**Mitosis and Meiosis Playdoughmation Project**

You will need different colors of play dough and yarn.

Use play dough for the different chromosomes and the centrioles.

You can either use play dough or yarn for the spindle fibers and nuclear membrane.

For mitosis, use 3 chromosomes. For meiosis, use 4 chromosomes.

**Taking the Pictures**

Place your figures and props on the background. Practice moving them before you begin taking pictures.

Place the camera on **a tripod. It is essential to use one**, or the picture will jump from frame to frame.

Adjust the camera so that only the backdrop is showing in the picture. There will be too many pictures to go back and crop the wall or countertop out of each one.

Practice reading the narration to get a general estimate of how long each section will be. You want to have four pictures per second, so take the number of seconds and multiply by four. It is a good idea to take a few extra pictures to allow yourself a little wriggle room.

Take a picture. **Move the figure or figures that you want to animate a quarter of an inch**. Take another picture. Repeat this process until all of your pictures have been taken.

**Making the Movie**

Transfer the pictures to your computer.

Open Windows Movie Maker. Is comes free with Windows XP. To find Movie Maker, select "All Programs" on the Start Menu and then select "Movie Maker."

Set the amount of time each clip will last. In the toolbar, click on "Tools" and then select "Options..." Click the "Advanced" tab. Set the clip duration and the transition duration to 0.25 seconds.

From the menu on the left, choose "Import Pictures." Choose the pictures you want to import to Movie Maker and click "OK."

Select all of the pictures and drag them down to the timeline.

Click on the microphone to narrate the timeline. You can narrate it all at once or one section at a time. Click "Start Narration" to begin and click "Stop Narration" to end. You may need to use an external microphone if your computer does not have one built in.

Adjust the length of the pictures and the narration in the timeline by dragging the edges in our out. You can check your work by clicking the "Play" button on the viewing screen.

When you are finished, click on "File" and choose "Save Movie File." Follow the steps. You will then have a movie that will play in Windows Media Player.

1. Prokaryotes do not have membrane bound organelles, like a mitochondria and chloroplast, so A and B are wrong. The cytoplasm is a clear Jelly like fluid. It needs a membrane for the ETC. Remember a gradient is used to through the membrane for chemiosmosis. Which membrane is better, the plasma or outer membrane? Answer C

2. I told you to remember this 15 times. I even said the pneumonic to use in class and on the review. “HI” intermembrane space. Answer D

3. Very good higher level question. Oxidative phosphorylation involves a proton (H+) gradient. Remember, some cells use something other than oxygen to catch the falling e-. I am sure a lot of you put C. Remember prokaryotic cells do not have a mitochondria. answer D

4. Same idea as question one. Bacteria would not have a chloroplast, so A and B are immediately wrong. Remember, they need a membrane. Bacteria do not have a membrane bound nucleus and of course cytosol is not a membrane. Answer E

5. Energy – passing e-, they do have long C tails with their buddy H attached to them. It is easy to strip an e- off of the H atoms. Yes, C is used to produce CO2 in respiration and we fix C in photosynthesis, but the question is asking about energy, not structure. Answer D

6. The Calvin cycle is the 2nd part of photosynthesis. What does photosynthesis do? Make sugar, specifically a 3C sugar. We are going to fix a C to a 5C RuBP molecule (now a 6C molecule) and reduce it to a 3C sugar. Answer E

7. 4 of the 5 answers take place in a mitochondrion. Answer A

8. When do we make O2 during photosynthesis? When plants split water and use one of the e- to replace the e- that left in the linear flow. That would be when PS II is working. That would be when there is light. Answer A

9. Good question. You have to read the text for reinforcement. AP Biology loves evolutionary ideas. C, D, and E are wrong. B answers why it evolved, not what it produces like answer A.

10. Only 2 ATP net made during glycolysis. Oxidative phosphorylation makes a ton of ATP with oxygen in the mitochondria. Must be substrate level phosphorylation. Answer A

11. Glycolysis does not use a mitochondrion. Answers A-D have mitochondria in their answers. Answer E

12. Light reactions make ATP and NADPH for use in the dark reactions, that take place in the stroma. The dark reaction (light independent reaction) is the Calvin cycle. Answer B

13. Oxygen is very electronegative. It likes to catch e-. Oxygen will catch the e- and hook up with a H+ to make water. In fact, the presence of oxygen to catch the e- is biggest reason why oxidative phosphorylation happens. Answer B

14. Fermentation does not use Oxygen and will produce lactic acid or ethanol. Glycolysis can break down sugar with or without Oxygen. So, Glycolysis happens with or without oxygen. If oxygen is present, it will undergo oxidative phosphorylation. If oxygen is not present, it will undergo fermentation. So, fermentation has to be without oxygen. C, D, and E have to have Oxygen. answer A

15. NAD+ is used in fermentation to oxidize glucose. NAD+ gets reduced in the process. We cannot just keep using NAD+ because we would eventually use it all up. So fermentation has a way to oxidize “recycle” NADH back to NAD+. Answer C

16. I am going to say this again. Highlakoid thylakoid, low stro(mo). This tells me the thylakoid space has a high concentration of H+ ions (**which is a low pH**). The stroma has a low concentration of H+ ions (which is a higher pH). Answer A

17. Remember, ATP and NADPH are made in the light reactions. Answer A

18. In photosynthetic cells, probably just threw you off. You saw photosynthetic and just thought about photosynthesis. Do not forget, plant cells have mitochondria too. Is there an ETC in chloroplasts? YES, in the membrane between PS II and PS I. Is there an ETC chain in mitochondria? Yes. Both ETC chains undergo chemiosmosis to make ATP. The answer is C

19. In the light, photosynthesis would occur. At night, respiration would occur in pant cells. Remember, they have mitochondria too. So in the light, they photosynthesize and produce oxygen, and in the dark, they would respire and use oxygen. Answer D

20. Photorespiration is when RuBisCo picks up O2. This happens to C3 plants a lot during hot dry days when they cannot afford to open their stoma. C4 plants are “built differently and use PEPcase that fixes C only. Answer B

21. If it depends on a proton-motive force (H+), it probably needs energy. Answers B-D do not use energy, but answer A does.

22. We use yeast to brew beer and wine. Why? Yeast undergoes fermentation to produce alcohol. That is called alcoholic fermentation. Animal cells would use lactate fermentation and produce lactic acid. Answer A

23. Pyruvate is a 3C molecule. One C is stripped off and given off as CO2. That leaves 2C left as acetyl coenzyme A. answer A

24. Plants are green because they absorb all of the colors of light except green. The green color reflects back and that is what you see. If the leaves are reddish yellow, I will bet the answer does not have the colors red or yellow being absorbed. All answers have a red or yellow being absorbed except one. Answer B

25. Breaking down one molecule of glucose will yield about 30-32 ATP, so 2 glucose will probably yield around twice that much. 2 X 30 or 32 = 60 or 64 Answer E

26. When the e- leaves the pigment complex of PS II, it has to be replaced. Water is split into H+ and e-. The e- is given to the complex to replace the one that went to linear flow. H+ are used in the gradient, and O2 is released into the atmosphere. That why plants “exhale” oxygen. Answer B

27. What does glycolysis produce? 2 ATP by substrate level phosphorylation, 2 NADH when we oxidize the glucose and reduce NAD+, and 2 3C pyruvate molecules when we break the 6C glucose down in two separate molecules. Answer B

28. Glycolysis proceeds with or without oxygen. All other answers involve a mitochondrion and they need oxygen to work. If there is no oxygen, it will never get to the second step and use the mitochondrion for oxidative phosphorylation. Answer B

29. Carotenoids are plant pigments. They help absorb light energy and pass it along to the PS complex. Since there are different wavelengths of light, they would also help in protecting the plant against different wavelengths of light energy. They made a comparison to animals with carotenoids ***protecting*** animals with antioxidants. Well, it also protects plants by absorbing the energy in sunlight. Answer B

30. Light reactions have to take place in the light. Light-independent (Dark) reactions can take place anytime. So plants can respire 24/7/365. Answer C

31. Absorption spectrum analyzes the different wavelengths of light being absorbed. Action spectrum analyzes how much O2 is being produced as a by-product, when photosynthesis is occuring. (Remember water splitting) Again, there are more pigments than just chlorophyll a. Chlorophyll a only absorbs a certain wavelength. Why then does photosynthesis occur and O2 given off at other wavelengths? Because of answer D.

32. C3 plants struggle on hot dry days when stomata close. When stoma close, not much CO2 gets in. Kinda hard to get through a closed door. There is only one answer. The other 4 are highly incorrect. Answer A

33. Adding a phosphate gets things going. Adding the P gives it energy. (That is called phosphorylation. Kinases like to phosphorylate.) Answer D

34. C4 plants have a mesophyll cell which fixes CO2 only and passes it into the bundle sheath cells. PEPcase is the CO2 fixer that picks up CO2 only, and not oxygen. This ensures CO2 is getting into the bundle sheath cells and not O2. answer B

35. You have to read your text. They talked about photorespiration being a relic that helps protect the plant against too much light. Oxygen being super electronegative and acting like a free radical screwing up the e- arrangement is not good. Photorespiration locks up oxygen so it does not get too out of hand. That is about the only good thing it does. The product it produces does nothing for the cell, but that is not what the question wants. It is asking about the good thing it does.

36. Substrate level phosphorylation produces 10% of the ATP. That is very poor. Oxidative phosphorylation produces 90%. It blows substrate level P away in the production of ATP. Answer E

37. Remember question #18? In a plant cell, plants have chloroplast. Plants also have mitochondria. What do both organelles have in common? Think inside a membrane. Answer D

38. Where is the ETC and ATP synthase located? Is it referring to chloroplasts, mitochondria, or both? Look at the answers. In a mitochondria? Think membrane. Christae. Where are they? Answer C

39. Remember question #18 and #37? A proton motive force exists in chloroplasts and mitochondria. Both have an ETC in a membrane. Answer C

40. What makes ATP during oxidative phosphorylation? When all the H+ ions come rushing back through the ATP synthase gate by diffusion, turning the turbine, slamming ADP and P together. **H+ ions are protons!** Answer D

41. This is describing a redox reaction. During the e- flow, energy is released! If an e- moves toward an atom, it will reduce it. Answer A

42. What happens in the Calvin cycle? Fixation, reduction, and regeneration. The question talks about the first two. What is left? Regeneration. What is getting regenerated to be used again? RuBP answer D

43. What does oxygen do in cellular respiration? O is very electronegative. It likes to catch e-. answer B

44. Linear flow does not cycle or “recycle” the e-. The e- leave to be used in the dark reactions. The product of PS II is ATP. The product of PS I is NADPH. Answer C

45. The glucose has hilltop e-. We are going to strip them off. Therefor we will oxidize glucose. Remember O likes to catch them so we will reduce it. Answer A

46. See explanation #44. Answer A

47. Stroma. Answer A

48. Glycolysis occurs with or without O2. All other answers need Oxygen. Answer D

49. A is the only answer. All others are false.

50. Pigment molecules help absorb light at varying wavelengths. Light is energy. They pass the energy to the complex. Answer B

51. See #47. Answer A

52. NADH produces more energy than FADH2. NADH places the e- higher on the hill. So FADH2 is lower in energy. Answer E

53. NADP+ in photosynthesis and made in light only through linear flow. NADH+ in respiration. Answer A

54. CAM plants close their stomata during the day and open them at night to conserve water. If they open them at night, that is when they will fix C. Answer A