric field in the gaps

This exerts a force on protons (and causes acceleration)

Idea that while the protons are traveling through a particular drift tube, the polarity reverses (so that once they reach the next gap they are again accelerated down the linac)

Explain why voltmeters should have high-resistance in capacitor involved circuits

The capacitor would discharge
Or Charge would be able to flow from the capacitor

At the start of LINAC, the drift tubes steadily increase in length along the path of the electrons. Explain why the drift tubes have a constant length at the other end of the LINAC

Speed of particles is near the speed of light
Or particles at relativistic speeds

Additional energy increases mass (not speed)
Or $E_K = \frac{1}{2} mv^2$ no longer applies

The idea that the alternating accelerating p.d. is synchronised with the passage of the electrons from one tube to the next, e.g. reference to tubes switching polarity at fixed time intervals

Time spent in each drift tube is constant and speed is constant (so length must be constant)

Explain which type of collision – colliding beams/fixed target is able to create a new particle with the largest mass/greater range of particles

Fixed target
There is momentum before the collision so there must be momentum after the collision.
So particle(s) created must have some kinetic energy
So not all KE converted to mass

Colliding beams
(If particles have the same mass and speed), total initial momentum is zero
Momentum after collision will be zero
If one stationary particle is created
All of the kinetic energy of the particle is converted to mass

State what is meant by De-Broglie wavelength

The wavelength (associated) with a particle/electron with a given momentum
Or
$\lambda = h/p$
all terms defined

Explain a neutral strange quark decays into a proton and a pion using the laws of conservation of momentum and energy?

Initial momentum of Λ is zero

proton moves off in opposite direction to pion

so, momentum of particles is equal and opposite

mass-energy of Λ = mass and E_k of p and π
Or links decrease in total mass to increase in kinetic energy

Explain how observations led to the following conclusions during the alpha scattering experiment

1. The atom is mostly empty space.
2. The atom contains a small region of highly concentrated charge.
3. Most of the mass of the atom is concentrated in a very small space relative to the size of the atom.

Conclusion 1
Observation - most of the alpha particles were undeflected
Or most of the alphas went straight through

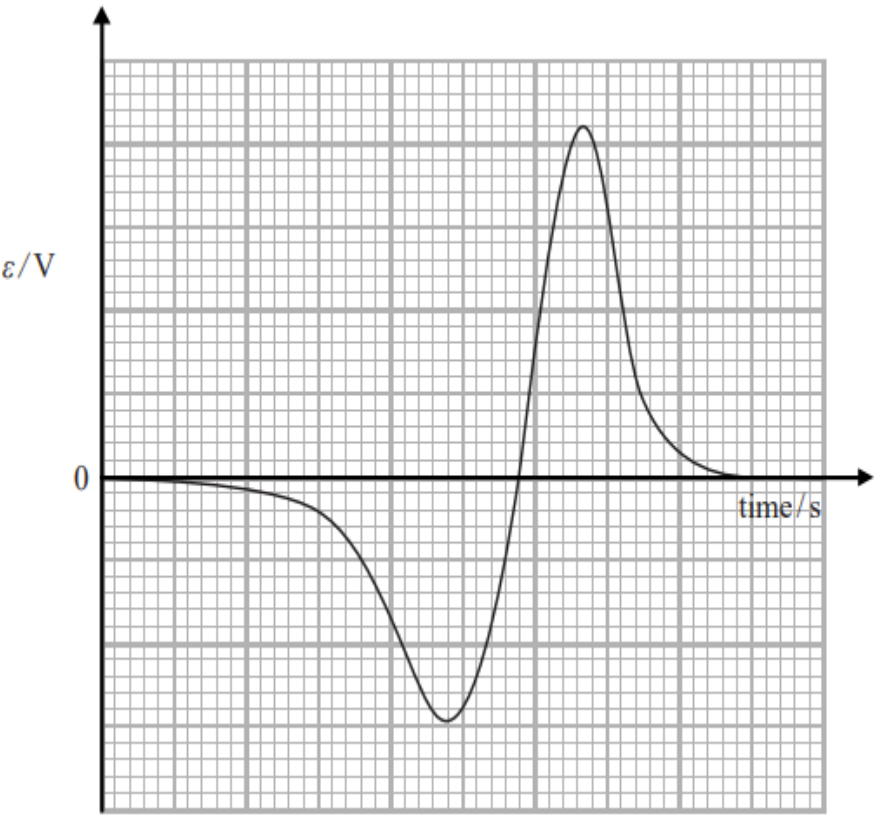
from this they could conclude –
that most did not get near enough to any matter to be affected

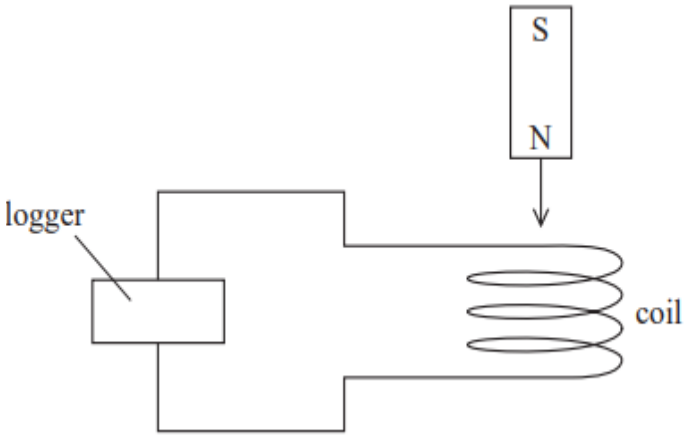
Conclusion 2
Observation - a few particles were deflected (by small angles)

from this they could conclude –
only a few particles came close enough to charge to be affected

Conclusion 3
Observation - a very small proportion of alpha particles were deflected through more than 90°

from this they could conclude that the nucleus must have mass much greater than the alpha particle mass in order to cause this deflection





Explain the shape of the graph (4 mark answer given below)

As the magnet produces a magnetic field as it moves down the coil cuts the magnetic field therefore since there is a change in magnetic flux linkage a voltage is induced $e.m.f = \frac{\Delta N\phi}{\Delta t}$. The magnet accelerates downwards ($a = 9.8 ms^{-2}$) therefore it leaves the coil faster than it enters hence voltage induced as it leaves is greater than when it enters. According to lenzs law the voltage induced opposes the change causing it hence as the magnet enters a North is induced on the top hence ~~current~~ voltage flows in one direction and as it passes the center the voltage induced is in the opposite direction therefore the gradient is initially negative then positive. Moreover, the area under ~~the~~ both graphs are the same as it represents magnetic flux linkage which remains constant

To get the 5th mark mention Lenz law concept

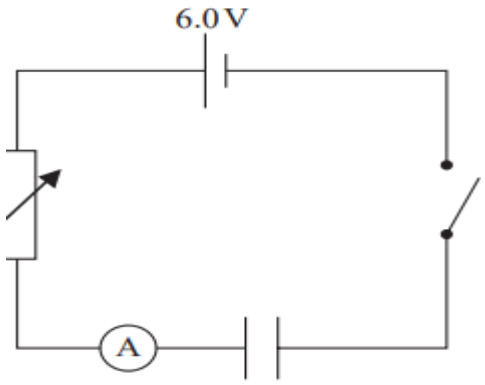
Explain why must there be resultant force acting on the cyclist?

Explain why a banked circular track acts an advantage to cyclists?

(1) Direction changing **Or** the velocity changes
Therefore (cyclist) accelerates

(2) The horizontal component of reaction force acts towards centre of rotation
Or The horizontal component of R provides/contributes to the centripetal force

The cyclist can go faster



Explain why there is max current when the switch is closed and why it decreases to zero over a period of time as the capacitor charges

Initially p.d. across C = 0V (producing maximum current)
Or initially p.d. across resistor is equal to e.m.f. of cell (producing maximum current)

As charge builds up on the capacitor the p.d. across resistor decreases (reducing the current)
Or As charge builds up on the capacitor, this opposes the flow of electrons/charge (reducing the current).

When capacitor is fully charged the p.d. across resistor is 0V (so current is zero)
Or Eventually, the p.d. across C = e.m.f. of cell (so current is zero)

Give similarities and differences between LINAC and cyclotron

Similarities

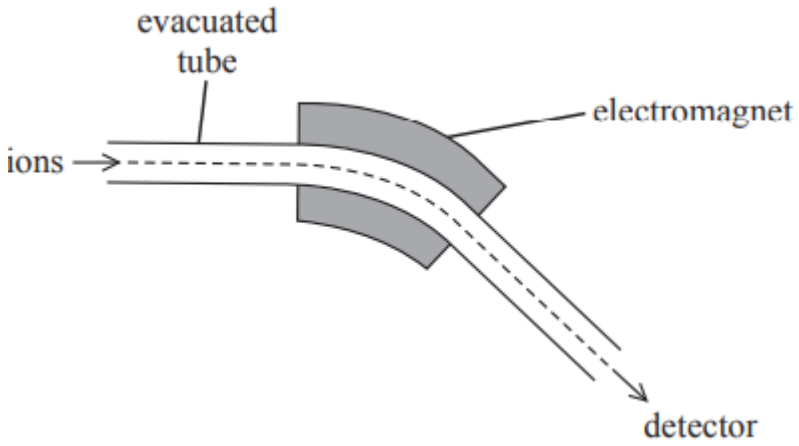
An electric field accelerates the particles

the time spent in each dee and each tube is constant
Or Particles increase in speed **only** in the gaps between dees and tubes
Or Particles travel at constant speed in dees and tubes

Differences

Cyclotron uses magnetic field (for circular path) but the linac doesn't

Idea that they manage the increasing speed of the particles in different ways, in the linac the drift tubes get longer and in the cyclotron the radius of the path increases

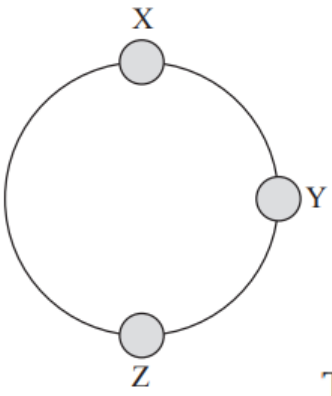


Explain how a magnetic field can be used to deflect the ion in circular path

the (magnetic) field acts at a right angle to the direction of motion
Or the velocity of the ion is perpendicular to the (magnetic) field

the force is perpendicular to the direction of motion.

the force acts as a centripetal force
Or this is the condition for circular motion



The tension in the chain varies as the sphere moves in the vertical circle.

State the position, X, Y or Z, at which the tension will be a maximum and the position, X, Y or Z, where it will be a minimum. Explain your answers.

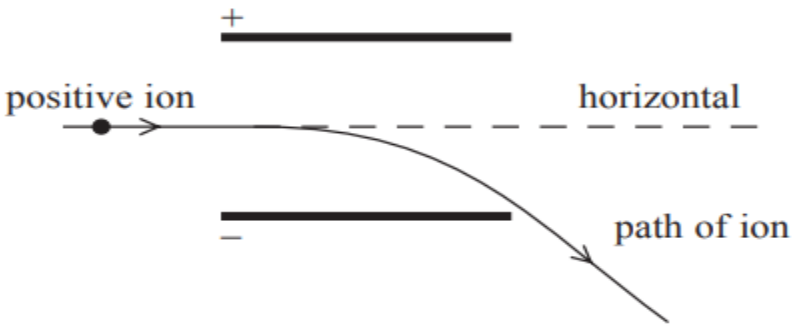
The centripetal force is the resultant force

Maximum at Z / bottom **and** Minimum at X / top

At Z Tension T greater than weight
(accept $T - W = mv^2/r$ or $T = W + mv^2/r$)

At X tension force is less than the weight.
(accept $W + T = mv^2/r$ or $T = mv^2/r - W$)

Explain the path of the ions between the plates and when it has left the plate



Between the plates there is a force
(references to repulsion and attraction are not sufficient)

Gives a downward acceleration
Or accelerates towards the negative plate

Constant horizontal velocity **Or** no forces act horizontally

Outside the plates no (electric) field /force acts
Or Outside the plates speed so large that gravitational effect negligible

During this mission, a planned explosion caused the separation of the module in which Armstrong was travelling and the final-stage rocket. This explosion resulted in an increase in the speed of the module.

Discuss how the conservation of momentum and the conservation of energy apply to this situation.

No external/unbalanced/resultant force so momentum of system is conserved

Rocket gains momentum in backward direction

Module gains equal amount of momentum in forward direction

Kinetic energy of the system increases

(Some) chemical energy converted to KE

PHYSICS U5 IMPORTANT QUESTIONS

Explain the conditions required to bring about and maintain nuclear fusion in stars

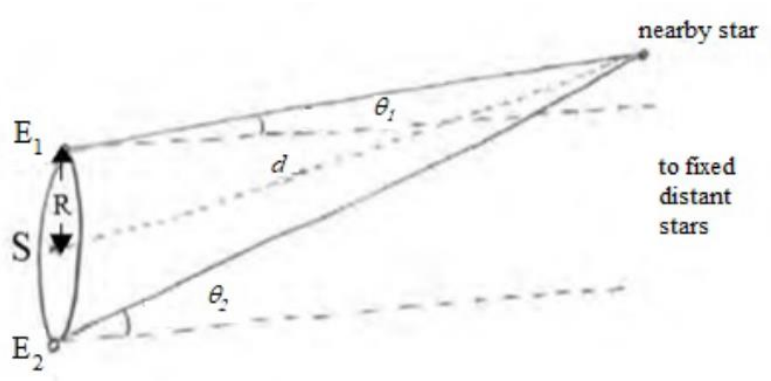
There is a very high temperature (in the core)
(So) nuclei/protons have a high kinetic energy
(Sufficient) to overcome electrostatic repulsion
And allow nuclei/protons to get close enough to fuse
Gravitational forces produce a very high density (in the core)
(So) the collision rate is high enough to sustain fusion

Describe how trigonometric parallax can be used to find distance to nearby stars

Find (angular) displacement of the star (as Earth moves around the Sun) over a 6 month period
Or find (angular) displacement of the star (as Earth moves around the Sun) over a diameter of the Earth's orbit

Measurements are made against the background of (more) distant stars

Radius/diameter of the Earth's orbit about the Sun must be known/measured (to calculate the distance to the star)



1) What is Simple Harmonic Motion?

(For simple harmonic motion the) acceleration is:

- (directly) proportional to displacement from equilibrium position
- acceleration is in the opposite direction to displacement
  Or (always) acting towards the equilibrium position

OR

(For simple harmonic motion the resultant) force is:

- (directly) proportional to displacement from equilibrium position
- force is in the opposite direction to displacement
  Or (always) acting towards the equilibrium position

2) What is Resonance?

An oscillating system is driven/forced at its natural frequency

There is a maximum transfer of energy

Resulting in an increasing/maximum amplitude of oscillation

3) What is elastic material?

Material returns to its original shape (and size) once (deforming) force removed

State differences and similarities between gravitational and electric fields

Gravitational fields are regions in which a mass experiences a force due to its mass
Electric fields are regions in which a charge experiences a force due to its charge

Both types of field have an infinite range

In each type of field the force varies as an inverse square

The force between masses is always attractive whereas the force between charges can be attractive or repulsive
Or electric fields can cancel or reinforce but gravitational fields always reinforce one another

The force between (unit) charges at a given separation is much stronger than the force between (unit) masses at the same separation

Explain how a massive planet orbiting a star can cause a change in the wavelength of light received from the star

The (massive) planet exerts a (large) gravitational force on the star.

The velocity of the star relative to the Earth changes.

(which causes a varying) Doppler shift

Explain why fusion of hydrogen nuclei should release energy

Mass of fused nucleus is less than sum of masses of fusing nuclei

Mass difference/deficit releases energy according to $\Delta E = c^2 \Delta m$

Explain why fusion isn't a viable source of energy at Earth

(Very) high temperatures are needed to give hydrogen/nuclei/protons enough kinetic energy to overcome the repulsive force (between charges).

High densities are needed to enable a high enough collision rate (of nuclei to sustain the fusion reactions)
Or
High densities are needed to enable a high collision rate (of nuclei) in order to sustain the fusion reactions

If the material/plasma undergoing fusion (on Earth) were to touch the container the temperature would decrease and fusion would stop
Or
If the material/plasma undergoing fusion (on Earth) were to touch the container then the container would melt (and containment cease)

(On Earth) strong magnetic fields are required because there are containment problems for a material undergoing fusion.

Explain in terms of momentum and motion of the molecules why pressure decreases as temperature of air falls

As the temperature of the air decreases the average/mean kinetic energy of the molecules decreases

So the (root mean square) velocity/speed of the molecules decreases

Or (Since $E_k = \frac{p^2}{2m}$) the (average) momentum of the molecules decreases

The change of momentum of a molecule during a collision with the container walls decreases

The rate of collision of molecules with the walls of the container decreases

So the rate of change of momentum decreases and so the force on the container walls decrease s

Hence the pressure exerted by the gas decreases, since $p = F/A$

Explain how standard candles can be used to determine distance to distant galaxies

A standard candle is a (stellar) object of known luminosity (L)

(accept locate an object of known luminosity)

The (radiation) flux (F) of the candle/star is measured (at the Earth)

$F = \frac{L}{4\pi d^2}$ is used to calculate the distance d (to the standard candle)

(symbols must be defined)

Discuss how the absence of dark matter in parts of the universe might affect the ultimate fate of the universe

Dark matter adds mass to the universe (and hence increases the average density of the universe).

The absence of dark matter (in parts of the universe) would reduce the density of the universe
Or the absence of dark matter (in parts of the universe) would reduce the gravitational forces (between galaxies in these regions)

The ultimate fate of the universe is dependent upon the (average) density (of the universe)
Or The rate of expansion of the universe is dependent upon the size of the gravitational forces

If the (average) density of the universe is less than a critical value, then the universe may continue to expand forever

Explain why motion of the atoms in the outer regions of the star causes the wavelength to become a range of wavelengths?

There is a Doppler shift (of the emitted radiation)

Motion (of atoms) towards the observer decreases the wavelength detected
Or motion (of atoms) away from the observer increases the wavelength detected

The hydrogen atoms have a range of (components of) velocities hence there is a range of wavelengths detected

What is parallax?

Parallax is the (apparent) change in position (of a star/object) relative to the background (owing to a change in position of the observer)

Why nuclear fission is only possible as an energy source from a massive nucleus?

(In fission) the nucleus splits to form less massive fragments
[Accept lighter fragments]

The binding energy per nucleon increases
Or The (fission) fragments are higher up the B.E. per nucleon curve

The increase in B.E per nucleon is quite small, but the large number of nucleons (in nuclides likely to undergo fission) means that the overall energy release is very large

- **Fission of smaller nuclei requires energy as the binding energy per nucleon decreases.**

Explain the limitations to the elements suitable for fusion?

Fe is the lowest point of the graph **Or** Fe has the smallest mass per nucleon

So fusion of nuclei more massive than Fe will require energy input
Or only elements with smaller nucleon number than Fe are suitable for fusion

Outline the method used by astronomers to determine distances to more distant galaxies of the universe

The frequency /wavelength of a line in the spectrum emitted by the distant galaxy must be measured

Determine the difference between this frequency/wavelength and the same line in a lab source

The Doppler equation is used to determine the velocity of the galaxy (relative to the Earth)

Hubble's law is used to determine the distance (of the galaxy from the Earth)

Source	Radiation emitted
Americium	α
Radium	α, β, γ
Strontium	β, γ

Describe an experiment using absorbers of different materials that could be carried out to identify the sources.

(With no source present) record the background count

(Handling the source with tongs) fix one source close to the GM-tube

Introduce a sheet of paper/aluminium between the source and the GM-tube

If paper/aluminium reduces the count rate to background levels it is the americium source

If paper causes no change in the count rate it is the strontium source
Or
If thin aluminium causes a small change in the count rate it is the strontium source

If paper reduces the count rate but the count rate is still above background levels it is the radium source

State two advantages of obtaining nuclear power from fusion instead of fission

Virtually unlimited fuel supply for fusion, but limited fuel for fission.

Hardly any radioactive waste for fusion, but significant radioactive waste for fission [accept "no" for "hardly any"]

What is half-life?

Half life is the average/mean time taken for half of the (unstable) nuclei/atoms to decay

Or Half life is the average/mean time taken for the rate of decay of (unstable) nuclei/atoms to fall to half of its original value

What is Damping?

(Damping is) the removal/dissipation of energy from an oscillation

(Hence) there is a decrease in the amplitude

Explain how fusion of hydrogen to helium in star core enables large amount of energy to be released

Mass is converted to energy

according to $\Delta E = c^2 \Delta m$, where Δm is the mass deficit/lost

Although energy released per fusion is small, fusion rate is very large